TRL Shaping transport

TRL REPORT XPR148
Evaluation of Bikeability Level 3 Training
Long-term impact

S Bozorg, A Rajasooriya, A Asmal, D Jenkins, T Pallikarides, J Weekley, G Beard

Report details

Report prepared for:	The Bikeability Trust
Project/customer reference:	11226467
Copyright:	© TRL Limited
Report date:	April 2026
Report status/version:	1.0
Quality approval:	

E Valdez (Project Manager)		G Beard (Technical Reviewer)	

Disclaimer

Contents amendment record

This report has been amended and issued as follows:

Version	Date	Description	Editor	Technical Reviewer
1.0	02/04/2026	First draft	SB	GB
2.0	01/05/2026	Final Report	SB	GB

Document last saved on:	01/05/2026 15:07
Document last saved by:	Sanaz Bozorg

Table of Contents

Executive Summary

Study aims

The Bikeability Trust commissioned TRL to explore the relationship between Level 3 (L3) cycle training, participation in cycling to/from school and the provision and quality of cycling infrastructure around schools. The study adopted a multi-method approach, including:

- A structured literature review examining existing evidence on the interaction between infrastructure and cycle training on cycling participation.
- Case study analysis of nine schools across York, Essex, Lancashire and London, involving:
    - On-street infrastructure audits to assess cycle infrastructure provision and factors such as route continuity, junction safety, and comfort
    - Analysis of reported cycling to/from school collected via pre- and post-training surveys administered by The Bikeability Trust
    - Analysis of STATS19 collision data (2015–2024) to identify trends in collisions involving cyclists aged 11-18 years old (i.e. secondary school age).

The study had two principal aims:

1) to explore how cycle training and cycle infrastructure interact to influence the ability and willingness of secondary school pupils to cycle safely and regularly, and
2) to provide recommendations on how to scale the case study analysis to other schools and areas, providing a repeatable approach which can be used to build a national dataset.

The findings in relation to each of these aims are summarised below.

The interactive effects of cycle training and cycle infrastructure

Evidence from the literature review showed that while cycling brings clear health and environmental benefits, secondary school pupils' cycling rates remain low because both cycling skills and the environment influence whether young people can and choose to cycle. High-quality, continuous cycling infrastructure, particularly protected routes, safer crossings, simpler junctions, and lower traffic speeds, plays a critical role in shaping children's actual level of risk and parents' perceptions of safety. These infrastructure characteristics are consistently associated with higher cycling participation and safer conditions on school journeys.

The literature review also showed that cycle training can improve children's skills, hazard perception, and confidence, supporting safer riding when they do cycle. However, the evidence identified suggests that training alone rarely increases cycling frequency, with route barriers and parental safety concerns often presenting significant barriers to greater cycling participation. The literature therefore suggests that the most effective approach for encouraging greater cycling participation is to combine high-quality infrastructure with skills training. Infrastructure reduces exposure to risk and improves the perceived safety of both parents/carers and children, while the training helps pupils develop safety-critical skills and build confidence, thereby reducing the impacts of any on-road risks that remain.

Assessing training outcomes alongside key environmental factors such as route quality, network connectivity, and collision patterns, especially at high-risk points such as crossings and junctions, provides a strong basis for understanding how training and infrastructure interact to influence pupils' willingness and ability to cycle safely and regularly. The case study analysis at nine selected schools set out to do exactly this, however limited responses to pre- and post-training survey responses were available for children who had completed Bikeability L3 at the case study schools. As such, there was insufficient data on participation in cycling to school to draw firm conclusions on this interaction from the case study analysis. Nevertheless, the following insights were drawn from the on-street infrastructure assessments and the collision data analysis at the case study schools.

- **Infrastructure barriers**: Site audits showed that cycling conditions around the case study schools were generally 'poor' to 'moderate'. Even in areas with high connectivity, cycling infrastructure was fragmented and inconsistent, requiring cyclists to negotiate complex junctions and share space with motor traffic.
- **Environmental constraints**: In the areas surrounding the London schools, high parking density and through-traffic on residential streets increased exposure to risks by forcing cyclists into narrow spaces between parked and moving traffic, and introduced hazards associated with parked car doors being opened. In the Lancashire and Essex school areas, domination of car-oriented layouts and large junctions reduced suitability for cycling and act as key deterrents. Whilst audits were limited only to nine schools in England, they highlight the types of risks and infrastructure challenges faced by cyclists which should be addressed in order to encourage greater participation.
- **Collision and risk patterns**: A total of 96 cyclist collisions involving secondary school-age riders were recorded across the nine study areas between 2015-2024. Most collisions resulted in slight injuries, and involved collisions with cars on the main carriageway. Higher collision numbers were observed in areas surrounding the two York schools compared with the other seven schools, however the lack of robust data on cycling activity means that injury rates cannot be calculated and therefore it is not known whether higher collision numbers are due to higher exposure or poorer safety conditions (or both).

Expanding the analysis in future research

The case study analysis considered three sources of data on infrastructure provision: iRAP/CycleRAP, OpenStreetMap data, and the on-street assessments using CERS (Cycle Environment Review System). CERS is the most robust and reliable of these methods, however it is also the most resource intensive. For the purposes of informing future research to scale the approach taken here to other schools and locations, it was therefore beneficial to assess how well the desk-based methods compare with on-street audits.

The available iRAP and CycleRAP data in the study areas was limited to the Strategic Road Network (SRN), managed by National Highways. No data was available for local roads and therefore this source was deemed to be insufficient for the study. Future studies in other locations may be able to make use of local road iRAP/CycleRAP data where relevant iRAP surveys have been undertaken, however it is expected that the overall sample of data for local roads is relatively small. As such, it is recommended that iRAP/CycleRAP data is deprioritised in future studies.

An initial desktop review using OpenStreetMap data and satellite imagery was undertaken for the selected case study schools and this proved useful for identifying route structure and an indication of the extent of cycle infrastructure provision. However, OpenStreetMap was not sufficient to assess infrastructure quality, user comfort, or junction complexity. On-street site assessments revealed considerable gaps between the mapped data and real-world conditions. While more resource-intensive, on-site assessments are therefore recommended as the preferred method for future studies, particularly where an accurate understanding of cycling conditions is required.

Recommendations

- **Prioritise provision of safe and consistent cycling infrastructure**: Investment should focus on continuous, dedicated cycling provision along key routes to school, reducing reliance on mixed traffic conditions. This should also include measures to improve junction safety, including clearer priority and safer crossing facilities, which are essential to reduce conflict and improve usability.
- **Adopt an integrated investment approach**: Local authorities should align cycle training programmes with infrastructure planning to maximise the impacts of both interventions on cycling participation.
- **Expand the research to additional schools and areas**: The scope of this study was limited to nine selected case study schools, and the ability to draw firm conclusion was further limited by the lack of available data on cycling participation amongst L3 learners. Future research would be beneficial to expand the approach taken here to additional schools and areas, enabling a national dataset to be developed over time. Such a dataset could be valuable for prioritisation of infrastructure funding, supporting implementation of an integrated approach noted above.
- **Strengthen evaluation**: Expansion of the research to other schools and areas is reliant on obtaining robust samples of pre- and post-training survey data, so that reliable measures of participation in cycling to/from school can be analysed alongside variables related to infrastructure quality. It is therefore recommended that interventions are considered to increase the response rates to pre- and post-training surveys, such as additional incentives, survey reminders and seeking support from schools and Training Providers.
- **Maintain focus L3 training on real-world conditions**: The L3 programme should continue to emphasise the application of established skills in realistic on-road settings, particularly when managing interactions with motor traffic and navigating complex junctions and constrained layouts encountered on everyday school journeys.

1 Introduction

1.1 Background

The Bikeability Trust, supported by funding from Active Travel England (ATE), works with local highway authorities and training providers to deliver Level 3 (L3) cycle training to equip young school children with the skills and confidence to cycle on more complex roads. While there is growing evidence on the impact of cycle training on knowledge, confidence and behaviour, there is less clarity on how training interacts with the surrounding street environment and recorded cycling collisions.

Children do not cycle in isolation. Their (and their parents'/carers') decisions to cycle to school depends not only on their skills, but also on the quality of the infrastructure they encounter, and the safety risks present on their journey. In some locations, high quality cycle infrastructure and low collision risk may support and reinforce training. In others, limited or hostile street environments (and poor-quality cycle infrastructure) may constrain and discourage children to cycle, even where training has been delivered.

At present, The Bikeability Trust collects survey data on children's cycling frequency before and after L3 training. However, infrastructure quality around schools has not been systematically assessed using a consistent and objective method, and local cyclist collision patterns have not been analysed alongside training outcomes. Without these additional data points, it is difficult to understand the extent to which any changes in cycling outcomes following training are mediated by the quality and nature of the environment in which children cycle.

In response to this gap, The Bikeability Trust, with support from ATE, commissioned TRL to explore how L3 training outcomes may relate to the surrounding street environment. To do this, TRL undertook a structured literature review and case study analysis at nine selected schools. The literature review gathered existing evidence on the interactive effects of cycling infrastructure and cycle training on cycling participation and safety. For the case study analysis of each school, we assessed L3 training data (on reported cycling levels before and after training), undertook structured infrastructure audits on selected school routes, analysed STATS19 cyclist collision data, and reviewed local socio-economic context.

By analysing these data together, the study sought to explore how training, infrastructure and collision patterns interact in shaping children's ability and willingness to cycle to and from school safely. The study also sought to provide recommendations on how to scale the analysis to other schools and areas, providing a repeatable approach which could be used to build a national dataset.

1.2 Objectives

The objectives of the study were to:

- Review existing evidence on the relationship between cycle training, cycling infrastructure, and cyclist collision risk and cycling to school.

- Describe patterns in reported cycling to school before and after L3 training at selected schools.
- Assess and audit the quality of cycling infrastructure around selected schools.
- Analyse recorded cyclist collision data and relevant socio-economic indicators around the selected schools to understand the local safety and contextual environment.
- Examine how training outcomes, infrastructure quality, and collision patterns relate to cycling participation among school-aged children.

1.3 Overview of approach and structure of this report

The approach followed a structured and evidence-based process, with the following activities being undertaken:

- **Literature review:** We conducted a focused literature review to identify what is already known about cycling behaviour, training effects, infrastructure quality, and cyclist collision risks. The findings are summarised in Section 2.
- **Case study analysis:** We undertook a case study analysis on nine schools selected to represent a range of cycling and environments (Section 3). This included:
    - Initial desktop analysis and assessments of infrastructure to inform final school selection (Section 3.1).
    - Assessment of cycling infrastructure provision in the areas surrounding each case study school (Section 3.2).
    - Analysis of cycling to school based on survey data from L3 learners to understand reported cycling levels before and after training delivery (Section 3.3).
    - Analysis of STATS19 collision data (Section 3.4) to understand the local context and safety trends.

The findings from the work are discussed in Section 4, along with overall recommendations.

2 Literature Review

2.1 Introduction

There is a growing consensus that cycling confers significant public health and environmental benefits by increasing physical activity and reducing the negative impacts of car use (Pucher et al., 2010). However, concerns about safety, especially the risk of collisions and injury, still limit cycling and influence whether children cycle to school (Boland et al., 2025). This review summarises what is known about how cycling infrastructure and cycle training relate to cycling to school, and how they link to cyclist collisions and injuries.

2.2 Literature search methodology

A list of search terms was created to guide the evidence review (see Table 1). These search terms were used across several research databases (Google Scholar, ScienceDirect, Springer, MDPI, Taylor and Francis, and PubMed) as Boolean search expressions. Multiple searches were conducted within each database through an iterative process, testing search terms individually and in combination to identify which yielded relevant results. The titles of the first 100 results after each search were examined, and sources with pertinent titles were downloaded for abstract review. This approach ensured that the search was as comprehensive and effective as possible in identifying appropriate literature.

Table 1. Search terms used to identify literature (* indicates wildcard)

1st Level		2nd Level		3rd Level
cycl* infrastructure	AND	cycl* training	AND	cycling to school
bike infrastructure		bike training		school travel
cycl* lanes		cycl* proficiency		active school travel
bike lanes		Bikeability		school commute
active travel infrastructure		cycl* education		barriers to cycling
built environment		collision		
road design		accident		
cycl* collisions		crash		

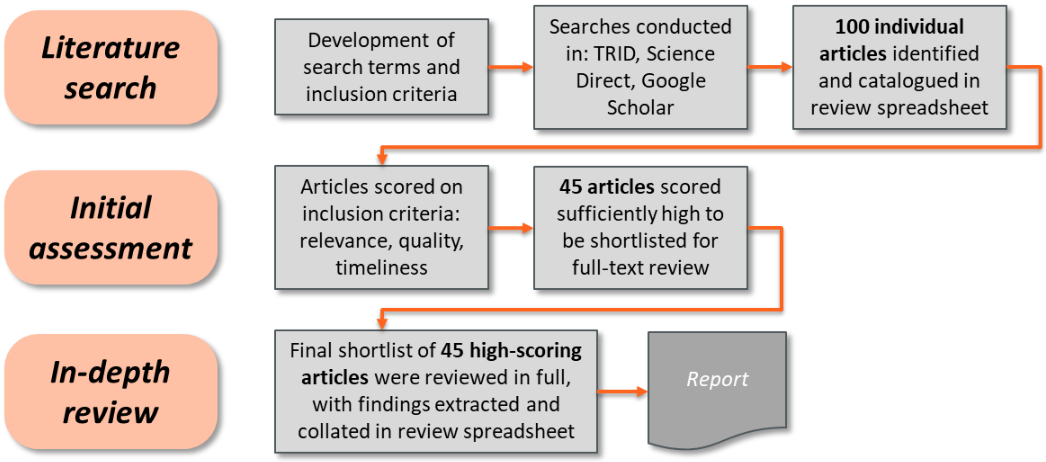

Figure 1. Diagram illustrating the evidence review methodology

We summarised key information found in the relevant literature. This was organised in a table in Microsoft Excel, which included the search terms used to find the article, the direct link to the references, study design, sample, country, study aims, and study findings.

The review synthesised evidence on cycling infrastructure, drawing on global analyses and intervention-specific studies to show how route continuity, separation from traffic, and high-quality facilities shape cycling behaviour (Section 2.3). We then narrowed our focus to the school context, identifying the infrastructural weaknesses commonly found around schools and their implications for children's mobility and safety. The review subsequently evaluated the effectiveness of cycle training and related "soft" measures, considering how skills, confidence, parental perceptions, and social factors influence children's decisions to cycle to school (Section 2.4). Building on this, we examined cyclist collisions and injury risk in school travel, highlighting how route design, junction complexity, traffic speed, and specific hazards shape risk, and why exposure and context must be considered when interpreting collision data (Section 2.5). Finally, the review integrated findings across infrastructure, training, and safety evidence to explain how these elements interact, with a summary of the conclusions that can be drawn from existing evidence (Section 2.6).

2.3 Cycling infrastructure and cycling to school

Cycling levels tend to be higher where routes provide continuous links to key destinations without major gaps in the network (Pucher et al., 2010), (Millard-Ball et al., 2025), (Bons et al., 2026). A comprehensive review by (Pucher et al., 2010) categorises the specific infrastructure interventions that have been shown to influence cycling behaviour. These can be grouped as follows:

On-Road Facilities:

- Cycle Lanes: These are striped lanes designating space for cyclists on the roadway. Their impact is supported by a cross-sectional study of US cities, which found that each additional mile of cycle lane per square mile was associated with a one percentage point increase in the share of workers commuting by cycle (Dill & Carr, 2003).

- Cycle Tracks: These are cycle lanes that are physically separated from motor vehicles by a kerb, parked cars, or another barrier. This greater separation provides greater safety and comfort. Evidence from Copenhagen indicates that the installation of new cycle tracks led to a 20% increase in cycle and moped traffic (Pucher et al., 2010).

Traffic Calming and Route Enhancement:

- Traffic Calming: This involves a set of physical measures designed to reduce the speed and volume of motor vehicles. Early studies from Germany demonstrated substantial effects: traffic calming measures doubled cycling in one town and increased it by 50% in another (Pucher et al., 2010).
- Cycle Boulevards: These are signed cycle routes on low-traffic streets that incorporate traffic calming features like speed humps and traffic circles to discourage motor vehicle use. Research has found that cyclists, particularly women and less-experienced riders, went out of their way to use these routes (Pucher et al., 2010).

Off-Street Facilities:

- Paved Paths: These multi-use paths are physically separated from motor vehicle traffic. Evidence on their impact is mixed; however, one study found that people living within a half-mile of a path were more likely to cycle weekly (Moudon et al., 2005).

Beyond the route itself, the provision of high-quality end-of-trip facilities is a key factor. Secure, sheltered cycle parking is important for preventing theft and protecting cycles from the elements (Pucher et al., 2010). The importance of these facilities is quantified in a UK study by Wardman et al. (2007), which estimated that providing secure indoor parking and showers at workplaces could increase the share of work trips made by cycle from a baseline of 5.8% to 7.1%.

A global study of 11,587 cities by Millard-Ball et al. (2025) identified street design as primary factors influencing active travel. The analysis revealed that population density has the largest effect on walking and a significant positive impact on cycling. Beyond density, the presence of cycle lanes is a crucial factor. The authors note that cycle lanes likely serve as a proxy for a broader suite of cycle-friendly street design practices, such as sidewalks and safe crossings. The impact is quantifiable: in the median city analysed, each new kilometre of cycle lanes is associated with approximately 13,400 additional kilometres of cycle travel per year.

Millard Ball et al. (2025) analysed 11,587 cities from 121 countries across six continents to analyse how city layout and transportation infrastructure effect walking and cycling rates. They reported that higher population density links to more walking and also more cycling. This effect is stronger in wealthier countries, where people usually have several travel options and can choose active travel. In lower income contexts, walking and cycling are often driven more by financial necessity than by urban form alone.

They also found that cities with more cycle lanes tend to have higher cycling levels. The authors note that cycle lanes may also reflect other features that support cycling, such as better crossings and improved footways. In the median city in their sample they analysed, each additional kilometre of cycle lanes was associated with around 13,400 additional kilometres of cycling per year (Millard-Ball et al., 2025).

Similarly, Bonsma-Fisher et al. (2026) analysed four years of cycle count data (counts of cyclists at set locations) from 64 communities. They measured cycling as people on bikes per hour and classified each count site using the Canadian Bikeway Comfort and Safety (Can BICS) system, based on Google Street View. The findings indicated a clear gradient effect. Compared with locations without cycling infrastructure, sites with medium comfort provision were associated with 55 percent higher cycling volumes, while high comfort infrastructure was associated with 105 percent higher volumes. A decline over time at low comfort sites. In this study, high comfort facilities include cycle tracks, bike only paths and local street bikeways, medium comfort primarily consisted of multi-use paths, while low comfort infrastructure included painted cycle lanes. The study also found that the higher accessibility to destinations was associated with higher cycling rates, highlighting that infrastructure quality alone is not sufficient.

While evidence shows that infrastructure quality and accessibility influence cycling levels, the conditions around schools need separate attention because they shape whether children can cycle safely and regularly. In a comprehensive study of 22 schools, Shaaban & Abdur-Rouf (2020) used an audit tool to assess four categories of infrastructure: school site, road network, parking/loading, and active transport. The findings suggested that the active transport category, which includes walking and cycling infrastructure, scored the lowest of all categories, receiving a 'Poor' rating of 47%. This contrasts sharply with the School Site category, which includes features such as fencing and building access, and received a 'Good' rating of 75%.

The study identified weaknesses in the infrastructure needed to support cycling and walking around schools. The mean percent scores for key active transport items underscored these deficiencies:

1. **Cycle Lanes**: Scored just 25%, indicating a near-total absence of dedicated cycling facilities on the road network surrounding the audited schools.
2. **Adequate Cycle Storage**: Scored only 27%, highlighting a critical lack of secure and sufficient end-of-trip parking for students and staff.
3. **Separation of Travel Modes**: Scored 45%, revealing inadequate design to safely separate vulnerable users like cyclists and pedestrians from motor vehicle traffic.

The analysis further revealed that high schools and most mixed-level schools scored 'poor' on active transport items, while elementary schools fared slightly better with an 'acceptable' rating. The study's main conclusion was that improving active-transport infrastructure was the most critical need for schools in the region. Such improvements could significantly increase the number of children walking and cycling to school rather than being transported by private vehicles or buses (Shaaban & Abdur-Rouf, 2020). However, while Shaaban & Abdur-Rouf (2020)'s paper highlights the issues with infrastructure around schools, the region this audit was conducted in was Doha, Qatar. Therefore, a similar audit needs to be conducted to evaluate the infrastructure arounds within the UK.

While physical infrastructure is a primary determinant of active travel, recent literature emphasises that engineering measures must be supported by soft interventions, including education, training, and promotional initiatives, to effectively increase cycling rates to school (Pucher et al., 2010; Kelly et al., 2020).

2.4 Cycle training and children cycling to school

Cycle training aims to improve children’s skills, confidence, and decision making when cycling in real traffic conditions. In the context of school travel, training may influence whether children feel able to cycle to school, whether parents allow it, and how children behave on the journey. Training may also reduce risk through safer riding behaviour, but the evidence for direct reductions in recorded collisions is less consistent than evidence for changes in skills and behaviour.

Research into the UK’s Bikeability scheme and similar international programs indicates that training significantly improves children’s knowledge of road rules and their ability to recognise hazards (Hodgson & Worth, 2015; Mandic et al., 2018). This training is important because a discrepancy has been highlighted between children's self-assessed skills and their actual riding abilities, suggesting that professional training is essential to bridge this gap and ensure that children possess the necessary motor skills for safe participation in traffic (Stark & Meschik, 2024). In a randomised controlled trial, cycle training improved practical cycling skills, with these improvements maintained five months post-intervention (Ducheyne et al., 2014).

However, translating these skills into perceived safety and confidence is complex. While training consistently improves children's confidence to cycle in controlled environments such as playgrounds or parks, some studies suggest a child’s increased confidence does not always correspond to increased cycling frequency post-intervention (Ducheyne et al., 2014; Sersli et al., 2019). One study investigating the impact of nationally coordinated training schemes in the UK found no evidence that offering cycle training in schools had a short-term effect on cycling frequency or independence (Goodman et al., 2016). The positive association often observed between a child's completion of training and their subsequent cycling behaviour may instead reflect a biased association in which children or parents who already intended to cycle were the ones seeking out the training (Goodman et al., 2016). Other parents who are not comfortable with cycling to school often act as gatekeepers. Despite improved skills, parental concerns regarding traffic danger remain a significant barrier, preventing children from utilising their training on the road (Boland et al., 2025; Atkins Limited, 2010). Parental worries often centre on road safety, particularly when they anticipate that their child will need to cross a busy road (Clayton & Musselwhite, 2013; Trapp et al., 2011). Parents also often perceive cycling as risky due to the risk of motor-vehicle accidents, inadequate cycling infrastructure, and the complexity of traffic regulations (Goodman et al., 2015). These concerns are supported by recent evidence showing that severe injuries and fatalities among child cyclists typically occur when they are hit by motor vehicles, emphasising the need for protected cycle lanes and safer infrastructure (Rosenfield et al., 2024). As children grow older, the nature of these barriers shifts. For older children and adolescents, issues of personal safety and crime become more salient. Concerns about theft, harassment, or assault while travelling to and from school can discourage cycling, especially in areas perceived as unsafe (Boland et al., 2025; Department for Regional Development, 2015; Scottish Government, 2017). Cycle theft is another deterrent: nearly

45% of cyclists reduce or stop cycling after experiencing theft, highlighting the importance of secure bike storage facilities at schools (Cohen et al., 2024).

Evidence regarding the ability of training alone to generate a modal shift from cars to cycling is mixed. As noted above, one natural experiment on the Bikeability scheme in England found no evidence that providing school-based training increased the frequency of cycling or independent cycling to school in the short term (Goodman et al., 2016). One explanation for the absence of model shift during school years is the lack of positive social support from family and friends (Boland et al., 2025). The stigma associated with cycling, such as perceptions that it indicates lower social status, can significantly influence decision-making. Adolescents may fear peer judgment or worry that cycling conflicts with their desired image, leading them to choose alternative modes of transport that align more closely with social norms at school age (Boland et al., 2025). Recent qualitative research confirms that peer pressure, appearance concerns, and discomfort are major barriers to safe cycling practices, with many teens perceiving cycling as socially undesirable (Verlinde et al., 2024). However, longer term behavioural changes have been reported (Goodman et al., 2016); retrospective analyses suggested that adults and adolescents who received training as children were more likely to cycle for transport later in life, suggesting that training helps embed cycling as a feasible travel option over the life course, once peer pressure no longer has a significant effect.

A more recent study which evaluated the impact of Bikeability Levels 2 and 3 on primary school pupils in England, did, however, report positive short-term changes in cycling behaviour and attitudes following training within the school context (SQW and Bryson Purdon Social Research, 2019). Here the findings showed that pupils who received Bikeability training were more likely to cycle, with 65% reporting cycling since the start of term compared with 56% in the comparison group. Trained pupils were also more likely to cycle on roads, with 34% reporting road cycling in the past week compared with 22% of those who did not receive training. The study further showed that Bikeability had a positive effect on parental permission, with 70% of parents allowing their children to cycle on roads compared with 58% in the comparison group, suggesting increased parental confidence in children's cycling ability. In addition, pupils who received training demonstrated better road safety knowledge, particularly in understanding how to safely enter roads at junctions. However, there was no significant improvement in pupils' self-reported confidence in cycling on roads, despite clear improvements in behaviour and knowledge. Parents generally reported positive perceptions of the training, noting that their children cycle more often and feel more confident. The impact was found to be stronger in schools with higher levels of deprivation, indicating greater benefits for more disadvantaged groups. The study also highlighted that pupils who were already more confident or more likely to cycle were more likely to take part in the training, suggesting some level of self-selection in participation. Goodman et al. (2016) suggests that while training can deliver short-term gains in behaviour, knowledge and parental permission within the school context, it may be insufficient to generate sustained changes in cycling behaviour unless supported by wider social and environmental interventions. This finding is supported by studies in New Zealand, where cycle skills training (CST) increased knowledge but did not significantly change the rate of cycling to school, unless accompanied by on-road components, which yielded only marginal increases (Mandic et al., 2018).

Another study (Bishop & Digaeva, 2025) examined longer-term outcomes associated with the UK's Bikeability Level 2 training, delivered to pupils during primary school and assessed on average three years later, after the transition to secondary school. Using survey data from young people and their parents, the study found that Bikeability Level 2 graduates reported significantly higher subjective wellbeing than non-graduates on two established measures. The authors suggest that cycle training may support independence and confidence by enabling young people to travel without reliance on parents, contributing to improved wellbeing during adolescence. Importantly, these differences were not explained by variations in parental living conditions, such as neighbourhood safety or access to green space, although the study design does not allow causal conclusions to be drawn.

In another study by Bishop (2025a), the relationship between Bikeability Level 2 training and cycling behaviour, attitudes, and confidence was examined using classroom-based survey data from over 8,000 UK schoolchildren aged 9 to 14. The findings show that pupils who had completed training were more likely to cycle for both transport and leisure compared with non-trained peers. Trained pupils also reported more positive attitudes towards cycling on roads, were less likely to perceive it as stressful, and demonstrated higher levels of confidence and understanding of key cycling skills. While the study does not establish causality, it provides evidence that Bikeability training is associated with increased cycling engagement and improved readiness to cycle in real traffic conditions.

Taken together, these findings suggest that impacts of cycle training are mixed. While Bikeability is associated with improvements in skills, confidence, and wider outcomes such as wellbeing, these effects do not consistently lead to increased cycling to school. This indicates that training alone is unlikely to change school travel behaviour without supportive environmental conditions, and that infrastructure and training need to be considered together, rather than as isolated interventions, as they work synergistically (Sersli et al., 2019).

Evidence from international reviews confirms that infrastructural interventions are highly effective in promoting cycling (Pucher et al., 2010). Purpose-built facilities, such as separated cycle tracks, are associated with reduced crash and injury risk compared to cycling alongside motor traffic (Thomas & DeRobertis, 2013). Improvements to the physical cycling environment can enhance the positive cycling experience by adding novelty and facilitating the kinaesthetic and sensory delight of movement, which is highly valued by riders, especially children (Clayton & Musselwhite, 2013). Dedicated infrastructure creates a sense of space legitimacy that can help dispel real or imagined safety fears associated with cycling, particularly among less experienced cycling families (Clayton & Musselwhite, 2013). Altering the immediate physical and social surroundings to make cycling easier and more socially accepted. This involves installing bike racks at schools, creating designated drop-off zones for cyclists, and enhancing signage for cycling routes. Research shows that small-scale design adjustments, such as adding coloured bike lanes, reducing traffic volume, and improving road markings, can notably improve perceived safety and motivate cycling (Olsson & Elldér, 2023). Global studies verify that expanding bike lane networks and redesigning streets to prioritise active travel can cut carbon emissions by up to 6% and yield significant health benefits (Millard-Ball et al., 2025). Additionally, grassroots initiatives that incorporate community feedback into environmental restructuring have proved effective in overcoming socio-cultural barriers and advancing cycling equity (Nixon & Schwanen, 2024).

Also, at a broader scale, cities that achieve high cycling participation rates typically implement a comprehensive policy package that includes infrastructure improvements, traffic calming (like low speed limits or filtered permeability), and sometimes restrictions on car use, alongside pro-cycle programs (Pucher et al., 2010).

2.5 Cyclist collisions and injuries in school travel

In practice, people decide whether to cycle based on two related questions. First, does the infrastructure feel safe enough, especially at crossings and junctions. Second, do they feel able to handle traffic conditions (skills, confidence, and safer riding behaviour) (Pucher et al., 2010), (Goodman et al., 2016), and (Clayton & Musselwhite, 2013). This matters because fear of a collision (and the chance of injury if one happens) can stop children and parents from choosing cycling for the school journey.

Evidence from route-based injury studies helps explain why junctions and crossings matter. Harris et al. (2013) compared injured cyclists in Vancouver and Toronto and used a case crossover approach, meaning they compared the injury location with a random control point on the same trip the injury location with a control point on the same trip. They reported that injury risk differed by street and junction type. In simple terms, locations that involved major roads and higher traffic speeds were associated with higher injury risk, while lower speed environments and some local street settings showed lower risk. They also identified junction forms that may increase risk even on local streets, and they highlighted specific hazards that increased risk between junctions, including tram or train tracks, downhill sections, and road works. They also reported lower risk where motor vehicle speeds were below 30 km/h. However, they found higher risk at some small traffic circles on local streets.

Teschke et al. (2012) reported a very similar pattern using a comparable design, again comparing injury locations with control points on the same trip. Their results showed that the cycling environment matters, not only whether some provision exists. They found the lowest injury risk on physically separated cycle tracks compared with cycling on major streets without dedicated provision. They also reported lower risk on quieter streets, and higher risk where cyclists faced hazards such as downhill gradients, streetcar or train tracks, or construction. Together, these two studies give a consistent message: separation from motor traffic, lower speeds, and reduced conflict at junctions are strongly linked to lower injury risk, while certain route hazards can increase risk even where cycling is present.

Although these injury studies focus on adults rather than children, the route features they identify map closely onto what matters for school travel. Many school journeys require children to cross distributor roads, negotiate multi arm junctions, or cycle near parked vehicles and turning traffic near school gates. A route can include some comfortable sections yet still feel unusable if it includes one difficult crossing or one complex junction. This is why collision and injury risk in school travel is often shaped by a small number of high-risk points rather than by overall route length.

The evidence also shows why it is important to interpret collisions carefully when cycling levels change. Infrastructure schemes can increase cycling, which increases exposure. In that situation, collision counts can rise even if risk per cyclist falls. Evaluation work on London Cycle Superhighways illustrates this issue and shows that design quality matters. Anupriya et al. (2025) reported increased cycling volumes on the routes and changes in collision outcomes that varied by the type of provision. In particular, outcomes differed between segregated and non-segregated sections, which supports the practical point that protection and junction treatment matter when cycling increases. This is relevant to school travel because schools with higher cycling levels may show more collisions in raw counts, so collision evidence needs to be interpreted alongside route conditions and exposure where possible.

These findings are consistent with the way infrastructure can reduce injury risk. Separation from motor traffic, lower speeds, and simpler junction movements can reduce the number and severity of conflict points, particularly at crossings and junctions where turning conflicts and limited visibility often drive risk (Thomas & DeRobertis, 2013) and (Pucher et al., 2010).

Evidence on cycle training adds a further layer. Teyhan et al. (2016) used UK cohort data to examine cycle proficiency training and later outcomes. They found that children who received training were more likely to cycle to school and more likely to report some safety related behaviours, such as helmet ownership and helmet use at age 14. However, they did not find an association between training and self-reported accident involvement as a cyclist, and hospital admissions were too rare to analyse by training status. This supports a cautious interpretation for school travel: training can improve skills and participation, but it does not automatically translate into lower recorded accident involvement, especially where routes remain difficult to use.

Cycle training can improve skills and confidence, but it cannot remove risks created by high speeds, complex junctions, or a lack of protection on the route (Goodman et al., 2016) and (Clayton & Musselwhite, 2013).

Mulvaney et al. (2015) and Anupriya et al. (2025) both reinforce the wider point that safety outcomes depend on context, including infrastructure type, junction design, and who uses the route. This matters for school travel because children face additional constraints, including lower tolerance for complex traffic interactions and stronger dependence on parent judgement. A useful way to read the literature is that infrastructure shapes the level of risk that children face on the route, while training shapes how children respond to that risk. For this reason, a school travel safety assessment should focus on where collisions and injuries are most likely to occur, particularly junctions, crossings, and school gate environments, and should interpret collision evidence alongside route quality and cycling exposure rather than relying on collision counts alone.

Overall, the literature suggests that infrastructure shapes the risk children face, while training shapes how they respond to that risk. This supports assessing training outcomes alongside route conditions and collision patterns, particularly for school travel where one difficult crossing or junction can determine whether cycling feels feasible (Thomas & DeRobertis, 2013) (Goodman et al., 2016)and (Clayton & Musselwhite, 2013).

2.6 Summary of literature review findings

In summary, while cycling offers documented health, environmental, and social benefits, its uptake among children remains limited in the UK context. Evidence suggests that isolated interventions, such as skills training, are insufficient to drive meaningful change. They should be applied within broader strategies that addresses road safety concerns and cultural misconceptions. The following points summarise the main conclusions from this literature review:

Infrastructure

- Route quality matters more than just having “some” provision. Continuous routes, safer crossings, and simpler junctions make cycling to school more likely.
- Protected provision and lower traffic speeds are linked to safer cycling conditions, and networks that connect key destinations support higher cycling levels, so facility type and accessibility both matters.

Skills and training

- Training can improve skills, hazard awareness, and confidence, which can support safer riding when children do cycle.
- Training alone may not reliably increase cycling to school because parental concerns and route barriers can still limit whether children use the skills on real roads.

Collisions and injuries

- Risk often concentrates at junctions and crossings, and conditions near school gates can add extra conflict, so a few high-risk points can shape the safety of the whole journey.
- Collision counts can increase when cycling increases, so interpretation of collision data alongside exposure and route context is needed, not counts alone.

Combined effects

- Infrastructure shapes the level of risk children face, while training shapes how children respond to that risk, so the best outcomes are likely when both are in place.

This suggests an assessment of training outcomes alongside infrastructure quality and collision patterns, with attention on the highest risk locations (crossings, junctions, etc.), is a useful step for exploring the interactive effects of training and infrastructure on cycling participation. The approach and findings from this assessment at selected case study schools are detailed in the following section.

3 Case Study Analysis

3.1 School selection

An initial list of 31 schools was screened for inclusion in the case study analysis. These schools were identified from the planned Bikeability Level 3 training programmes scheduled by training providers between December 2025 and March 2026 (when this study took place), enabling exploration of potential links between infrastructure quality and pre- and post-training survey feedback from participating pupils. The schools fell under the jurisdiction of the following Local Authorities: Lancashire, Shropshire, Essex, Gloucestershire, Bournemouth–Christchurch–Poole (BCP), York, Hertfordshire, Cornwall, Hammersmith and Fulham (London).

The schools were located across a mix of urban, semi-urban, and rural settings. This mix was selected as geographical context is known to have some influence on the accessibility and quality of active travel routes. For example, rural and semi-rural locations typically lack continuous cycle networks, routes often have narrow verges and limited segregated cycle infrastructure. Surrounding roads also often carry high-speed traffic which increases severity of risk presented to cyclists. In contrast, urban schools tend to benefit from a greater number of route options, but they also experience higher traffic volumes on average, more turning movements, and increased exposure to conflict points.

3.1.1 *Desktop review – Route mapping*

A desktop review was undertaken to understand the existing level of cycle infrastructure on roads surrounding each of the 31 schools. This activity was done to help identify a shortlist of schools with varied infrastructure which would support investigation into the relationship between L3 training and cycle infrastructure.

Initially, a 2 km radius around each school was considered as a reference distance, in line with LTN 1/20 guidance (Department for Transport (DfT), 2020)[1] and typical school cycling trips of 15-minutes (Cycling UK, 2023). However, it was instead decided to focus the review on the main corridors that pupils are most likely to use when travelling to school, which would have been missed if only routes within a 2km radius had been considered.

Many of the streets within the study areas operated a 20mph speed limit and were residential, where dedicated cycle lanes are not typically required. LTN1/20 guidance (Department for Transport (DfT), 2020) indicates that low-speed, low-volume residential streets can provide suitable conditions for cycling in mixed traffic.

Satellite imagery and OpenStreetMap data were used to identify mapped cycle routes, links and junctions. Routes were identified from the surrounding residential areas. These

[1] National guidance (LTN 1/20) notes that a large proportion of pupils live within a 15-minute cycle ride of secondary schools. Cycling UK advises that children typically cycle at around 5 mph (8 km/h), including slowing and short pauses. At this pace, a 15-minute ride covers approximately 2 km (Cycling UK, 2023).

commonly included Northern, Southern, Western, and Eastern approaches, informed by the distribution of land uses Each route was further broken into links and junctions.

Clear patterns emerged from the review:

- **Good environments:** Network with continuous links, safe approaches and legible routes.
- **Acceptable environments:** Isolated networks and shared paths. Infrastructure gaps are present, but the network is broadly usable with caution.
- **Poor environments:** These have no mapped cycle networks and cyclists are expected to share the road network.

Each school received a rating of Good, Acceptable or Poor based on the overall strength of these factors.

As part of the desktop review, available tools such as iRAP (International Road Assessment Programme) were considered to support assessment of road safety risk. iRAP estimates the likelihood of collisions for different road users based on existing road design and infrastructure characteristics. CycleRAP is a related tool that applies the same principles specifically to cyclists and light-mobility users.

However, a review of available datasets confirmed that iRAP coverage in York, Lancashire, Essex, and London is limited to the Strategic Road Network (SRN) managed by National Highways. As these SRN sections do not represent the local streets and routes typically used by pupils for school travel, iRAP data was not included in the study.

3.1.2 *Final selection of schools*

Nine schools were selected for inclusion in the case study analysis and detailed on-street CERS assessments were undertaken. The locations and characteristics of these nine schools are presented in Figure 2 and Table 2, respectively. Across these nine schools, there was participation in Bikeability L3 training and a range of different cycling environments, enabling exploration of how the effects of training may interact with infrastructure provision in the local area.

To further understand the context of the selected schools and their surrounding environments, additional analysis was undertaken using two national datasets: Department for Transport Connectivity Tool Lite[2]. and the Index of Multiple Deprivation (IMD[3]).

The IMD mapping tool was then used to examine the deprivation profile of the Lower Layer Super Output Areas (LSOAs) surrounding each school. The analysis considered relative levels of income, education, health, access to services, and crime. For each school, the LSOA containing the school postcode was identified, and the overall IMD percentile was recorded. This percentile indicates how deprived the neighbourhood is relative to England (0 = most deprived, 100 = least deprived).

[2] https://www.gov.uk/guidance/connectivity-tool

[3] https://deprivation.communities.gov.uk/maps?type=imd&geog=lsoa

The Connectivity Tool provides scores for cycling as a mode of transport, which estimates how easily destinations can be reached within a given travel time by cycle. Scores consider the strength of local networks, journey times, barriers created by major roads or rail lines, and levels of severance between neighbourhoods. The tool provided a consistent view of how well connected each school community is, and whether pupils have realistic and safe alternatives to car travel.

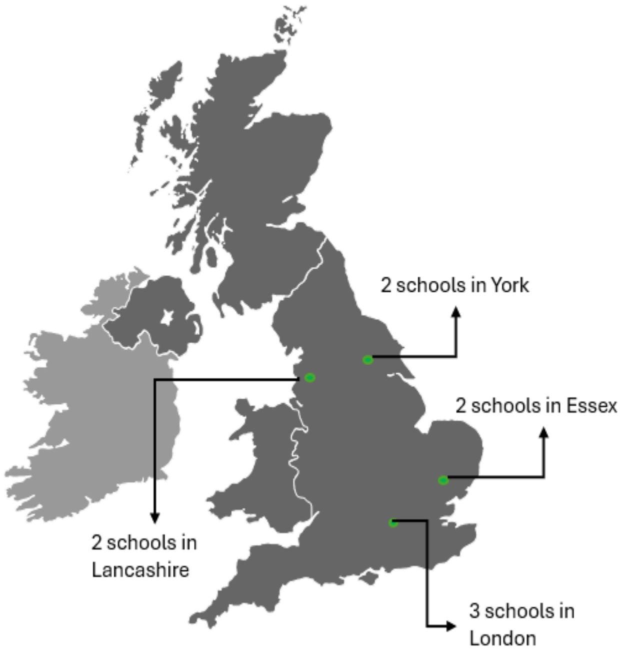

Figure 2: Geographic distribution of the nine case study schools

As shown in Table 2, the nine study schools were in areas with varying socio-economic conditions. The York school areas were among the least deprived, with York 2 and York 1 located in neighbourhoods less deprived than around 87% and 90% of England respectively. The Essex schools showed greater contrast: the area surrounding Essex 1 School had an IMD score close to the national average, while Essex 2 School is in a considerably more deprived area. The Lancashire schools also showed contrast. Lancashire 1 School is in a more deprived neighbourhood (particularly in education and skills) while Lancashire 2 is in a less deprived area with an IMD score above the national average.

The three London schools located in Fulham and Hammersmith sit within urban boroughs with moderate levels of deprivation. London 1 school is located in an area less deprived than around 75% of England, while London 2 and London 3 are located in areas less deprived than around 59% and 62% respectively. Despite being situated within dense urban environments with established transport networks, the desktop review indicated that cycle infrastructure provision is mixed. Facilities were identified on main corridors, including marked lanes and signal-controlled crossings, but infrastructure was deemed to be fragmented overall, and not consistently provide continuous protected routes to the school gates.

Across the sample, there was some indication of a relationship between deprivation and the desktop ratings of cycling infrastructure quality. The least deprived areas generally showed acceptable infrastructure ratings, while the most deprived areas tended to have poorer provision. However, this pattern is not consistent across all locations, with both acceptable and poor infrastructure ratings observed among schools in mid-range deprivation areas. For example, London 2 (59%) and London 3 (62%) showed acceptable conditions, while Essex 1 School (54%) and Lancashire 2 (65%) were rated as poor.

Table 2: Summary of desktop review findings, Overall IMD and Connectivity Tool ratings for each shortlisted school

School names based on Region	Setting	Desktop Rating	Overall IMD rating	Connectivity rating
York 1	Semi-urban	Acceptable	90%	69
York 2	Urban	Acceptable	87%	70
Essex 1	Urban	Poor	54%	59
Essex 2	Urban	Poor	24%	71
Lancashire 1	Urban	Poor	13%	67
Lancashire 2	Suburban	Poor	65%	73
London 1	Urban	Acceptable	75%	90
London 2	Urban	Acceptable	59%	89
London 3	Urban	Acceptable	62%	90

Connectivity of the school locations was assessed using the Department for Transport Connectivity Tool Lite[4]. Scores were extracted for cycling mode, which estimates how easily destinations can be reached within a given travel time by bicycle. The connectivity score ranges from 0 to 100, with higher values indicating better accessibility.

Across the nine schools, cycling connectivity scores ranged from 59 to 90, indicating generally moderate to high accessibility for cycling. The London schools showed the highest connectivity scores, with London 1 and London 3 both scoring 90, and London 2 scoring 89. This reflects the dense urban street network and close proximity of services and destinations within these boroughs.

The York schools also showed relatively high connectivity scores, with scores of 69 for York 1 and 70 for York 2. These values suggest that, although the surrounding environment is less dense than London, the street network still allows relatively direct cycling access to nearby destinations.

The Essex and Lancashire schools showed more variation, with connectivity scores ranging between 59 and 73. Essex 1 School had the lowest connectivity score (59), suggesting a less connected street network for cycling. In contrast, Lancashire 2 showed relatively strong connectivity (73) despite being located in a suburban setting.

Overall, the connectivity analysis suggested that most schools are located in areas where cycling trips to nearby destinations are feasible. However, connectivity alone does not reflect the quality or safety of cycling infrastructure. In several urban locations, high connectivity scores were observed alongside only moderate infrastructure conditions. For example, London 1, London 2 and London 3 all have high connectivity scores (89–90), but are rated only as acceptable in terms of infrastructure. This may reflect the dense street

[4] https://www.gov.uk/guidance/connectivity-tool

networks in urban areas such as London, which increase accessibility but also introduce higher traffic volumes, parking pressure and more complex junctions. As a result, connectivity alone does not fully capture the safety or usability of cycling conditions, which was examined separately through the desktop review and detailed CERS site assessments.

3.2 Cycling infrastructure provision and quality

This section presents the assessment that was undertaken to review the cycle infrastructure on a sample of routes to and from schools. The purpose was to quantify the provision of cycling infrastructure in the areas surrounding each school to enable exploration of how the design, quality, and safety of local routes may influence cycling to school.

3.2.1 *CERS audit methodology*

A ‘CERS’ audit was undertaken by two Auditors to review the level of cycle infrastructure provided on the assessed routes. CERS, or ‘Cycle Environment Review System’, is an on-street audit methodology for assessing the quality and safety of the cycling environment and cycle facilities. The methodology guides the auditor through the multitude of design considerations that impact cyclists. For this project, the audit focused on the following aspects:

- **Convenience** – Assesses whether routes are direct, legible and follow cyclists’ desire lines. It considers signage, markings, priority for cyclists and the provision of cycle parking.
- **Accessibility and Safety** – Assesses how infrastructure performs in practice, including capacity, delay and interaction with motor traffic. Particular attention is given to cyclist exposure to traffic and conflict points.
- **Comfort** – Assess surface quality, gradients, obstructions and maintenance, and how these influence the ease and attractiveness of cycling.
- **Attractiveness** – Assesses the quality of the environment, including lighting, passive surveillance and cleanliness, which may affect willingness to cycle.

CERS audits typically include an assessment of:

- **Links** – sections of cycle lane or road space used by cyclists Cycle parking – Locations where cycle storage facilities are provided
- **Junctions** – Intersections between major roads to be negotiated by cyclists
- **Interchanges** – Looking at how ‘connected’ the cycle facilities are with other modes of transport in the audit area

However, the ‘Interchange’ component was not assessed within this study. An interchange space refers to a defined location where cycling connects directly with another transport mode, such as a rail station forecourt, bus station, or formal park and ride facility. As the study focused on local school travel by secondary school pupils, trips were expected to be undertaken directly by cycle rather than involving a change of transport mode. For this reason, interchange facilities were considered outside the scope of the assessment.

During the audit, each parameter was assessed through on-site observation using the CERS guidance and supporting checklist. Scores were assigned based on the quality of cycling provision and the level of interaction with motor traffic. Dedicated and well-designed cycling facilities, such as protected or clearly segregated cycle tracks, generally received positive scores (+2 to +3). Shared carriageway conditions with low traffic volumes or calm residential streets typically scored around 0 to +1. Locations with no cycling provision, higher traffic exposure, constrained space, or complex junction movements were assigned negative scores (−1 to −2). Where several conditions were present, professional judgement was applied to determine the most representative score, considering the overall experience of a secondary school cyclist travelling along the route.

Additional factors such as junction design, traffic speed, parking pressure, surface quality, and obstructions were also considered when assigning scores. For example, streets with frequent parked vehicles, narrow effective width, or high turning movements tended to score lower due to increased cyclist exposure. Environmental factors such as cleanliness, maintenance, and passive surveillance were also recorded but generally had a smaller influence on the overall safety score.

The scores for each parameter were weighted and aggregated to give an overall RAG (Red, Amber, Green) rating for the component.

Full CERS audit sheets, scores, and supporting observations for each school are provided in 0, which presents the detailed site visit information collected during each CERS assessment. This includes photographs, field observations and parameter scoring notes for the assessed routes, links and junctions around each case study school. These records provide supporting evidence for the infrastructure ratings presented in the following section.

3.2.2 *Results from on-street assessments*

Table 3, Table 4, and Table 5 present the weighted scores for routes, links and junctions, respectively, for each case study school. The weighted scores reflect the conditions experienced by secondary school pupils cycling on public roads.

Parameters that have a stronger influence on cyclist safety and exposure to motor traffic were assigned greater importance in the analysis. Environmental factors such as lighting, streetscape quality, and general maintenance were considered less influential in determining the safety of the cycling environment and therefore were given lower weightings. These parameters also showed relatively similar scores across the case study schools and therefore had a limited effect in distinguishing infrastructure conditions between locations.

Higher weight was given to factors associated with interactions between cyclists and motor vehicles, including:

- Cycle path continuity
- Cyclist provision at junctions
- Traffic proximity and traffic speed
- Junction conflict points

- Effective carriageway width
- Overall traffic exposure

These factors are considered particularly important for children cycling to school, because L3 learners are expected to ride on-road and interact directly with traffic during training.

Parameters relating to environmental quality, such as lighting, general maintenance, or visual quality of the streetscape, were assigned lower relative importance. This reflects the principles set out in LTN 1/20, where design priority is given to factors that reduce conflict with motor traffic and improve safety at links and junctions. While environmental factors influence comfort and perceived safety, they are not the primary determinants of route safety and usability (Department for Transport (DfT), 2020).

Applying these weightings allowed the analysis to focus more strongly on infrastructure characteristics that influence the actual and perceived safety of cycling routes to school. The weighted results therefore provide a more realistic representation of how supportive the surrounding road environment is for pupils cycling to/from school following Level 3 cycle training, compared with using unweighted scores. The weightings ranged from 1 (lowest influence) to 5 (highest influence).

Table 3 presents the weighted scores for the assessed routes around each case study school. The scores reflect the combined influence of all parameters, with higher positive values indicating more supportive cycling conditions and negative values indicating less supportive environments. The results should be interpreted on a relative basis between schools rather than against an absolute maximum score.

Table 3: Weighted Parameter Scores for Routes

Factor for Routes	Weighting	York 1	York 2	Essex 1	Essex 2	Lancashire 1	Lancashire 2	London 1	London 2	London 3
Directness	3	0	3	3	3	0	3	3	3	3
Permeability / Junctions	4	0	0	-4	-4	-4	-4	-4	-4	-4
Identifying where to go	3	3	3	0	0	-3	-3	-3	-3	-3
Road Safety	4	-4	-4	-4	-4	-4	-4	-4	-4	-4
Personal Security	2	0	0	0	0	0	0	0	0	0
Feeling comfortable	2	-4	-4	-4	-2	-2	-2	-2	-2	-2
Cycle parking	1	0	0	0	-2	1	1	1	1	1
Quality of the environment	1	0	0	0	0	-1	0	0	0	0
Obstructions	2	-2	0	-2	-2	-2	-2	-2	-2	-2
Total of weighted score		**-7**	**-2**	**-11**	**-11**	**-15**	**-11**	**-11**	**-11**	**-11**

Overall, route scores showed relatively limited variation between schools. In most locations cyclists are required to share carriageway space with motor traffic, and dedicated cycling facilities are generally limited.

Lower scores were largely associated with factors such as traffic exposure, lack of protected cycling space, and sections where cyclists must negotiate busy junctions or complex road layouts. While cycling along these routes is generally feasible, the infrastructure does not consistently provide conditions that would be considered supportive of less confident cyclists.

Some routes achieved higher scores where traffic levels were lower or where road layouts were simpler and more legible. However, none of the assessed routes demonstrated consistently high levels of dedicated cycling provision.

Table 4 summarises the weighted scores of links which connected the main routes to the school entrances. These weightings were applied to reflect the relative importance of each factor.

Table 4: Weighted Parameter Scores for Links

Factor for Links	Weighting	York 1	York 2	Essex 1	Essex 2	Lancashire 1	Lancashire 2	London 1	London 2	London 3
Legibility	3	6	1	0	0	-1	-1	-1	0	0
Directness	3	3	1	1	1	0	0	0	1	1
Worst junction conflict point	5	-5	-5	-5	-5	-5	-5	-5	-5	-5
Traffic proximity / mix	4	0	0	-4	-4	-4	-4	-4	-4	-4
Traffic speed	5	0	0	-5	-5	-5	-5	-5	-5	-5
Link conflict points	5	-5	-5	-5	-5	-5	-5	-5	-5	-5
Effective width	4	0	-4	-4	-4	-4	-4	-4	-4	-4
Surface quality	3	-3	0	0	0	-3	-3	-3	-3	-3
Personal security	2	-2	0	0	0	0	0	0	0	0
Lighting`	1	1	1	1	1	1	1	1	1	1
Total weighted score		**-5**	**-11**	**-17**	**-17**	**-21**	**-21**	**-20**	**-19**	**-19**

The results indicate that link conditions were generally constrained by motor traffic exposure, limited effective road width, and the presence of conflict points along the carriageway.

In many cases cyclists are required to share narrow road space with general traffic, and few links provide dedicated cycling infrastructure. Several links also showed lower scores due to higher traffic speeds or complex interactions with vehicles entering or leaving side streets.

Overall, link scores across the case study schools were predominantly negative, reflecting environments where infrastructure conditions may have a deterring effect on cycling rates. As such, these conditions are likely to reduce the likelihood of pupils choosing to cycle to school, particularly among less confident riders, even after completing Level 3 training.

Table 5 presents the weighted junction scores. Junctions generally represented the weakest elements of the cycling environment across the case study locations.

Table 5: Weighted Parameter Scores for Junctions

Factor for Junctions	Weighting	York 1	York 2	Essex 1	Essex 2	Lancashire 1	Lancashire 2	London 1	London 2	London 3
Cyclist provision	5	-5	-5	-5	-5	-10	-10	-10	-10	-10
Deviation from the desire line	4	0	-4	0	0	-4	-4	-4	-4	-4
Legibility	3	0	0	-3	-3	-6	-6	-6	-3	-3
Delay	2	0	-1	-2	-2	-4	-4	-4	-2	-2
Sightlines	4	4	0	-4	-4	-4	-4	-4	-4	-4
Total weighted score		**-1**	**-10**	**-14**	**-14**	**-28**	**-28**	**-28**	**-20**	**-23**

Lower scores were largely driven by limited cyclist provision at junctions, which can lead to cyclists needing to move away from their desire line, and increasing potential conflicts with motor traffic. In many locations cyclists are required to merge with traffic or position themselves within mixed traffic lanes when navigating junctions.

Sightlines and junction geometry varied between locations, but dedicated cycling facilities or clear cyclist priority measures were generally absent. As a result, junction conditions may require cyclists to rely on confident positioning skills when navigating through traffic.

Across the nine case study schools, the overall scoring pattern indicated generally poor infrastructure, though with some variations in provision. In most locations cyclists are required to share carriageway space with motor traffic, and dedicated cycling facilities are limited. As a result, scores tended to fall around neutral or slightly negative values, reflecting environments where cycling is possible but not strongly supported by dedicated infrastructure provision.

To support comparison across the nine case study schools, the weighted scores for routes, links and junctions were summarised using a Red-Amber-Green (RAG) classification (see Table 6). RAG classifications were applied using defined score bands to support consistent interpretation across sites. Scores near zero (≥ –5) were classified as green, representing comparatively more supportive conditions. Scores between –6 and –15 were classified as amber, indicating moderate constraints. Scores of –16 and below were classified as red, reflecting poor cycling conditions.

The rating system was designed to provide a simple visual overview of infrastructure conditions across the assessed locations. However, it should be noted that these thresholds represent *relative* performance across the study sample rather than measures of absolute infrastructure quality. In other words, a ‘green’ rating reflects comparatively better performance of a given location, but should not be interpreted as indicating that the infrastructure is of a good or optimal standard.

Table 6: (RAG) classification of schools

Schools	Score and RAG		
	Links	Junctions	Routes
York 1	-5	-1	-7
York 2	-11	-10	-2
Essex 1	-17	-14	-11
Essex 2	-17	-14	-11
Lancashire 1	-21	-28	-15
Lancashire 2	-21	-28	-11
London 1	-20	-28	-11
London 2	-19	-21	-11
London 3	-19	-23	-11

In the areas surrounding the London schools (London 1, 2 and 3), the street network was dense and offered multiple route options through residential streets. However, several local streets appeared to be used for 'rat-running', with relatively high traffic volumes for residential environments. In addition, on-street parking was widespread, which reduces effective carriageway width and creates frequent interaction between cyclists and parked vehicles. In turn, such conditions require cyclists to position themselves within traffic lanes and navigate around parked cars, increasing exposure to moving vehicles.

In the areas surrounding the York schools, the environment was generally characterised by lower traffic speeds and more residential street networks, which can support cycling even where dedicated infrastructure is limited. Some sections included shared pedestrian and cycle facilities or advisory cycle lanes. However, cycling provision was often discontinuous, and cyclists were likely to encounter junctions where they had to merge with motor traffic or cross distributor roads.

The Lancashire schools showed a different pattern. The surrounding routes were generally car-oriented and included wider roads and larger junction layouts. Dedicated cycle facilities were limited and often absent on key corridors. Junction design typically prioritised motor vehicle movements, meaning cyclists were required to negotiate turning traffic and had longer crossing distances.

In Essex, infrastructure provision was also fragmented and often limited to short sections of shared paths or indirect routes. Some roads appeared to support higher vehicle speeds, and junction layouts were largely vehicle-focused. As a result, cyclists travelling to school were likely to experience mixed-traffic conditions with a lack of continuous cycling facilities increasing the importance of careful route choice.

3.3 Participation in cycling to school

Information on children's participation in cycling to school for each case study area was gathered from self-report surveys administered by The Bikeability Trust to parents/carers of children who complete L3 training. Data on reported cycling levels are routinely gathered by

The Bikeability Trust via two means. Firstly, a consent form is sent to parents/carers of children prior to completion of training in order to obtain consent to take part in training. As part of this consent, parents/carers are asked to indicate how frequently their child currently cycles to/from school. Secondly, a parent/carer survey is sent two days after completion of the training which includes a question on expected frequency of cycling to/from school following training. Cycling frequency is reported using standard categories (e.g. never, less than once a month, monthly, and weekly). Together, these two questions provide a means of tracking cycling participation and behaviour change following Bikeability training. The Bikeability Trust distributes the surveys digitally via Training Providers.

In total, 298 pre-training surveys (via consent forms) were completed (69 in 2024 and 229 in 2025) from four of the nine schools, all from the York and Lancashire areas. No pre-training survey data was available for L3 learners who completed training in the Essex or London schools.

The sample of post-training survey responses was considerably lower, with only 22 responses in total, covering three of the nine schools: York 1, Essex 1 and Essex 2.

Thus, pre- and post-training survey data was only available for one of the nine case study schools: Lancashire 2. Neither pre-training nor post-training data was available for the three London schools. For both the pre- and post-training surveys, all respondents were in Year 7 at the time of survey completion. A breakdown of the pre- and post-training survey sample sizes for each school is shown in below.

Table 7: Breakdown of pre- and post-training survey sample sizes for each of the nine case study schools.

School	Pre-training (via consent form)	Post-training (via parent/carer survey)
York 1	85	0
York 2	80	0
Essex 1	0	12
Essex 2	0	5
Lancashire 1	67	0
Lancashire 2	66	5
London 1	0	0
London 2	0	0
London 3	0	0
Totals	**298**	**22**

In the surveys administered by The Bikeability Trust, pre- and post-training responses are not matched to individuals. Instead, the goal is to understand patterns and overall changes in behaviour across the sample of L3 learners. However, for the nine case study schools, the sample size of 22 responses to the post-training survey is insufficient to draw any conclusions on behaviour change in this case.

Due to the considerable differences in sample size between pre-training and post-training surveys, comparisons of counts are not useful. Instead, the data were converted to percentages and error bars were calculated representing 95% confidence intervals using the

Wilson method (chosen because it gives accurate bounds for proportion data and remains stable with small sample sizes). Percentages should be interpreted with caution however for the post-training data as the overall sample is considerably smaller than 100 (22 responses in total). These data are shown for each school in the following figures.

As a result, the survey data cannot be used to assess the impact of Bikeability L3 training on participation in cycling to school, and the results presented here are included for descriptive purposes only.

Figure 3, Figure 4 and Figure 5 show the reported pre-training frequency of cycling to/from school for York 1, York 2 School and Lancashire 1, respectively.

Figure 6 and Figure 7 show the reported post-training frequency of cycling to/from school for Essex 1 and Essex 2, respectively.

Lancashire 2 was the only school for which both pre-training and post-training survey responses were available - these responses are shown in Figure 8.

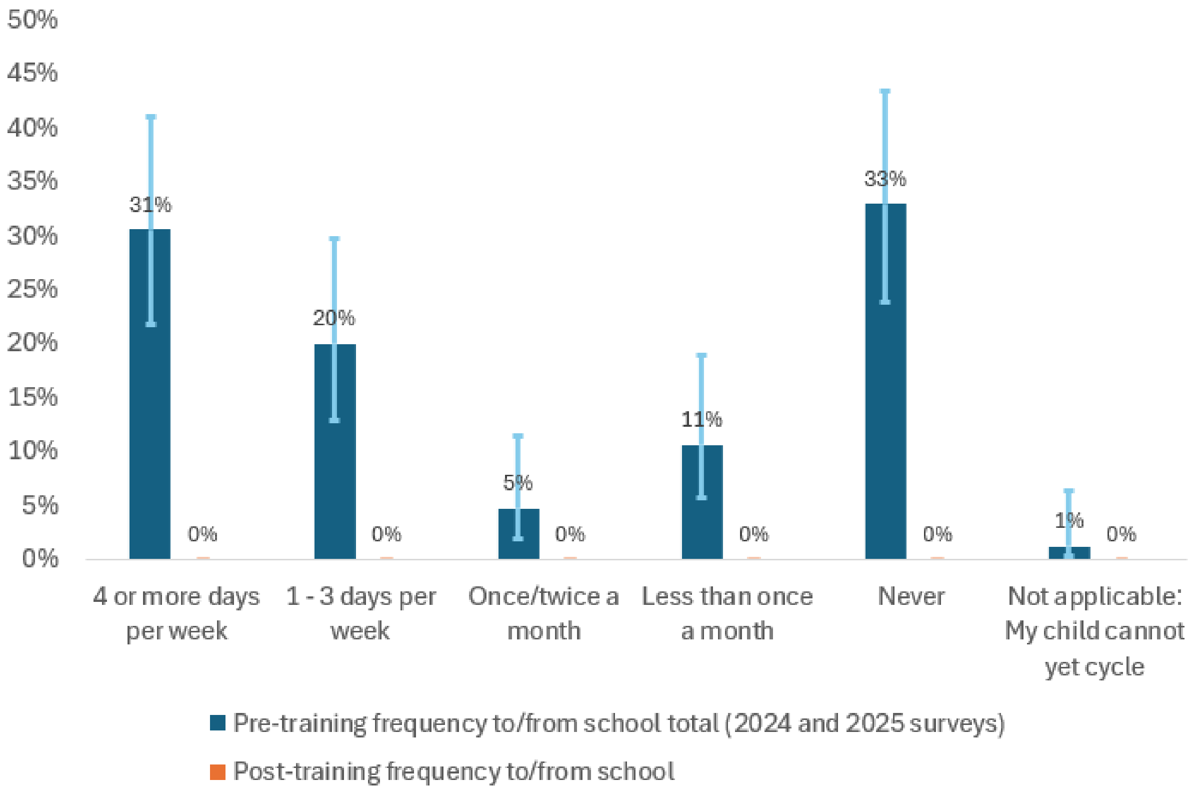

Figure 3: Reported frequency of children cycling to/from York 1 (N=85)

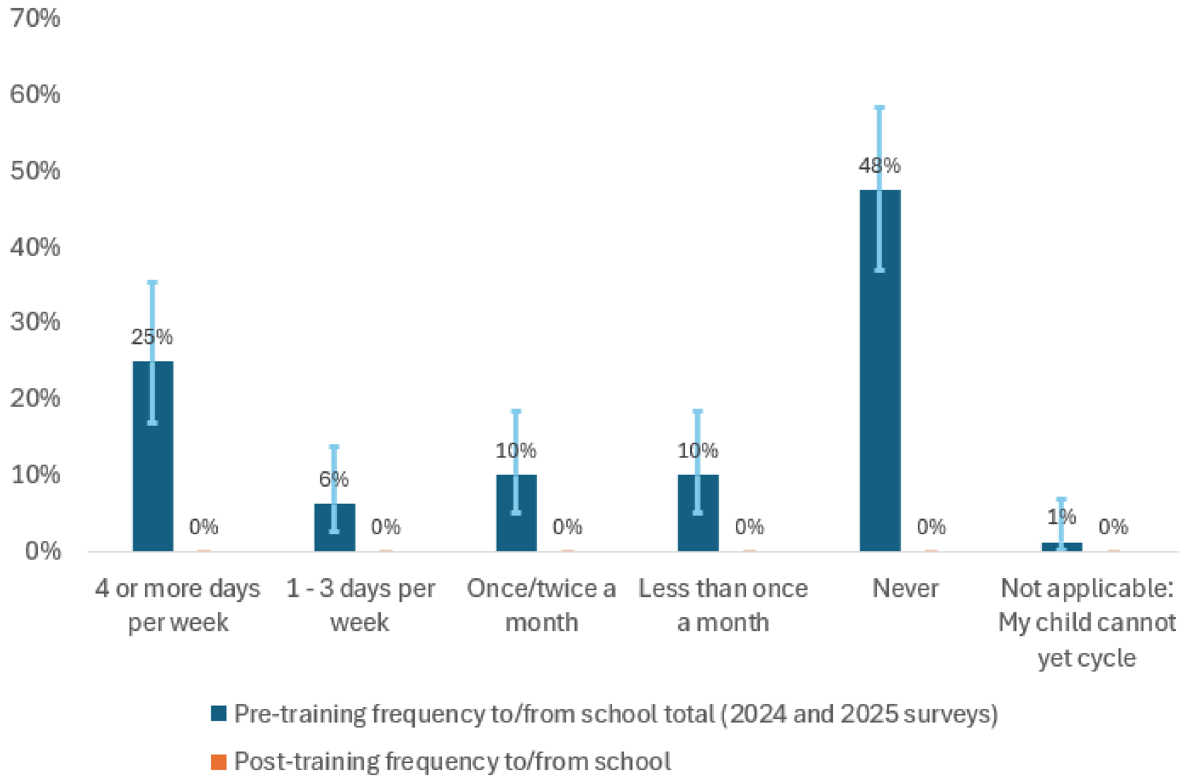

Figure 4: Reported frequency of children cycling to/from York 2 (N=80)

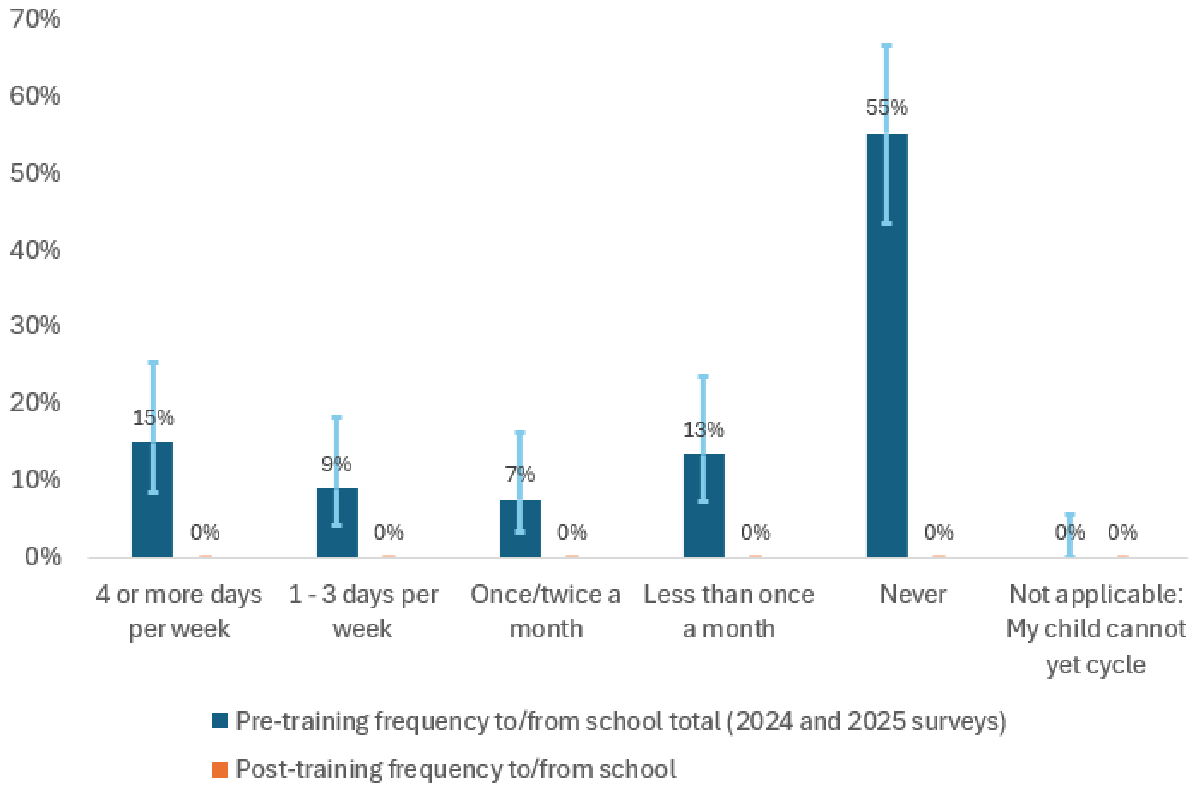

Figure 5: Reported frequency of children cycling to/from Lancashire 1 (N=67)

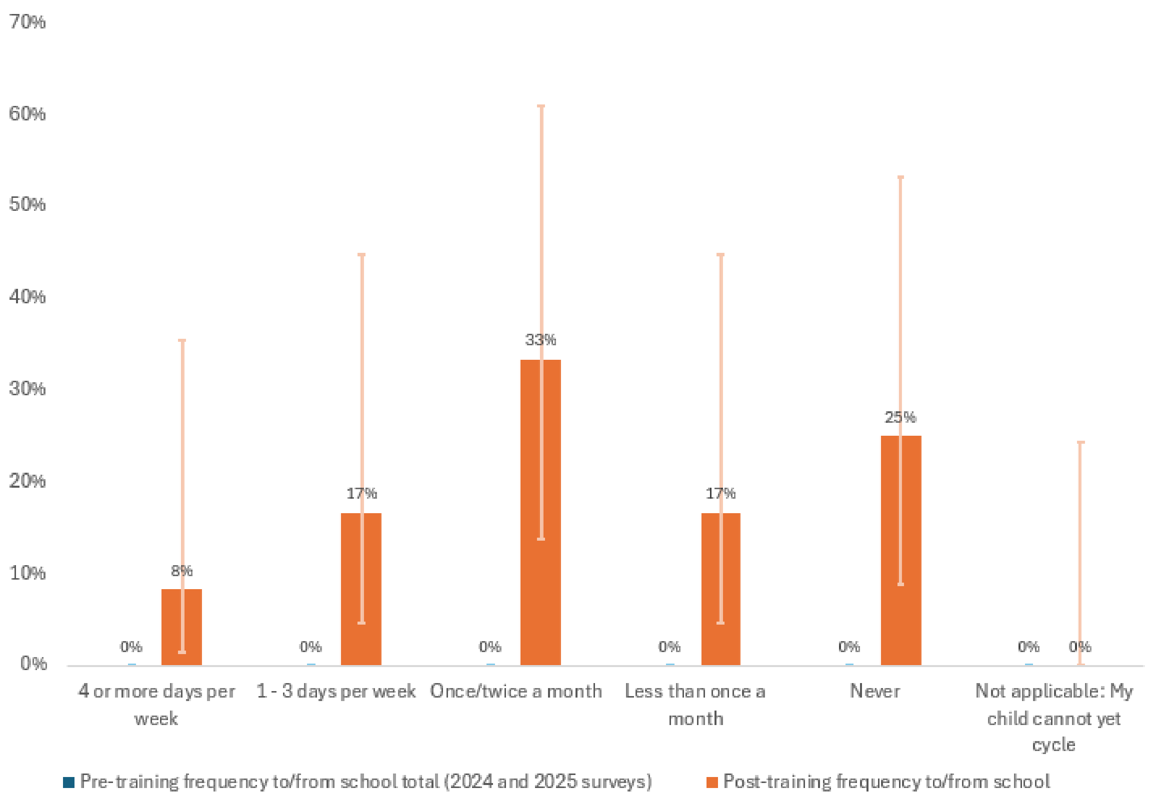

Figure 6: Reported frequency of children cycling to/from Essex 1 (N=12)

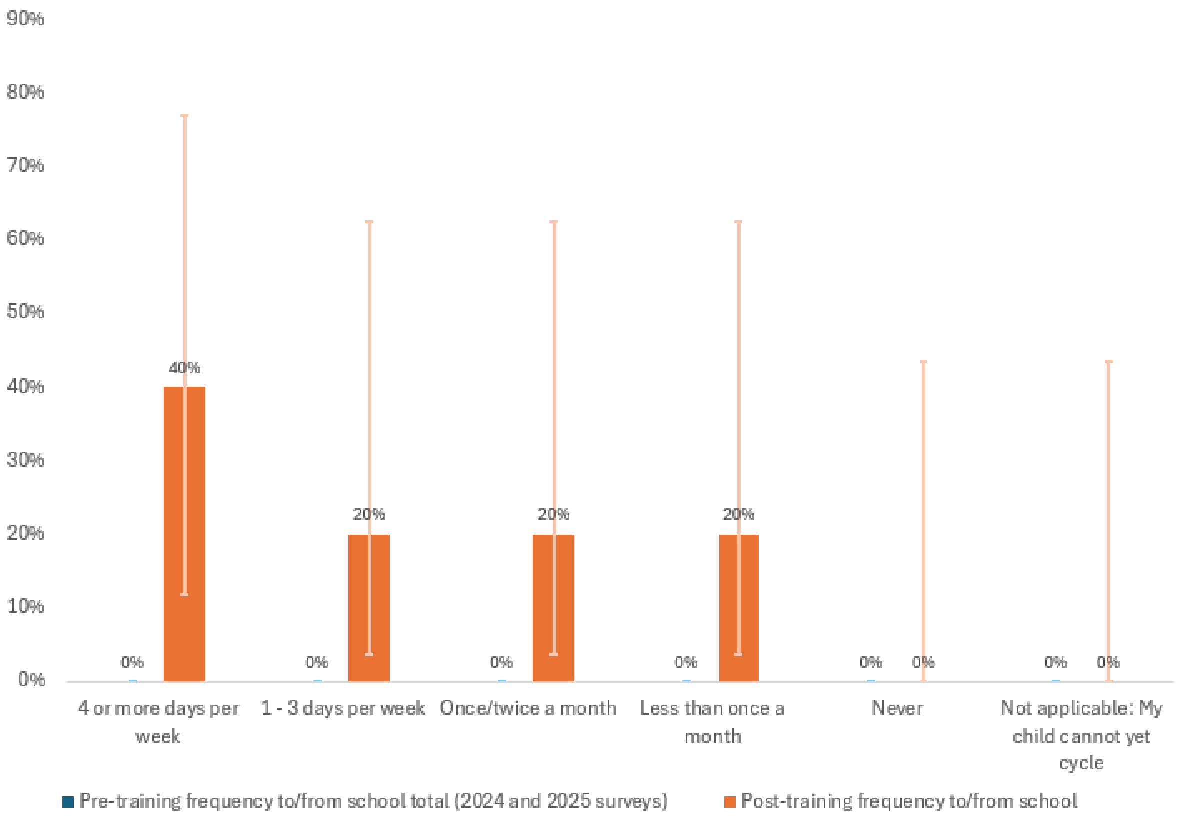

Figure 7: Reported frequency of children cycling to/from Essex 2 (N=5)

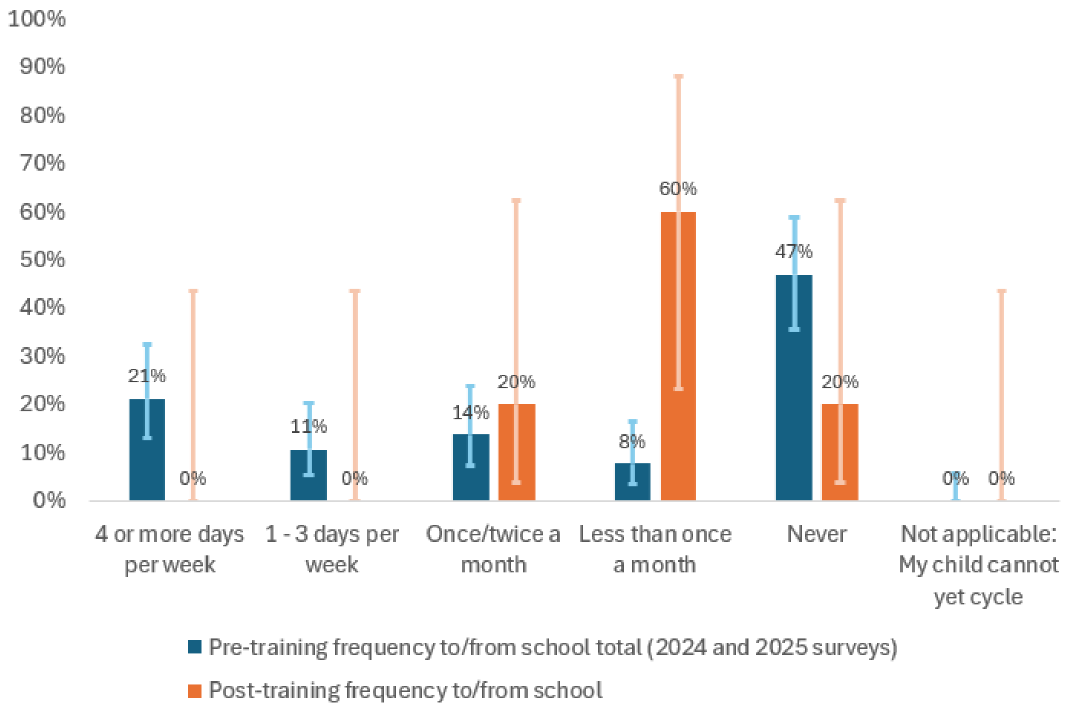

Figure 8: Reported frequency of children cycling to/from Lancashire 2 (pre-training N=66, post-training N=5)

Figure 9 shows the aggregated data across all nine schools.

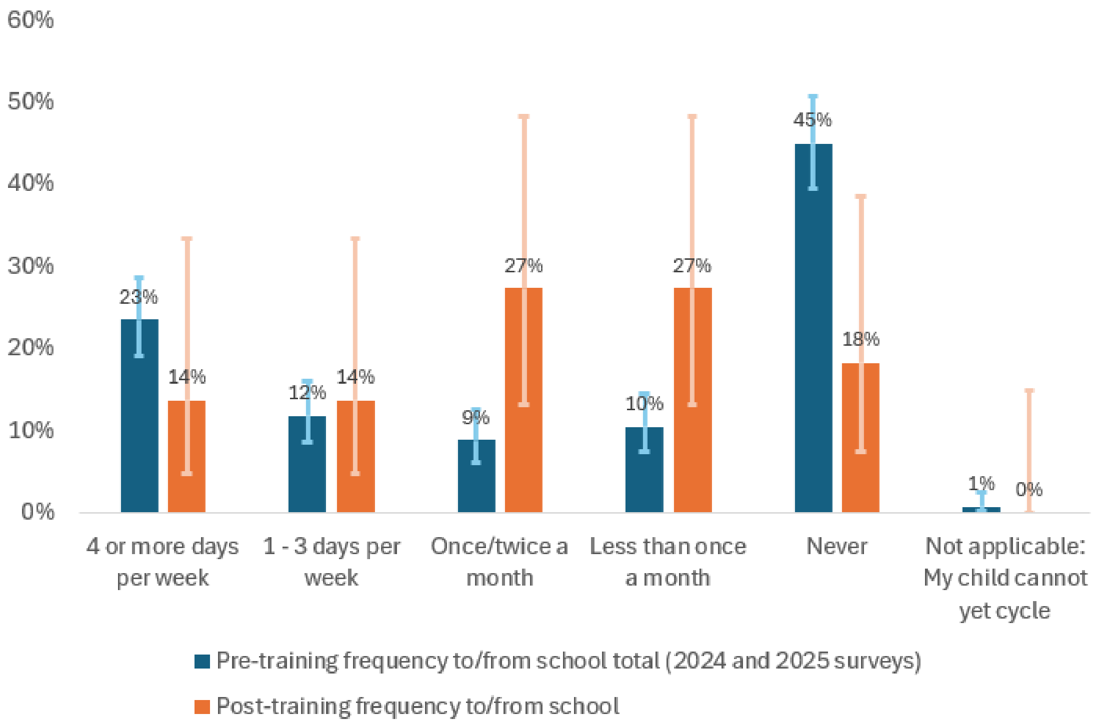

Figure 9: Reported frequency of children cycling to/from school pre- vs post-training (all case study schools)

3.4 Cyclist-involved collisions and injuries in school travel

Collision data were examined to understand the safety record in each of the case study school locations. Collision data were obtained from the STATS19 database, which records police-reported road traffic collisions that result in personal injury and occur on the public highway. The dataset includes information on the location, severity and characteristics of the collision, as well as details about vehicles and road users involved.

It is important to note that STATS19 does not capture all road traffic collisions. Only collisions that are reported to, or recorded by, the police and involve personal injury on the public highway are included. Collisions that do not involve injury, occur on private land (such as car parks), or take place on paths and off-road routes that are not part of the public highway network are not included in the dataset.

Previous research has shown that some collisions are under-reported in police data, particularly those involving pedal cycles or minor injuries. Studies linking police collision records with health data suggest that a proportion of cycling collisions treated in hospitals are not recorded in STATS19. As a result, the dataset should be interpreted as representing reported injury collisions rather than the full number of cycling incidents occurring on the network (Department for Transport (DfT), 2023). Despite these limitations, STATS19 remains the most consistent national dataset available for analysing road collision patterns and identifying locations where safety issues may occur (Transport, 2022).

The analysis included collisions occurring within the Lower Layer Super Output Areas (LSOAs) surrounding each school. Multiple LSOAs were selected for each case study to capture the wider neighbourhood street network used for school travel. The selected LSOAs covered the areas examined during the on-street site assessments and included the main routes, links and junctions assessed as part of the infrastructure audits. This approach allowed collision patterns to be examined across the network of routes most likely to be used by pupils travelling to and from the schools.

The number of LSOAs included varied between schools depending on the size and density of the surrounding urban area. Schools located in dense urban environments, such as those in London, were associated with a larger number of LSOAs due to the finer street network and higher junction density, while fewer LSOAs were required for schools located in less dense areas. Collision data were analysed for the period 2015–2024 within the defined study areas around the selected schools. The collision dataset included years affected by the COVID-19 pandemic, when travel behaviour and traffic volumes differed from typical conditions.

Across the nine study school areas, a total of 96 collisions involving pedal cyclists of secondary school age (11–16 years old) and 17-18 year olds were recorded within the defined study areas and time period. This includes all injury collisions in which a cyclist within this age group was involved, regardless of whether the cyclist or another road user was the injured party. Of these, 10 were classified as serious injuries and 86 as slight injuries, with no fatalities recorded in the dataset. Table 8 shows a breakdown of the age of cyclists involved in collisions. Collisions were grouped by secondary school age (11-16 years old) and older children (17-18 years old).

Table 8: Cyclist collisions by age group, 2015-2024

Schools based on region	11- 16 y/o	17-18 y/o	Total
York 1	35	11	46
York 2	17	5	22
Essex 1	1	0	1
Essex 2	0	1	1
Lancashire 1	5	1	6
Lancashire 2	1	0	1
London 1	4	4	8
London 2	2	3	5
London 3	2	4	6
Grand Total	**67**	**29**	**96**

Overall, around 70% of casualties were secondary school aged children (11–16 age group), while approximately 30% were older children aged 17–18. This pattern is particularly evident in York 1 and York 2, where the majority of casualties were concentrated in the 11–16 age group. A similar trend was observed for the areas surrounding Lancashire 1 and Lancashire 2, although there were smaller sample sizes for these schools.

Figure 10 shows the distribution of cyclist collision locations by carriageway and facility type across all study areas.

The majority of cyclist collisions occurred on the main carriageway outside of restricted lanes, accounting for 83 out of 96 recorded cases. In contrast, only a small number of collisions took place within dedicated cycling facilities, including cycle lanes (2 cases) and cycleways or shared-use paths (1 case).

A limited number of collisions were also recorded on the footway (5 cases) and in bus lanes or busways (1 case), while 3 cases were classified as unknown.

This distribution indicates that most cyclist collisions occurred in mixed-traffic environments, where cyclists interact directly with motor vehicles, rather than within segregated or designated cycling infrastructure. This may be due to a general lack of dedicated cycling infrastructure at the case study location (as described in Section 3.2).

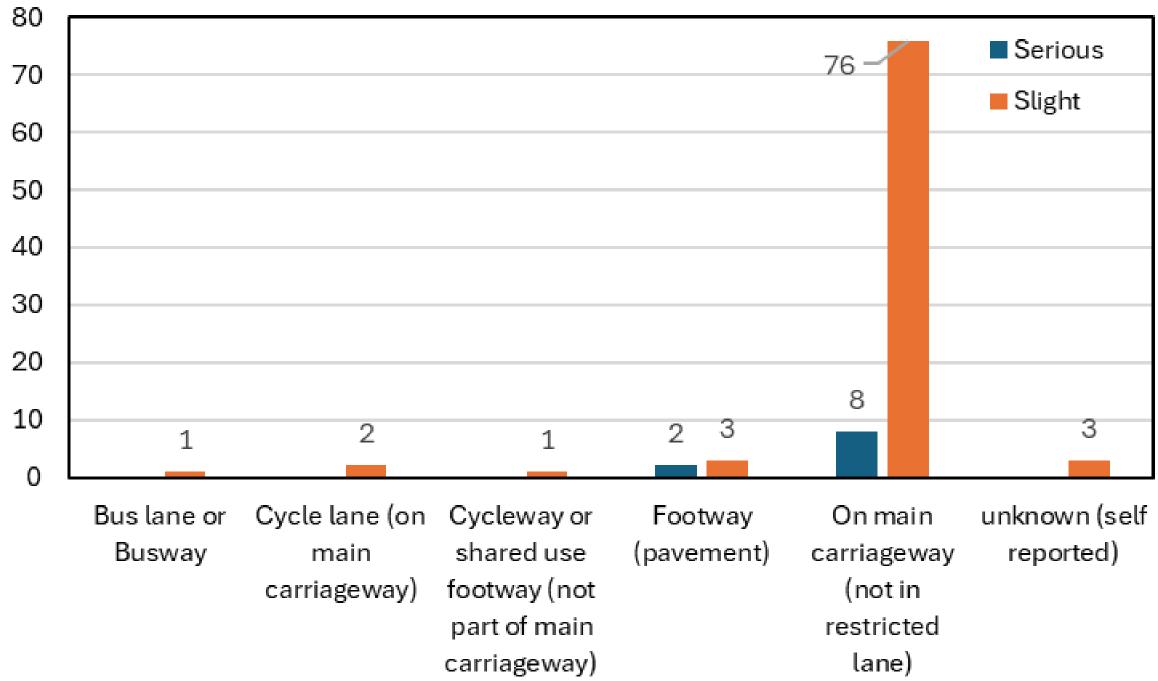

Figure 10: Distribution of cyclist collision locations by carriageway and facility type across all study areas

National STATS19 data (2020–2024), as reported in the Department for Transport pedal cycle factsheet (Department of Transport (DfT), 2025), shows that approximately 40% of pedal cycle casualties occur away from junctions, along carriageway sections, with a further 36% occurring at T or staggered junctions. This indicates that cyclist risk is not limited to junction locations but is strongly associated with exposure to motor traffic along links. The patterns observed in the case study areas are consistent with these national trends, where collisions were also more frequently recorded along carriageway sections.

Figure 11 shows the distribution of cyclist collision locations by facility type across study schools. The distribution of cyclist collision locations varied across the study schools, but the pattern of most collisions occurring on the main carriageway outside of restricted lanes was consistent across schools. This is particularly evident for the areas surrounding York 1 and York 2, which accounted for the highest number of collisions overall and where incidents were predominantly concentrated in mixed-traffic conditions.

Areas with fewer recorded collisions, such as those surrounding Essex 2, Essex 1, and Lancashire 2, showed a similar pattern, with very limited occurrences within dedicated cycling infrastructure.

Some variation was observed in urban areas. For example, London 3 and London 1 showed a small number of collisions which occurred on footways, in cycle lanes, or shared-use facilities.

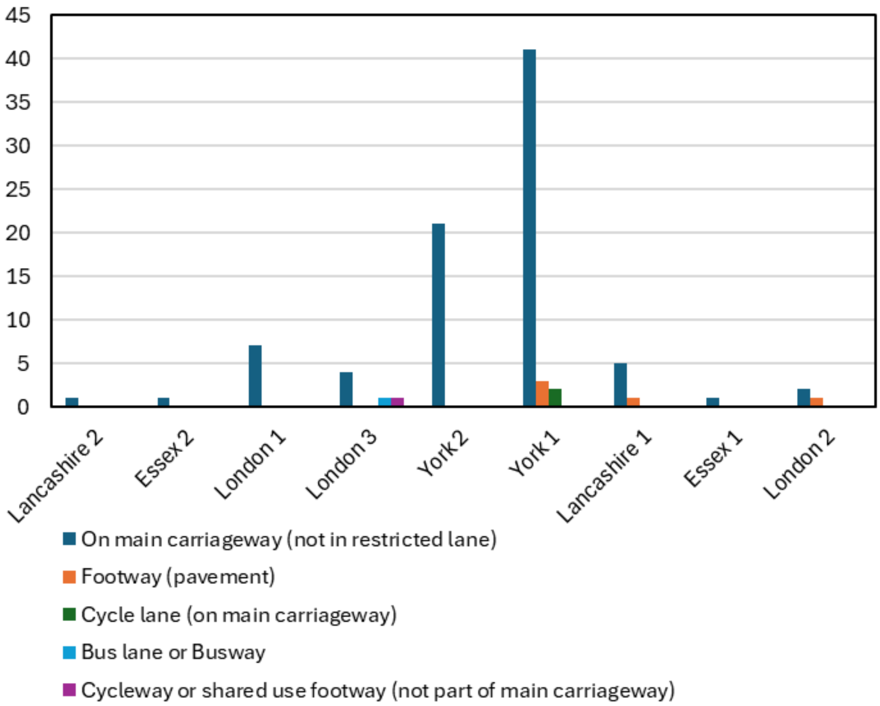

Figure 11: Distribution of cyclist collision locations by facility type across study schools

Figure 12 shows the annual number of cyclist injury collisions by injury severity between 2015 and 2024.

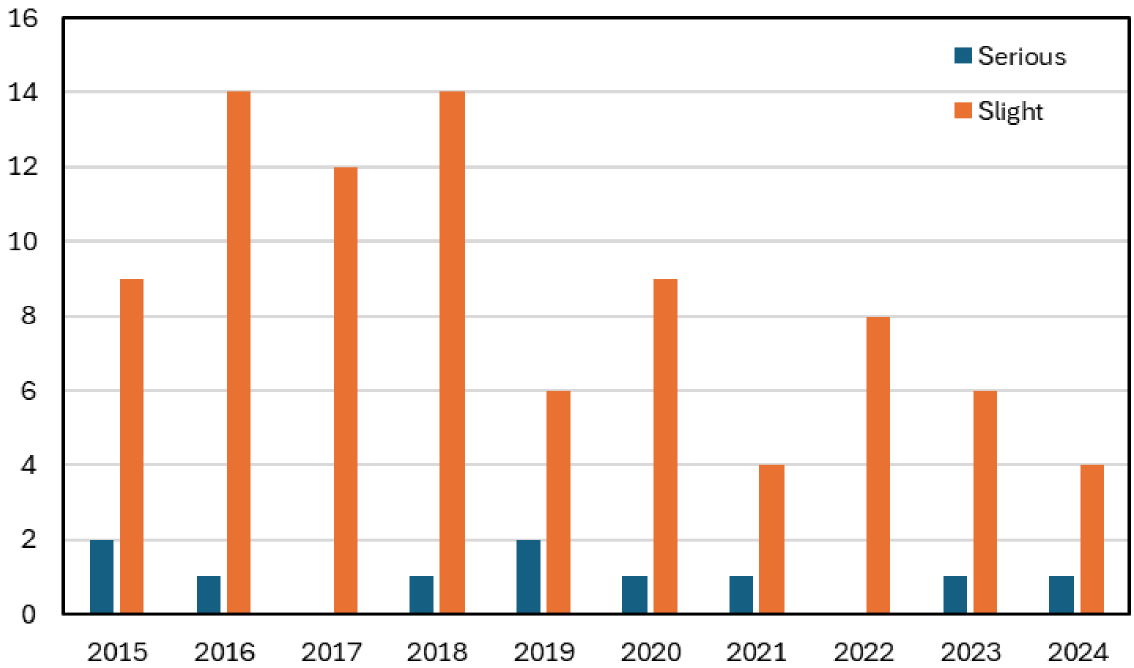

Figure 12: Annual number of cyclist collisions by severity within the study areas

Slight injury collisions accounted for the majority of incidents in every year, while serious injuries occurred much less frequently. The highest numbers of collisions were recorded between 2016 and 2018, when slight injury collisions peaked. From 2019 onwards, the overall number of collisions declined, with lower levels observed in 2021–2024. However, these years include the Covid-19 pandemic period (2020–2021), when travel demand was substantially lower. As a result, the reduction in collisions during these years should be interpreted with caution. The number of collisions generally remained lower from 2022-2024 than the pre-Covid period, with the exception of 2019. The higher number of collisions observed in earlier years may reflect higher cycling exposure or different traffic conditions prior to recent changes in infrastructure and travel behaviour. Recent years (post-2021) may be considered more representative of current conditions following recovery from COVID-19.

At the national level, reported STATS19 data for Great Britain shows that there were approximately 15,300 pedal cyclist casualties in 2024, of which around 80% were slight injuries and approximately 20% were classified as killed or seriously injured (Department of Transport (DfT), 2025). The STATS19 data reflects a national decline in the reported killed or serious injury collisions which involved pedal cyclists between 2014 and 2024, matching the trend in declining numbers of collisions in the sample of data analysed for this study.

This distribution is consistent with the pattern observed in the study areas, where slight injuries also account for the majority of recorded collisions. However, these national figures are not directly comparable to the results presented here due to differences in scale and exposure. The study areas represent relatively small school catchments, and without normalisation (using data on exposure, such as distance travelled) direct comparison is not possible.

Figure 13 shows the distribution of recorded cyclist collisions across the nine school study areas.

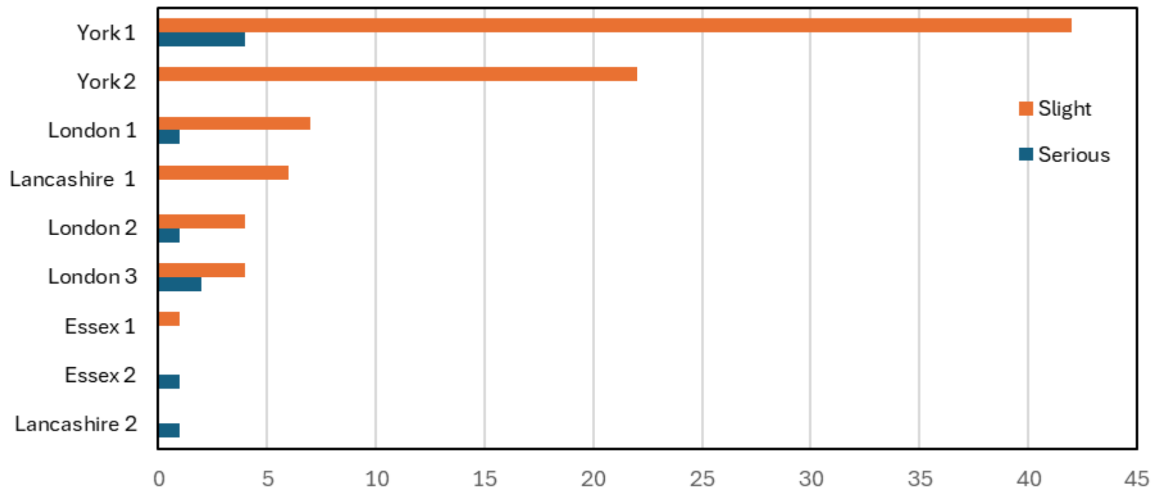

Figure 13:Number of cyclist collisions by severity across the nine school areas

The number of collisions varied substantially between locations. The highest number of collisions was recorded around York 1, with 42 slight injuries and 4 serious injuries. This is followed by York 2, where 22 slight injury collisions were recorded and no serious injuries.

In contrast, the areas surrounding the remaining schools were associated with considerably fewer incidents. For example, in the areas around London 1, London 3, and London 2 there were between 4 and 7 slight injury collisions, with one or two serious collisions. For several schools, including Lancashire 2, Essex 2, and Essex 1, there were very few cyclist collisions recorded in the surrounding areas.

Overall, the areas surrounding the two York schools accounted for the majority of recorded collisions in the dataset, while the areas around the remaining schools showed relatively low numbers of incidents. Higher collision numbers in the York area may partly reflect higher cycling activity rather than poorer safety conditions. Collision counts should therefore be interpreted alongside exposure and cycling levels, which are likely to vary between locations.

The majority of the 96 cyclist collisions involved cars, accounting for 66 slight injuries and 11 serious injuries, making this by far the most common collision type. A much smaller number of cyclist collisions involved other vehicles, including vans, buses, heavy goods vehicles (HGVs), and powered two-wheelers. There were 19 cyclist collisions which did not involve a car (4 serious, 15 slight) and these were spread evenly across the other vehicle types, including with pedestrians, other cyclists and collisions where no other party was involved. Overall therefore, the results show that most cyclist collisions involved interactions with cars. This highlights that interactions between cyclists and motor vehicles, particularly cars, represents the primary safety risk within the study areas.

Figure 14 shows the distribution of cyclist collisions by vehicle type across the nine school study areas. In most locations, collisions involving cars represented the largest share of incidents. The highest number of car related collisions occurs around York 1, with 39 incidents, followed by York 2, where 16 collisions involving cars were recorded.

Other vehicle types were involved much less frequently. A small number of collisions involved vans, motorcycles, buses, and heavy goods vehicles, and these occurred mainly in the York school areas. Multi-vehicle incidents and cyclist-only collisions were rare.

The areas around the remaining schools, including London 3, London 2, and London 1, showed relatively small numbers of collisions overall, although car related incidents remained the most common collision type. Overall, the results show that cyclist collisions in the study areas were predominantly associated with interactions with cars, while collisions involving other vehicle types occur only occasionally.

The concentration of car-related collisions in the York study areas may reflect higher interaction between cyclists and general traffic on key routes. In contrast, lower numbers in other locations may be associated with lower cycling volumes or less complex traffic environments.

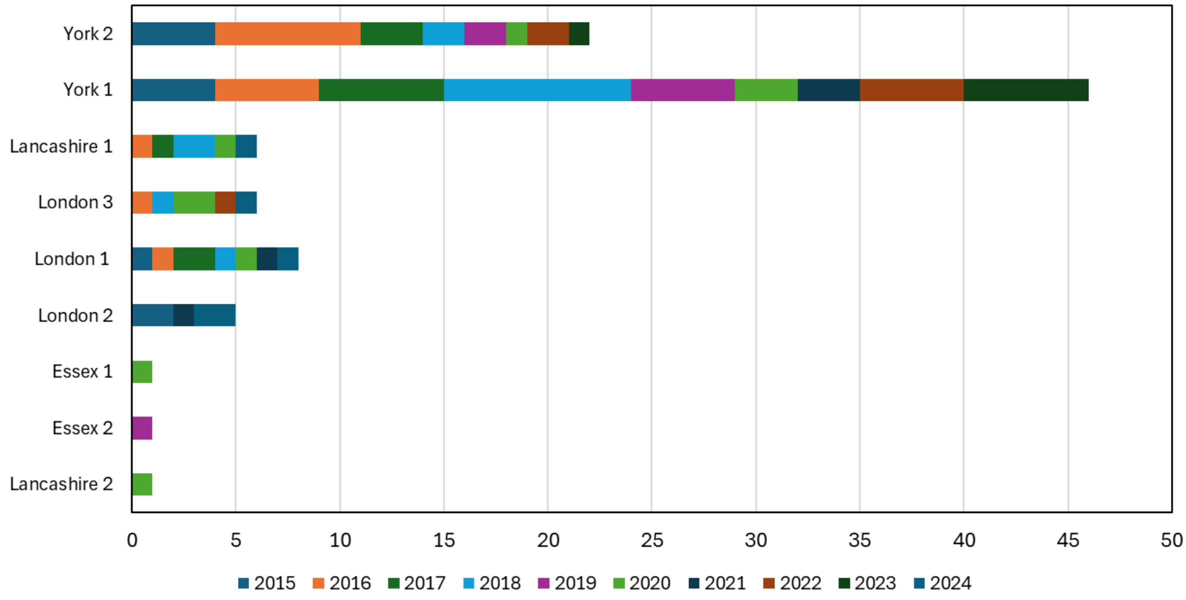

Figure 14: Cyclist collisions by vehicle involvement across the schools

Figure 15 shows distribution of pedal cycle collisions by junction type and first point of impact across the study areas. The first point of impact refers to the part of the vehicle that first came into contact with the cyclist (e.g. front, nearside or offside). For instance, a "front" impact indicates contact with the front of the vehicle. However, this variable does not indicate the direction of movement or which road user initiated the collision.

The highest number of collisions occurred away from junctions (not at junction or within 20 metres), and at T junctions and staggered junctions, where front impacts were most common at both locations.

Roundabouts and mini roundabouts showed comparatively fewer collisions, although side impacts (nearside and offside) were still present, which is consistent with merging and circulating movements.

Across all location types, front impacts were the dominant collision type, while side impacts were more prominent at junctions. Rear impacts were less common overall.

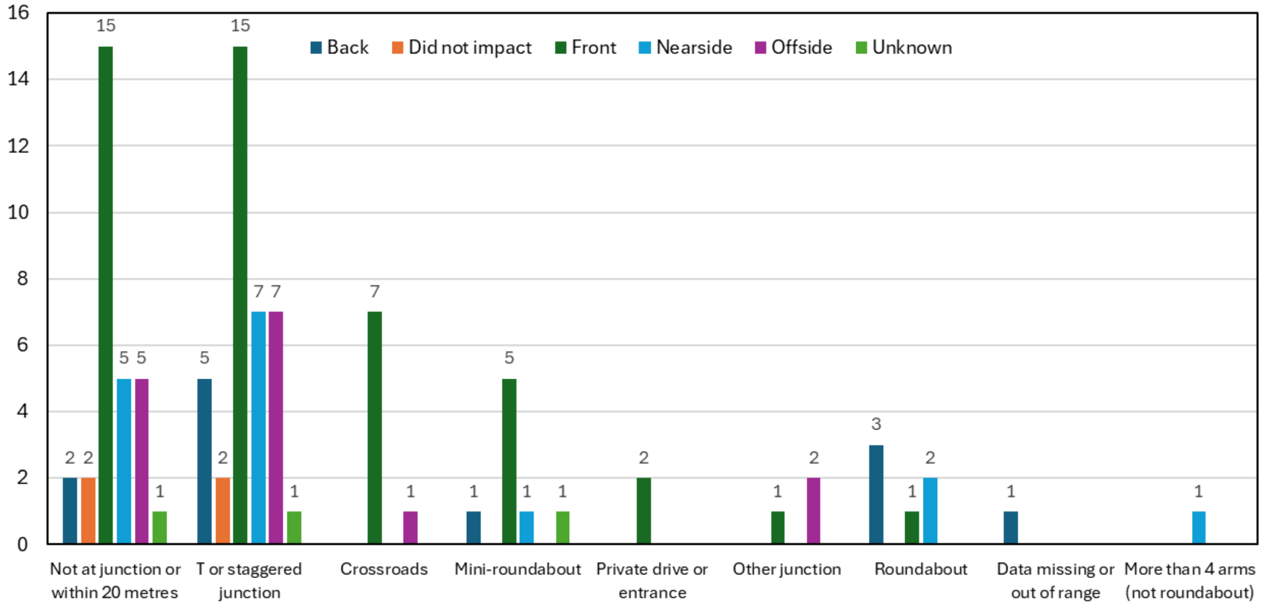

Figure 15: Distribution of pedal cycle collisions by junction type and first point of impact across the study areas.

3.5 School summaries

This section provides a short summary of findings for each case study school. For each location, the summary brings together the key results from the infrastructure assessment, and STATS19 collision analysis. As the survey data was collected and analysed at an aggregated level, due to limited number of respondents, it is used to provide overall context on cycling behaviour rather than school-specific findings. Therefore, the survey data are not included in the school-by-school conclusions.

3.5.1 *York 1*

School information	Name		LA	Setting	IMD Rating
	York 1		York	Semi-urban	90%
Infrastructure	Desktop rating	Connectivity score	On-road audit		
			Links	Junctions	Routes
	Acceptable	69	-5	-1	-7
Cycling to/from school	Survey	Sample size	At least once a week	Less than once a week	Never / NA
	Pre-training	85	51%	16%	33%
Cyclist collisions (2015-2024)	11-16 y/o	17-18 y/o	Total	Characteristics	
	35	11	46	Primarily collisions with a car on the main carriageway, slight severity	

The assessment of York 1 indicated that cycling conditions were relatively more supportive compared to other case study locations, particularly at junctions. Most surrounding streets included in the on-site assessment were residential with 30 mph speed limits and generally lower traffic levels. This results in fewer severe conflict points at junctions, reflected in the comparatively stronger junction performance score.

However, cycling provision across the network was inconsistent. Sections of shared use paths, on-road cycling, and areas without dedicated infrastructure required cyclists to transition between different facility types. This reduces route continuity and limits overall route quality, despite localised strengths at links and junctions.

While routes between residential areas were generally direct and legible, exposure increases where cyclists interact with higher traffic roads, including connections influenced by the A59 and distributor routes. These locations introduce higher levels of risk and reduce suitability for less confident cyclists.

The STATS19 data indicated that the highest number of recorded collisions involving cyclists aged 11-18 years old were interactions with cars. The majority led to slight injuries.

3.5.2 *York 2*

School information	Name		LA	Setting	IMD Rating
	York 2		York	Urban	87%
Infrastructure	Desktop rating	Connectivity score	On-road audit		
			Links	Junctions	Routes
	Acceptable	70	-11	-10	-2
Cycling to/from school	Survey	Sample size	At least once a week	Less than once a week	Never / NA
	Pre-training	80	31%	20%	49%

Cyclist collisions (2015-2024)	11-16 y/o	17-18 y/o	Total	Characteristics
	17	5	22	Collisions all on the main carriageway, all slight severity, primarily with a car.

The assessment of York 2 School indicated that cycling conditions were moderate, but characterised by corridor-related weaknesses. Most surrounding streets reviewed during on-site audits were residential and operated with relatively low to moderate traffic volumes and speeds, providing generally acceptable conditions for cycling within these sections.

However, cycling provision across the local network was not continuous, and cyclists are frequently required to share space with motor traffic. While residential links were relatively supportive of cycling, overall route quality and comfort were reduced by exposure to distributor roads and junction complexity. In particular, routes influenced by the A1237 Ring Road crossing and Haxby Road introduced interfaces that increase risk and reduce suitability for less confident school-aged cyclists.

STATS19 data included 22 recorded cyclist collisions (for riders aged 11-18 years old) in the surrounding area, all of which were classified as slight injuries. The majority of these incidents (16 in total) involved cyclists and cars, reflecting a consistent pattern of collisions occurring in mixed-traffic conditions rather than within dedicated infrastructure. The casualty data also showed that most individuals involved were in the secondary school age group (11–16 years old), though in the absence of exposure data conclusions on relative risks between age groups cannot be drawn.

Overall, York 2 School represents a location where local residential conditions are generally supportive of cycling, but where key corridors and crossings introduce higher-risk environments that limit the suitability of the network for encouraging more regular cycling to/from school.

3.5.3 *Essex 1*

School information	Name		LA	Setting	IMD Rating
	Essex 1		Essex	Urban	54%
Infrastructure	Desktop rating	Connectivity score	On-road audit		
			Links	Junctions	Routes
	Poor	59	-17	-14	-11
Cycling to/from school	Survey	Sample size	At least once a week	Less than once a week	Never / NA
	Post-training	12	25%	50%	25%
Cyclist collisions (2015-2024)	11-16 y/o	17-18 y/o	Total	Characteristics	
	1	0	1	Collision with car on main carriageway, slight severity	

The assessment of Essex 1 School indicated that cycling conditions were poor and dominated by motor traffic. While some residential links offered relatively manageable cycling conditions, the main approach corridors operated as distributor routes where cyclists were required to regularly mix with high volumes of motor traffic.

Cycling provision across the local network was also limited and fragmented. Dedicated cycling infrastructure and wayfinding signage were largely absent, meaning route legibility relied primarily on familiarity with the local street layout. Cyclists were generally required to share the carriageway with motor traffic, particularly on higher-traffic sections such as Burnham Road, Wickford Road, and Hullbridge Road. The absence of continuous infrastructure and limited cyclist priority at junctions reduced overall comfort and made the network less suitable for school-aged riders.

STATS19 data showed only one recorded cyclist collision (for riders aged 11-18 years old) in the surrounding area between 2015 and 2024, classified as a slight injury involving a child aged 11–13. This low collision count contrasts with the York schools but does not necessarily indicate a safer environment, as data on exposure were not available.

Essex 1 School had the lowest connectivity score (59) in the study sample, suggesting a street network that is less conducive to accessing nearby destinations by cycle.

Overall, the case study analysis highlights a traffic-dominated environment and lack of dedicated cycling provision in the area. These factors may act as barriers to regular cycling, potentially limiting the effectiveness of L3 training in supporting sustained behaviour change.

3.5.4 *Essex 2*

School information	Name		LA	Setting	IMD Rating
	Essex 2		Essex	Urban	24%
Infrastructure	Desktop rating	Connectivity score	On-road audit		
			Links	Junctions	Routes
	Poor	71	-17	-14	-11
Cycling to/from school	Survey	Sample size	At least once a week	Less than once a week	Never / NA
	Post-training	5	60%	40%	0%
Cyclist collisions (2015-2024)	11-16 y/o	17-18 y/o	Total	Characteristics	
	0	1	1	Collision with car on main carriageway, serious severity	

The assessment of Essex 2 indicated that cycling conditions were moderate to poor and strongly influenced by traffic. While residential sections provided relatively calmer environments, the wider network relies on distributor corridors where cyclists must interact with higher volumes of motor traffic.

Cycling provision across the surrounding area was limited and fragmented. Dedicated infrastructure was largely absent, and existing provision was not continuous, requiring cyclists to share the carriageway for most of their journey. Junction performance was a key weakness identified in site visits, particularly at intersections along Valley Road and Holland Road, where higher turning volumes and a lack of cycle-specific design reduce comfort and increase risk for less confident riders.

STATS19 data showed only one recorded cyclist collision (for riders aged 11-18 years old) in the surrounding area between 2015 and 2024, which resulted in a serious injury to a person aged 17–18. While the low number of recorded collisions might suggest limited risk, it is more likely to reflect low levels of cycling activity and exposure rather than inherently safer conditions.

In terms of socio-economic context, the school is located in a relatively more deprived area (IMD percentile of 24%) compared to schools such as York 1 and York 2 School. Despite this, the area had a relatively strong connectivity score (71), indicating that the surrounding street network is structurally capable of supporting direct cycling to nearby destinations, especially if infrastructure quality and safety are improved.

Overall, Essex 2 represents a location where underlying connectivity was reasonable, but traffic-dominated conditions and weak junction design limit the suitability of the network for regular cycling to/from school.

3.5.5 *Lancashire 1*

School information	Name		LA	Setting	IMD Rating
	Lancashire 1		Lancashire	Urban	13%
Infrastructure	Desktop rating	Connectivity score	On-road audit		
			Links	Junctions	Routes
	Poor	67	-21	-28	-15
Cycling to school	Survey	Sample size	At least once a week	Less than once a week	Never / NA
	Post-training	67	24%	20%	55%
Cyclist collisions (2015-2024)	11-16 y/o	17-18 y/o	Total	Characteristics	
	5	1	6	Collisions all with car, of slight severity and primarily on the main carriageway	

The assessment of Lancashire 1 School indicated that cycling conditions were poor to moderate and strongly influenced by junction density. Although the surrounding street network included in the audit were primarily residential with moderate traffic levels, there were a high number of mini roundabouts and closely spaced junctions. These frequent interaction points require cyclists to negotiate multiple priority changes and turning movements in mixed traffic, reducing overall comfort and increasing complexity.

Cycling provision across the local network was limited, with no dedicated cycling infrastructure, cycle-specific signage, or protected crossing facilities identified on the surveyed routes. Routes were generally car-oriented and included wider roads and larger junction layouts compared to more supportive locations. Junction design typically prioritised motor vehicle movements, requiring cyclists to navigate turning traffic and longer crossing distances without dedicated space.

STATS19 data showed six recorded cyclist collisions (for riders aged 11-18 years old) in the surrounding area between 2015 and 2024. All incidents resulted in slight injuries and involved cyclists in the secondary school age group (11-16 years old).

The school is located in a more deprived area (IMD percentile of 13%), with particular deprivation in education and skills. Despite this, the connectivity score of 67 indicated that the street network is structurally capable of supporting direct cycling access to nearby destinations, but would benefit from improved infrastructure and junction conditions.

Overall, Lancashire 1 School represents a location where frequent and complex junction interactions, rather than route continuity alone, form the primary barrier to safe and comfortable cycling.

3.5.6 *Lancashire 2*

School information	Name		LA	Setting	IMD Rating
	Lancashire 2		Lancashire	Suburban	65%
Infrastructure	Desktop rating	Connectivity score	On-road audit		
			Links	Junctions	Routes
	Poor	73	-21	-28	-11
Cycling to school	Survey	Sample size	At least once a week	Less than once a week	Never / NA
	Pre-training	66	32%	20%	47%
	Post-training	5	0%	80%	20%
Cyclist collisions (2015-2024)	11-16 y/o	17-18 y/o	Total	Characteristics	
	1	0	1	Collision with car on main carriageway, serious severity	

The assessment of Lancashire 2 indicated that cycling conditions were poor to moderate and constrained by corridor conditions. While residential and park-side links near Worden Park provided more supportive environments for cycling, the main approach routes were dominated by higher-traffic distributor corridors, particularly Leyland Lane.

Cycling provision across the local network was also limited, with cyclists frequently required to share the carriageway with motor traffic. Although the street network was relatively direct and legible, the presence of repeated mini roundabouts and complex junctions, especially along Leyland Lane, reduces overall comfort and introduces multiple conflict points. The lack of continuous infrastructure and protected crossings meant cyclists must rely on positioning within mixed traffic, creating a barrier for less confident riders.

STATS19 data indicated that there was only one recorded cyclist collision (for riders aged 11-18 years old) in the surrounding area between 2015 and 2024, resulting in a slight injury to a person aged 14–16. As with other non-York case study areas, this low number may reflect limited cycling activity and reduced exposure rather than inherently safer conditions.

Lancashire 2 is the only school in the study with both pre- and post-training survey data available to assess behavioural change, however the post-training sample size is very small (n=5), meaning no conclusions on behaviour change could be drawn.

The school had a relatively strong connectivity score (73), indicating that the underlying street network is capable of supporting direct cycling access if supported by improved infrastructure and reduced traffic exposure.

Overall, Lancashire 2 represents a location where corridor conditions and junction complexity, rather than network structure, are likely to act as key barriers to regular cycling to/from school.

3.5.7 *London 1*

School information	Name		LA	Setting	IMD Rating
	London 1		Fulham	Urban	75%
Infrastructure	Desktop rating	Connectivity score	On-road audit		
			Links	Junctions	Routes
	Acceptable	90	-20	-28	-11
Cycling to/from school	No survey data available				
Cyclist collisions (2015-2024)	11-16 y/o	17-18 y/o	Total	Characteristics	
	4	4	8	Collisions all on main carriageway, primarily slight severity and with car.	

The assessment of London 1 indicated that cycling conditions were moderate, but strongly influenced by motor traffic exposure, parking pressure, and frequent junction interactions. The surrounding street network included in the audits consisted of closely spaced streets with frequent junctions, providing multiple route options and generally good directness.

However, dedicated cycling infrastructure across the local network was limited and inconsistent. Cyclists were generally required to share the carriageway with motor vehicles, and route continuity was frequently interrupted by competing demands within the urban environment. A key constraint identified was the high level of on-street parking, which reduces effective carriageway width and introduces “dooring” risk (i.e. parked car doors being opened into the path of cyclists), requiring cyclists to position themselves further into the traffic stream. In addition, some residential streets appeared to function as through-routes, resulting in higher traffic volumes than would typically be expected in a local street context.

STATS19 data indicated that there were eight recorded cyclist collisions in the surrounding area between 2015 and 2024, including seven slight injuries and one serious injury. Most incidents involved interactions with cars, reflecting the dominance of mixed traffic conditions.

The school achieved the highest connectivity score (90) in the study, reflecting its location within a dense urban environment with close proximity to services and destinations. However, this high level of connectivity did not correspond to high-quality cycling conditions. The environment was rated as acceptable rather than good, due to the combined effects of traffic volume, parking pressure, and junction complexity.

Overall, London 1 represents a highly connected but traffic-intensive cycling environment, where network structure supports accessibility, but operational conditions limit comfort and safety for regular cycling.

3.5.8 *London 2*

School information	Name		LA	Setting	IMD Rating
	London 2		Hammersmith	Urban	59%
Infrastructure	Desktop rating	Connectivity score	On-road audit		
			Links	Junctions	Routes
	Acceptable	89	-19	-21	-11
Cycling to/from school	No survey data available				
Cyclist collisions (2015-2024)	11-16 y/o	17-18 y/o	Total	Characteristics	
	2	3	5	Collisions primarily on the main carriageway, with car and slight severity.	

The assessment of London 2 indicated that cycling conditions were moderate but influenced by traffic. While surrounding residential streets provided relatively calm conditions, the wider network was constrained by busy urban corridors such as Uxbridge Road and Wood Lane.

Cycling provision across the local network was limited and fragmented and did not provide continuous protected routes to the school. Cyclists were generally required to share the carriageway with motor vehicles, while widespread on-street parking reduced effective road width and introduced “dooring” risk. Junction performance was a key weakness identified in the audits, particularly where local streets connect to major corridors, resulting in higher traffic volumes and more complex turning movements.

STATS19 data included five recorded cyclist collisions (for riders aged 11-18 years old) in the surrounding area between 2015 and 2024, including four slight injuries and one serious injury. Three of the five casualties were in the 17–18 age group. As seen across other locations, most incidents involved interactions with cars, possibly reflecting the dominance of mixed traffic conditions.

The school achieved a high connectivity score of 89, reflecting its location within a dense urban area with close proximity to services and destinations. However, this high connectivity does not equate to high-quality cycling conditions, as demonstrated by the on-street audit. The environment was rated as acceptable rather than good, due to the combined effects of traffic volume, parking pressure, and junction complexity.

3.5.9 *London 3*

<table>
<tr><td rowspan="2">School information</td><td>Name</td><td></td><td>LA</td><td>Setting</td><td>IMD Rating</td></tr>
<tr><td colspan="2">London 3</td><td>Hammersmith</td><td>Urban</td><td>62%</td></tr>
<tr><td rowspan="3">Infrastructure</td><td rowspan="2">Desktop rating</td><td rowspan="2">Connectivity score</td><td colspan="3">On-road audit</td></tr>
<tr><td>Links</td><td>Junctions</td><td>Routes</td></tr>
<tr><td>Acceptable</td><td>90</td><td>-19</td><td>-23</td><td>-11</td></tr>
<tr><td>Cycling to/from school</td><td colspan="5">No survey data available</td></tr>
<tr><td rowspan="2">Cyclist collisions (2015-2024)</td><td>11-16 y/o</td><td>17-18 y/o</td><td>Total</td><td colspan="2">Characteristics</td></tr>
<tr><td>2</td><td>4</td><td>6</td><td colspan="2">Collisions all on main carriageway and slight severity, primarily with car.</td></tr>
</table>

The assessment of London 3 indicated that cycling conditions were moderate but influenced by traffic. The school is located within a dense urban environment with a closely connected street network, offering multiple route options through surrounding residential streets. However, cycling provision across the local network included in the review was fragmented and inconsistent. While the street network provided good directness, it did not offer continuous protected routes to the school. A key constraint identified was the high level of on-street parking, which reduced effective carriageway width and created frequent interactions between cyclists and parked vehicles, increasing "dooring" risk. In addition, some residential streets function as through-routes, resulting in higher traffic volumes than expected for a local street environment.

STATS19 data showed six recorded cyclist collisions (for riders aged 11-18 years old) in the surrounding area between 2015 and 2024, including four slight injuries and two serious injuries. Four of the six casualties were cyclists in the 17–18 age group. Most incidents involved interactions with cars; however, unlike several other case study areas, some collisions were also recorded on footways, in cycle lanes, and in shared-use facilities, indicating that risk is not limited to on-carriageway conditions.

The school achieved a connectivity score of 90, equal to the highest in the study, reflecting its location in a dense urban area with close proximity to services and destinations. However, this high level of connectivity did not translate into high-quality cycling conditions. The environment was rated as acceptable rather than good, due to the combined effects of traffic volume, parking pressure, and junction complexity.

Overall, London 3 represents a highly connected but complex cycling environment, where multiple sources of interaction across different facility types contribute to overall risk and may reduce suitability for encouraging regular cycling to/from school.

3.6 Summary of case study findings

Limited responses to pre- and post-training survey responses were available for children who had completed Bikeability L3 at the case study schools. As such, there was insufficient data on participation in cycling to school to draw firm conclusions on the interaction between Bikeability L3 training and cycling infrastructure from the case study analysis.

Nevertheless, some general insights were drawn from the on-street infrastructure assessments and the collision data analysis at the case study schools; these are summarised below.

Across all case study locations, some common characteristics were identified. First, dedicated cycling infrastructure was limited, with most routes requiring cyclists to travel in mixed traffic conditions. Second, existing infrastructure was generally fragmented, with cycle facilities that were discontinuous and failing to provide consistent connections between residential areas and schools.

Some differences between schools and regions were also observed. In London, although there was a relatively denser network of potential routes available for cyclists compared with other locations, site observations identified issues such as parking conflicts and ‘rat-running’ that are likely to reduce usability and safety in practice. At some locations, cyclists were also required to dismount to use underpasses, which disrupts journey continuity and reduces the practicality of cycling routes. In York, calmer residential streets provided greater support for cycling, but provision was discontinuous. Areas surrounding the schools in Lancashire were characterised by more car-oriented road environments, while the school surroundings in Essex showed fragmented and inconsistent infrastructure.

Findings from the literature review showed that higher-quality infrastructure provision, including continuous routes and reduced interaction with motor traffic, is associated with more supportive cycling conditions, particularly for younger or less experienced riders. Poor conditions are therefore likely to influence both pupil and parental decisions around regular cycling. Even where pupils have received on-road cycle training, the perceived and actual risks associated with these environments may discourage frequent use.

Further insight is provided by the characteristics of the recorded collisions. A large proportion involved interactions between cyclists and motor vehicles, particularly cars, reflecting the limited provision of segregated infrastructure and the need for cyclists to operate in mixed traffic conditions. Further, the spatial distribution of collisions showed that most incidents occurred on the main carriageway, particularly on roads with a 30-mph speed limit. This aligns with the infrastructure assessment, which found limited provision of segregated cycling facilities, requiring cyclists to travel in mixed traffic conditions. As a result, exposure to motor vehicles remains the dominant source of risk.

The distribution of impact types provides further insight into the nature of risk. Front impacts, defined as collisions where the front of a motor vehicle strikes the cyclist, were the most common across all locations. These were particularly frequent along carriageway sections, suggesting conflicts with vehicles travelling in the same direction or opposing flows. Side impacts (nearside and offside) were more frequently observed at junctions, indicating turning and crossing conflicts. This reinforces the importance of both mid-block protection and improved junction design in reducing cyclist risk.

4 Summary and Recommendations

This study set out to understand how infrastructure, safety conditions and training collectively influence cycling to school. The study also sought to identify how this analysis could be scaled nationally. A mixed-method approach was used, combining a structured literature review, and detailed case studies of nine schools across York, Essex, Lancashire and London which included on-street infrastructure audits, analysis of pre- and post-training survey data, and review of STATS19 collision records involving 11-18-year-old cyclists.

4.1 How training and infrastructure interact

Evidence from the literature review showed that both cycling skills and the built environment strongly shape children's ability and willingness to cycle. The literature indicated that high-quality, continuous and protected cycling infrastructure - particularly safe crossings, simpler junctions, and lower traffic speeds - reduces exposure to risk and is consistently linked to higher cycling participation. Parental perceptions of road danger remain a major determinant of whether pupils are allowed to cycle, meaning that route quality plays a decisive role in real-world uptake.

The literature also showed that cycle training improves road awareness, confidence, and hazard perception in riders, helping them ride more safely once on the road. However, training alone rarely results in increased cycling to school over the long-term. Persistent route barriers, traffic conditions, and parental concerns limit the extent to which young people can use their skills in practice. The evidence therefore points to the greatest benefits occurring when high-quality infrastructure and cycle training are delivered together: infrastructure reduces exposure to risk and improves perceptions of safety, and training equips riders with the essential skills and confidence to cycle more and manage any risks that remain.

Given this interaction, assessing training impacts in isolation is insufficient. Instead, training outcomes should be understood alongside the wider environment, particularly route continuity, junction complexity, network connectivity, and collision patterns. The case study assessment in this study attempted to do this, but limited pre- and post-training survey responses meant that the case study evidence alone was not sufficient to draw firm conclusions. As such it is recommended that the analysis undertaken here is expanded to other schools and locations, in order to build up a national dataset which can support a robust analysis.

4.2 Insights from the nine case study locations

Although cycling participation data was insufficient for the case study schools, the on-street site audits and collision analysis revealed a number of insights:

4.2.1 *Infrastructure barriers*

Cycling conditions were generally rated 'poor' to 'moderate'. Infrastructure was often fragmented, inconsistent, or absent. Even in areas with good network connectivity, cyclists often faced complex junctions, gaps in protected provision, and frequent interactions with motor traffic. This is also reflected in the collision patterns, where incidents were commonly recorded in mixed traffic conditions and at junctions.

4.2.2 *Environmental constraints*

In the areas surrounding the London schools, high parking density and through-traffic forced cyclists into narrow spaces between parked and moving vehicles, creating risks such as "dooring". In Lancashire and Essex, large junctions, car-dominated layouts, and wide crossing points reduced the suitability and attractiveness of cycling. Whilst taken from only a small sample of schools, these conditions illustrate the kinds of environmental barriers that must be addressed to support higher levels of cycling in school-aged children.

4.2.3 *Collision patterns*

Ninety-six cyclist collisions involving riders aged 11-18 were recorded across the case study areas (between the years of 2015–2024). Most of these collisions involved interactions with cars on the main carriageway and resulted in slight injuries with additional concentrations at junctions involving turning movements. This is consistent with site observations, where cyclists were often required to travel in mixed traffic conditions and navigate complex junctions. Two schools in York recorded higher numbers of collisions, although the absence of reliable data on cycling activity means those higher numbers cannot be interpreted as higher risk without understanding exposure.

4.3 Applicability to Bikeability Level 3 training

The results of this study, alongside the scope of Bikeability Level 3 (L3) training set out in the Delivery Guide (Bikeability Trust, 2022), provide insight into how cycle training interacts with real-world cycling conditions on journeys to and from secondary school.

L3 training focuses on applying established skills independently on real roads in complex traffic environments, including locations with high traffic volumes or speeds, multi-lane roads, signal-controlled junctions, etc. Findings from this study show that pupils' school cycling environments are often characterised by fragmented infrastructure and mixed-traffic conditions, busy junctions and crossings. This pattern was consistent across study areas, including those with relatively high network connectivity.

In such contexts, the benefits of L3 training are strongly shaped by the surrounding environment. Pupils are often required to rely heavily on judgement, riding position, observation and hazard perception when interacting with motor traffic, rather than being supported by continuous or protected infrastructure. This reflects the core intent of L3, which emphasises assertive riding, independent decision-making and the ability to adapt to varied and sometimes sub-optimal road conditions.

The findings do not suggest a need for changes to the L3 curriculum as set out in the 2022 Delivery Guide. However, they do highlight the importance of ensuring that L3 training continues to be closely aligned with the real-world conditions pupils are most likely to encounter on school journeys, particularly:

- negotiating complex and signal-controlled junctions

- cycling in mixed-traffic environments with limited road space or parking pressure
- making informed decisions about route choice, riding position and the use (or non-use) of cycling infrastructure where provision is fragmented or inconsistent.

More broadly, the findings support that Bikeability Level 3 training and cycling infrastructure operate as complementary, rather than substitutable, interventions.

4.4 Scaling the analysis to other areas

Three types of infrastructure data were reviewed as part of the case study analysis: iRAP/CycleRAP, OpenStreetMap, and on-street assessments using CERS. CERS provided the most reliable and detailed understanding of real-world conditions but is also the most resource intensive, requiring ‘on-the-ground’ assessments.

***iRAP/CycleRAP*:** Coverage was limited to the Strategic Road Network in the case study areas, making it unsuitable for analysing school routes that primarily rely on local roads. For most future applications, iRAP/CycleRAP should be deprioritised unless comprehensive local-road surveys are available.

***OpenStreetMap*:** This was useful for identifying route layout and general provision, but was insufficient for assessing infrastructure quality, junction safety, or user experience to sufficient depth. There were many discrepancies between mapped data and the conditions observed during on-street surveys, suggesting limitations using OpenStreetMap as a secondary dataset.

***On-street audits (CERS)*:** Despite higher resource demands, these provided the most accurate basis for understanding cycling conditions and are recommended for future studies if this analysis is extended to additional schools.

In addition to the above sources, analysis of connectivity and socio-economic indicators (using the Connectivity Tool and IMD scores) provided useful insight into the wider environment, including potential accessibility and underlying travel patterns. However, these measures did not fully reflect the real-world cycling conditions observed during site visits. For example, the measures did not capture factors such as traffic behaviour, junction complexity, surface quality, or user comfort, which were recorded via CERS audits. As such, while these tools support initial understanding, detailed on-site assessment remains essential for evaluating actual cycling conditions.

To strengthen future evaluation, there is a need for more consistent and complete survey data collection. This could include improving response rates for post-training surveys, ensuring better alignment between pre- and post-training samples, and exploring alternative data collection approaches (for example, follow-up surveys through schools or integration with school travel planning data).

4.5 Recommendations

The recommendations from this study are as follows:

Prioritise provision of safe and consistent cycling infrastructure

- Improving infrastructure is critical to enabling regular cycling to school. Continuous and dedicated cycling provision should be prioritised along key school routes to reduce reliance on mixed traffic, particularly along carriageway sections where cyclists are most exposed to motor vehicles.
- Particular attention should be given to junctions, where conflict between cyclists and motor vehicles is most pronounced. Measures such as clearer cyclist priority, reduced turning speeds, and safer crossing facilities should be implemented.
- Routes should be designed to be coherent and legible, allowing pupils to follow direct and intuitive paths. Reducing gaps in provision and avoiding abrupt transitions between different infrastructure types will improve both safety and user comfort.

Adopt an integrated investment approach

- Bikeability training should be delivered alongside improvements to the local cycling environment. Training is most effective when pupils can apply their skills in conditions that support safe cycling. Where possible, training routes should reflect realistic journeys to school, ensuring relevance to pupils' daily travel patterns.
- Local authorities and stakeholders should align training programmes with infrastructure planning to ensure that interventions are mutually reinforcing and deliver sustained outcomes.

Maintain Bikeability Level 3 training focus on real-world conditions

- Bikeability L3 programme is intended to prepare pupils to ride independently in real traffic conditions. The findings from this study show that many pupils cycle in environments characterised by mixed traffic, fragmented infrastructure and complex junction layouts. L3 training should therefore continue to place strong emphasis on supporting pupils to apply existing skills in realistic on-road settings, particularly when managing interactions with motor traffic, navigating complex junctions, and responding to inconsistent or discontinuous cycling provision.

Expand the research to additional schools and areas

- Findings from the evidence review suggest that improving cycling uptake requires both safe infrastructure and appropriate training. However, the limitations of the case study analysis described here, in particular due to small samples of survey data, mean that further research is needed to better understand how these factors influence the outcomes of the Bikeability L3 programme.

Strengthen evaluation

- To strengthen the evidence base, future evaluations should address the limitations observed in this study, particularly the small sample size with pre- and post-training data on cycling participation. The low number of post-training responses in particular and the small samples per school meant that reliable conclusions on behavioural change could not be drawn.
- Expansion of the research to other schools and areas is reliant on obtaining robust samples of pre- and post-training survey data, so that reliable measures of participation in cycling to/from school can be analysed alongside variables related to

infrastructure quality. It is therefore recommended that interventions are considered to increase the response rates to pre- and post-training surveys, such as additional incentives, survey reminders and seeking support from schools and Training Providers.

5 References

Anupriya, Z., Xiaowei, M., Graham., E. &., & J., D. (2025). Safe streets for cyclists? Quantifying the causal impact of cycling infrastructure interventions on safety. *Accident Analysis and Prevention, 220*, 1-17. https://doi.org/https://doi.org/10.1016/j.aap.2025.108168

Atkins Limited. (2010). *An evaluation of the 'Travelling to School Initiative' programme final .*

Bikeability Trust. (2022). *Bikeability delivery guide: For registered Bikeability training providers and instructors in England.* https://www.bikeability.org.uk/wp-content/uploads/2022/01/Bikeability-Delivery-Guide-2022-1.pdf.

Bishop, D. (2025a). s Bikeability cycle training an effective active travel behaviour change intervention?Confirmatory evidence from classroom-based surveys of UK schoolchildren. *International Journal of Behavioral Nutrition and Physical Activity*.

Bishop, D. T., Batley, P., Waheed, H., Dkaidek, T. S., Atanasova, G., & Broadbent, D. P. (2024). Barriers and enablers for cycling: A COM-B survey study of UK schoolchildren and their parents. *Journal of Transport & Health, 35*. https://doi.org/10.1016/j.jth.2024.101765

Bishop, D., & Digaeva, A. (2025). Bikeability cycle training: a route to increasing young people's subjective wellbeing? A retrospective cohort study. *BMC Public Health, 25*(:2826). https://doi.org/10.1186/s12889-025-23838-2

Boland, P., Nowland, R., Tellis, K. D., Adams, M., Westwood, J., Crook, D., & Ridley, J. (2025). Barriers and Facilitators to Cycling to School for Children in the UK: A Systematic Review. *Active Travel Studies, 5*(1), 1-26. https://doi.org/10.16997/ats.1553

Bons, a.-F. M., Zanotto, M., Walker, K., Benoit, S., Kirk, S., & Winters, M. (2026). Cycling rate trends from Canada's national volunteer cycling count. *Journal of Cycling and Micromobility Research*(7), 1-13. https://doi.org/https://doi.org/10.1016/j.jcmr.2025.100100

Clayton, W., & Musselwhite, C. (2013). Exploring changes to cycle infrastructure to improve the experience of cycling for families. *Journal of Transport Geography, 33*, 54-61. https://doi.org/10.1016/j.jtrangeo.2013.09.003

Clayton, W., & Musselwhite, C. (2013). Exploring changes to cycle infrastructure to improve the experience of cycling for families. *Journal of Transport Geography, 33*, 54-61. https://doi.org/10.1016/j.jtrangeo.2013.09.003

Cohen, A., Nelson, T., Zanotto, M., Fitch-Polse, D. T., Schattle, L. H., & Winters, M. (2024). The impact of bicycle theft on ridership behavior. *18*(5), 453-463. https://doi.org/10.1080/15568318.2024.2350946

Cycling UK. (2023). *Family bike rides: tips for cycling with children*. Available at: https://www.cyclinguk.org/guide/family-bike-rides (Accessed: 08/12/2025).

Department for Regional Development. (2015). *Travel to/from school by post primary .*

Department for Transport (DfT). (2020). *Cycle infrastructure design (LTN 1/20).* Available at: https://assets.publishing.service.gov.uk/media/5ffa1f96d3bf7f65d9e35825/cycle-infrastructure-design-ltn-1-20.pdf.

Department for Transport (DfT). (2023). *Other sources of information on road casualties.* https://www.gov.uk/government/publications/other-sources-of-information-on-road-casualties/other-sources-of-information-on-road-casualties.

Department of Transport (DfT). (2025). *Reported road casualties in Great Britain: pedal cycle factsheet, 2024.* https://www.gov.uk/government/statistics/reported-road-casualties-great-britain-pedal-cyclist-factsheet-2024/reported-road-casualties-in-great-britain-pedal-cycle-factsheet-2024.

Dill, J., & Carr, T. (2003). Bicycle commuting and facilities in major US cities: if you build them, commuters will use them. *Transportation research record, 1828*(1), 116-123. https://doi.org/10.3141/1828-14

Ducheyne, F., De Bourdeaudhuij, I., Lenoir, M., & Cardon, G. (2014). Effects of a cycle training course on children's cycling skills and levels of cycling to school. *Accident Analysis & Prevention, 67*, 49-60. https://doi.org/10.1016/j.aap.2014.01.023

Goodman, A., van Sluijs, E. M., & Ogilvie, D. (2015). Cycle training for children: Which schools offer it and who takes part? *Journal of Transport & Health, 2*(4), 512. https://doi.org/10.1016/j.jth.2015.07.002

Goodman, A., van Sluijs, E. M., & Ogilvie, D. (2016). Impact of offering cycle training in schools upon cycling behaviour: a natural experimental study. *International Journal of Behavioral Nutrition and Physical Activity, 13*(1), 34. https://doi.org/10.1186/s12966-016-0356-z

Götschi, T., Garrard, J., & Giles-Corti, B. (2016). Cycling as a part of daily life: a review of health perspectives. *Transport reviews, 36*(1), 45-71. https://doi.org/10.1080/01441647.2015.1057877

Harpham, N., Marino, I., Smith, L., & Beard, G. (2024). *Modelling the impacts of Bikeability training on KSIs: Final project deliverable.* TRL.

Harris, M. A., Reynolds, C., Winters, M., Cripton, P. A., Shem, H., Chipman, M., Cusimani, M., Babul, S., Brubacher.J., Friedman, S., Hunte, G., Monro, M., Vernich, L., & Teschke, K. (2013). Comparing the effects of infrastructure on bicycling injury at intersections and non-intersections using a case–crossover design. *Injury Prevention, 19*, 303-310. https://doi.org/doi:10.1136/injuryprev-2012-040561

Hodgson, C., & Worth, J. (2015). *Research into the impact of Bikeability training on children's ability to perceiveand appropriately respond to hazards when cycling on the road .* National Foundation for Educational Research (NFER).

Jahanshahi, D. B., Costello, S., Natasha Dirks, K., & van Wee, B. (2025). Toward an equitable transport strategy by assessing cycling initiatives and identifying barriers to implementing cycling equity policies. *Transportation Research Record, 2679*(3), 258-280. https://doi.org/10.1177/03611981241275559

Jahanshahi, D., Chowdhury, S., Costello, S. B., & van Wee, B. (2021). Review of key findings and future directions for assessing equitable cycling usage. *Transportation research record, 2675*(6), 453-464. https://doi.org/10.1177/0361198121995193

Kelly, P., Williamson, C., Baker, G., Davis, A., Broadfield, S., Coles, A., & Gill, J. M. (2020). Beyond cycle lanes and large-scale infrastructure: a scoping review of initiatives that groups and organisations can implement to promote cycling for the Cycle Nation Project. 1405-1415. https://doi.org/10.1136/bjsports-2019-101447

Loo, B. P., Leung, K. Y., & Chan, F. C. (2020). How short-term cycling training promotes cycling among schoolchildren in high-density cities. *International journal of sustainable transportation, 14*(11), 872-885. https://doi.org/10.1080/15568318.2019.1642971

Lorenc, T., Brunton, G., Oliver, S., Oliver, K., & Oakley, A. (2008). Attitudes to walking and cycling among children, young people and parents: a systematic review. *Journal of Epidemiology & Community Health, 62*(10), 852-857. https://doi.org/10.1136/jech.2007.070250

Mandic, S., Flaherty, C., Pocock, T., Kek, C. C., McArthur, S., Ergler, C., & Bengoechea, E. G. (2018). Effects of cycle skills training on children's cycling-related knowledge, confidence and behaviours. *Journal of Transport & Health*, 271-282. https://doi.org/10.1016/j.jth.2017.12.010

Millard-Ball, A., Reginald, M., Yusuf, Y., & Bian, C. (2025). Global health and climate benefits from walking and cycling . *Global health and climate benefits from walking and* *cycling infrastructure., 122*(24), e2422334122. https://doi.org/10.1073/pnas.2422334122

Moudon, A. V., Lee, C., Cheadle, A. D., Collier, C. W., Johnson, D. S., & Weather, R. D. (2005). Cycling and the built environment, a US perspective. *Transportation Research Part D: Transport and Environment,, 10*(3), 245-261. https://doi.org/10.1016/j.trd.2005.04.001

Mulvaney, C., Smith, S., Watson, M., Parkin, J., Coupland, C., Miller, P., Kendrick, D., & McClintock, H. (2015). Cycling infrastructure for reducing cycling injuries in cyclists (Review). *Cochrane Database of Systematic Reviews*(12). https://doi.org/DOI: 10.1002/14651858.CD010415.pub2

Murillo, S., Philipsheck, A., Dementyev, F., Bello-Sotto, B., Bhatt, E., Wilson, H., & Wlson, S. M. (2025). Psychosocial well-being in middle schoolers: effects of a school cycling program in the wake of COVID-19. *Frontiers in Sports and Active Living, 7*, 1646805. https://doi.org/10.3389/fspor.2025.1646805

Nixon, D. V., & Schwanen, T. (2024). Community smarts in grassroots initiatives to support cycling and walking in large urban areas. *Journal of Urban Technology,, 31*(1), 9-28. https://doi.org/10.1080/10630732.2024.2324851

Olsson, S. R., & Elldér, E. (2023). Are bicycle streets cyclist-friendly? Micro-environmental factors for improving perceived safety when cycling in mixed traffic. *Accident Analysis and Prevention, 184*, 1-10. https://doi.org/10.1016/j.aap.2023.107007

Panter, J. R., Jones, A. P., van Sluijs, E. M., & Griffin, S. J. (2010). Attitudes, social support and environmental perceptions as predictors of active commuting behaviour in school children. *Journal of Epidemiology & Community Health,, 64*(1), 41-48. https://doi.org/10.1136/jech.2009.086918

Pucher, J., Dill, J., & Handy, S. (2010). Infrastructure, programs, and policies to increase bicycling: An international review. *Preventive medicine,, 50*, S106-S125. https://doi.org/10.1016/j.ypmed.2009.07.028

Rosenfield, D., Fuselli, P., & Beno, S. (2024). Improving cycling safety for children and youth. *Paediatrics & Child Health, 29*(5), 324-328. https://doi.org/10.1093/pch/pxae035

Scottish Government. (2017). *Scottish government tackling the school run research study.* Scottish Government. https://doi.org/https://www.gov.scot/publications/tackling-school-run-research-study

Sersli, S., Scott, N., & Winters, M. (2019). Effectiveness of a bicycle skills training intervention on increasing bicycling and confidence: A longitudinal quasiexperimental study. *Journal of Transport & Health, 14*. https://doi.org/10.1016/j.jth.2019.100577

Shaaban, K., & Abdur-Rouf, K. (2020). Assessing Walking and Cycling around Schools. *Sustainability, 12*(24). https://doi.org/10.3390/su122410607

Shared Intelligence Limited. (2013). *Bike club evaluation final report.* http://www.gilliangranville.com/wp-content/uploads/20130512_BIKE-CLUB-EVALUATION_Report1.pdf

SQW and Bryson Purdon Social Research. (2019). *Evaluation of Bikeability: Impact Study.* A study commissioned by the Department for Transport. Avilable at: https://www.bikeability.org.uk/wp-content/uploads/2022/03/SQQ-Bikeability-Impact-Study.pdf.

Stark, J., & Meschik, M. (2024). On the Road to Safety: Examining Children's Cycling Skills and Physical Activity Levels. *Children, 11*(12), 1556. https://doi.org/10.3390/children11121556

Teschke, K., Anne Harris, M., Reynolds, C., Winters, M., Babul, S., Chipman, M., Cusimano, M., Brubacher, J., Hunte, G., Friedman, S., Monro, M., Shen, H., Vernich, L., & Cripton, P. (2012). Route Infrastructure and the Risk of Injuries to Bicyclists: A Case-Crossover Study. *American Journal of Public Health , 102*(12), 2336-2343.

Teyhan, A., Cornish, R., Boyd, A., Joshi, M., & Macleod, J. (2016). The impact of cycle proficiency training on cycle-related behaviours and accidents in adolescence: findings from ALSPAC, a UK longitudinal cohort. *BMC Public Health, 16*(469), 2-10.

Thomas, B., & DeRobertis, M. (2013). The safety of urban cycle tracks: A review of the literature. *Accident Analysis & Prevention,, 52*, 219-227. https://doi.org/10.1016/j.aap.2012.12.017

Transport, D. f. (2022). *Linking police and health data on road collisions: an initial feasibility study.* https://www.gov.uk/government/statistics/linking-police-and-health-data-on-road-collisions-feasibility-study/linking-police-and-health-data-on-road-collisions-an-initial-feasibility-study.

Trapp, G. S., Giles-Corti, B., Christian, H. E., Bulsara, M., Timperio, A. F., McCormack, G. R., & Villaneuva, K. P. (2011). On your bike! a cross-sectional study of the individual, social and environmental correlates of cycling to school. *International Journal of Behavioral Nutrition and Physical Activity, 8*(1), 123. https://doi.org/10.1186/1479-5868-8-123

TRIPS Lab. (2024). *Bicycle and Pedestrian Safety Research.* The University of Iowa.

Verlinde, L., Verlinde, F., Van Doren, S., De Coninck, D., & Toelen, J. (2024). Cycle safe or cycle cool? Adolescents' views on bicycle helmet use and injury prevention campaigns in Belgium. *Injury prevention*. https://doi.org/10.1136/ip-2023-045227

Volterra. (2025). *National evaluation of free bikes.*

Walker, E., & Schuck, L. (2025). Increasing Access to Cycling among . *Outride*. https://doi.org/https://www.cyclingandsociety.org/wp-content/uploads/2025/09/CyclingAndSociety2025-4-Walker.pdf

Wardman, M., Tight, M., & Page, M. (2007). Factors influencing the propensity to cycle to work. *Transportation Research Part A: Policy and Practice, 41*(4), 339-350. https://doi.org/10.1016/j.tra.2006.09.011

TRL

Bikeability Level 3, Infrastructure, Collisions and Cycling to School

Other titles from this subject area

XPR119	Gupta, B., Harpham, N., Bull, N., Lee, L.S., and Beard, G. (2023). Bikeability Widening Participation: Fund (WPF) Evaluation. TRL Report XPR119.
CPR4082	Gupta, B., Lynam, R., Bull, N., Weekley, J. and Beard, G. (2023). Development of The Bikeability M&E Framework and Tools. TRL Report CPR4082.
XPR147	Gupta, B., Nowak, K., Marino, L., Hitchings, J., Asmal, A., and Beard, G. (2026). Evaluation of Bikeability Level 2 Training – long term impact. TRL Report XPR147.
-	Bishop, D. T., Harpham, N., Shirm, R., Marino, I., Smith, L., & Beard, G. (2026). Modelling the impact of Bikeability cycle training on the number of people killed or seriously injured on UK roads. Transportation Research Part F: Traffic Psychology and Behaviour, 118, 103506.

TRL
Unit 19 The Business Centre
Molly Millars Lane
Wokingham, RG41 2QY
United Kingdom
T: +44 (0) 1344 773131
F: +44 (0) 1344 770356
E: enquiries@trl.co.uk
W: www.trl.co.uk

XPR148