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Trials of segregation set-back at side roads

Annex 3 Trial M2 with car drivers and cyclists

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1 Introduction

1.1 This document

This Annex reports trial M2, the second track trial into segregation set-back at side-road junctions. It involves participant car drivers turning left into a side-road that has a cycle lane marked across it, the lane being a continuation of a kerb-segregated lane that ends at a range of distances from the turning. Participant cyclists were also involved, riding in the cycle lane alongside the car drivers, but not continuing across the junction.

1.2 Aims and objectives of the trial

The overall aim of this trial was to investigate:

- What segregation set-back distance minimises the risk of conflict between all road users?
- What segregation set-back distance is the most appealing and preferred by the different road users?

To fulfil these aims the following research objectives were defined:

Research objective 1: To understand how different segregation set-back distances affect the path and position of vehicles approaching and turning into the side-road, specifically:

- The path taken by different vehicles when approaching the side road and turning left into it;
- How long cars were within the cycle lane (a measure of encroachment);
- The distance of the cars from the cycle lane's kerb;
- The distance between cycles and cars on the approach to the junction;
- The distance of cars from the side road when entering the cycle lane (another indicator of encroachment); and
- The variation in paths taken by cars entering the side road.

Research objective 2: To determine the effect of different set-back distances on the speed of cars approaching and making the turn, by measuring changes in the time taken to travel a 60m section to a point at the start of the side-road.

Research objective 3: To determine the effect of set-back distance perceptions of safety reported by the participants.

Research objective 4: To measure how different set-back distances affect the ease with which cyclists can obtain their preferred position for passing a side-road turning.

Research objective 5: To determine which set-back distances participants perceive to provide the greatest ease of making the turn into the side road.

Research question 6: To assess drivers' and cyclists' understanding of the road markings and layouts used.

Research question 7: To explore participants' views of the benefits segregation in general and on the approach to a side-road turning.

1.3 Layout of trial site

The highway layout for this trial is shown in Figure 1. It comprises a segregated cycle lane up to a side road junction with triangular markings to distinguish the side entry for left turning cars.

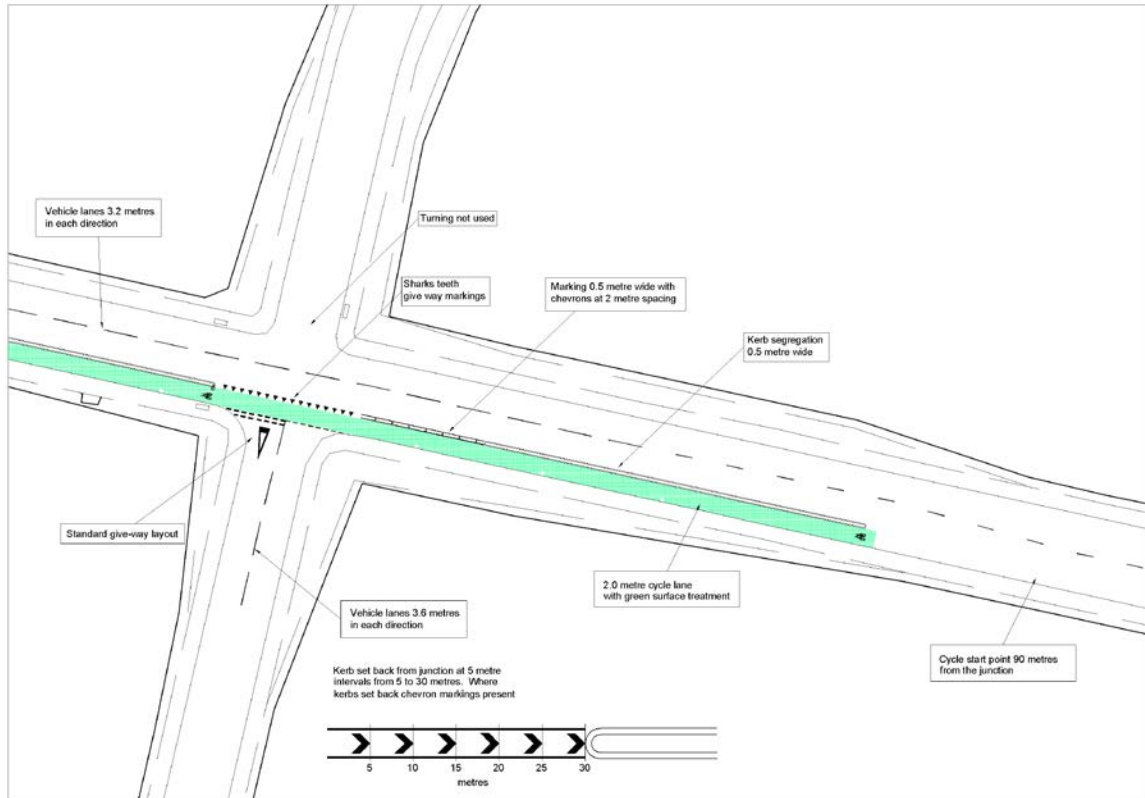


Figure 1: Segregated cycle lane layout

The simulated environment involved the layout of a segregated cycle lane at carriageway height, intersecting with a side road. The trial considered the relative set-backs that can be provided for cyclists at the side road and their effect on user behaviour and safety.

1.4 Trial location

The trial took place on the Small Roads System at TRL in Crowthorne. An overview of the trial layout is shown in Figure 2 and a photo of it in Figure 3.

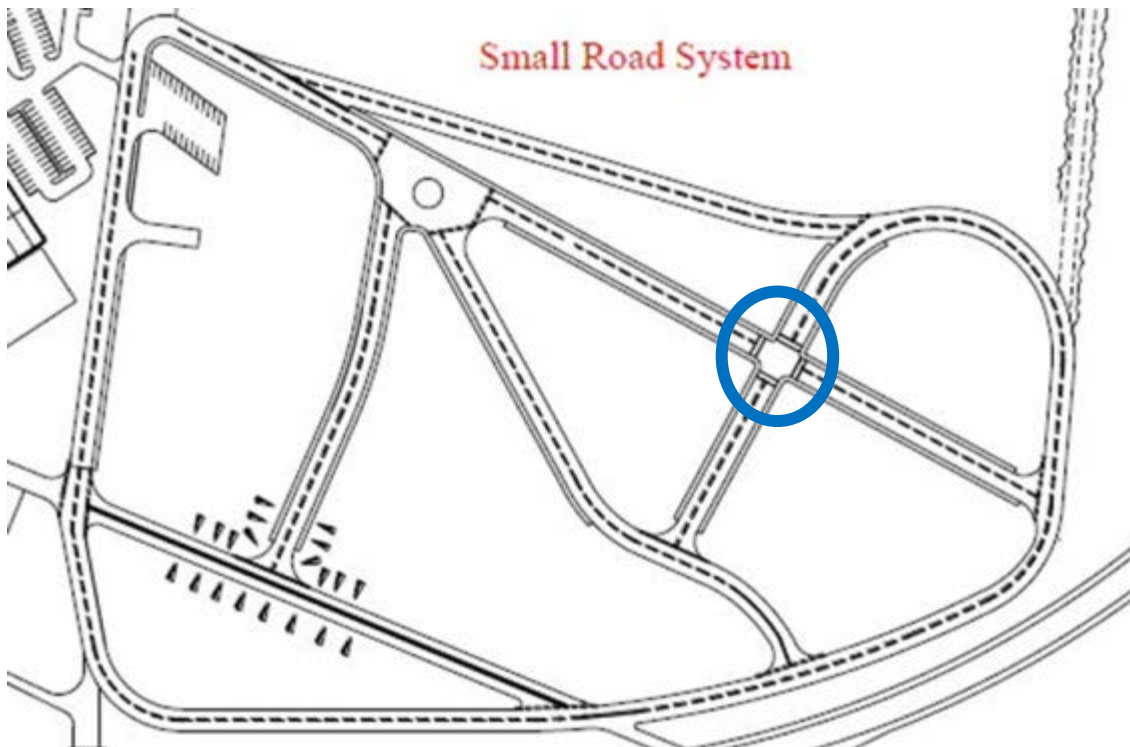


Figure 2: Trial location



Figure 3: Photo of trial location

2 The trial methodology

2.1 Trial methodological design

The trial was designed to investigate the situations where a cyclist using the cycle lane reaches a side-road turning at the same time as a driver travelling in the same direction as them but intending to turn left.

The trial considered paths, speeds and decisions for situations created such that when the car driver was 5 metres before the side road, the cyclist was at one of six different distances from the side road: 5m, 10m, 15m, 20m, 25m or 30m.

These situations were created by the participants (both cyclists and car drivers) being led by a guide in separate cycles and cars. The car driver was asked to maintain a distance of 5 metres behind the guide driver, and the cyclist asked to maintain one of the six above distances behind the guide cyclist. In this way when the guide cyclist, and guide car driver, simultaneously passed over the side road, the correct situation (in terms of relative position to the junction and each other) was presented to the participants. For safety reasons participant cyclists could not be allowed into potentially dangerous situations at the junction. Instead, cyclists were asked to proceed along the cycle lane towards the junction as if they were going to continue straight ahead, but then to pull off the carriageway onto the footway using a dropped kerb 4.7m before the side road.

Each participant encountered each of these situations at a segregated cycle lane with three different set-back distances. Depending on the sessions they participated in they either encountered the 5, 15, 25 metre set-backs, or the 10, 20, 30 set-backs.

Right turning cyclists were not the focus of this trial. However, the crossroads layout of the junction provided an opportunity to include a limited investigation of right turns. After experiencing all situations with one set-back distance, cyclists were asked to travel down the cycle lane and turn right at its end. This manoeuvre was performed without any other vehicles on the test track, and was included to obtain feedback on the ease of cyclists getting into their preferred position when turning right at the end of the cycle lane (with different set-back distances).

Video analysis was used to examine the behaviour and actions of the car drivers and cyclists when they encountered each of the above situations. This included timing vehicles, making a note of their decisions and recording their paths at the side road. To record their paths, a virtual grid was created over the carriageway on the approach to the side road: i.e. a grid was marked on a tarpaulin, which was temporarily placed on the carriageway when the trial was not being conducted and was subsequently used in the video analysis. The grid was used to record the lateral position (distance from the kerb edge) of the vehicle's front wheel when at known distances from the start of the side road. Distances from the side road were marked with one metre spacing, and the distance from the kerb was recorded to the nearest half metre.

On track questionnaires were utilised to gain immediate feedback on the decisions participants' made and their perceived safety in the resulting situation. Finally, all participants were asked to complete a questionnaire after completing the trial to ascertain their overall thoughts, preferences and understanding.

2.2 Limitations to methodology

The situations presented to the participants were necessarily lacking some aspects of realism. However, their relative judgements of the presented situations were based upon consistent circumstances. Thus their assessments provided a clear insight into driver and cyclist preferences.

Drivers and cyclists in any such an experiment are:

- aware they are being studied;
- aware cyclists will not actually continue straight on, and therefore a conflict cannot occur in reality;
- no other vehicles present to cause distractions;
- no opposing flow to limit turning movements into the side road;
- likely to drive more carefully than they would on the road;
- less likely to be engaged in any other distracting tasks (e.g. using mobile phone, adjusting radio etc.);
- have clear information about their route;
- are not under time pressures.

Furthermore this trial did not consider features such as bus stops, on-street parking, loading/drop-off zones or pedestrian crossings which would influence driver behaviour.

2.3 Participant and vehicle quantity, composition and type design

Sixty-six car drivers and sixty-six cyclists took part. However adverse weather resulted in 12 car drivers and 12 cyclists not completing the whole experiment. The sample included 65% males in the cyclists and 48% in the car drivers. In comparison, the National Travel Survey NTS (2012) showed 54% of car trips, and 74% of cycle trips, made by males in the UK. Therefore, the sample appears to have slightly under-represented males.

The age distribution of these participants was also investigated to assess the extent the participants were representative of those on the road network. This is summarised in Figure 4.

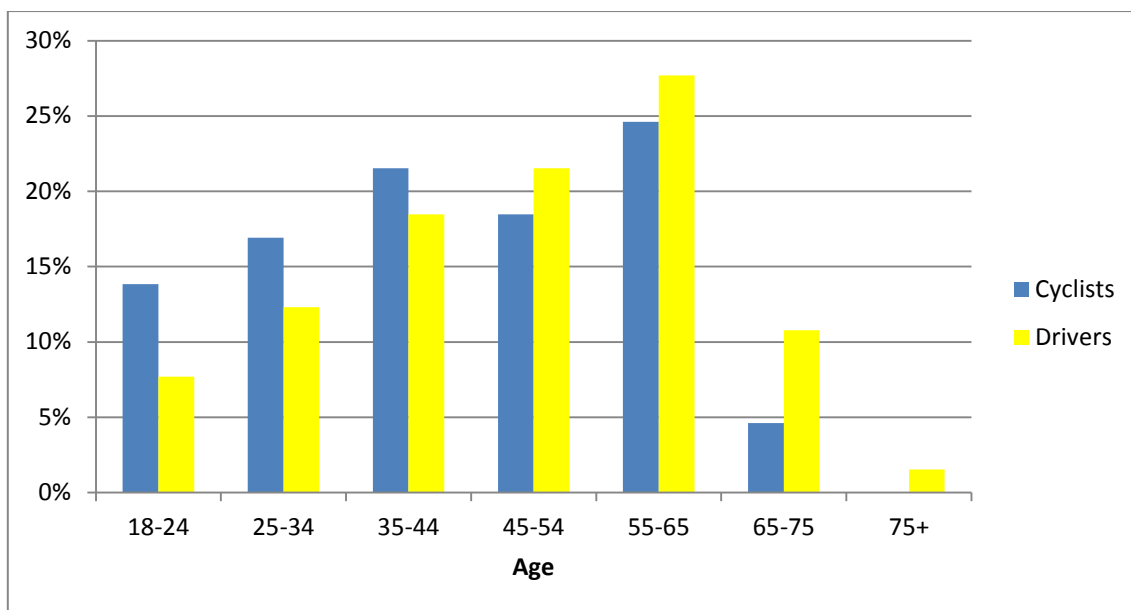


Figure 4: Age of participants

Differences between age ranges in this study and the National Travel Survey (2012) make direct comparison difficult. However, overall, the trial participants' age distribution appears reasonably representative. A few of the cyclists drive infrequently or never, most are regular drivers. Almost all of the drivers drive frequently, see Figure 5.

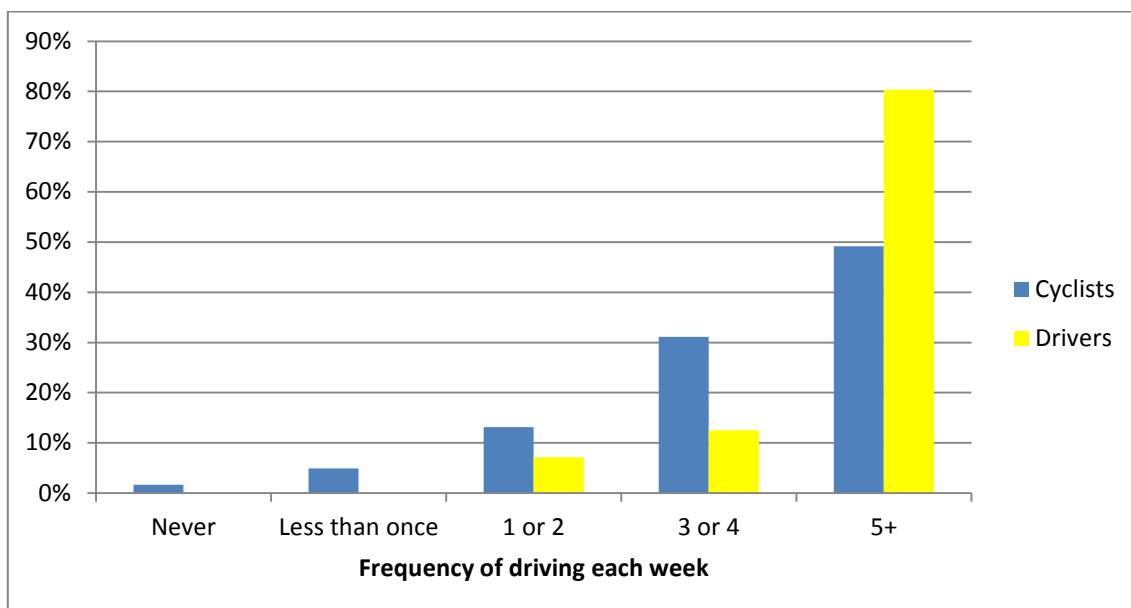


Figure 5: Driving experience of participants

Almost half of the drivers also cycle, but infrequently. A few of the participants who cycled in the trial (less than 10%) did not usually cycle at all. A fairly high percentage (28%) cycled infrequently. However 63% of them did cycle once a week or more often (Figure 6).

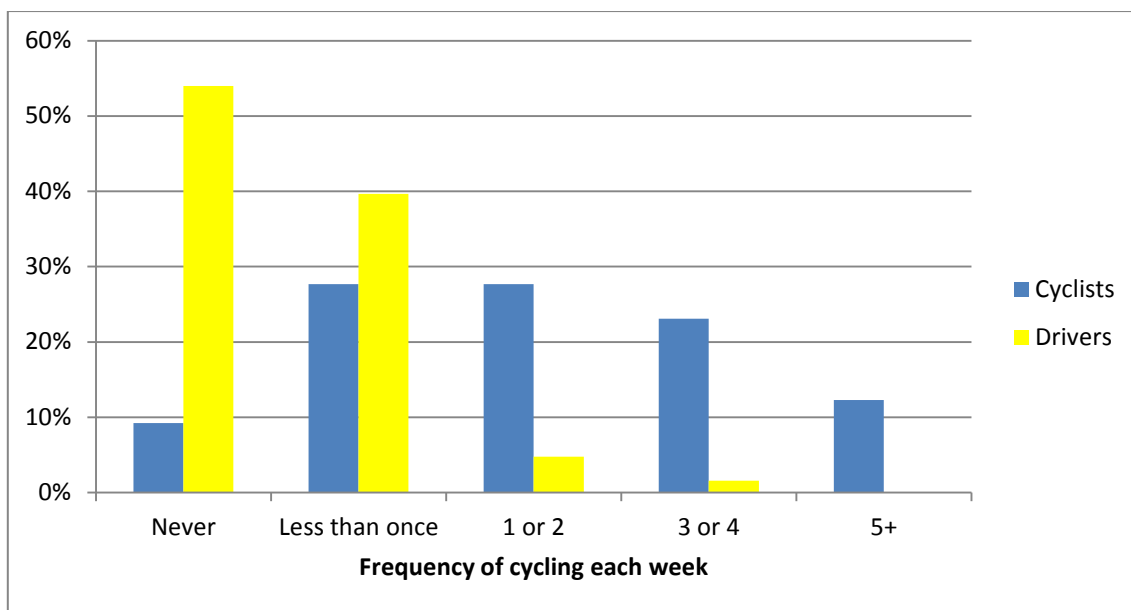


Figure 6: Cycling experience of participants

The main reason for cycle journeys by those taking part in the trial was leisure.

Both cyclists and drivers covered a range of distances in their regular cycle journeys, but with few saying that their regular cycle trips were less than a mile.

When cycling, just over half of the cyclists usually ride on the road in traffic (see Figure 7). Drivers who cycle were split more evenly between those who ride on roads, on separate cycle paths and off-road.

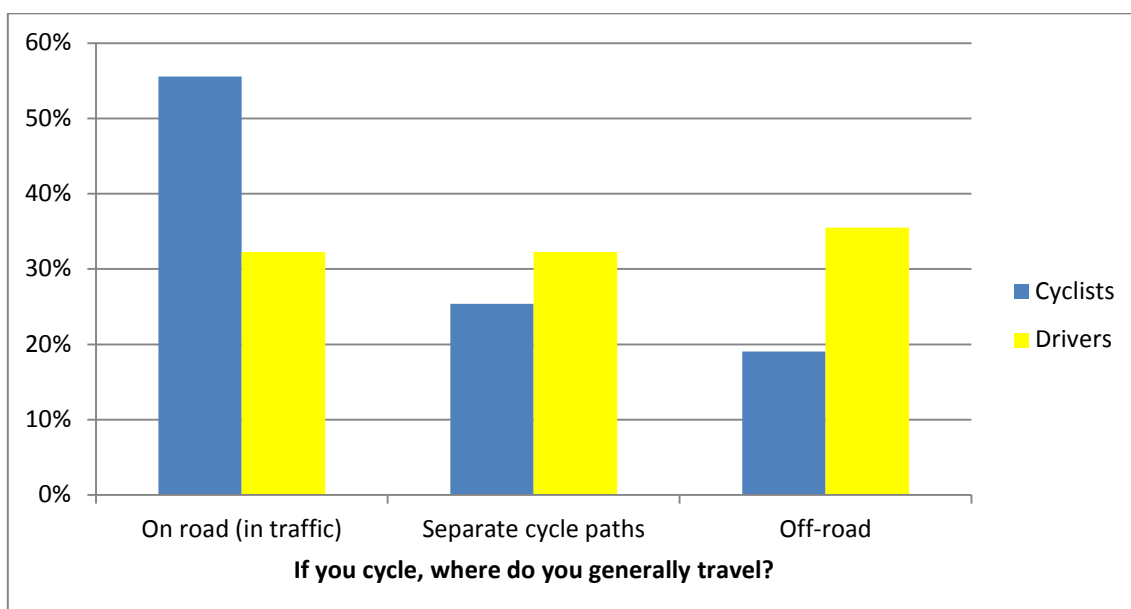


Figure 7: Type of cycling experience of participants

The percentage using separate cycle paths, or cycling on road, will vary according to the cycling network available in any given area. Many of the participants lived in an area with extensive off road cycle path provision (Bracknell), much of which was not adjacent

to carriageways. This would be a main explanatory factor in nearly half of the cyclists not usually cycling on road. It was also evident in the sample that cyclists who usually cycled off-road tended to be less frequent cyclists than the others.

3 Results

3.1 Cautions and caveats

This trial involved a sample of sixty-six car drivers and sixty-six cyclists. These results should be interpreted with some caution as they are indicative rather than a definitive representation of the likely outcomes in a real-life situation. Participants experiencing a new feature on the road will, of course, be likely to behave in a manner different to that when they are familiar with the feature and how other road users adapt their behaviour.

Where participants provided comments during the evaluation surveys after the trial, a cross section of pertinent remarks covering the main points have been quoted to illustrate and provide further interpretation of the quantitative results. Not all participants made comments in response to each question, and the most succinct comments tended to be made by several participants using the same, or similar words, so the number of quotes is not the same as the numbers of participants shown in the quantitative analysis.

3.2 Findings against trial research objectives

3.2.1 Objective 1: Effects on path and position

Path taken through junction

The average paths used by the drivers are shown in Figure 8 for the car drivers, with the underlying image showing a schematic of the left hand side of main road, and the segregated cycle lane with a 5 metre set-back, on the approach to the side road.

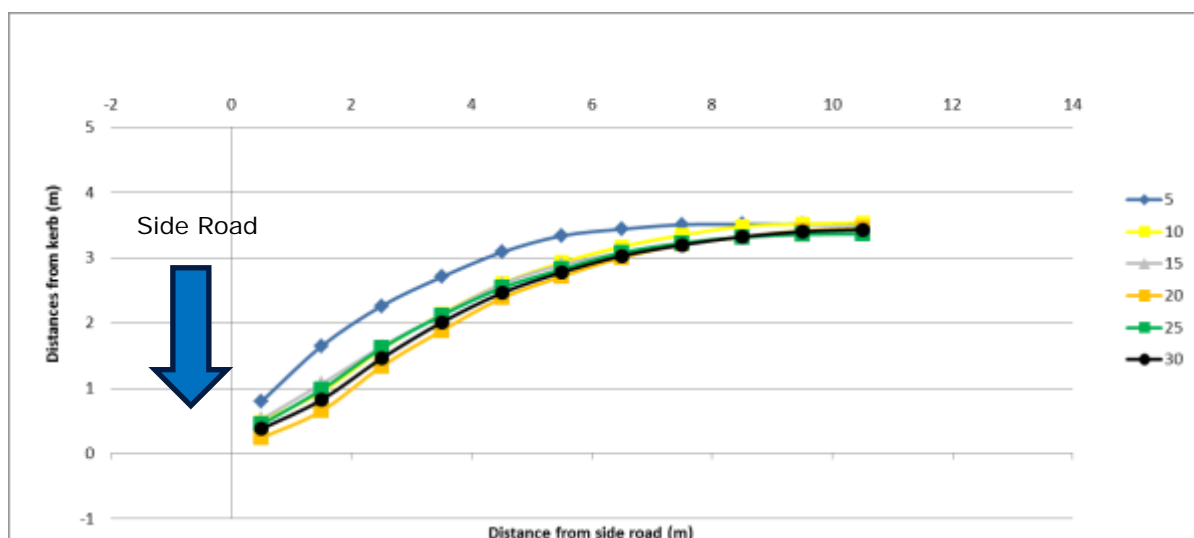


Figure 8: Average paths used by cars with different set-back distances for the kerb segregation

Table 1: Estimates of time and distance car drivers spent in cycle lane when turning

Set-back Distance (m)	Average distance car entered cycle lane (m)	Time spent in cycle lane (seconds)
5	2.1	0.3
10	3.2	0.5
15	3.2	0.5
20	3.7	0.5
25	3.3	0.5
30	3.5	0.5

The average paths used by the car drivers were consistent across kerb segregation set-backs of 10 metres to 30 metres. However, their average path varied slightly from these paths when a 5 metre set-back was present: with the front wheel being between 0.4 and 0.8m further from the kerb. The distances of the front wheel from the main carriageway kerb, when both vehicles were 1.5 and 2.5 metre away from the side road, were statistically significantly greater (at the 95% confidence level) for a 5 metre set-back compared to a 30 metre set-back.

This variation in car path resulted in car drivers approaching the side road closer to perpendicular than with the longer set-backs. This had the result that they entered the cycle lane later, travelled a short distance in it and spent less time in it.

The position of cyclists in the lane on the approach to the side road was consistent for all set-backs, and on average they cycled in the centre of the lane (1m from the kerb in a 2m wide lane).

The average paths used by drivers and cyclists did not vary greatly with segregated cycle lane set-back distance when they were greater than 10 metres from the side road. The average actual distances between the cyclist and the car, when the car passed the cyclist, are summarised in Figure 9 (over page).

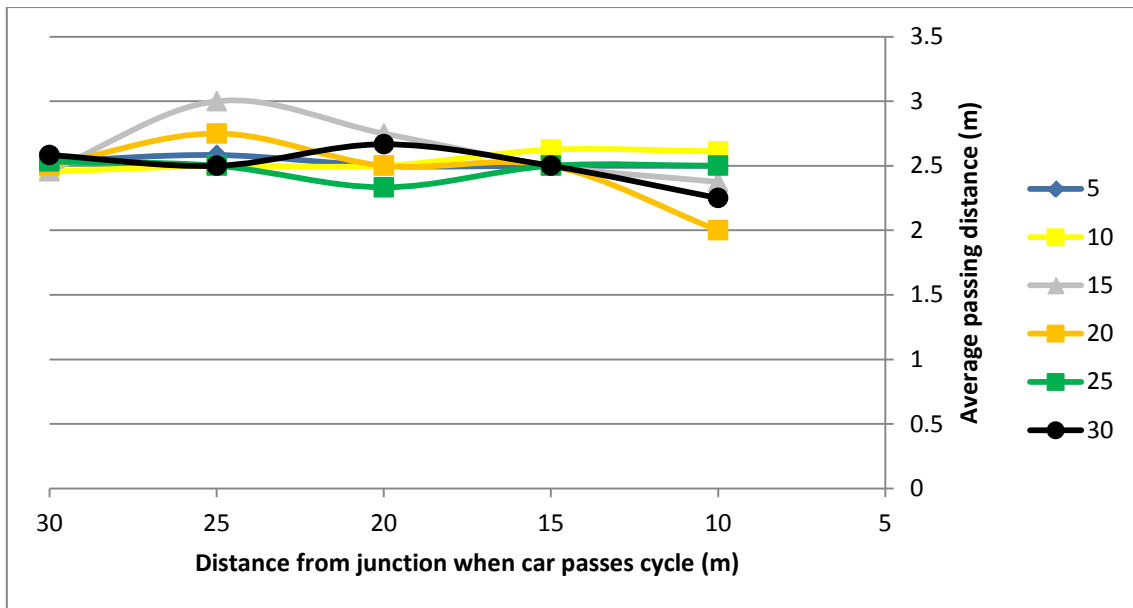


Figure 9: Average distance between cars and cycles against distance of car from junction when it passes the cyclist

As expected given the lack of variation in average paths the distances only varied between 2 and 3 metres, and most were approximately 2.5 metres: 60% were within the range 2.4 metres of 2.6 metres.

Distance from the side-road

Measurements of the paths taken by cars showed that they entered the segregated cycle lane approximately 0.6 to 2.3 metres closer to the side road when the cycle lane kerb segregation had a 5 metre set-back, compared with longer set-backs.

The confidence intervals (i.e. 95% of drivers would be expected to travel between the upper and lower bounds) of the distance of the front wheel of the cars from the kerb on their approach to the side road when the kerb segregation was set-back 5 and 30 metres from the side road is summarised in Figure 10, and the confidence intervals for set-back distances between 25 and 10m were very similar to those for the 30m set-back.

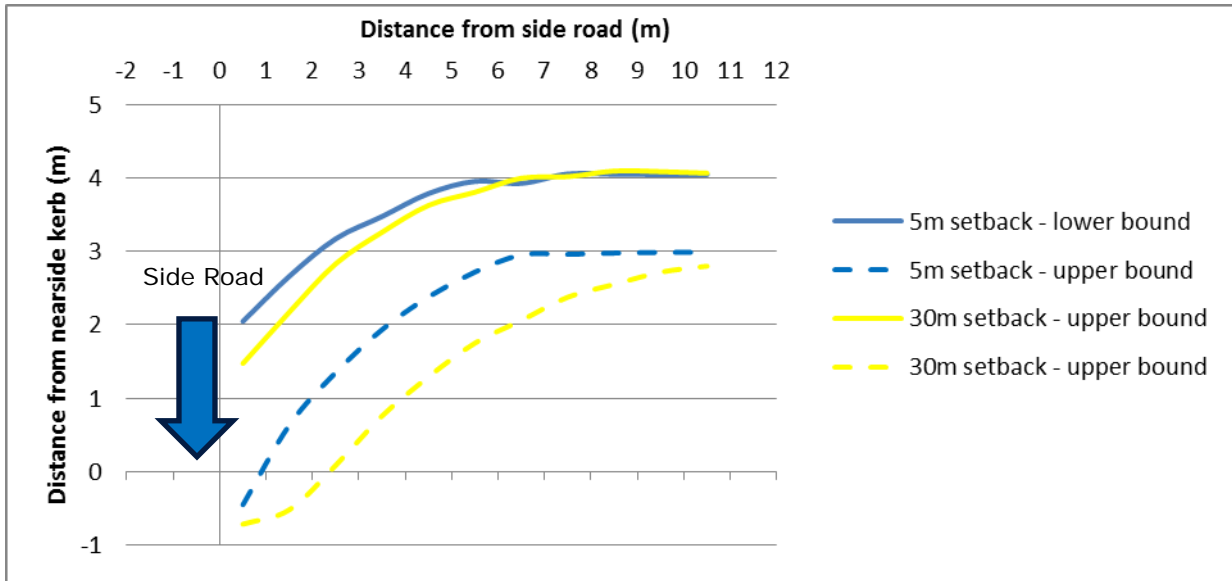


Figure 10: Ranges of distance from the kerb segregation of cars with different set-back distances

In line with expectations, the variation in paths used increases closer to the side road, i.e. during the turning movement. One feature of interest is the difference in the observed variations for the 5 metre compared with other larger set-backs. The paths used with a 5 metre set-back were less variable, and therefore more predictable.

The majority of cyclists (over 79%) travelled between 0.75 and 1.25 metres from the kerb, and the set-back distance therefore had no observable effect on the cyclist's position in the cycle lane.

3.2.2 Objective 2: Speed

The time that each vehicle took to travel between a point 60 metres before the side road until entering the side road was measured; i.e. when their rear wheels cleared the cycle lane. The time differences are displayed in Figure 11.

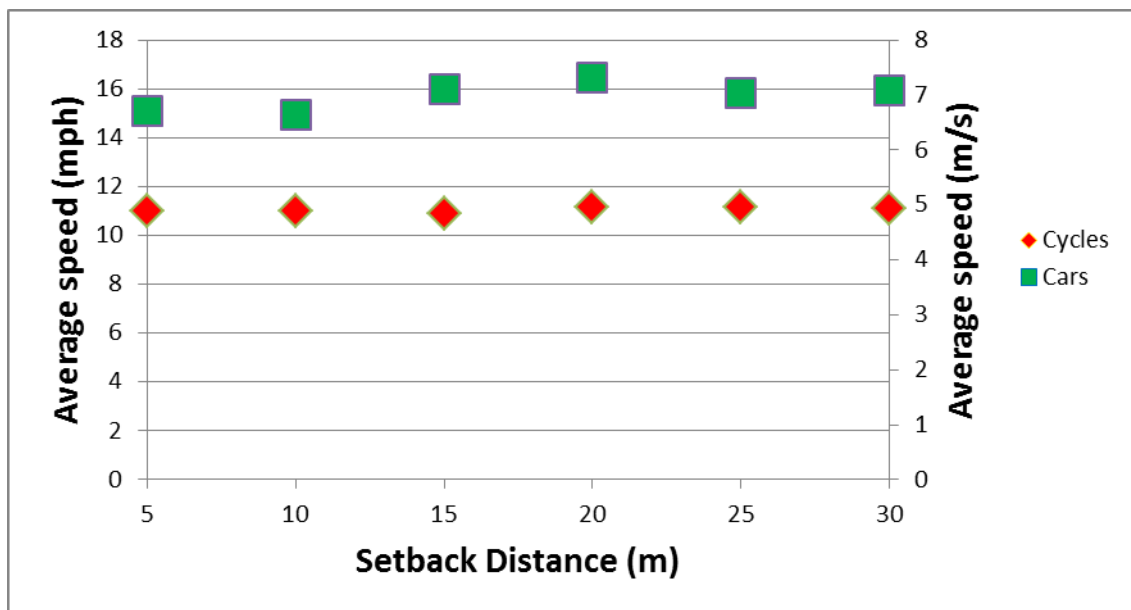


Figure 11: Average Speed over 60m for each set-back distance

Drivers’ average speed was approximately 1 mph less with a 5 and 10 metre set-back distance than with longer set-backs, and the difference was statistically significant (at the 95% confidence level). In contrast, the cyclists’ speeds were unaffected by the set-back distance.

3.2.3 Objective 3: Perceived safety

Drivers – Overall safety when turning left

The drivers were asked to assess the safety of turning into the side road. Most drivers said that they found that it was either safe (73%) or very safe (16%) when making the turn left.

Drivers – Safety with different situations and set-backs

After the drivers had completed each run in a vehicle, they were asked to score the safety of the situations they experienced on a scale of 1 to 10, where 1 was very unsafe and 10 was very safe. Their average safety scores according to the set-back distance, and the relative distance between the car and cycle, are summarised in Figure 12. The relative distance between the car and the cyclist was set to one of six levels. The distance was measured when the car was 5 metres from the side road, and the six relative distances were obtained with the cycle at 5, 10, 15, 20, 25 or 30 metres from the side road.

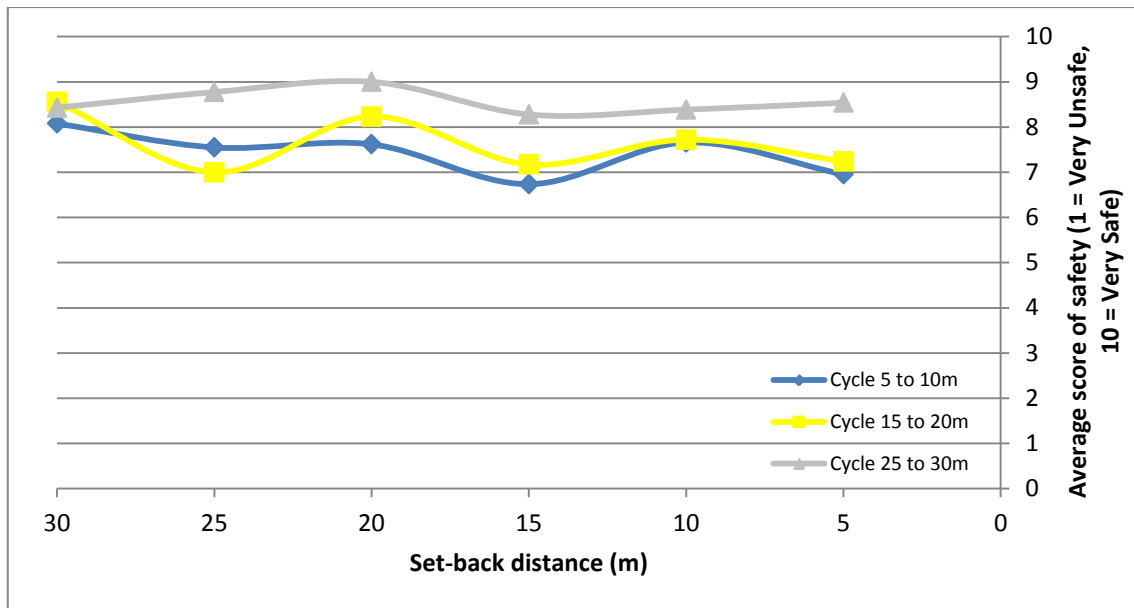


Figure 12: Safety perceptions with different set-backs for drivers

Car drivers felt that all created situations were consistently safe, that is neither set-back distances nor distance of the cyclist from the side road when they were 5 metres from it greatly affected their average score: their average score was 7.8.

Any effect of variation in set-back distance on car drivers' perceived safety was small, and not possible to robustly isolate. However, the weak indication from regression analysis was that perceived safety increased, with increasing set-back distances. The order of the effect was only changing the average scores by 0.1 to 0.2 for each 10m change in set-back.

Driver decision making and consistency

Car drivers were asked about the decisions they made on the approach to the side road after each run. Firstly, whether their initial decision was to enter the side road in front of the cyclists, or to wait for the cyclist to pass over the side road and then enter the side road. Then they were asked to state if they subsequently changed that decision in light of how the situation at the side road evolved. Their answers have been summarised in Figure 13.

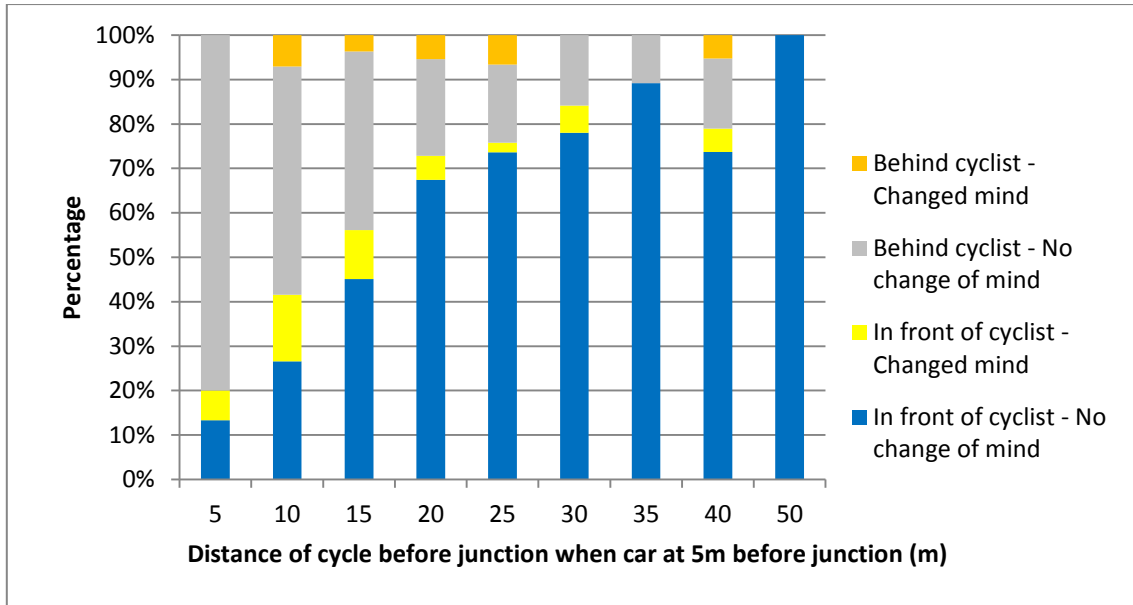


Figure 13: Driver decision-making on turning with different set-back distances

The percentage of decisions to enter the junction before the cyclist increased with the distance of the cyclist from the side road (when the car driver was 5 metres before the side road). Also, the degree of certainty in such decisions was greater: at most two-thirds of drivers did not change their decision to enter the junction before the cyclist when the cyclist was at most 10 metres before the side road, whilst 80% did so when the cyclist was 15 metres before the side road and over 90% if the cyclist was further from the side road.

Particular attention should be given to those driver decisions where drivers decided to turn into the side road in front of a cyclist who was also close to the side road. At the observed average cyclist speed they would take approximately 1, 2 and 3 seconds to reach the side road from 5, 10 and 15 metres before the side road. Therefore decisions to turn under these conditions are examined more closely, see Figure 14.

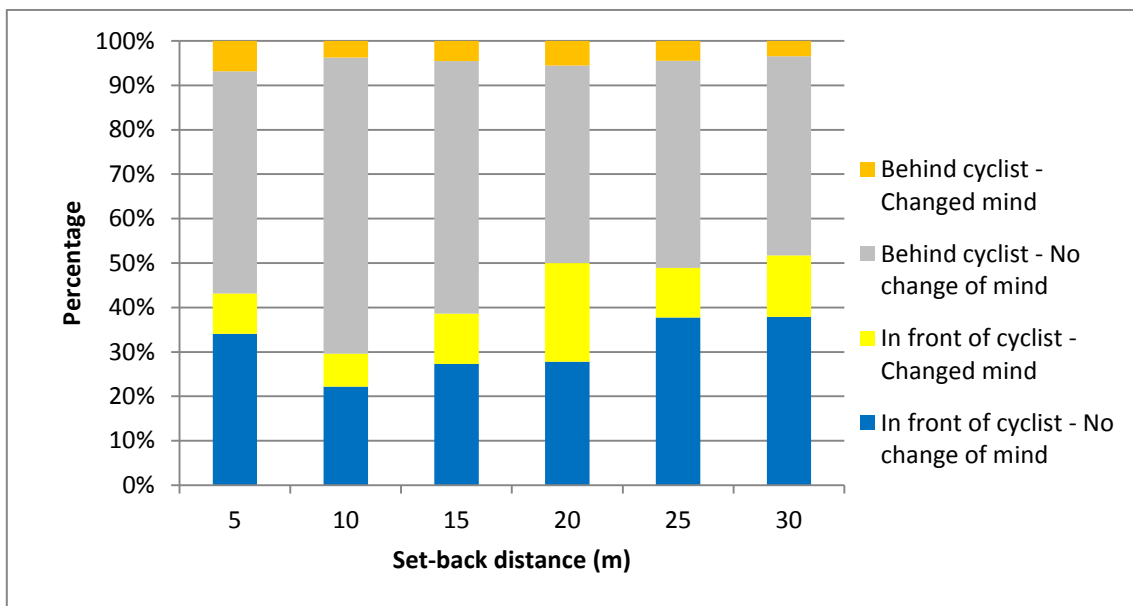


Figure 14: Turning decisions for when both cycle and car close to the side road (Cycle between 5 and 15 metres, car driver 5 metres, before the side road)

The highest percentages of decisions to turn in front of the cyclist occurred for long and short set-backs, and slightly less at interim set-back distances. Even though the number of these occurrences was limited, the difference in percentages with a 10 metre and a 30 set-back were weakly statistically significant (i.e. significant at the 90% confidence level).

Cyclists – Overall safety when continuing straight on

Cyclists were asked to assess the safety of the junction for continuing straight on. They were asked to think about approaching the junction with the intention of continuing straight on, even though, as previously explained, for safety reasons the cyclists actually pulled off the carriageway by means of a dropped kerb just before the side road. Over 40% of cyclists thought it was safe using this junction when going straight on, and a similar proportion thought it was neither safe nor unsafe. However, a substantial minority thought continuing straight on would have been unsafe (13%) and 2% thought it was 'very unsafe'.

The nature of the comments made by cyclists in explaining their answers can be summarised in Figure 15.

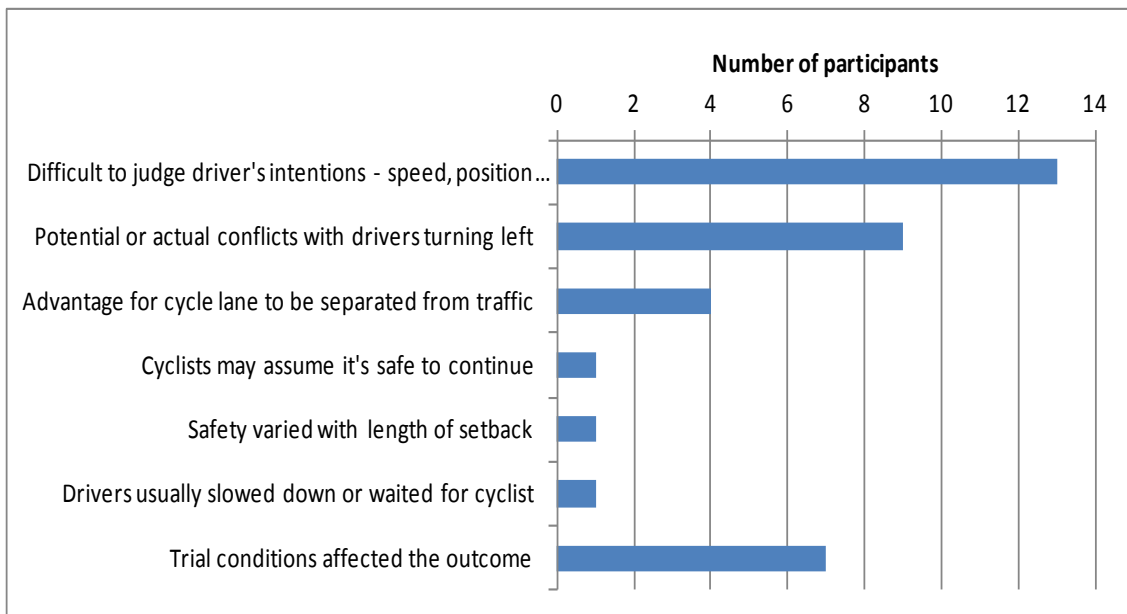


Figure 15: Reasons for safety ratings

Further details of the comments are:

- It is difficult to judge the driver's intentions - speed, position or manoeuvre;

"On some occasions I felt safe to continue straight on but only when I could see the car in front of me. When the car was behind and out of vision I felt unsafe to go straight on as I wasn't sure what the car would do - concerned it would cut across me where the kerb ended."

"It depended largely on whether the driver turned in front of me, which was easier to judge their speed and position. If they turned behind they slowed and drove next to me or just behind which is more distracting."
- Potential or actual conflicts with drivers turning left;

"At times if I had continued straight on I would have collided with the car."

“Car drivers are far too close to cyclist.”

“When the cars were slowing down alongside me it was obviously much more threatening and I would probably have stopped rather than continuing straight on.”

- The advantage of the cycle lane being separated from traffic;

“Kerbs protect up to junction but a car could still cut in front of you so you need to be fully aware of situation around you.”

“The position of the car being further away because of the kerb made judging safe distances easier, and allowed a fraction time more to make the decision. Without kerb car drivers are closer to cyclist when passing.”

- Cyclists may assume it is safe to continue without taking account of the possibility of drivers turning left;
- Safety varied with the length of the set-back;
- Drivers usually slowed down or waited for the cyclist to go first.

Seven of the cyclists made comments to the effect that the trial conditions affected the outcome (factors such as slow speed, timing, and knowing that they would be turning left).

Cyclists –Perceived safety with different situations and set-backs

After the cyclists had completed each run, they were asked to score the safety of the situation they experienced on a scale of 1 to 10, where 1 was very unsafe and 10 was very safe. The 95% confidence intervals for their average safety scores according to the set-back distance, and the relative distance between the car and cycle, are summarised in Figure 16. The distance of the cycle from the side road when the car was 5 metres before it was either 5, 10, 15, 20 25 or 30 metres

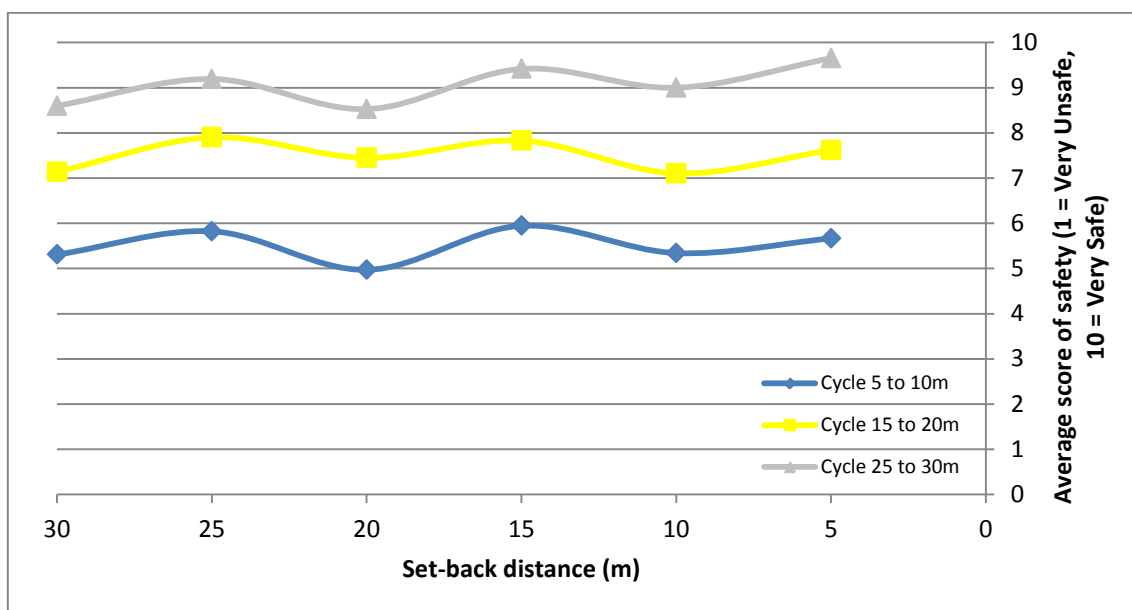


Figure 16: Safety perceptions with different set-backs distances

Cyclists felt fairly safe on average, but less so than car drivers: their average score was 7.2. However, their perceived safety decreased significantly (at the 95% confidence level) with their distance from the car when it was at the junction.

Any effect of changing set-back distance on cyclists' perceived safety was small, and not possible to robustly isolate. However, the weak indication from regression analysis was that cyclists' perceived safety decreased with increasing set-back distances. The order of the effect was only changing the average scores by 0.1 to 0.2 for each 10m change in set-back.

3.2.4 Objective 4: Ease of obtaining preferred position on the road

Cyclists continuing straight on at side road

Cyclists were asked to consider how easy it would have been to get into their preferred position for continuing straight on although as mentioned earlier, for safety reasons the cyclists actually pulled off the carriageway by means of a dropped kerb just before the side road.

Most cyclists had no difficulty (87%), and the majority (70%) found it easy or fairly easy, to get into their preferred position when continuing straight on at the side road. The cyclists gave the reasons stipulated in Figure 17.

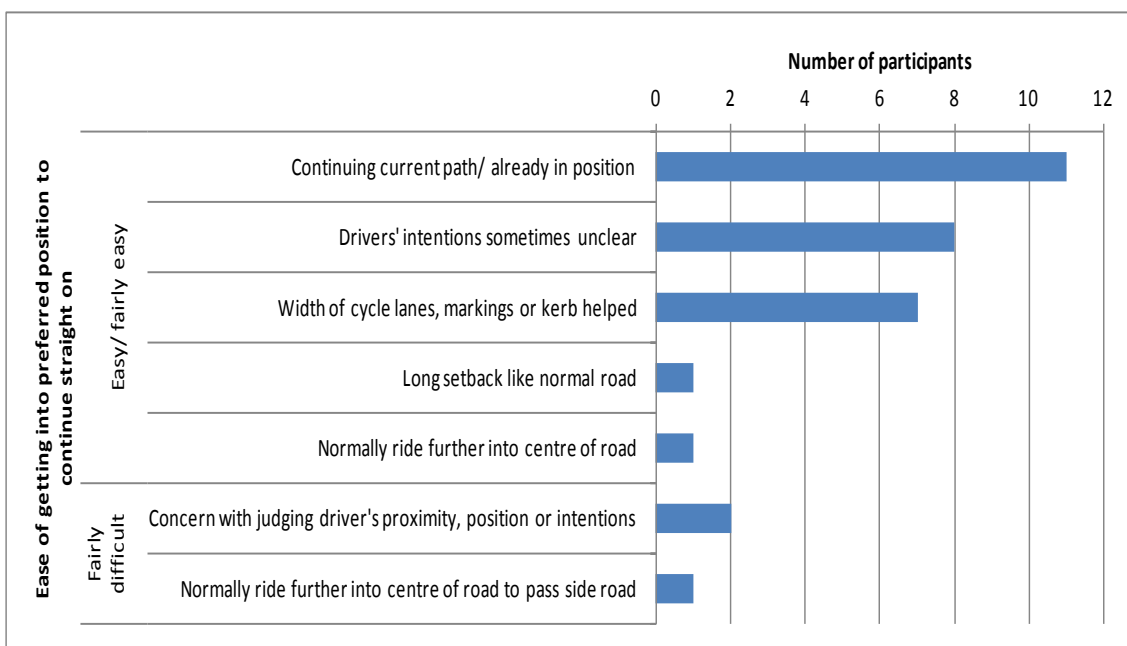


Figure 17: Reasons why cycling straight on was easy

The cyclists who thought that it was easy or fairly easy gave the reasons:

- Continuing on current path, or already in position:

"Going straight on required no change in position or course."

"I would not change my position if I was going straight on, I would just check my brakes and look."

"Would continue roughly in the centre of cycle lane."

- There were times when the driver's intentions were unclear:
"More difficult if the driver appeared unsure of his/her intentions."
"Easy to navigate, tricky trusting motorists to acknowledge turn."
- The width of the cycle lane, the markings, or the kerb helped:
"Cycle lane was fairly wide and my preferred position for continuing straight on would be fairly close to the kerb."
"Drivers have to slow down when turning as the kerb acts as a traffic calmer allowing cyclists to get into position easier."
"Having the barrier there made looking behind properly safer and therefore better decision making."
- One compared the different set-backs:
"As the kerb ended further upstream of junction the situation [it] felt more like a traditional road without car cycle segregation"
- Another mentioned that they usually adopt a more central position when passing a side road than was possible here:
"Car drivers were aware of the cyclist and it would have been safe to go straight on. I would usually prefer to move out more when passing a side road junction."

Cyclists who thought it was fairly difficult to get into position for going straight on mentioned:

- Concerns with judging a driver's proximity, position or intentions;
"Judging the actual position and proximity of the car is very difficult."
"Unsure when driver was going to turn. I could see his indicator but he seemed very hesitant as to whether to go before me or after me."
- The inability to take up a position in the centre of the lane before passing a side road.
"Normally I would want to come out a bit further to go past a side road and the concrete blocks made it more difficult if they were too close to the junction."

These responses indicate that cyclists' approaches to continuing straight on at the junction varied, and that some of the difficulties experienced were due to them some wishing to take a position further into the centre of the road than was possible with the layouts tested in this trial.

Cyclists turning right at side road

It would be expected that turning right at the end of a segregated cycle lane would be more problematic than continuing straight on. On track participants were asked to rate difficulty after turning right with different segregation set-backs. Note that this manoeuvre was carried out when no vehicles were present. Their answers are from the on track questions are summarised in Figure 18.

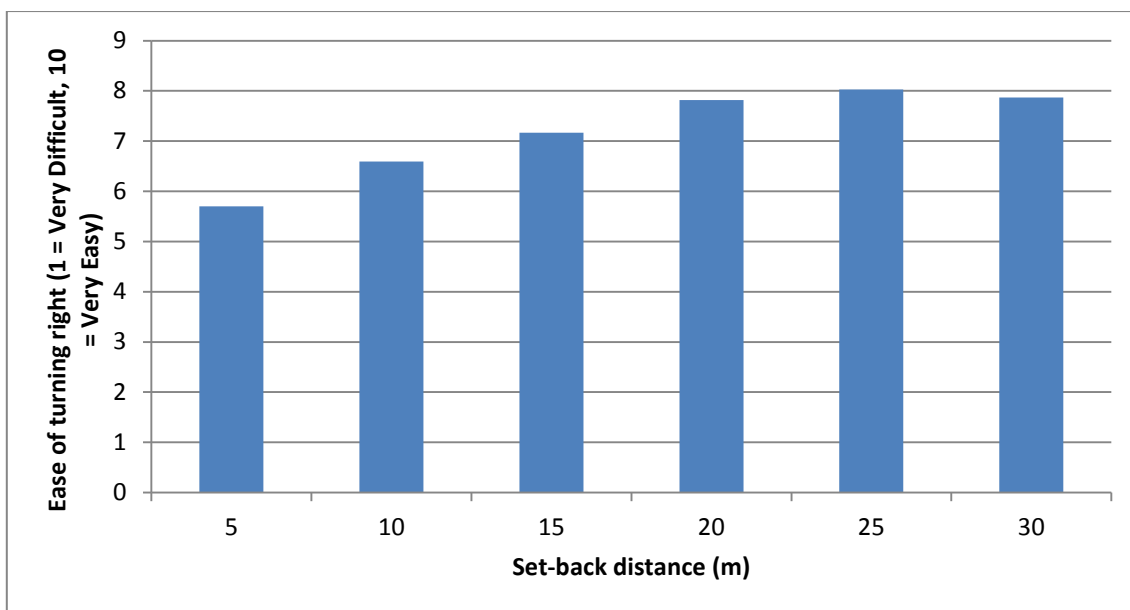


Figure 18: Ease of getting into preferred position to turn right with different segregation set-backs

Figure 18 indicates that the extent to which it was considered easy to turn right varied with the set-back distance. Cyclists found it harder to get into position when the set-back was short, although there was little difference in the extent to which participants rated the ease of turning right between set-backs of 20, 25 and 30m from the junction. The reported difficulty was significantly greater (at the 95% confidence limit) with a 5 metre set-back than with those of 15 metres or above. This implies that from the point of view of turning right, set-back distances greater than 20m provide little additional benefit.

After the trial, participants were asked a question about the ease with which they were able to obtain their preferred position when turning right at the side road. Fewer (57%) found it easy to get into their preferred position when turning right at the end of the segregated lane, than when continuing straight on, and 32% found it difficult. Cyclists gave the reasons summarised in Figure 19.

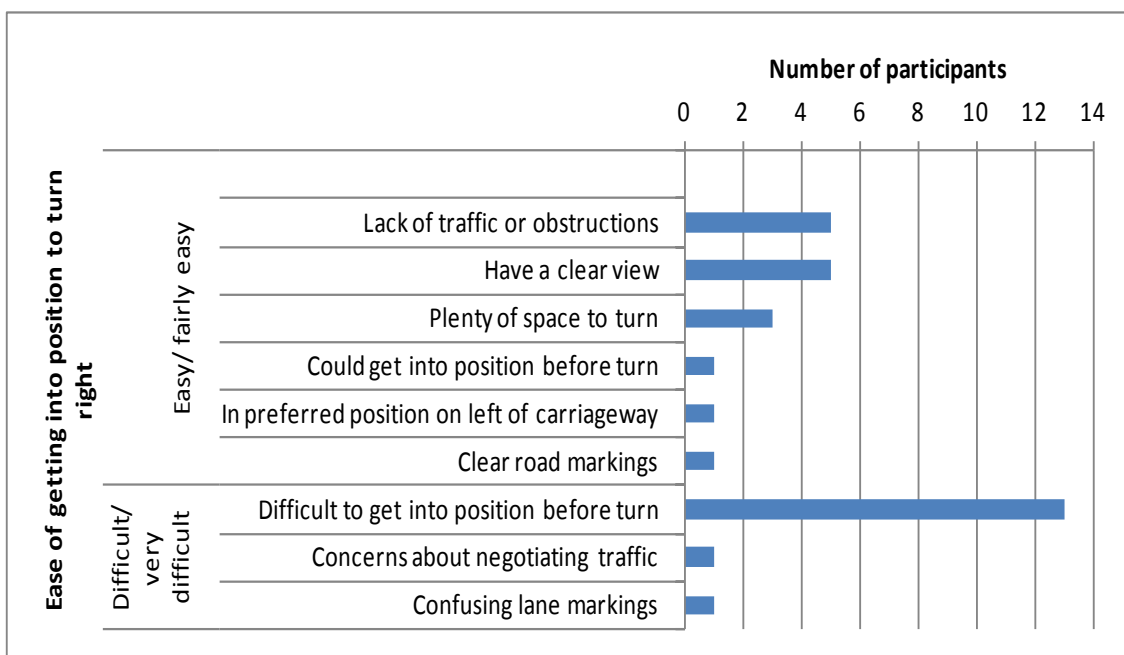


Figure 19: Reasons why cyclists turning right at the side road found it easy

Cyclists who said it was easy or fairly easy to turn right gave the reasons:

- lack of traffic or obstructions;
"Whole trial was easy due to light traffic conditions."
- having a clear view;
"Wide road, clear lines of vision."
- plenty of space to turn;
"Kerb provided enough distance to move into position for turning at junction."
- being able to get into position in advance of the turn;
"I looked ahead and behind, it was clear so I was able to get into position before I turned."
- being in their preferred position on the left hand side of the carriageway before turning;
"I prefer to be in nearside lane to turn right rather than in middle of the road and so this was easy."
- road markings were seen by one cyclist as clear.

Of those who found it difficult or very difficult to turn right:

- Most said this was due to the difficulty of getting into their preferred position in the centre of the road early enough in advance of the turn. Some explained this was because they wished to make their intentions clear to other road users;
"Because of the kerbing I couldn't get into lane position early enough as I would like. This means a car would have to let me across with no clear right of way."
"Difficult because I could not get in the correct position in the middle of the road."

"I would normally drift into the middle of the road much earlier to make my intentions clear to other road users."

- Concerns about negotiating traffic;

"Going downhill with restricted turning obstruction- fairly difficult- not taking into consideration any traffic at 4 way junction."

"I worry about traffic coming in the same direction."

- Confusing lane markings;

"I found the markings on the road very confusing and couldn't work out where I should be in order to turn."

Some of the cyclists who found it easy or very easy made comparisons between different set-back distances; those who said that the difficulty varied also made comparisons. Those making comparisons tended to favour the longer set-backs, but some could see both pros and cons. Some thought that longer set back distances or no kerb made it easier to turn right as they could position themselves sooner or were had more time or space to position themselves. But the advantage of the short set-back distance for protecting them from vehicles was also noted.

"When the barrier ended at the junction I felt very vulnerable 1. because I felt it was blocking any possible traffic exiting from the left hand junction. 2. because I felt car drivers would be more concerned about catching their wheels on the barrier and therefore give more attention to that and not the position of the cyclist."

"Layout with kerbing closest to junction provided limited to no opportunity to pull out right. The problem would be much worse at greater cycling speeds 20mph+ that regular leisure/competition cyclists would be travelling at."

"The kerb was too big and became an obstacle the longer it became. The longer it was the less time I had to position myself which in heavy traffic could be a problem."

"It was easier to get to the right of the car lane when the raised pavement stopped well short of junction. Other times felt there wasn't enough space/time to move across especially if there was lots of real traffic."

"When the kerb was forward most it restricted positioning but was protected as a cyclist, when kerb was back there was greater freedom to position but more exposed to cars."

The responses indicate that cyclists are by no means a homogeneous group, with different views on how easy it was to negotiate the various layouts, and why. However a common theme in their remarks was serious concern over the safety and acceptability of the short set-back distance from junctions for cyclists wishing to turn right.

3.2.5 Objective 5: Ease of making the turn

Questions were included to assess whether participants (both drivers and cyclists) found it easy, or hard, to make their manoeuvres at the side road, and whether the difficulty was affected by the distance of the set-back.

Drivers - Ease of making the decision to turn left when a cyclist is present on approach to the side road

Drivers were asked to consider how easy they had found it to initially decide whether to turn into the junction before, or after, the cyclist. Most drivers said they found it either fairly easy (43%) or easy (20%) to decide. Some (17%) found it fairly difficult and a few (5%) found it difficult. Drivers gave the reasons summarised in Figure 20.

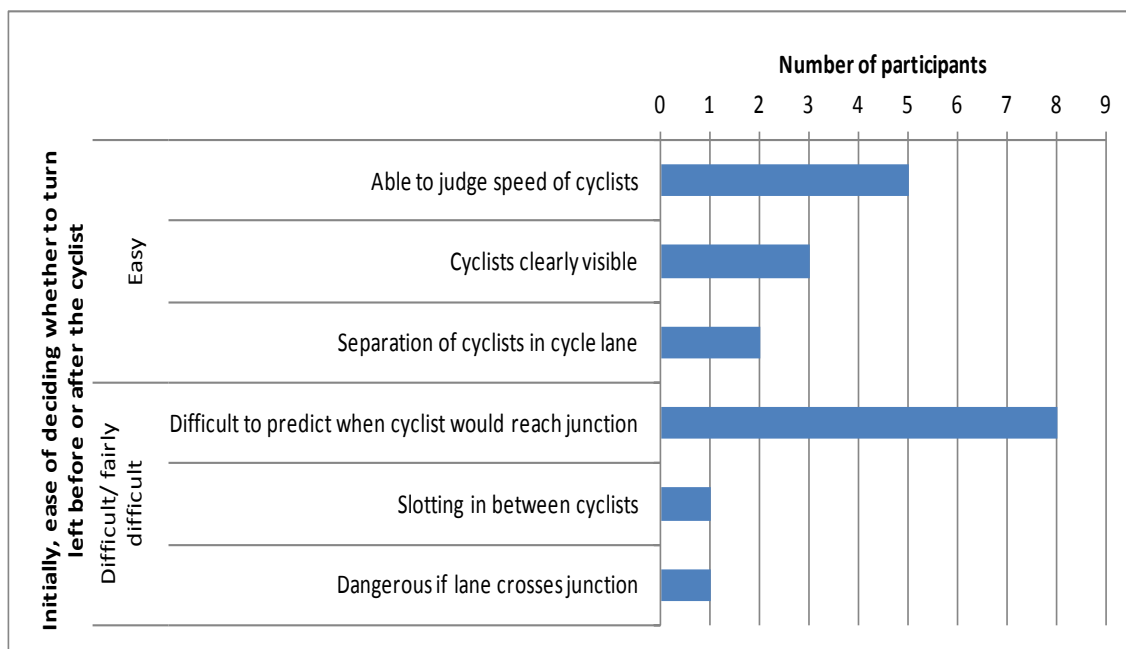


Figure 20: Reasons why drivers found making the decision to turn left easy

Drivers who found it easy gave the reasons:

- Ability to judge the speed of the cyclists;
"Able to judge speed; also cycle in cycle lane."
"Cyclist well-spaced and easy to see; the speed they travelled at made it easy to decide."
- Clear visibility of the cyclists;
"Could see cyclist clearly and cycle path easy to see."
"Easy to view junction ahead and distance of cyclist prior to turn."
- Ability to judge the position of the cyclists;
"You had enough time to judge the speed and the position of cyclist."
- Separation of cyclists in the cycle lane.

Drivers who found it fairly difficult or difficult tended to talk about uncertainty of difficulty predicting how soon the cyclist would reach the junction:

- "Difficult to know how quickly the cyclist would approach once I had stopped the car to make turn."*
- "Judging whether you had enough time and distance to turn in front of the cyclist. On a couple of occasions I thought the car in front slowed down a little so the decision was made later on."*

"Judging the speed of car in front and the speed of the bike, was it going to speed up?"

Other difficulties mentioned were:

- Slotting in between cyclists;

"It was difficult because the ... cyclist was ahead and it depended on how close together they were as to whether I turned before or after the cyclist."

- Continuing the cycle lane across the junction seems dangerous.

"I think the idea of having a cycle lane that goes right across a junction is very dangerous."

Of those who found that the difficulty of making the initial decision varied, just one driver mentioned that the length of the kerb, among other factors, affected the ease of deciding whether to turn.

"The short length of road before turning, the distance between car and cyclist at starting point, and the length of the kerb."

Drivers were also asked how often they changed this decision on the approach to the side road, in light of how the situation with the cyclist developed. Most drivers (84%) said that they never or rarely found they had to change their initial decision about whether to turn into the junction before or after the cyclist, the comments regarding their changes in decision are summarised in Figure 21

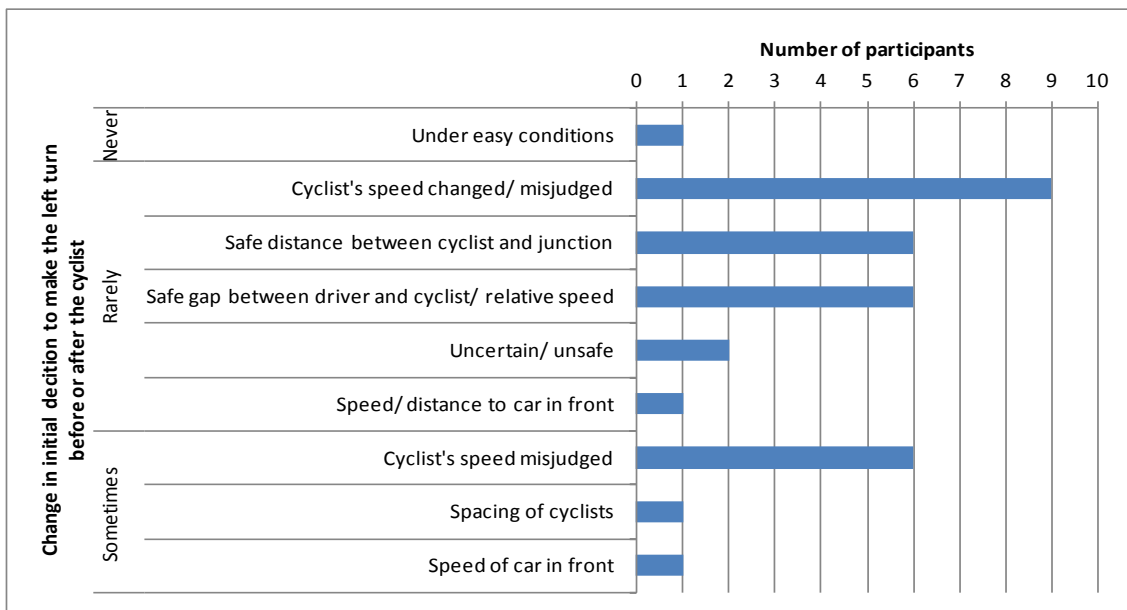


Figure 21: Reasons why drivers changed, or did not change, their initial decision

One of those who said they never had to change their decision commented that this was because the test was "under easy conditions".

Those who 'rarely' had to change this initial decision described the situations in which they tended to change their decision.

The most common responses referred to cyclists' speed changing or having mis-judged or been uncertain about the cyclist's speed:

"Change in cyclist speed."

"Cyclist going faster than originally thought."

"Travelling very slow - needed to reassess."

"Initially as I set off I thought I would have time to get in front of the cyclist, but realised towards the junction that I would not be able to turn in time and for it to be safe."

Most of the rest of the responses were about gaps and distances – either between the cyclist and the junction or the cyclist and their vehicle:

- Safe gaps, or safe distances between the cyclist and the junction;

"I changed if the cyclist was too close to the junction."

"When the cyclist started further away from me the car starting point so was near junction at point of decision."

- The gap between the driver and the cyclist, or the relative speed of the two;

"If there was a safe enough gap."

"The bike was too close for comfort and may not if been enough time to turn full corner. Rather wait than have a bike hit me."

"When closer to cyclist but not far from junction, would change decision to be on the side of caution."

"When I slowed for turn cyclists caught me up, for safety I changed decision."

- Safety concerns or uncertainty.

"Was not sure."

"When I thought safety of the cyclist would be jeopardised."

One referred to the speed and distance of the car in front affecting the decision.

Drivers - relative ease of making the left turn with different set-back distances

On balance, across the whole trial, almost all of the drivers found it easy or very easy to see the cyclist, to get into position to make the turn, to make the turn and to use the junction overall. Only two of the drivers (3%) said they found it hard to see the cyclists. The aspects of using the side road which were most likely to be reported to be hard or very hard (but by only 10 – 15% of drivers) were correctly judging the speed of the cyclist, the position of the cyclist and deciding whether to turn before or after the cyclist.

Drivers' assessments of different set-back distances were used to identify the relative ease of making the turn with different set-backs. After completing all of the runs, they were asked about whether these were easier with:

- A short set-back with the cycleway kerb segregation stopping 5 to 10m before the junction;
- A medium set-back with the cycleway kerb segregation stopping 15 to 20m before the junction;
- A long set-back with the cycleway kerb segregation stopping 25 to 30m before the junction.

The answers are summarised in Figure 22, which shows that there was no clear preference for any one of the three set-back distances.

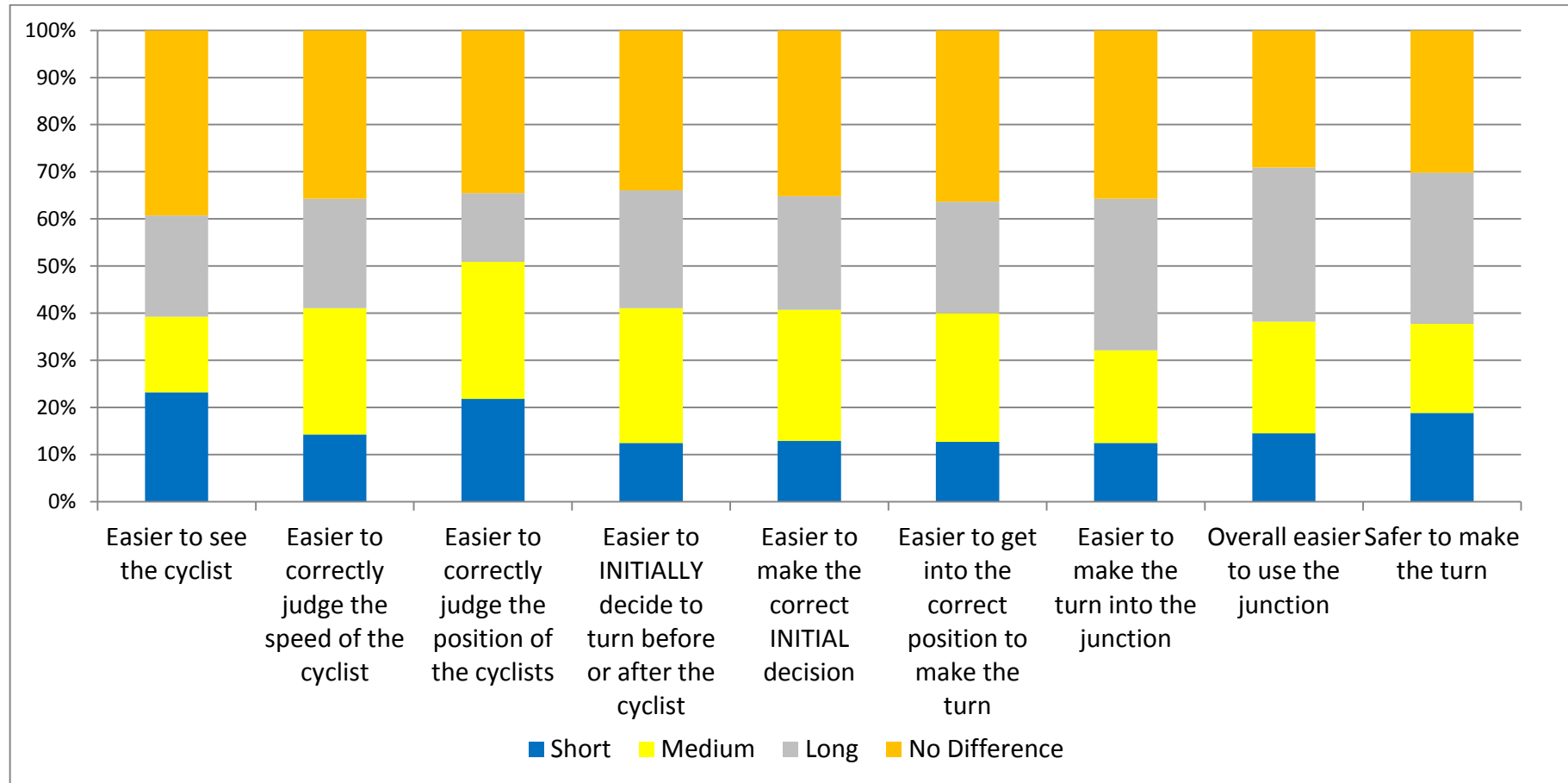


Figure 22: Assessed relative ease of turning left into the side road with different set-back distances - drivers

The segregated cycle lane set-back made no difference to seeing the cyclist, judging their speed or position, making a decision to turn, and making the turn, for about 35 – 40% of the drivers.

For 30% of drivers the set-back distance made no difference to overall ease of using the junction or safety of making the turn.

Differences in preferences for specific set-back distances were not particularly marked. The long set-back distance (25 – 30m) was felt by about a third of drivers to be better for ease of making the turn, overall ease of using the junction and for safety of making the turn.

The short set-back distance (5 – 10m) was generally favoured less than others on most aspects; it was most popular (among about 20%) for being easier to see the cyclist and for judging the position of the cyclist correctly.

Drivers commenting on the short set-back distance talked about it being easy to see the cyclists and maintain a distance from them, but greater difficulty in turning:

“The short cycle lane would make it more difficult to turn but easier to keep your distance from the cyclist.”

“Short lane allowed good vision of the cyclist but as you get closer to the turn the medium provided a better vision.”

Drivers whose explanations were about the long set-back distance referred to the drivers having the advantage of more space and more time to make a decision, at the expense of space for cyclists.

One explained the effect of the different distances:

“A segregated cycle lane makes you more aware of cyclists. I don't think the long one aids the situation. I think the medium one makes you aware but doesn't distract from the junction itself. The short one you are very aware but could make more indecisive decisions - makes like it's part of the pavement.”

Four drivers explained that other factors unrelated to the set-back distance influenced their decisions. These comments were about position of the cyclist in relation to the car, speed of the cyclist, and unpredictability of the cyclist's speed.

One commented more generally on the advantage in the driver anticipating further ahead:

“It didn't allow you to start moving into cyclists' lane, it made you think more ahead of you”.

Cyclists - relative ease of continuing straight on with different set-backs

Overall, on balance across the whole trial, cyclists found getting into position for continuing straight on was generally easy or very easy (almost 90%). Only about 20% of cyclists found it hard to correctly judge the speed or position of the motorist, and to decide whether it was safe to continue. Furthermore, less than 10% of cyclists rated the junction as hard to use overall.

After the trial had been completed, cyclists were asked to evaluate how easy it would have been to continue straight on at the junction with different set-backs. Their assessments are summarised in Figure 23. As for drivers, this shows that there was no clear preference for any one of the set-back distances.

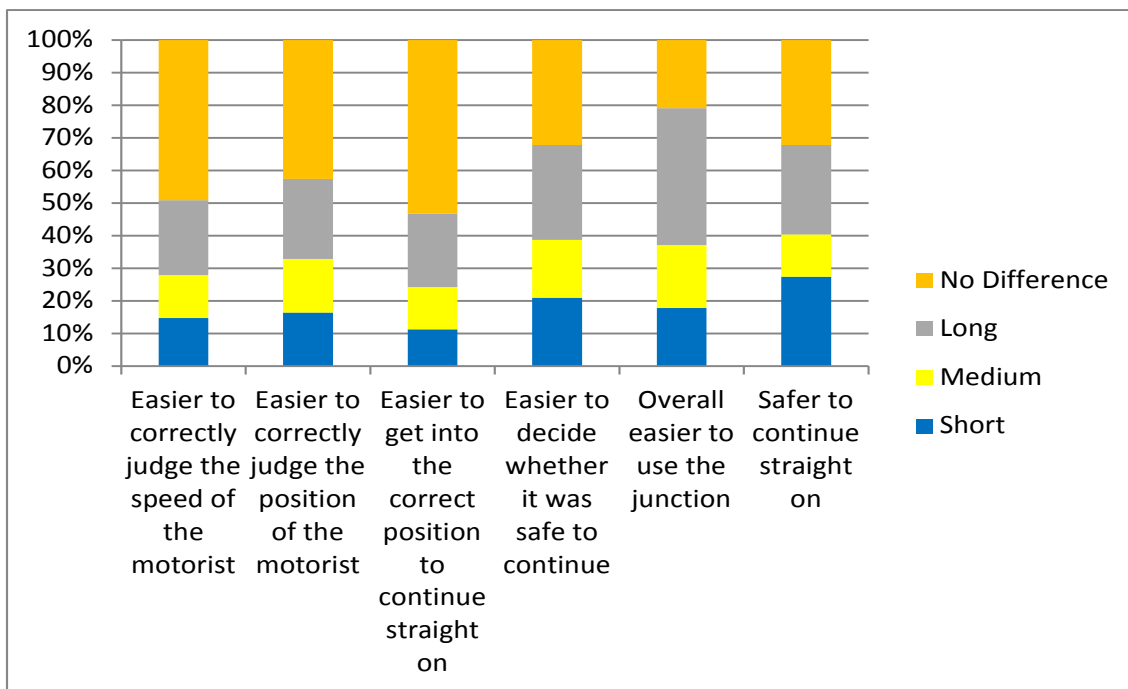


Figure 23: Assessed relative ease of continuing straight on with different set-back distances – cyclists

For judging the speed or position of the motorist and getting into the correct position, about half of the cyclists said that the length of the set-back made no difference. Among the rest, the proportion who found these aspects easier with longer set back was marginally greater than for the other set-backs.

Cyclists tended to find it easier to decide whether it was safe to continue, and to consider that it was safer to continue straight on, with a long set-back. However, the proportion preferring any one set-back was not significantly greater than the proportion preferring the other ones. The largest proportion thought that the long set-back was the one where it was overall easiest to use the junction. Over half (53%) of those finding the junction easier to use with one set-back, chose the long set-back, and this was statistically greater than the proportions choosing the other two.

The responses to these questions were also analysed for cyclists who said they cycled once a week or more often and who also said they usually cycle on the road in traffic (rather than on segregated cycle lanes or off-road) – 24 cyclists in total. Figure 24 shows that for this sub-group, there was again no clear preference for any one set-back distance.

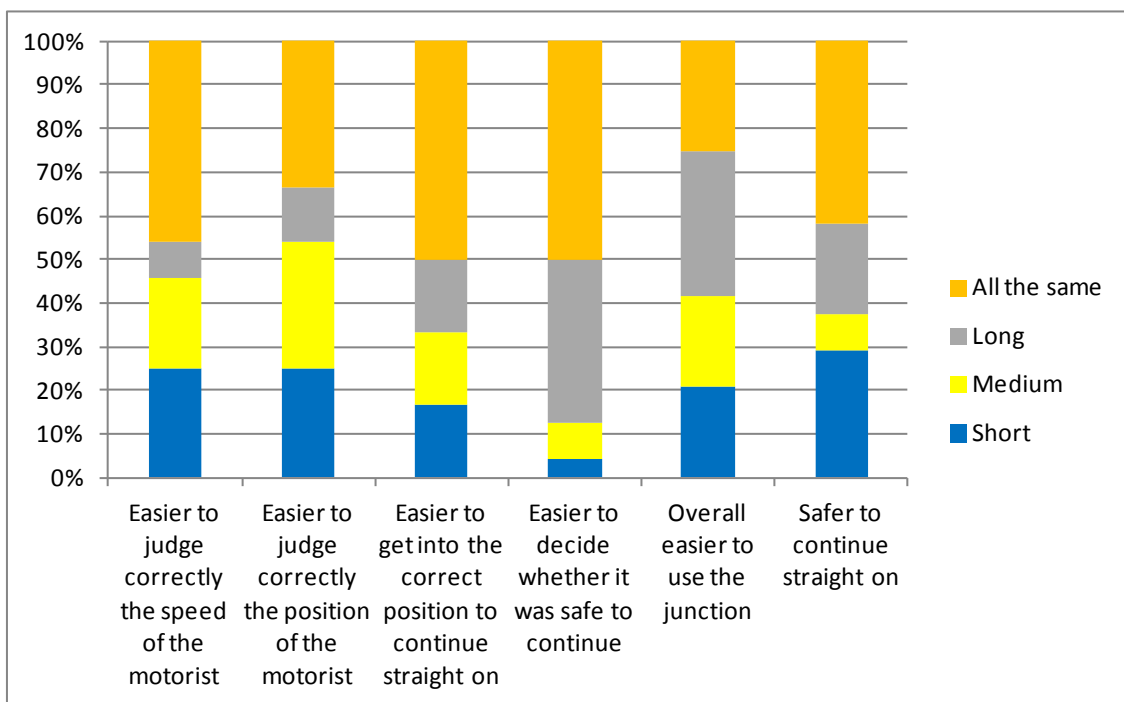


Figure 24: Assessed relative ease of continuing straight on with different set-back distances – regular road cyclists

About half said the length of the set-back made no difference to judging the speed of the motorist, getting into the correct position for continuing straight on and deciding whether it was safe to continue.

Between about a quarter and half said it made no difference to judging correctly the position of the motorist, ease of using the junction or safety for continuing straight on.

3.2.6 Objective 6: Understanding

Cyclists and drivers were asked whether you should cross the solid white lines after the cycle lane kerb ends before the junction; their answers are summarised in Figure 25.

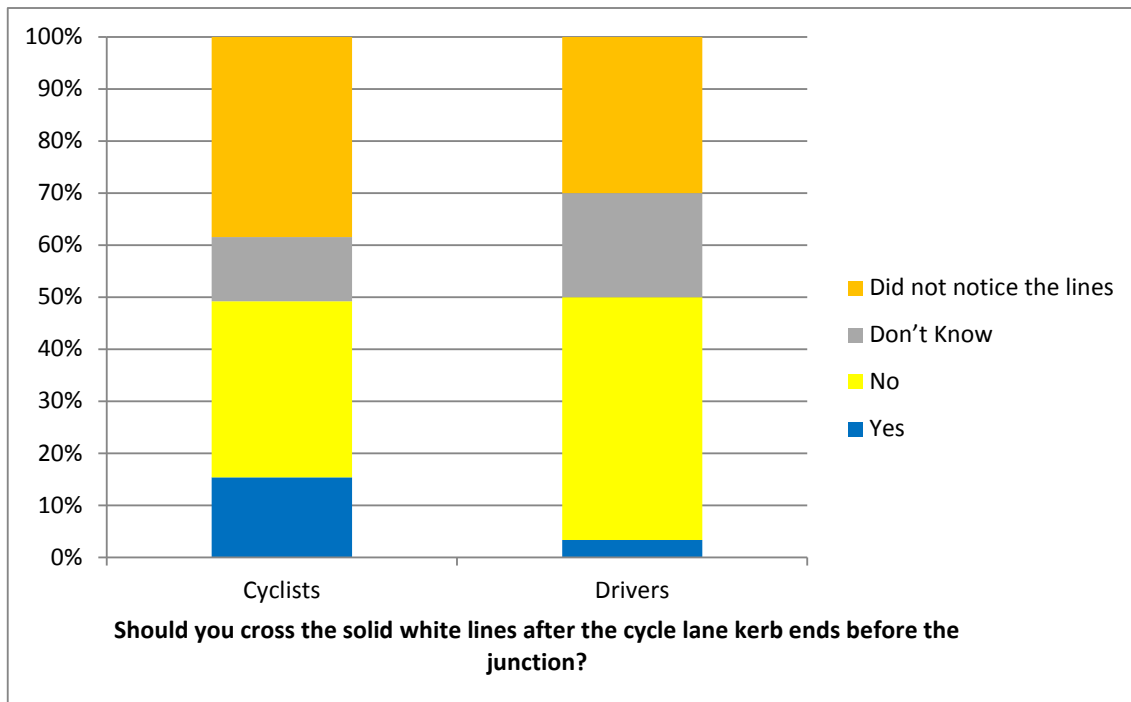


Figure 25: Should you cross the solid white lines after the cycle lane kerb ends?

For both cyclists and drivers, the most common response was 'no' and only 2 drivers and 10 cyclists said 'yes'. However, almost 40% of cyclists and 30% of drivers did not notice the lines.

Cyclists and drivers were also asked about the meaning of the triangular markings delineating the cycle lane from the main carriageway as the cycle lane crossed the junction, see Figure 26.



Figure 26: Triangular markings

About half of the participants noticed the markings and half did not (see Figure 27). There was little difference between the cyclists and the drivers in the responses; this lack of difference between cyclist and driver response rates was also true for the subsequent questions on the meaning of the markings.

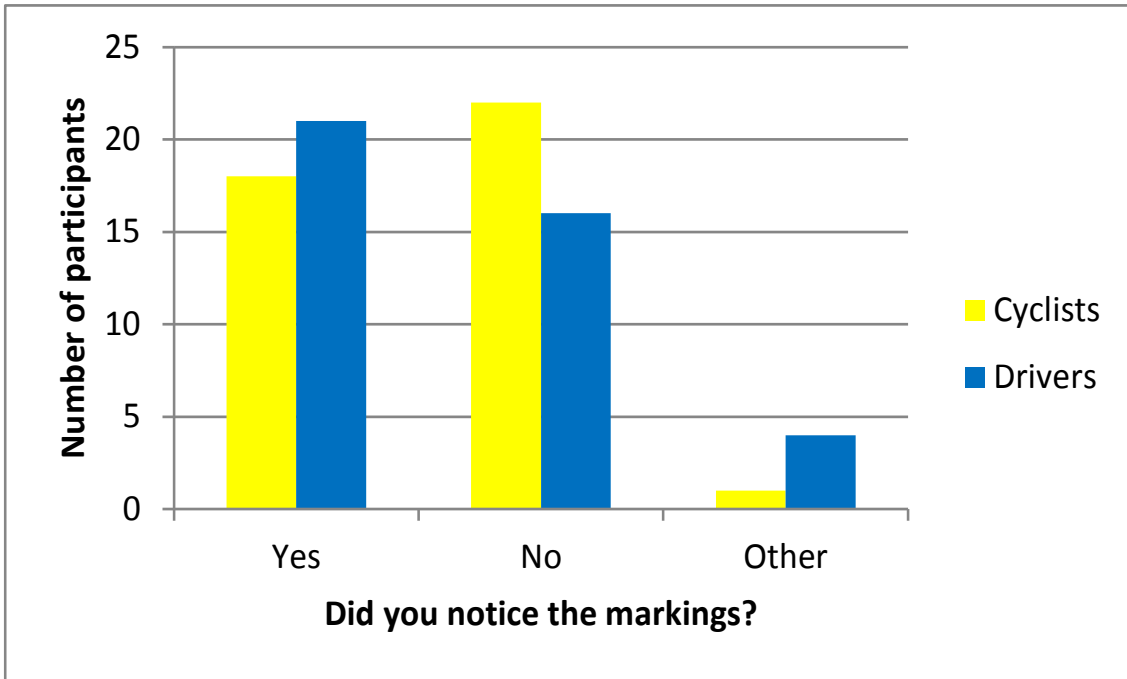


Figure 27: Did you notice the markings? – drivers and cyclists

When asked what they thought the markings meant from the point of view of a cyclist going straight ahead, a relatively small number of participants gave the correct interpretation ‘right of way over motorists’ (see Figure 28). The most common response was that it was a warning about vehicles; although these participants did not use terminology which indicated a precise understanding of the meaning of the markings, they did have a general appreciation of what the markings imply.

A few thought the markings meant that the cyclists had to stay in the cycle lane, a few thought it was a general warning and one thought it was to mark that the cycle kerb had ended.

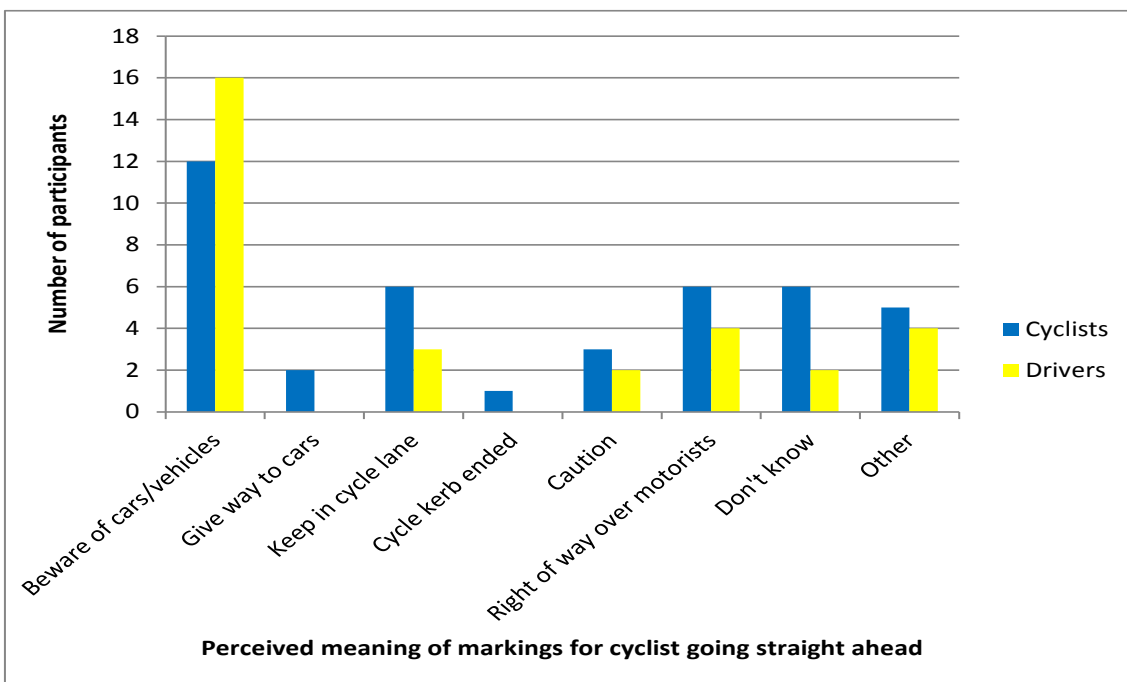


Figure 28: Meaning of markings for cyclist going straight ahead

This overarching interpretation of the markings meaning ‘beware’ also held for the questions on their meaning for the cars turning into and out of the side road.

The participants were also asked who they thought has priority at a junction if a car is turning into the junction and a cyclist is continuing straight on. In this case, most (over 80%) of the participants correctly said that the cyclist has priority. However it is important to note that a few drivers (approximately 10%) wrongly thought they had priority.

Participants were asked whether they thought a car can stop on the cycle lane behind the markings, when exiting the junction. Almost all (85% of drivers, 89% of cyclists) of the participants correctly answered ‘no’. However, 4 (10%) of the drivers thought they could stop on the cycle lane. Participants’ further comments on the markings are summarised in Figure 29.

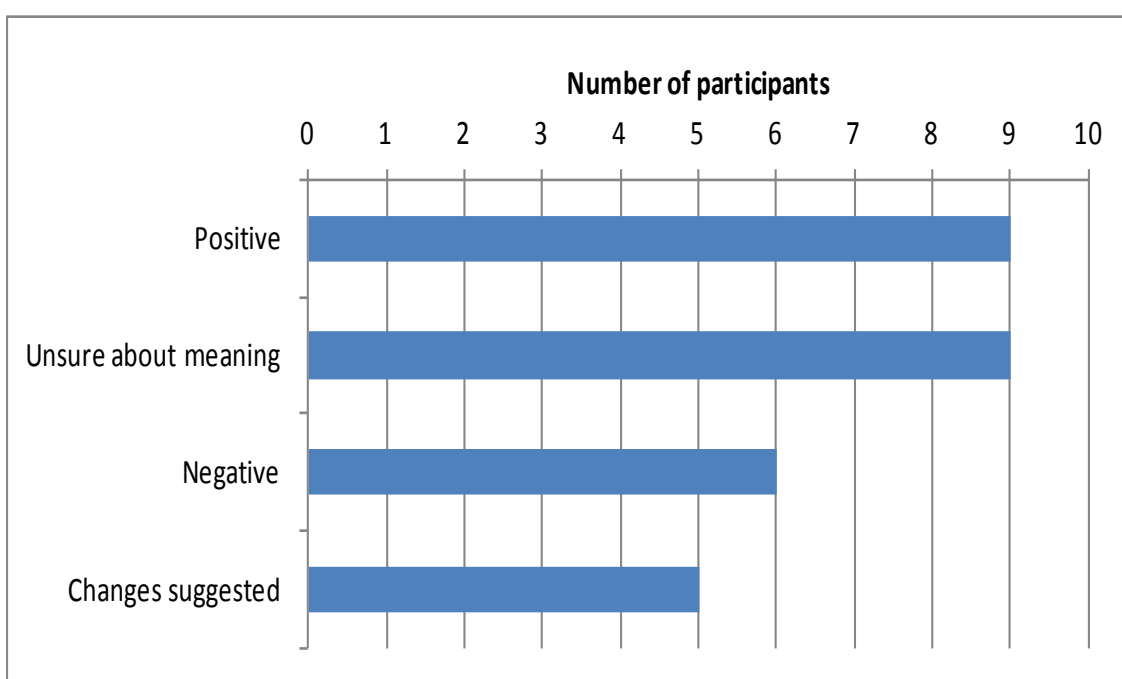


Figure 29: Summary of comments made on triangular markings

When asked for other comments about the meanings, nine of the participants made positive comments about these triangular markings. These tended to be about their role in demarcating the lane or making drivers more aware of cyclists:

“I like them as they give a clear warning to cyclists and drivers, make you think more which has to be good.”

“Since they are unusual people have not seen them before they are more likely to notice and pay attention and take more care when using them.”

“Make a visible demarcation lane.”

“They make you more aware of the cycle lane.”

“Should be an awareness campaign about what they mean and how they should be used to ensure maximum safety for all road users.”

Six people made negative comments about their expense, maintenance, slipperiness, confusion if there are too many markings, and not noticing them:

"Not sure they are a good idea, they will only apply in urban areas, are expensive to install and then maintain."

"They add to the amount of paint on the road and the possible slipperiness of it."

"It can be confusing with so many marks on the road. The green path is a good indication of bikes could be around."

"Different colour- as a cyclist I did not notice them."

"Unnecessary - better to allow cyclists and drivers to use their eyes and ears."

There were some participants who were unsure about the meaning of markings, or unsure about whether they were beneficial:

"Not widely understood by car drivers as to meaning."

"There is nothing wrong with the shark's teeth (triangular markings) however they do not mean anything specific to me (above and beyond a dashed line)."

"I'm not at all sure if the markings give right of way to cyclists."

A few made suggestions about changing the way they are used or laid out:

"They are quite large and very frequent and increase the amount of info given to road users at junctions. I would be concerned at making junctions stand out too much".

"Not sure if it would help if teeth were pointing in opposite direction (away from junction)."

"Maybe use a rough surface under the teeth to give impression of separate lane and maybe a different colour"

"Should start earlier than indicated in the picture."

"I would say that they should only be on one side of the junction, maybe to show traffic could be entering at that point".

3.2.7 Objective 7: Views on segregation

Attitudes towards segregated cycle lanes

After completing the trial, drivers and cyclists were asked whether they thought that segregated cycle lanes are a good idea for cyclists and for car drivers. The responses are summarised in Figure 30.

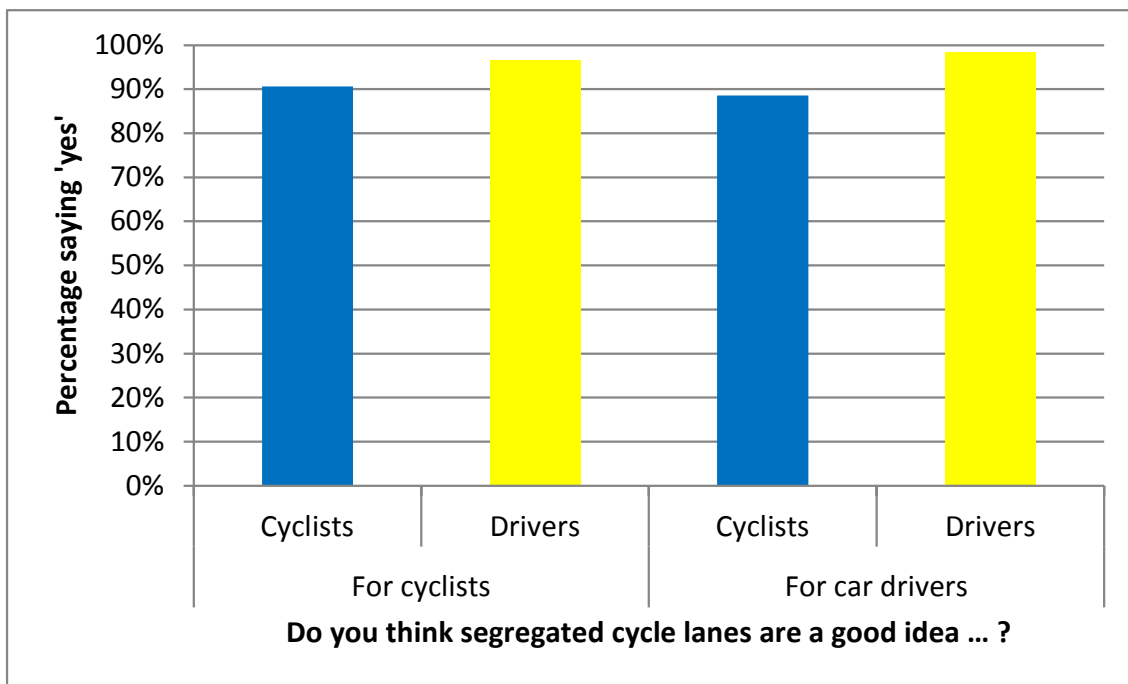


Figure 30: Views on segregated cycle lanes

Almost all of the participants thought segregated cycle lanes are a good idea for cyclists and for car drivers. The expressed detailed views of cyclists on segregated cycle lanes are summarised in Figure 31.

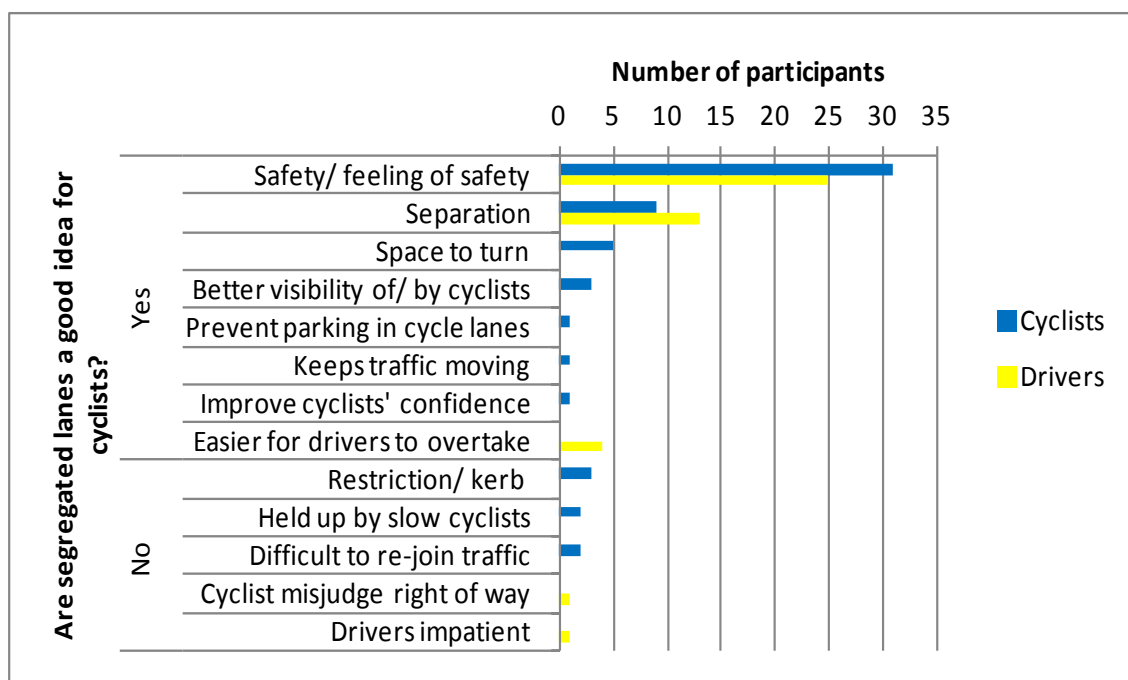


Figure 31: Cyclists' views on segregated cycle lanes

The types of reasons given by cyclists who thought they are a good idea for cyclists were:

- Safety, or a feeling of safety;

"Overall feel safer than cycling in traffic."

"It ensures safe segregation so that cars do not pass dangerously close."

"Makes cars keep a safe distance from cyclists, avoids conflict and makes cyclists be noticed by driver."

"Safer for cyclists, as drivers cannot come across you - you have more room."

"Safety, especially of you have children on the back who wobble your bike."

- Separation from traffic;

"Prevents cars getting too close."

"Takes away the drivers judgement about what is close to a cyclist."

"Motorist and cyclist will both know their position on the road and the motorist unlikely to swerve towards the kerb and cut in front of cyclist."

"Feel more protected and feel as a driver myself it would make motorists drive with more care."

- Having space, which in turn gives certainty and security and enables cyclists to proceed at their chosen speed:

"Gives me space on the road - not pushed over, free to go at pace."

"Distinct more directional area for cyclist to proceed."

"Gives the cyclists a sense of space on the carriageway providing a sense of security when travelling between junctions."

"Cyclists will have a clear idea where to be."

"It gives cyclists a defined area on the road that encourages vehicles to give cyclists space."

- Better visibility of cyclists or by cyclists;

"More visible to other road users including pedestrians."

"They do make other road users think about cyclists on the road."

"Gives a better view of other traffic."

- Kerb separators prevent parking in cycle lanes;
- Keeps traffic moving;
- Improve cyclists' confidence.

Some cyclists qualified their comments. Some of these qualifiers were about design, layout and maintenance:

"Provided they are kept clear! Less stressful."

"Dependent on quality of tarmac, width of cycle lane, proximity to traffic."

"They are a good idea but really needs sorting out at junctions."

"Keeps cars away, not sure on the kerb though."

Two of the qualifying comments from cyclists were about attitudes and behaviour (of drivers and cyclists):

"In general yes - but if they cause resentment amongst motorists, they maybe counter-productive."

"Generally cyclist can become complacent about their right of way and issues when they both need to share the road."

The expressed detailed views of cyclists on segregated cycle lanes are summarised in Figure 32.

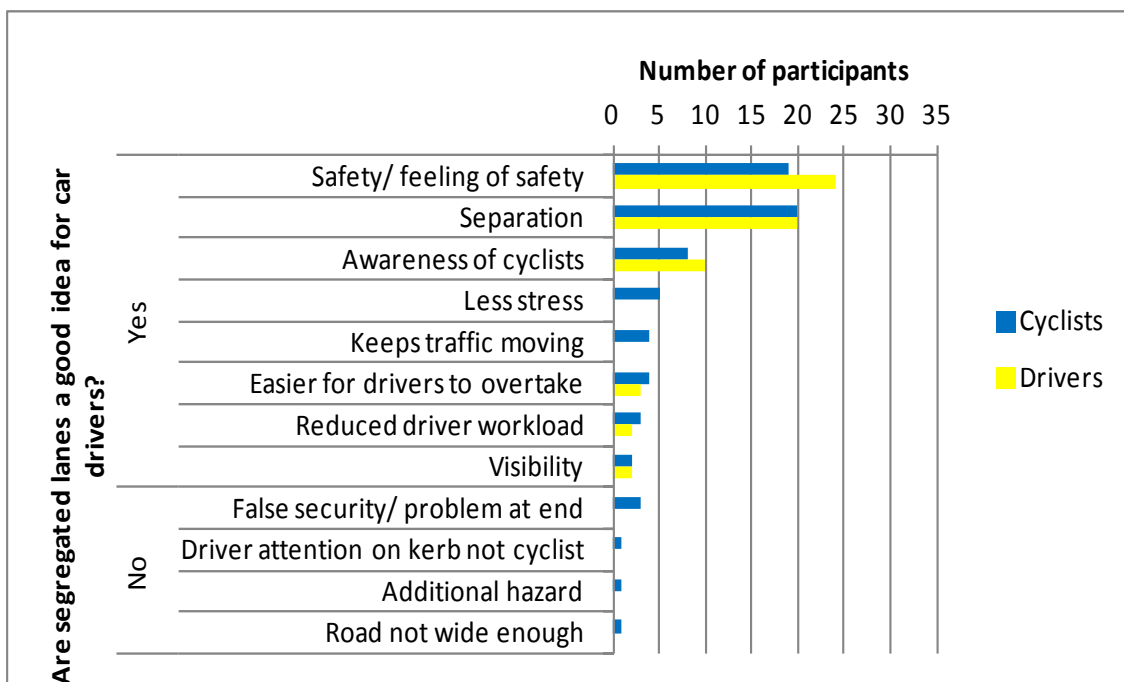


Figure 32: Drivers' views on segregated cycle lanes

The types of reasons given by drivers who thought segregated lanes are a good idea for cyclists were similar to those mentioned by cyclists:

- Safety of cyclists (and in some cases drivers), which comes about through awareness and separation;

"Keep them safer, give drivers a safer idea of distance."

"Overtaking can be difficult and too many drivers take risks in doing so putting everyone's life in danger."

"Keeping cars and cycles separated must be safer for both, particularly cyclists."

"Increased safety for cyclist but the junction will always remain hazardous."

"Gives cyclists more space on the road but can make them less aware of cars."

"Make motorists more aware of cyclists."

"Safer better flow of traffic on the roads. Less chance of accidents."

"Safer keeps cars far away, stops cars passing too close."

"Safer option than travelling with difference classes of vehicles."
- Clear or separate areas for cyclists (and motorists) which improves certainty as well as safety;

"Clearly defined area for both cyclist and motorist."

"Clearly marked as 'their' territory with a barrier stopping vehicles mowing them down."

"Both cycles and cars know where they should be."

"Stop cyclists weaving through traffic."

"They don't have to squeeze between kerb and vehicles."

- Makes it easier for drivers, avoiding the need to judge when to pass cyclists.
"It is sometimes difficult to judge how much room to give a cyclist when traffic is travelling towards you. Segregated cycle lanes would help."
"Cyclist more visible and a safe driving decision is easier to make."
"Keep cars more focused on staying away from cycle lane, also if a car drifts over a little bit then they will touch the kerb but be prevented from going into the cyclist."

Cyclists who thought segregated lanes are not a good idea for cyclists were concerned about:

- Restrictions of delimited cycle lanes, with safety implications;
"Could hinder positioning for certain movements."
"I think road markings are sufficient, raised kerbs pose a danger for cyclist colliding with them and being thrown into the traffic."
- Being held up behind slower cyclists;
"Overtaking other cyclists may prove difficult."
"Forces all cyclists to go as slow as the slowest cyclist."
- Difficulty with re-joining the traffic stream.
"Gives them a false sense of security which is then shattered when it ends."
"There's always confusion about priority when re-joining traffic."

Two drivers thought segregated lanes are not a good idea for cyclists; one was concerned about cyclists thinking they have right of way when they do not, and one who was unsure whether drivers would be patient enough for cyclists to be safe.

The types of reasons given by cyclists who thought they are a good idea for car drivers were similar to the reasons why they are seen as being good for cyclists: safety, separation and certainty for drivers that a cyclist will not pull out.

Drivers' reasons for segregated cycle lanes being good for drivers were about safety, visibility of cyclists, separation, visibility and awareness, and reducing workload (not needing to think about cyclists).

A few cyclists gave reasons why these lanes are not a good idea for drivers. The reasons given were about hazards and distraction and driver awareness:

- a false sense of security or problems where the segregation ends;
"It creates a false sense of security and raises the possibility of problems where they don't exist."
"Because when it ends you are suddenly faced with a flood of cyclists."
"Due to segregation, don't notice cyclist as much - could cause problems at junction."
- paying attention to the kerb and less attention to cyclists;
"I think the car drivers will see the kerb and pay less attention to the cyclist as they think it's safer therefore possibly bumping into kerbs and knocking cyclists down."
- additional hazards in the road;
- the roads are not wide enough.

Purpose of segregation set-back

Drivers and cyclists were asked why they thought the cycle lane kerb ended a distance before the side road, and their answers are summarised in Figure 33.

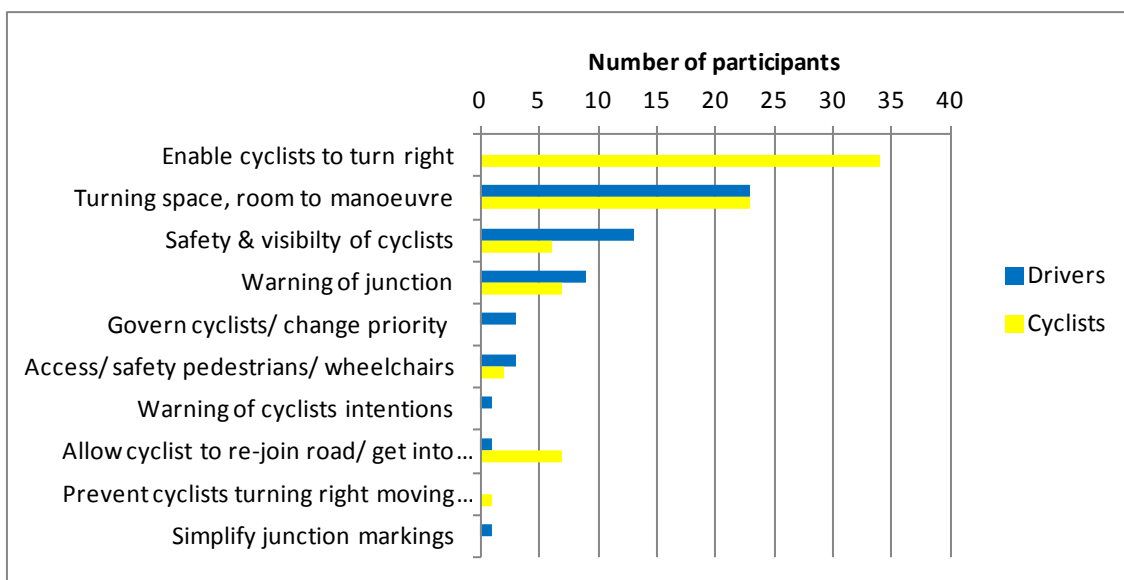


Figure 33: Detailed views on why the segregated cycle lane ended before the side road

The most common reasons suggested by drivers were:

- Turning space for larger vehicles and giving room or time for manoeuvre, which also helps to avoid drifting into the next lane and influences speed;
 - "To allow larger vehicles to make the turn."*
 - "To allow a car to make a smooth turn in."*
 - "Stop vehicles hitting the kerb."*
 - "So the car does not have to go wider into the other lane and impede traffic."*
 - "To save cars feeling the need to take the turn wider than needed and potentially causing an accident."*
 - "To make the turn faster and easier."*
 - "To demonstrate a wider/narrower approach. To govern entry speed."*
- Safety and visibility of cyclists and another mentioned visibility of both cyclists and drivers; specific situations mentioned were for cyclists turning right and cars turning left;
 - "Keeps bike safe till last minute."*
 - "To ensure ... cyclist ... safe and visible."*
 - "So cyclist can join road safely."*
 - "Allow cyclists to pull out to turn right if required."*
 - "Safer for cars to turn left."*
- To provide an indication or warning that a junction was approaching and vehicles may be turning – either for the drivers, cyclists, or both.
 - "To let both cyclist and motorist know."*

"To give warning to drivers that junction was approaching."

"The areas that cars would cross and cycles need to be cautious of."

"For ease of seeing the turn to the left."

"To warn cyclist of closer integration with cars."

"Make cyclist more aware of the upcoming junction."

"Make cyclist aware that traffic could be turning left."

Other reasons mentioned by fewer drivers were:

- To govern the behaviour of cyclists or change the balance of priority;
 - "To make cyclists slow down."*
 - "So that cyclists also have to manoeuvre the junction instead of going straight over."*
 - "To allow motorists slightly more priority owing to cycle slow/stopping earlier."*
- Access or safety for wheelchairs and pedestrians crossing;
- Warning about cyclists' possible intentions, allowing cyclist to re-join the road and to simplify the junction markings.

Some drivers (10%) said they did not know the reason, but some then made a guess.

Half of the cyclists said that they thought the set-back ended before the junction to enable cyclists to turn right (this reason was not mentioned by drivers):

"Good for turning right. Good vision into junction to decide/motorist to think of what cyclist may do."

"So if you were turning right, you had time to manoeuvre into the middle and get into your position."

The other common reasons suggested by cyclists were similar to those suggested by drivers:

- Turning space for vehicles, including larger vehicles going left;
 - "So cars don't have to turn so sharply to go left."*
 - "To allow a more convenient radius for motorists turning right."*
 - "To allow longer vehicles to have a gentler turn at junction."*
 - "If car turned left they didn't risk going over kerb."*
- Safety of cyclists (described in terms of protection and separation, some of whom talked about the safety of a short set-back distance;
 - "The closer the kerb to the junction the safer it is for the cyclist."*
 - "To keep cyclist and cars apart."*
 - "To stop motorists moving over into the cycle lane before the junction."*
 - "To protect the cyclist and encourage the car driver to not turn too early."*
 - "Make it better for cyclist."*
- To provide an indication or warning that a junction was approaching or provided more time to anticipate others' actions at the junction;
 - "To give all road users the impression that the segregation has ended and that all road users should be extra aware of the dangers caused by others."*

"Indicate to cyclist that there is a junction and cars may be turning across your path."

"Make the cyclist aware of the end so they would look for motorists."

"To allow a person's thought process to judge turning position and speed."

"So there was plenty of time for the car or bike to turn."

- Allowing cyclists to re-join the main road or get into position.

"To allow cyclists to re-join main traffic if appropriate."

"To make it easier to move into the middle of the road in a situation where there was traffic."

"The further back the concrete kerbs were made it easier for the cyclist to get into preferred position to pass the side road, however if a big HGV vehicle or bus wanted to turn left then the cyclist would have nowhere to go and would then have to slow down to allow large vehicle to turn."

Other reasons mentioned by fewer cyclists were about preventing right-turning cyclists from moving out too early, and providing for pedestrians, buggies and wheelchairs.

Views on whether cyclists approaching a side-road should join traffic early or remain separate as long as possible

After the trial had been completed, drivers and cyclists were asked whether they thought it is better for cyclists to join the main traffic earlier before the junction, or to remain separate for as long as possible. The responses are shown in Figure 34.

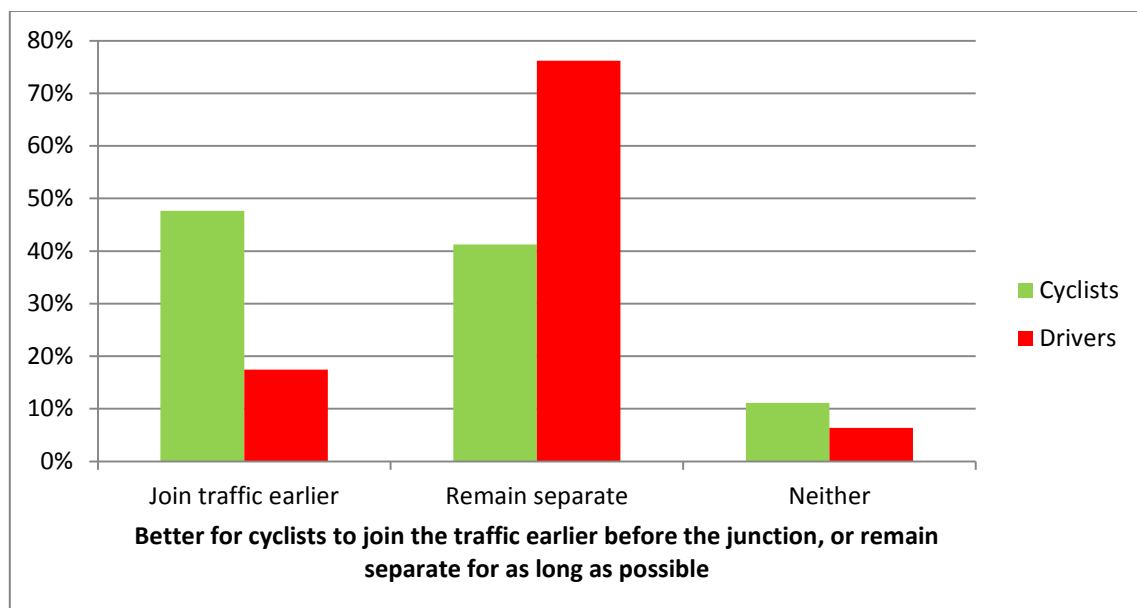


Figure 34: Preferred position for cyclists joining the carriageway after the set-back

Cyclists were almost equally divided in their opinions, indicating that there are different groups of cyclists to be catered for. In contrast, most of the drivers favoured cyclists remaining separate for as long as possible. The detailed reasons for their preferences are summarised in Figure 35.

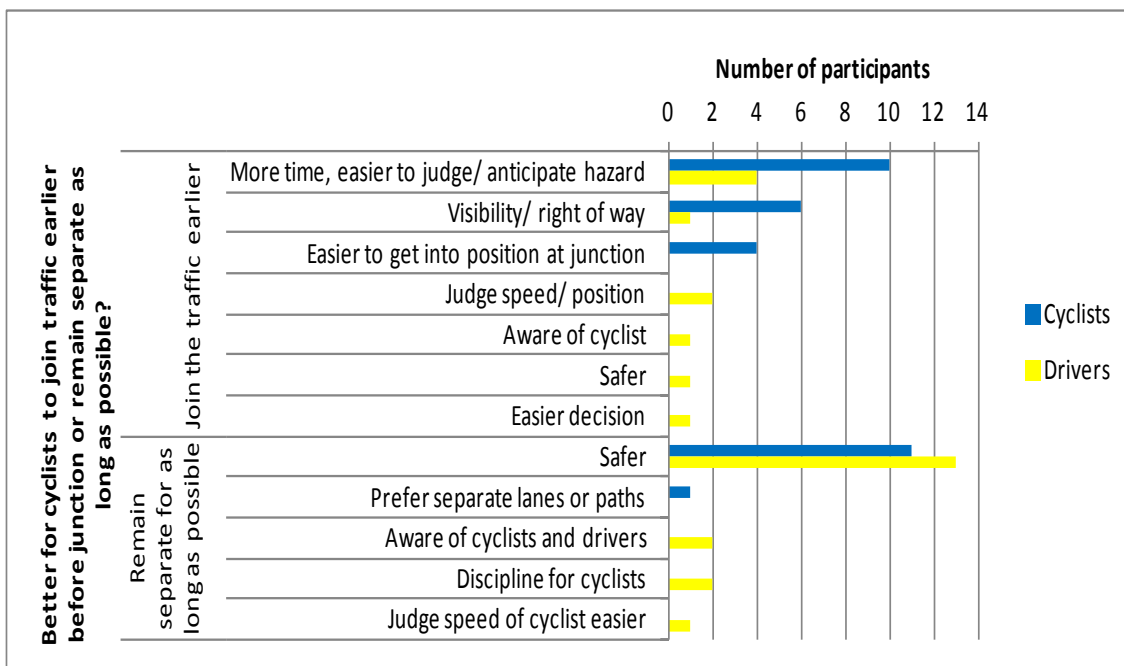


Figure 35: Reasons for preferring cyclists to join main flow early or remain separate for as long as possible

Cyclists who thought it best to join the traffic earlier gave the following types of reasons:

- allows more time or makes it easier to judge the situation;
 - "More time to get into correct position on road; other road users aware of cyclist for longer."*
 - "If separate for as long as possible there will be a panic 'I must get across now' attitude or the junction will be missed."*
 - "Makes you more alert."*
- visibility to motorists, or having 'right of way';
 - "It is safer to make your intentions clear as you are part of the traffic thereby better accepted by the motorists."*
 - "To enable the motorists to pay more attention to the cyclists' movements."*
 - "Earlier so the driver will spot the cyclist sooner."*
 - "The shorter the exposed end of the protected lane, the more it feels like popping out of a bottle i.e. the less time feeling comfortable about being in mixed company."*
 - "The sooner the cyclist joins the traffic the sooner they can have a right of way in traffic."*
- easier to get into the preferred position for the junction.
 - "Although perhaps slightly unsafe it allows the cyclist the chance to position themselves where they want to be."*
 - "Particularly for cyclists making a right turn, giving more space in which to move out to the centre line (my preferred position)."*

Drivers gave similar reasons to cyclists for joining the traffic earlier and tended to talk about drivers and cyclists both having more opportunity to be aware of each other.

Two cyclists said it depends on which way the cyclist is going (earlier for a right turn).

Cyclists who thought it best to remain separate from the traffic as long as possible almost all mentioned safety:

"Being separate means it feels safer and more caution is taken by both cars and cyclists."

"By increasing the distance of the kerb from the junction, drivers would get closer to cyclists. Keeping the kerb distance from the junction shorter keep car drivers in position."

"Cars and cycles don't mix so keep them apart as long as possible."

"If it joined main traffic earlier cars would be more likely to cut across in front of cyclists when turning left."

"If you have a long stop, vehicles more likely to use the cycle lane so more dangerous for cyclist."

The two cyclists who thought it best to remain separate who did not mention safety, said they preferred separate lanes or paths, and another noted that for right turning a longer set-back is better.

Drivers who thought it best for cyclists to remain separate for as long as possible mentioned the following reasons:

- Safety for both cyclists and motorists – some specifically mentioned the barrier provided by the kerb;

"Joined in with traffic must be more dangerous seems sensible to minimise the duration of this danger time."

"Keeps cyclists away from possible danger i.e: lapse of drivers concentration."

"Think it is safer to be protected for longer by barrier."

- Increase mutual awareness of drivers and cyclists;

"Cars are more aware of approaching cyclists if there is a cycle lane."

"Cyclists would be more aware as they join traffic later."

- Discipline for cyclists;

"Cyclists a law unto themselves, some will not use lanes provided, think they are above using safety of lane."

"Cyclists need discipline too."

- Easier to judge cyclists' speed if kerb remains constant.

Among those who replied 'neither' to the question about whether it is best to join earlier or remain separate for as long as possible, four cyclists explained that it depends on which way the cyclist is turning, or speed, traffic, or whether looking at it from the point of view of the driver or the cyclist. One driver said that each junction is different, and hazards vary from day to day.

Concerns about particular segregation set-back distances

Cyclists and drivers were asked if they had any particular concerns or issues with the kerbs stopping at different distances before the junction. The results are shown in Figure 36.

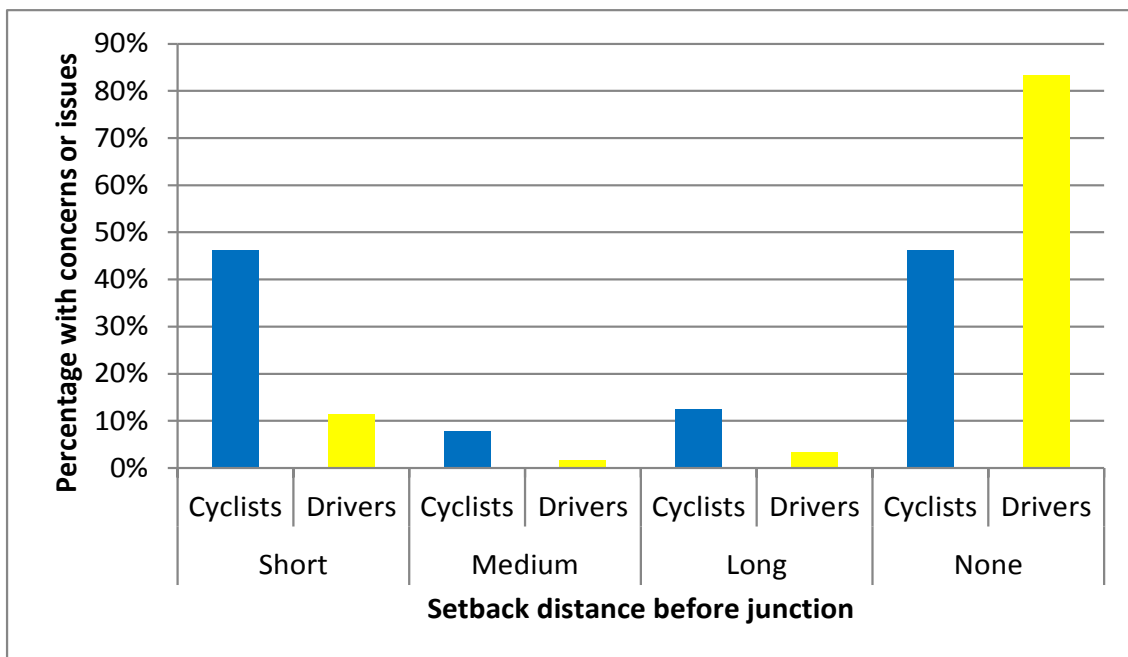


Figure 36: Concerns when using the road when the kerb stops at any distance before the junction

Almost half of the cyclists reported no concerns, and almost half had concerns with the short distance to the junction. A few had concerns with the medium or long distance.

Most of the drivers reported no concerns; of those with concerns, the main concern was with the short set-back distance. The types of concerns expressed are summarised in Figure 37.

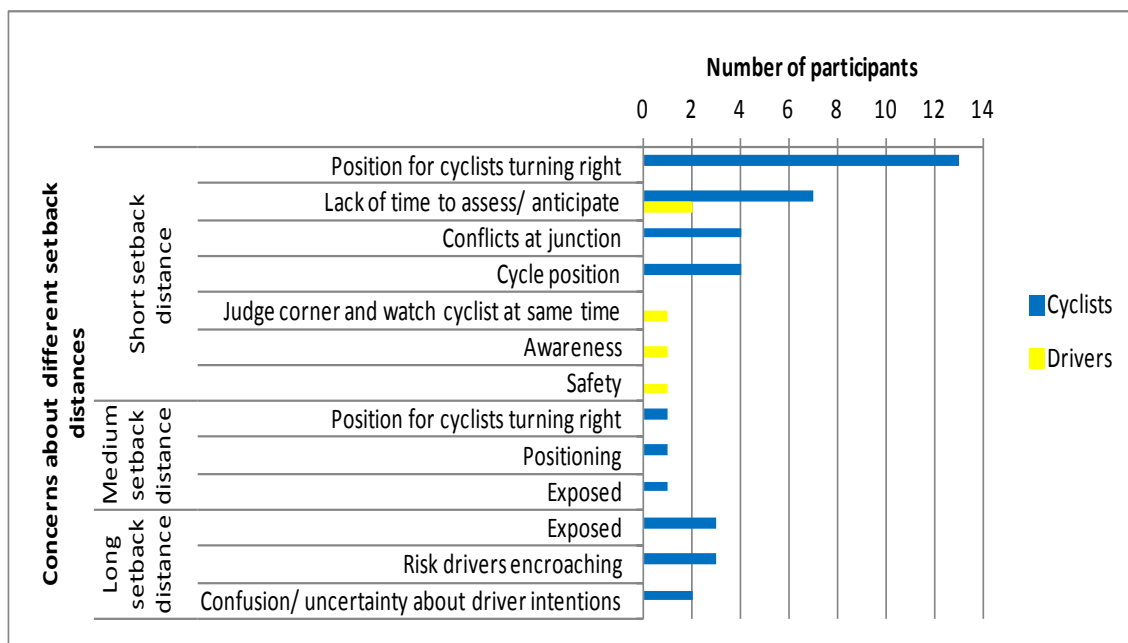


Figure 37: Types of concerns when using the road when the kerb stops at any distance before the junction

Cyclists' concerns about the short set-back distance were focused on cyclists turning right:

- Positioning for cyclists turning right;

"Feels unsafe to be able to turn right."

"More difficult to move over to turn right."

"Not being able to cross the 'car' lane to turn right."

"Not enough room to go right safely in traffic."

"Not enough space for safe right turn manoeuvre considering bike speeds and finding gaps in traffic to turn right."

"Not sufficient space/time to position correctly to cross oncoming traffic."

"Right turns for cyclists, but not too difficult."

"Short limits the time you have to get in position for turning right so traffic conditions would impact the opportunities to get in the correct place to turn."

"The right turn out of the cycle lane was extremely difficult."

- Lack of time to assess the situation and anticipate vehicle movements; one mentioned having to think about the barrier and the traffic at the same time;

"No time to make the right decision."

"Does not allow time to assess the situation."

"Had to look out for traffic and whether I was clear of concrete partition."

- Conflicts between cars and cyclists at the junction, including too much activity;

"Bike arrived at junction at same time as the car on short stops, possible conflict and caused hesitation by both driver and cyclist."

"I felt the car was too close to me although it had stopped and I would have been able to go safely straight on, I preferred it when the car had already turned the junction."

"If the car's exit was impeded and it stopped across the lane there is nowhere for the cyclist to go."

- Cycle positioning generally.

Too close to the junction. The cyclist cannot get into an appropriate and safe position if the blocks are there. The blocks do not protect the cyclist past the junction."

Drivers' concerns about the short set-back were also about lack of time to assess the situation, and having to judge the corner at the same time as keeping an eye on the cyclists.

Three cyclists and no drivers expressed concerns about the medium set-back distance. The concerns mentioned were right turns (but said they were not too difficult) and feeling more exposed.

The cyclists' concerns about the long set-back distance were about being more exposed, risk from drivers 'encroaching' and confusion or uncertainty e.g. about drivers' intentions:

"Felt more exposed that car could encroach into cycle lane when turning left."

"Motorists may be tempted to cut across the lines where the kerb stops."

"Not sure what the driver intended."

"Slightly confusing, too much freedom."

Two drivers who preferred the long set-back said it was clearer to have the kerbs continuing close to the junction and that they might have been tempted to cut the corner turning into the junction.

Suggestions for changes in trial layout

Participants were asked whether they had any suggestions for changes in the layout they had experienced during the trial.

Cyclists' suggestions could be categorised as follows:

- Further signs, different markings or bollards at the ends of the kerbs:
- No kerb
- Insert gaps in the kerb (for joining the traffic, e.g. to turn right).

Drivers also suggested further signs and markings.

The suggestions for signs were as follows:

"A bollard or sign on end of kerbs and maybe a sign saying 'look for bikes'."

"sign stating 'think bike' or 'be aware of cyclists'."

"Sign to let you know to 'give way' to cyclists."

"Cyclists should be warned to look their shoulder in case car drivers do not notice them when turning left."

The suggestions for markings were as follows:

"A clearer indicator all the way along the concrete partition."

"Luminous markings."

"I would like to see less confusing white road markings, I found the triangles and lines too much to observe. I think there should be one clear marking indicating where cyclists should turn right from."

"Marking to show end of lane."

"I think road markings are sufficient, raised kerbs pose a danger for cyclist colliding with them and being thrown into the traffic."

The suggestions about the kerb involved using lines instead, making them rounded, or inserting gaps:

"Give cyclist route marked on road for them to turn right- makes drivers aware of cyclist moving in different options."

"Medium distance was good for straight on and left turns but not right. A small gap further back for cyclist to join main traffic earlier giving time to get to correct position for right turn."

"Does the kerb need to be solid-continuous? If there were gaps maybe it would allow more flexibility for cyclists"

"Use intermittent delimitator poles so the cyclist can choose when to leave the cycle lane and join traffic."

"Preferably no blocks. Cyclists may need to move out past another slower cyclist but wouldn't be able to. More cyclists would tend to avoid them altogether if faster cyclists."

4 Summary of findings

The key findings of the trial are summarised below.

Impacts on path taken when approaching the junction

- The average paths used by the car drivers were consistent for different kerb segregation set-backs of 10 metres to 30 metres. However, their average path varied slightly from these paths when a 5 metre set-back was present. The front wheel being between 0.4 and 0.8m further from the kerb close to the side road and therefore their path into the side road was more acute;
- The paths followed by car drivers with a 5 metre set-back were less variable, and therefore more predictable, than with larger set-backs.
- The majority of cyclists travelled between 0.75 and 1.25 metres from the kerb, and set-back distance had no observable effect on the cyclists' position in the cycle lane;

Distance of vehicles from cycle lane

- The passing distance between the cars and cycles varied between 2 and 3 metres, and most cars were approximately 2.5 metres from the cyclist when they overtook.

How far vehicles were from the side road when they started moving into the cycle lane

- Measurements of the paths taken by vehicles showed that cars entered the segregated cycle lane approximately 0.6 to 2.3 metres closer to the side road when the cycle lane kerb segregation had a 5 metre set-back, compared with longer set-backs.

Impacts on speed of vehicles at junction

- Drivers' average speed over the length of the run was approximately 1 mph less with a 5 and 10 metre set-back distance than with longer set-backs;
- No significant changes were observed in cyclist speed with different set-backs.

Impacts on perceived safety and decision making taken

- Car drivers felt that all created situations were consistently safe. Neither set-back distances nor the distance of the cyclist from the side road when they were 5 metres from it greatly affected their average score. There was a weak indication that perceived safety slightly increased, with increasing set-back distances;
- Cyclists felt fairly safe on average, but less so than car drivers. However, they felt less safe as their distance from the car decreased when it was at the junction. Any effect of set-back on cyclists' perceived safety was small, but there was a weak indication that cyclists' perceived safety decreased with increasing set-back distances;
- The highest percentages of decisions to turn in front of the cyclist occurred for long and short set-back distances.

Impacts on ability of cyclists to achieve their preferred position in the road

- Most cyclists stated that the set-back distance had no effect on their ability to judge the speed or position of the motorist and to get into the correct position to continue across the junction. Among the rest, who noted a difference, the proportion who found these aspects easier with longer set back was marginally greater than for the other set-backs;
- Cyclists found it harder to get into position to turn right at the end of the cycle lane when the set-back was short, although there was little difference in the extent to which participants rated the ease of turning right between set-backs of 20, 25 and 30m from the junction.

Impacts on ease of turning into the side road

- The segregated cycle lane set-back generally made no difference to car drivers seeing the cyclist, judging their speed or position, making a decision to turn, making the turn, the overall ease of using the junction or the perceived safety of making the turn. However, the short set-back distance (5 – 10m) was generally favoured less than others on most assessed aspects; participants commenting on the effect of a much tighter turning radius.

Understanding of road markings and priorities

- Only about half of the participants noticed the triangular markings. Participants were also asked about the meaning of the markings. Very few gave the correct interpretation 'give way to cyclists'. More commonly, both drivers and cyclists thought it as a type of warning but were not precise in their interpretation. However, when participants were asked whether they thought a car can stop on the cycle lane behind the markings, when exiting the junction. Almost all of the participants correctly answered 'no'.

Attitudes towards segregation and reintroduction of cyclists to traffic before junctions

- Cyclists were almost equally divided as to whether they preferred a long, or a short set-back of a kerb segregated cycle lane when approaching a side road. In contrast, most of the drivers favoured cyclists remaining separate for as long as possible;
- Almost half of the cyclists reported no concerns with any set-back distances, and almost half had concerns with the shortest distances to the junction (5m to 10m). Most drivers (over 80%) reported no concerns; of those with concerns, the main concern was with the shortest set-back distance;
- Cyclists also tended to find it easier to decide whether it was safe to continue, and to consider that it was safer to continue straight on, with a long set-back. However, the proportion preferring any one set-back distance was not significantly greater than the proportion preferring the other ones;
- Concerns expressed by cyclists included concerns that drivers may not be expecting to have to deal with cyclists on the road with them when the segregation ends;
- Both groups of participants express a preference for highlighting the point where segregation ends, such as the use of signs, bollards or markings;

- Over half (53%) of those finding the junction easier to use with one set-back, chose the long set-back;
- Almost all of the participants thought segregated cycle lanes are a good idea for cyclists and for car drivers.