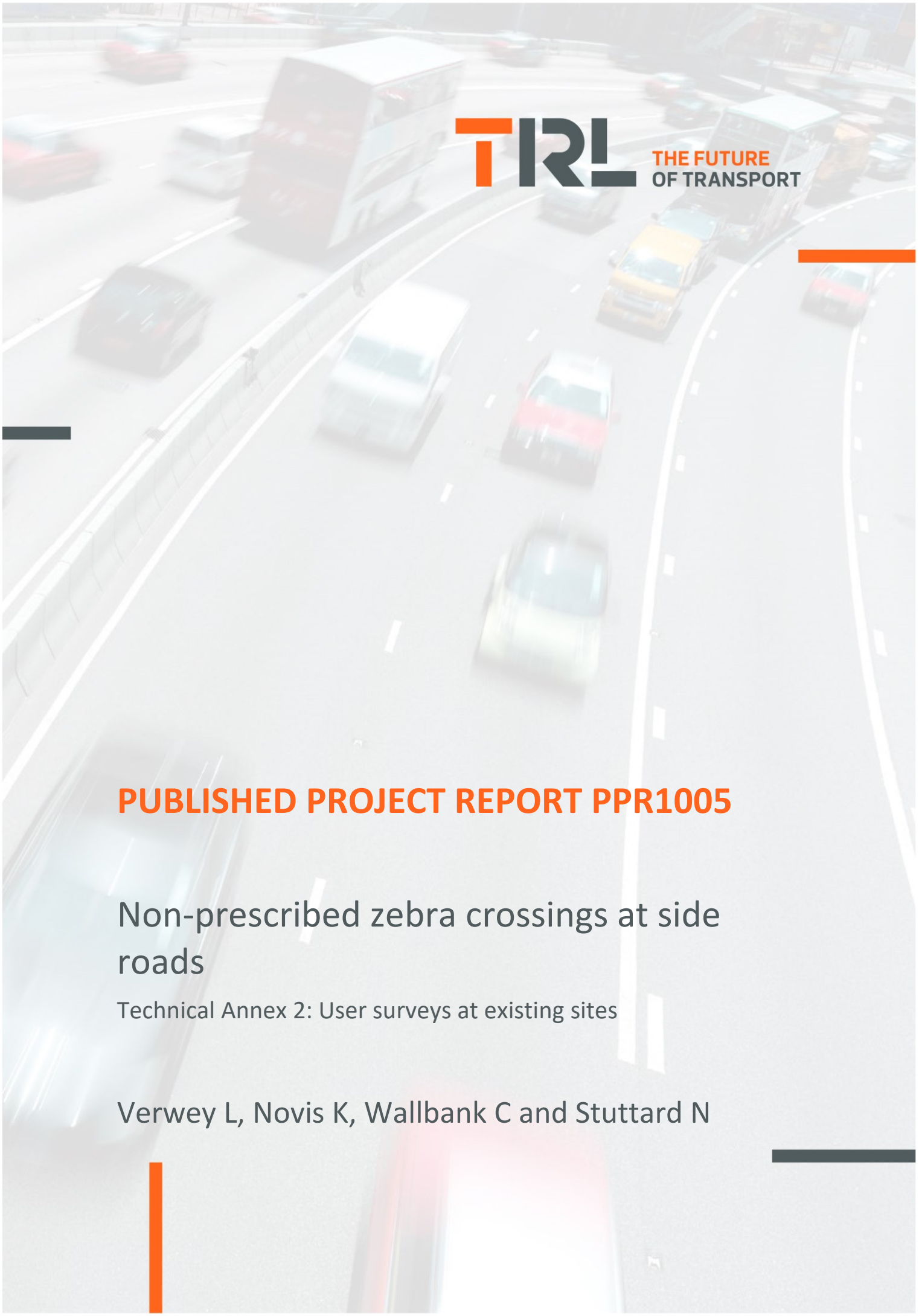

THE FUTURE OF TRANSPORT

PUBLISHED PROJECT REPORT PPR1005

Non-prescribed zebra crossings at side roads

Technical Annex 2: User surveys at existing sites

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Executive Summary

This document forms a Technical Annex to the report *Trials of non-prescribed Zebra crossings at side roads: Final Report*. It forms part of a programme of research involving desk-based research, behavioural studies and on-street trials commissioned by Transport for Greater Manchester (TfGM), to understand how non-prescribed zebra crossings can be positioned flush against the mouths of side roads. This technical annex reports on road user surveys undertaken at sites with existing (non-compliant) zebra crossings.

Transport for Greater Manchester (TfGM) commissioned TRL to undertake research into the use of non-prescribed zebra crossings positioned at the mouth of side roads at junctions with main roads. These crossings are intended to give pedestrians priority when they wish to cross the side road; this applies to vehicles on the side road approaching the junction, and to vehicles on the main road wishing to turn into the side road.

A variety of regulation-prescribed and non-prescribed zebra-style crossings exist in use across Great Britain. Through surveys of members of the public who use them, we obtained insight into public perceptions of these crossing types.

Public perceptions of non-prescribed zebra crossings

Through surveys of members of the public who use them, we obtained insight into public perceptions of non-prescribed zebra crossings. Specifically, surveys were administered to provide an understanding of whether the presence or absence of various design elements of the non-prescribed crossings had an impact on how they were perceived as a crossing space and the types of actions elicited by those design elements.

Method

A total of ten locations (seven in London and three in Manchester) were selected from the sites identified in an earlier task[1]. All ten sites had non-prescribed zebra crossings. Five of the sites were classified as full zebra crossings, and five were classified as non-full zebra crossings. Full zebra crossings had black and white stripes and zig-zag markings on one or both sides of the crossing. The crossings had Belisha beacons. Generally, they were placed flush with the mouth of a side road or aligned with the footpath. The non-full zebra crossings had black and white stripes and no Belisha beacons. With the exception of one site, there were no studs or zig-zag lines.

Two types of participants were recruited at each site - pedestrians and drivers. The questionnaires were administered using a 'pen and paper' approach. Researchers interviewed participants at the selected sites and captured their responses directly on a response tracking sheet. In total, 230 questionnaires were undertaken, 177 with pedestrians and 53 with drivers.

Results and conclusions

The results showed that there were no differences between the perceptions of safety of participants (both drivers and pedestrians) when the data from full and non-full non-

[1] Hammond, J. and Simms, G. (2019). Side road zebra crossings: analysis of collision records. Crowthorne: TRL

prescribed zebra crossing sites were compared. However, drivers typically reported feeling less safe when having to drive over a crossing than the pedestrians using them. Several drivers at both full and non-full zebras attributed this to the positioning of the crossings close to the main road that made an impact on their ability to turn into or out of the side road safely. Comparing the data from drivers from full and non-full zebra sites, the study did not find a difference in how visible they reported full and non-full zebras to be. For both types of zebras around half of participants reported that they were visible while the other half reported that they were not very visible.

The study found that pedestrians at full zebra sites tended to be more likely to report these crossings as convenient to use as compared to pedestrians at non-full zebra sites. In line with this, pedestrians at full zebras reported that they were less likely to cross the road without using the zebra as compared to pedestrians at sites with non-full zebras. This discrepancy may have been due to contextual differences between the non-full and full zebras, such as different set back distances, however, there were both full and non-full zebras which were positioned in line with the mouth of the junction and so this was not always a differentiating factor. The full zebras which were in line with the mouth of junctions were mainly in busier areas, whereas the non-full zebra crossings were located in quieter streets.

For full zebra crossings, drivers typically reported that pedestrians already on the crossing should have priority, while for non-full zebras drivers reported that pedestrians approaching should have priority. For both full and non-full zebras, the responses of pedestrians were mixed with both pedestrians approaching and pedestrians on the crossings reported as having priority.

Both pedestrians and drivers wanted to make changes to the design of the crossings for both the full and non-full zebras. However, it should be noted that within the scope of this study, the tendency of participants to want to make changes to a crossing was not measured against prescribed zebra or no-zebra contexts and it is therefore not clear if similar issues would have been raised. However, a clear majority of pedestrians stated that without the full zebra crossing being there they would have been unlikely or very unlikely to cross the road at the given point. This insight offers some evidence to support the case that many pedestrians do not have the confidence to cross side roads on their desire line without a crossing of some type being present.

1 Introduction

1.1 This document

This document forms a Technical Annex to the report *Trials of non-prescribed Zebra crossings at side roads: Final Report*, which presents the findings of a programme of user research and trials into the proposed use of a non-prescribed form of zebra crossing at side-roads. Technical Annex 2 sets out the methodology and findings from the second stage in this programme, surveys of road users at existing sites where zebra crossing markings have been installed at the mouth of side-road junctions. The overall conclusions from the research programme are set out in the Final Report.

1.2 Background

A variety of regulation-prescribed and non-prescribed zebra-style crossings exist in use across Great Britain. Through surveys of members of the public who use non-prescribed zebras, we can obtain insight into the public's perceptions of these crossing types.

Specifically, surveys were administered to provide an understanding of whether the presence or absence of various design elements of non-prescribed crossings had an impact on how they were perceived as a crossing space and the types of actions elicited by those design elements.

The markings, equipment and signs used to denote a zebra crossing in the UK are prescribed in statutory government regulations. Key differences between a prescribed and non-prescribed zebra crossing are shown in Table 1.

Table 1: Key differences in the design of a prescribed vs. non-prescribed zebra crossing

Design feature	Prescribed zebra crossing	Non-prescribed zebra crossing
Crossing markings	Black and white stripes	Black and white stripes
Peripheral markings	• Line of studs • Zig-zag markings	May include zig-zag markings on one or both sides of the crossing
Set-back distance from junction	The requirement for at least two zig-zag markings creates a working minimum set-back distance of around 5 m	No minimum distance due to no requirement for zig-zag markings; could be flush with the end of the side road
Additional equipment	Yellow globe on a black and white striped pole (Belisha beacon)	–

A prescribed zebra crossing is indicated by a series of alternate black and white stripes on the carriageway; a yellow globe is positioned at each end of the crossing (commonly referred to as a Belisha beacon); and the crossing area is marked with a line of studs and zig-zag markings. The requirement for at least two zig-zag markings means the minimum a zebra can be set-back from the mouth of a side road is 4.8m. Some designers reduce this distance by bending the zig-zag markings around the radius of the kerb; such zebras are still regarded as prescribed.

Conversely, non-prescribed crossings exclude all or some of the following design elements: studs, zig-zag markings and Belisha beacons[2]. A simplification in the crossing could lower implementation and maintenance costs for TfGM and local authorities. In addition, removing the requirement for zig-zag markings (and therefore avoiding the need for a set-back of about 5m) has an advantage of keeping pedestrians on their desired walking line, giving them a more direct route across the mouth of the junction. Together, these benefits are fundamental to the approach proposed by TfGM in promoting their 'Bee Network' across the city of Manchester.

1.3 The current study

This study is one of several tasks in this project investigating side-road pedestrian crossings for TfGM. TfGM is seeking to understand how pedestrian crossings positioned flush against the mouths of side road junctions or aligned with the pedestrian walk lines in urban areas can be used to provide direct but safe crossing options for pedestrians.

An earlier task[3] in this project provided insight into the collision record at different zebra crossings that were located on a side road (near the junction with a main road) and compared them with other similar locations where no zebra crossings were present. That analysis found no indication that the collision record was different between the two types of sites. This earlier task provided a list of sites across the UK where a non-prescribed zebra crossing was present.

In this study public perception at two categories of non-prescribed zebra crossings were investigated:

- *Full zebra crossings:* This category of non-prescribed zebra crossing had black and white stripes and zig-zag markings on one or both sides of the crossing. The crossings had Belisha beacons. Generally, they were placed flush with the mouth of a side road or aligned with the footpath.
- *Non-full zebra crossings*: This category of non-prescribed zebra crossing had black and white stripes and no Belisha beacons. Some of the trial sites were placed flush with the mouth of a side road or aligned with the footpath. With the exception of one site, there were no studs or zig-zag lines.

1.3.1 Research question

The aim of this study was to gain a more in-depth understanding of how people perceive non-prescribed zebra crossings. The research question for this trial was:

- What is the public perception of zebras at non-prescribed crossings with different design characteristics?

[2] One exception to this in the UK is a type of prescribed zebra crossing used across a cycle track, which does not require Belisha beacons or zig-zag markings.

[3] Hammond, J. and Simms, G. (2019). Side road zebra crossings: Analysis of collision records. TRL CPR2715

2 Method

2.1 Participant sample

Two groups of participants, pedestrians and drivers, were recruited. The project team sought to gather responses from a range of demographic groups at each of the two crossing types. In total, 230 questionnaires were completed, 177 with pedestrians and 53 with drivers.

The gender and age characteristics of the two samples are presented in Figure 1.

Figure 1: Sample characteristics (age and gender)

The sample included individuals across most age groups and genders, although there were no younger drivers (aged 18-24 years) in the sample[4].

Most participants identified their ethnic group as white (41 of the 53 of drivers; 121 of the 177 pedestrians). Other ethnic groups were also represented in the sample: two of mixed ethnicity, 27 Asian/Asian British, 11 Black/African/Caribbean/Black British and 14 other ethnic groups. Fourteen people preferred not to state their ethnicity.

Eleven of the pedestrians reported having factors or conditions which affect their mobility. These included visual impairments, back problems, arthritis and hip problems.

2.2 Survey locations

A total of ten locations across London and Greater Manchester were selected from the sites identified in an earlier task[5]. Five of the sites had full zebra crossings and five had non-full zebra crossings. Full details of the survey locations, characteristics and photos can be found in Appendix A.

The survey captured 121 participants at full zebras (29 drivers and 92 pedestrians) and 109 at non-full zebras (24 drivers and 85 pedestrians).

[4] This could be due to the locations of the surveys and/or the times of day that the surveys took place (commonly between 09:00 to 12:00 and 13:00 to 15:00). Also, the age range of 18 to 24 year olds are smaller than any of the other age range options on the surveys.

[5] Hammond, J. and Simms, G. (2019). Side road zebra crossings: Analysis of collision records. TRL CPR2715

2.3 Procedure

The questionnaire was administered using a 'pen and paper' approach (see Appendix B). Researchers interviewed participants at each of the ten sites and captured their responses directly on a response tracking sheet.

Researchers roamed sites in pairs, with the aim of completing one or two sites per day. Researchers approached members of the public who were walking in the area, one-at-a-time. Researchers ensured that they stood in a safe position on the footway. Researchers then:

- Informed participants about the trial;
- Sought (and noted) their consent to take part;
- Read the questions aloud to participants, and;
- Wrote down their responses.

The procedure was similar for both pedestrians and drivers. To capture data from drivers, researchers asked the participants if they drove in the area, and if they did, they were asked to complete the questionnaire from a driver's viewpoint. Otherwise, participants were asked to complete the questionnaire from a pedestrian's viewpoint.

Researchers gave contact cards to any participants who requested further information about the research.

2.4 Questionnaire

The duration of the questionnaire was confirmed during piloting as being no longer than 10 minutes to complete. At the sites, the actual duration varied between about 5 and 10 minutes per questionnaire.

To track the demographic range of participants the questionnaire contained a section that gathered information about their age range, gender, ethnic background and mobility. Drivers were asked about their perceptions of safety and the visibility of the crossing at the site. The survey administered to pedestrians focused on their perceptions of safety and convenience in using the crossing. All participants were asked how frequently they used the crossing, if they wanted to make changes to it and their perception of how the crossing should be used.

2.5 Analysis

Due to the small sample sizes at individual crossing sites, it was not possible to examine differences between individual pairs of crossings, or between groups of participants (e.g., by age or gender). However, responses gathered at the two types of crossing (full and non-full) were pooled to enable comparisons and statistical testing to identify differences in perceptions between the two crossing types. The statistical tests used depended on the questions of interest: Mann-Whitney U tests were used for the ordinal (Likert scale) responses, and chi-squared tests for the nominal responses.

3 Results

3.1 Drivers

3.1.1 Sample characteristics

Most of the drivers in the sample were experienced drivers who have held a licence for 10+ years (Figure 2). The majority of the sample also drove more than once a week (Figure 3).

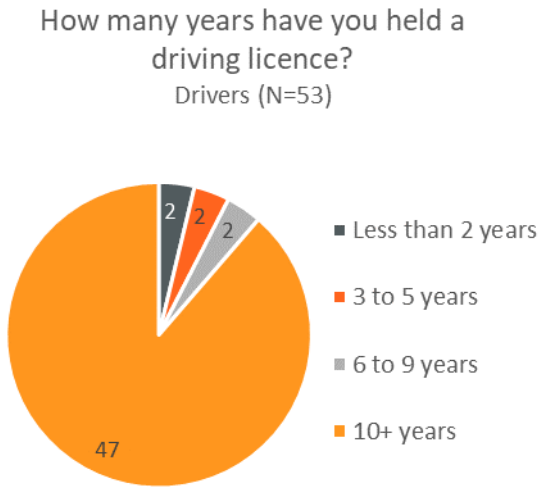

Figure 2: Driver experience

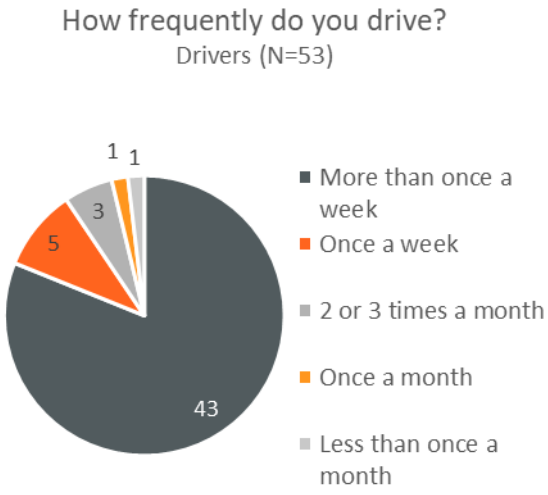

Figure 3: Frequency of driving

Figure 4 shows that the majority of drivers were familiar with the crossings of interest and drove over them at least once a week: 23 out of 29 participants in the full zebra sample and 12 out of 24 in the non-full zebra sample. Chi squared tests show that this difference was not significant ($p = 0.05$).

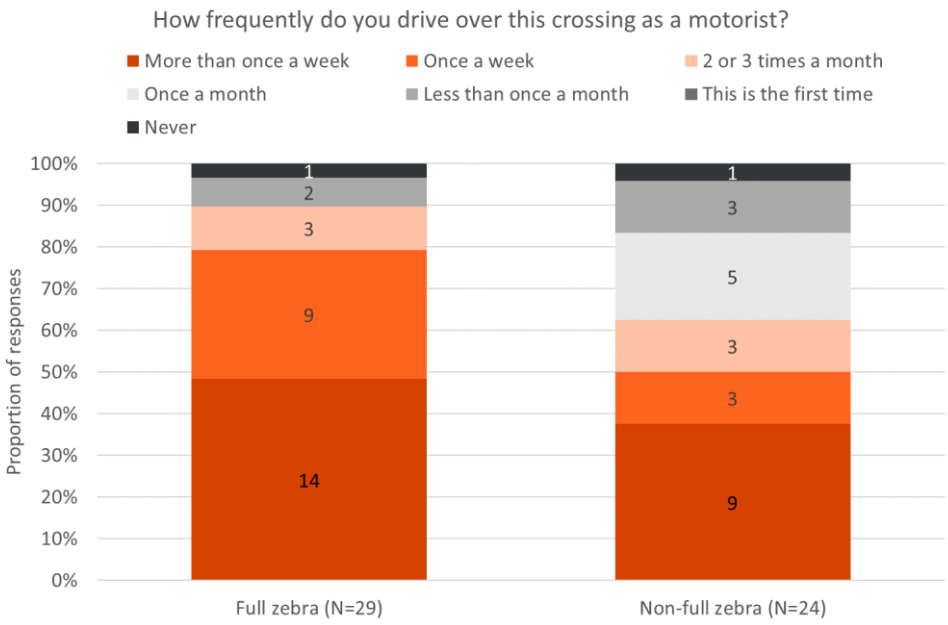

Figure 4: Frequency of driving this crossing (N=53)

3.1.2 Ratings of safety

Figure 5 shows the reported feelings of safety for each crossing type. Over half of participants (17 out of 28) reported feeling 'very unsafe' or 'fairly unsafe' using the full zebra crossing. This figure was lower (9 out of 24) for the non-full zebra crossing, although a Mann-Whitney U test showed this difference was not significant (p = 0.176).

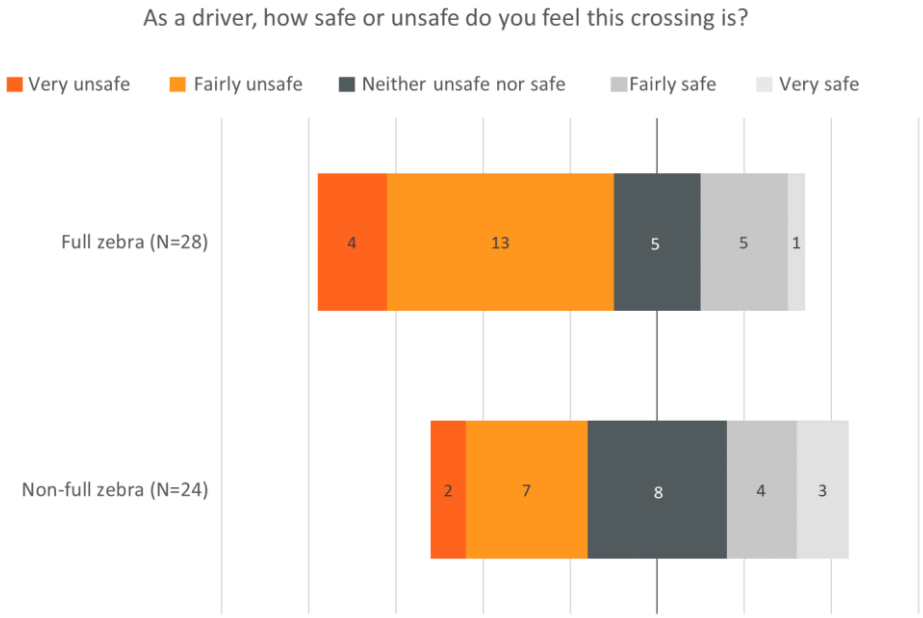

Figure 5: Reported feelings of safety (N=52)

The results from the qualitative analysis provided some insights into the above findings. These included experiences around the impact of the crossing on driver visibility and the behaviour of pedestrians on or approaching a crossing.

Full zebras

Commenting on their perceptions of safety, several drivers reported that the positioning of the crossing made it difficult to see oncoming vehicles in the main road:

- *"As a driver: not an easy turn, not much visibility, need to come really close to the end of the road, where the crossing is, to see to exit the junction."*
- *"Low visibility since it is on a T junction and it is quite a wide crossing."*

Drivers also reported that the busyness of the road impacted their ability to focus on pedestrians while trying to turn into a main road:

- *"It is very busy, turning right onto the main road is the main focus when (I am) driving."*
- *"Busy road, turning right out of the sideroad is difficult. You have to be fast. Turning right into the sideroad, it is difficult to do it since you are focussed on the oncoming traffic, so not looking out for pedestrians."*

Another aspect that impacted drivers' perceptions of safety was that of the behaviour of pedestrians approaching or on the zebra:

- *"Pedestrians do not always look before they cross, but they are visible during the day. At night times pedestrians are not visible."*
- *"Pedestrians walk across it without looking."*

Some drivers commented that they felt that familiarity with a crossing made an impact on safety when crossing:

- *"Most drivers are local and drive safely."*

Non-full zebras

Drivers reported that they felt unsafe due to the proximity of the crossing to the main road:

- *"The position of the crossing is too close to the main road."*
- *"Drivers drive fast when turning in from the main road. It is close to the road so you are watching the traffic so that you can turn in rather than the pedestrian crossing."*

Several drivers who perceived the crossing as safe or fairly safe reported that they had enough space to stop before the crossing:

- *"Onus are on drivers to stop. It provides easy access and space to stop."*
- *"Everyone stops and there is enough space to stop before the crossing."*

3.1.3 Visibility of the crossing

The rated visibility of the two crossing types is shown in Figure 6. The responses were mixed for both crossings, with approximately half of participants reporting that the crossings were difficult to identify, and half reporting they were easy to identify. A Mann-Whitney U test shows the distribution of responses was not significantly different ($p = 0.924$) between the two crossing types.

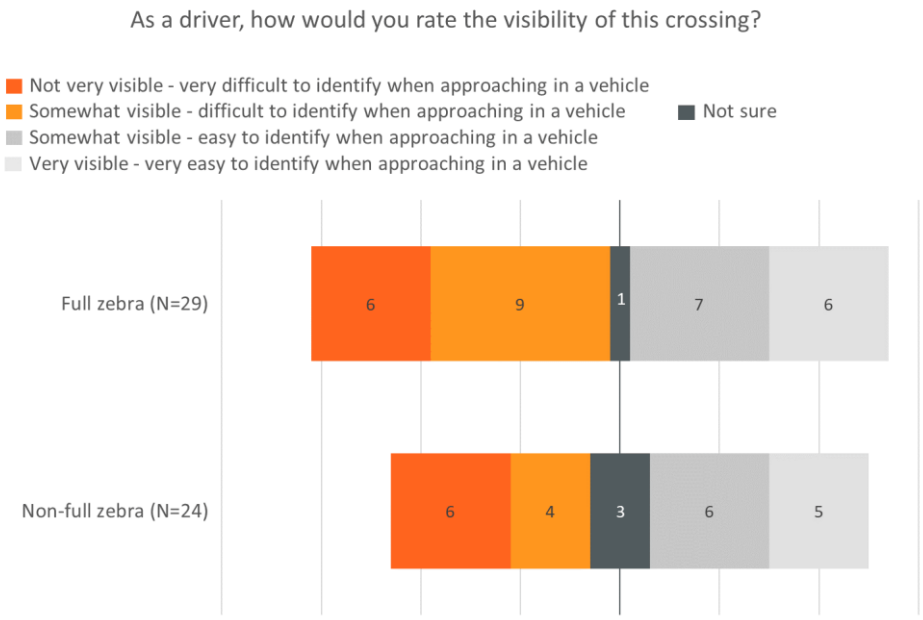

Figure 6: Rated visibility of the crossing (N=53)

3.1.4 Changes to the crossing design

Participants were also asked "would you like to see any changes in the design of this crossing in order to improve safety?" 23 of the 29 respondents for the full zebra crossings responded 'yes' (five 'no' and one 'not sure'). Similarly, 16 of the 24 respondents at the non-full zebra crossings also responded 'yes' (four 'no' and four 'not sure'). The sample sizes in the groups were too small for robust statistical tests on this measure.

Full zebras

For the full zebra crossing, drivers' qualitative responses suggested that the crossing could be improved by adding traffic lights or other design features to aid the visibility of the crossing.

- *"Drivers are not aware that it is there, more visibility from [place name] would be good."*
- *"Make the whole crossing more visible; add a traffic light."*
- *"Add a light."*

Drivers also commented that the location of the full zebra crossing could be changed; many of these suggestions centred around moving the crossing further down the street:

- *"Move it back about 2 car lengths so people can stop before turning."*
- *"Move the pedestrian crossing further away from the road. Large vehicles block the road if they turn in and stop for pedestrians. Need peak period lights or a big roundabout."*

Non-full zebras

For the non-full zebra crossing, driver responses suggested that the visibility of the crossing could be enhanced:

- *"Add Belisha beacons."*

- *"Put in Belisha beacons. The road markings are faded, repaint those."*

Other comments suggested that moving the crossing could enhance its function:

- *"Move the crossing to the drop kerb."*
- *"Move the crossing further from the road."*

3.1.5 Priority on the crossing

Finally, participants were asked to comment on their understanding of how the crossing should be used, in particular who has priority – see Figure 7. For the full zebra crossing, almost two thirds of participants (19 out of 29) reported that pedestrians on the crossing have priority; whilst for the non-full zebra crossing this figure was much smaller (8 out of 24) and more people stated that pedestrians approaching the crossing have priority (11 out of 24). The sample sizes in the groups were too small for robust statistical tests on this measure.

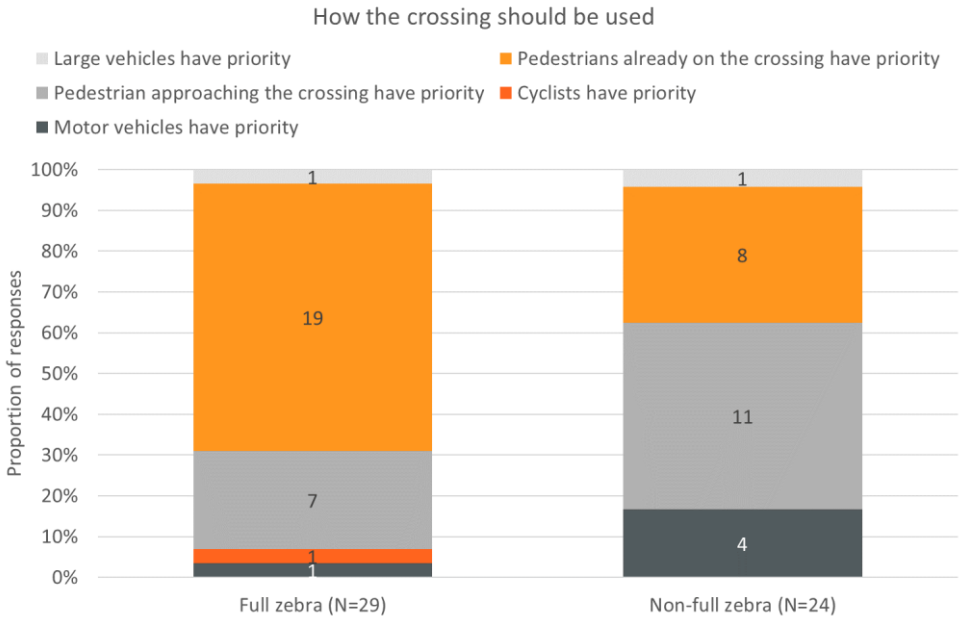

Figure 7: How the crossing should be used (N=53)

3.2 Pedestrians

3.2.1 Sample characteristics

The majority of pedestrians surveyed were familiar with the layout/location of the crossing of interest. Figure 8 demonstrates that over half of respondents for both crossings use the crossings at least once a week: 75 out of 92 participants in the full zebra sample and 54 out of 85 in the non-full zebra sample. However, chi-squared tests showed that the difference between the two groups was significant ($p = 0.01$) with proportionately more reporting use of the full zebra crossing at least once a week.

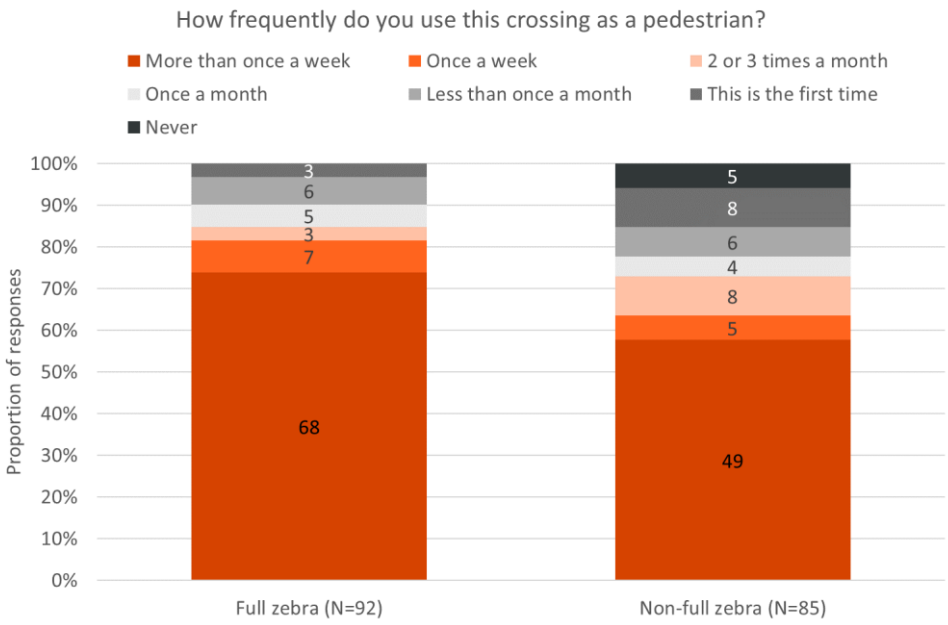

Figure 8: Frequency of using this crossing as a pedestrian (N=177)

3.2.2 Feelings of safety

Pedestrians were asked to rate how safe they feel when using the crossing (Figure 9). Responses were mixed: just under half of participants in both samples reported feeling 'fairly safe' or 'very safe', and over one third reported feeling 'fairly unsafe' or 'very unsafe'. A Mann-Whitney U test showed there was no significant difference (p = 0.94) between the two crossing types.

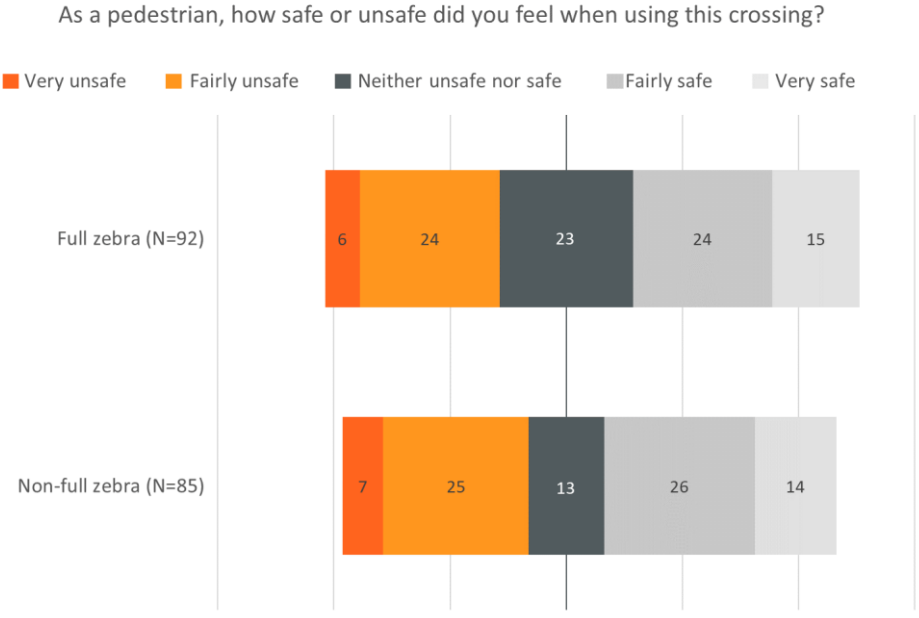

Figure 9: Reported feelings of safety (N=177)

Full zebras

The comments made by participants gave some insight into their perceptions of safety while using full zebras as a pedestrian. They stated that vehicle drivers generally did not stop when confronted with the crossing or drove too fast across it:

- *"I have had a couple of near misses on this crossing, one from a car turning on to [street name] who was driving too fast."*
- *"Cars come down [street name] far too fast, don't often stop for the crossing."*
- *"Vehicles hardly give way for pedestrians."*

Pedestrians also reported that the position of the full zebra crossing obstructed the view of drivers:

- *"Drivers turning left out of the sideroad, stop on the zebra crossing and cannot see pedestrians, due to right turning vehicles. Those that turn right into the main road, just go for it."*
- *"Cars do not stop or cannot see pedestrians due to cars turning right into the main road. They stop on the crossing and you have to walk around them."*
- *"Cars are too busy looking out to check for pedestrians. The junction is very close to a bus stop on the main road. Reduces visibility for vehicles turning right into the side road."*

Several pedestrians stated that the presence of other pedestrians on the crossing helped to bolster how they felt using the crossing. Comments included:

- *"A lot of people crossing."*
- *"I read street behaviour. Lots of people crossing so it is pretty safe."*

Non-full zebras

Several participants reported that drivers appeared not to stop for the non-full zebra crossing:

- *"Cars ignore all crossings in the area."*
- *"Cars do not necessarily stop; they sometimes keep on going."*
- *"People don't pay attention when crossing it and there are many bikes, cars and motorcycles crossing it daily; vehicles reverse."*

However, some comments suggested that a lack of traffic on the roads made the crossing appear safer to pedestrians:

- *"Not many cars passing in this road; cars go pretty slow; can be packed with parking cars."*
- *"Small road, not a lot of traffic."*

3.2.3 Convenience of the crossing

Pedestrians were asked about the convenience of the crossings (Figure 10). Over three quarters of participants (78 out of 92) reported that the full zebra crossings were 'convenient' or 'very convenient', but this figure was lower (just over half, 49 out of 85) for the non-full

crossings. A Mann-Whitney U test showed this difference between samples was significant ($p < 0.01$).

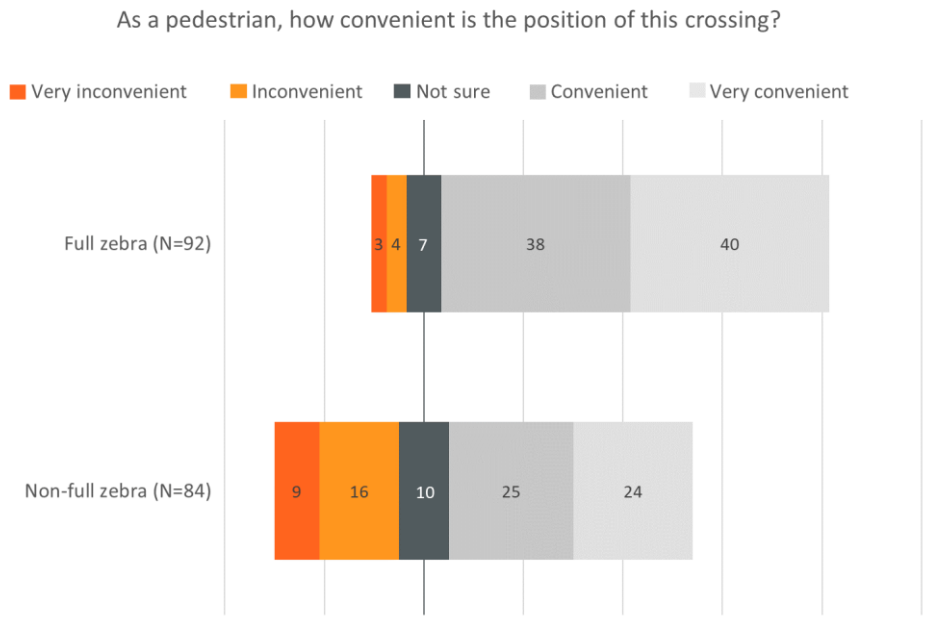

Figure 10: Reported convenience of the crossing (N=176)

Full zebras

Pedestrians commented that full zebra crossings were convenient in relation to their positioning on the road, providing a straight walking line for pedestrians across the road:

- *"Right on the footpath so well situated."*
- *"I don't have to move out of the walking line to continue up the road."*
- *"Use it straight off the tube, going to lectures."*

Non-full zebras

Several pedestrians related their convenience in using non-full zebras to the layout of the road, and to how other road users interact with the crossing:

- *"Traffic is too fast; I walk down further to cross."*
- *"Cars ignore it."*
- *"It is too close to the main road."*
- *"Because of the bend."*

3.2.4 Use of the crossing

Responses to the question "when walking in the area, how likely or unlikely are you to cross the road without using this crossing?" are presented in Figure 11. Those using the full zebra were more likely to response 'very unlikely' or 'unlikely' (56 out of 91) compared with the non-full zebra sample (29 out of 83). A Mann-Whitney U test showed this difference between samples was significant ($p < 0.01$).

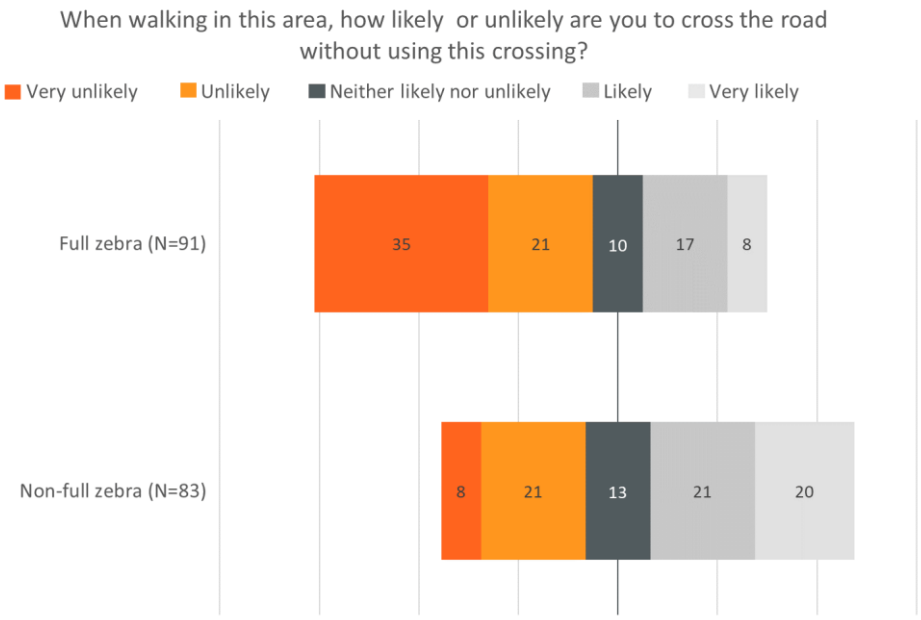

Figure 11: Reported likelihood of crossing the road without using the crossing (N=174)

Full zebras

The finding that pedestrians were less likely to cross the road without using the full zebra crossing compared to the non-full zebra crossing is supported comments from pedestrians that using the crossing made them feel safer:

- *"I feel safer with it."*
- *"It is dangerous to not use it."*
- *"It's a safe place."*

Non-full zebras

Conversely, the finding that pedestrians were more likely to cross the road without using the non-full zebra crossing is supported by comments stating that they felt vehicles ignored the crossing and that they were more likely to cross where it was most convenient for them:

- *"Depends on my destination."*
- *"Cars ignore it."*

3.2.5 Changes to the crossing design

Participants were also asked "would you like to see any changes in the design of this crossing in order to improve safety?" 61 of the 92 respondents for the full zebra crossings responded 'yes' (26 'no' and five 'not sure'). Similarly, 54 of the 85 respondents at the non-full zebra crossings also responded 'yes' (25 'no' and six 'not sure). A chi-squared test indicated no significant difference ($p = 0.878$) in the distribution of these responses.

Full zebras

For the full zebra crossing, the evidence obtained from the qualitative comments suggested that the position and orientation of the crossing could be altered. Specific comments included:

- *"Move the position of the crossing up [street name] and make it clearer on the main road that a crossing is there."*
- *"Makes sense to have crossing go straight but it may be safer if it is also perpendicular to the road."*

Non-full zebras

For the non-full zebra crossing, pedestrians stated that the crossing could be enhanced by making its lighting better or generally making it more visible:

- *"Improve the visibility of the crossing somehow."*
- *"Repaint it to make it more visible. The position is good away from the main road."*
- *"The colour is fading out, make it more visible."*

Pedestrians also commented that the location of the non-full zebra crossing could be changed:

- *"Move the crossing to the drop kerb - drivers will find it easier to see people approaching or on the crossing."*
- *"Move it further down so that vehicles can stop and slow down."*

3.2.6 Priority on the crossing

As with drivers, pedestrians were also asked to comment on their understanding of how the crossing should be used, in particular who has priority – see Figure 12. For both crossing types around half of participants reported that a pedestrian on the crossing had priority (46 out of 92 for full zebra and 40 out of 85 for non-full zebra). Pedestrians approaching the crossing was also a popular choice (44 out of 92 for full zebra and 32 out of 85 for non-full zebra). However, overall the responses were more mixed for the non-full zebra with 13 respondents saying vehicles (motor vehicles or large vehicles) had priority, compared to just two for the full zebra. A chi-squared test showed this difference was significant ($p < 0.01$).

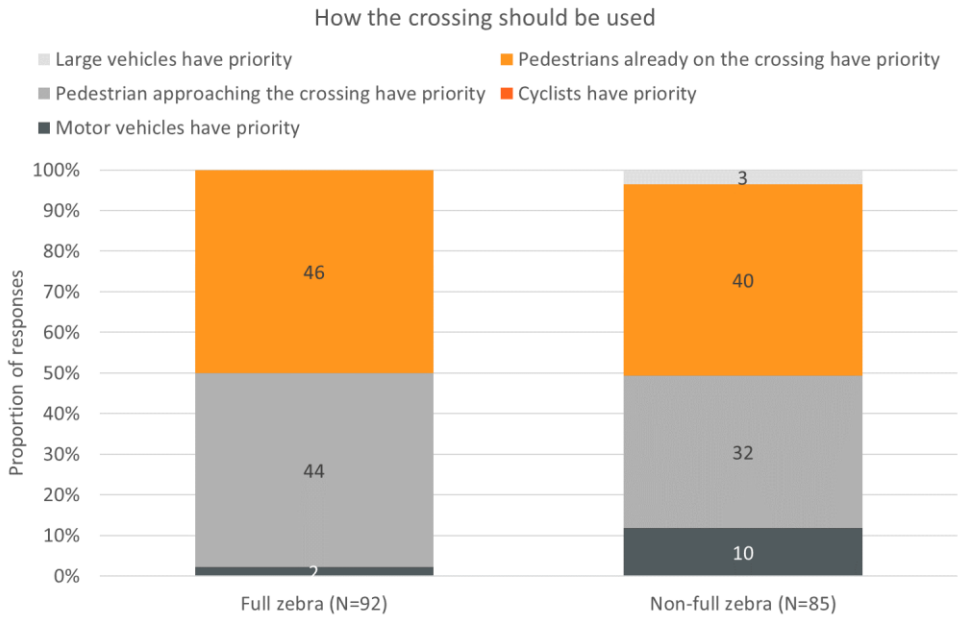

Figure 12: How the crossing should be used (N=177)

4 Summary and conclusions

4.1 Summary of findings

This study aimed to investigate public perceptions of two types of non-prescribed zebra crossings (full and non-full) to understand whether the presence or absence of various design elements of non-prescribed crossings had an impact on how they were perceived as a crossing space and the types of actions elicited by those design elements. This section summarises the key differences identified from the survey responses.

Feelings of safety

Drivers and pedestrians were both asked to rate how safe they felt using the crossings. Responses for both samples were mixed – with some reporting they felt safe and others unsafe – however there was no significant difference between crossing types.

The reasons given for feeling unsafe were similar across the crossing types:

- Both drivers and pedestrians commented that the position of the crossing obstructed the view of drivers.
- Pedestrians commented that car drivers generally do not stop when confronted with the crossing or drive too fast across it.
- Drivers suggested that they had difficulty turning into the road and exiting due to the proximity of the crossing to the main road.

In contrast, some pedestrians commented on feeling safe because of the presence of other pedestrians on the crossing (full zebra) or because of a lack of traffic on the road (non-full zebra).

There was no difference in reported feelings of safety between the two zebra types.

Visibility of the crossing (drivers only)

When asked about visibility of the crossings, responses were mixed with a similar number of drivers reporting it was difficult to identify the crossing as those reporting it was easy to see the crossing. There was no significant difference between the two crossing types.

No difference in subjective ratings of visibility between the crossing types for drivers.

Convenience and likelihood of not using the crossing (pedestrians only)

The full zebra crossings yielded higher ratings of convenience than the non-full crossings; one possible reason for this is because the full zebras were more commonly situated in line with the pedestrian path. Consistent with these findings, more pedestrians reported that they were unlikely to cross the road without using the crossing at sites with full zebras compared with sites at non-full zebras.

Full zebra crossings were reported as being more convenient to use, and pedestrians reported that they were less likely to cross the road without using these crossings, compared with non-full zebras.

Changes to the crossing

When asked whether they would like to see any changes to the crossings, the majority (two thirds) of respondents said 'yes'; responses were fairly consistent across crossing types and pedestrians/drivers. The suggested changes included:

- Moving the crossings further down the street (suggested for both full and non-full crossings, by both drivers and pedestrians).
- Enhancing the visibility of the non-full zebra crossings by adding lighting/beacons (suggested by both pedestrians and drivers).
- More lighting in the form of a traffic light was also suggested for the full zebra crossings (suggested by drivers).

Similar changes to both crossing types were desired by both drivers and pedestrians.

Use of the crossing

When questioned about use of the crossing and in particular who has priority, responses differed between crossing types (although differences for the drivers could not be tested statistically due to the small sample size). For the full zebra crossing drivers typically thought pedestrians already on the crossing had priority; pedestrians thought either pedestrians on the crossing had priority or pedestrians approaching the crossing had priority.

In contrast, for the non-full crossing, drivers and pedestrians more commonly considered that pedestrians approaching had priority. More participants considered that vehicles had priority for this crossing type than for the full zebra crossing.

For both crossing types, understanding of who has priority varied across both the driver and pedestrian samples.

4.2 Conclusions

Several conclusions can be drawn from the results of this research:

- The differences in design features between full and non-full zebras, such as the Belisha beacons, stripes and studs, did not significantly impact on how safe or unsafe participants felt using the zebras, or perceptions of the level of visibility of the crossings for drivers.
- The positioning of the zebra crossings was an issue for drivers who reported feeling unsafe while driving over them. However, the difference in design features between full and non-full zebras did not significantly impact on this perception and it should be noted that a control site with no crossing was not included in this study. Potentially,

feelings of being unsafe may lead to slower approach speeds and more consideration given by drivers; this will be examined in a future on-street trial.

- Full zebra crossings were reported as being more convenient to use than non-full zebras. Qualitative comments suggested that the perceived convenience of using the zebras was impacted by both perceptions of safety and by being able to continue along a walking route across the mouth of the side road in a straight line. Since there was no significant difference in perceived safety between full and non-full zebras, it could be inferred that the main contributing aspect of convenience for pedestrians was being able to continue their journey in a straight line - some of the non-full zebra trial sites were not in line.
- The majority of drivers and pedestrians wanted to see changes made to both zebra crossing types. These included enhancing the visibility of both full and non-full zebras through improved lighting and moving the zebras further down the street, therefore bringing them more in line with the design of prescribed zebras.
- The majority of drivers and pedestrians reported that pedestrians, either on or approaching the zebras, should have priority. However, of those that did not, more participants considered vehicles to have priority at non-full zebras compared with full zebras. This may be a result of the different contexts tested. For example, the full zebras were mainly in busy central locations whereas the non-full zebras were in quieter locations.

In conclusion, this study found that the design features which differed between the two crossing types (namely, Belisha beacons, stripes and studs) did not have a significant impact on how pedestrians and drivers perceived crossing them in terms of their safety and visibility.

Appendix A Survey sites for full and non-full non-prescribed zebra crossings

A.1 Photos of the sites

Full zebras: four sites in London (1M, 1K, 1I, 1G) and one in Manchester (2A)

Non-full zebras: two sites in Manchester (E18, E23) and three sites in London (E39, E17, E86)

A.2 Design characteristics

Type	Location ID	Black and white zebra stripes	Belisha beacons	Island	Studs	White stripes demarcating zebra stripes	Zig-zag lines	In line
Full	1G	✓	✓	✓	✓	✓	✓	✓
	1F	✓	✓	✓	✓	✓	✓	✓
	1M	✓	✓	✓	✓	✓	✓	✓
	1K	✓	✓			✓	✓	✓

Type	Location ID	Black and white zebra stripes	Belisha beacons	Island	Studs	White stripes demarcating zebra stripes	Zig-zag lines	In line
	2A	✓	✓	✓	✓	✓	✓	
Non-Full	E17	✓						✓
	E39	✓						
	E86[6]	✓			✓	✓	✓	✓
	E23	✓						
	E18	✓						

A.3 Locations of crossings

ID	Location	Location details	Latitude	Longitude	Type
1G	London	Outside 55 Broadway, Westminster	51.4996817	-0.1330187	Full
1I	London	Hatton Garden / Clerkenwell Road	51.521952	-0.109272	Full
1M	London	Highgate High Street / South Grove	51.5707154	-0.1479029	Full
1K	London	Roman Road / Morpeth Street	51.5288169	-0.0482342	Full
2A	Manchester	Irlam Road / Flixton Road, Flixton, Trafford	53.4474893	-2.3814908	Full
E17	London	Kings College, Collingwood Rd, Southwark	51.5035725	-0.087872	Non-full
E39	London	Thomas More St, St Katharine's & Wapping	51.5074547	-0.0683034	Non-full
E86	London	Brady St / Durward St, Whitechapel	51.5205332	-0.0586794	Non-full
E18	Manchester	Reddish Lane / entrance to ASDA	53.4550831	-2.158609	Non-full
E23	Stockport	A560 / entrance to Peel Centre	53.414773	-2.1509801	Non-full

[6] Sensitivity analysis (removing site E86 which has slightly different characteristics to the other non-full sites) shows the same results as those presented in section 3.

Appendix B Questionnaire

Side Road Zebra Crossings

RQ7: What is the public perception of zebras at the sites identified in RQ5?

I am 18 years or older and give my full consent to participate

[ALL PARTICIPANTS]

Background information

1. Please indicate your gender

a. Male

b. Female

c. Prefer not to say

2. Please indicate your age group

a. 18-24

b. 25-49

c. 50+

3. Please indicate your ethnic background

a. White

b. Mixed/Multiple Ethnic Groups

c. Asian/Asian British

d. Black/African/Caribbean/Black British

e. Other ethnic group

f. Prefer not to say

4. Mobility

Please provide details of any relevant factors or conditions which you feel affect your mobility (e.g. are you partially sighted, or a wheelchair user?)

5. Do you ever drive over this crossing?

a. Yes [Please complete the driver-focused questions]

b. No [Please complete the pedestrian-focused questions]

[DRIVERS ONLY]

Questionnaire

6. How many years have you held a driving licence?

a. <2

b. 3-5

c. 6-9

d. 10+

7. How frequently do you drive? (Please tick whichever option most closely matches how often you drive)

a. More than once a week

b. Once a week

c. 2 or 3 times a month

d. Once a month

e. Less than once a month

8. How frequently do you drive over this crossing as a motorist?

a. More than once a week

b. Once a week

c. 2 or 3 times a month

d. Once a month

e. Less than once a month

f. This is the first time

g. Never

9. On a scale of 1 *(Very Unsafe)* – 5 *(Very Safe),* how safe or unsafe do you think this crossing is?

1. Very unsafe
2. Quite unsafe
3. Neither safe nor unsafe
4. Quite safe
5. Very safe

Please give a reason for your answer:

10. How would you rate the visibility of this crossing?

a. Not very visible – very difficult to identify when approaching in a vehicle

b. Somewhat visible – difficult to identify when approaching in a vehicle

c. Not sure

d. Somewhat visible – easy to identify when approaching in a vehicle

e. Very visible – very easy to identify when approaching in a vehicle

[PEDESTRIANS ONLY]

Questionnaire

11. How frequently do you use this crossing as a pedestrian?

a. More than once a week

b. Once a week

c. 2 or 3 times a month

d. Once a month

e. Less than once a month

f. This is the first time

g. Never

12. On a scale of 1 *(Very Unsafe)* – 5 *(Very Safe),* how safe or unsafe did you feel when using this crossing?

1. Very unsafe
2. Quite unsafe
3. Neither safe nor unsafe
4. Quite safe
5. Very safe

Please give a reason for your answer:

13. How convenient or inconvenient is the position of this crossing?

a. Very inconvenient – I always have to take a diversion on my walking route to cross here

b. Inconvenient – I often have to take a diversion on my walking route to cross here

c. Not sure – neither convenient nor inconvenient

d. Convenient – I sometimes have to take a diversion on my walking route to cross here

e. Very convenient – I never have to take a diversion on my walking route to cross here

Please give any further details to explain your answer:

14. When walking in this area, how likely or unlikely are you to cross the road <u>without</u> using this crossing?

a. Very unlikely

b. Unlikely

c. Neither likely nor unlikely

d. Likely

e. Very likely

Please give any further details to explain your answer:

[ALL PARTICIPANTS]

15. Would you like to see any changes to the design of this crossing in order to improve safety?

a. Yes

b. No

c. Not sure

If yes, please describe the changes you would like to see in order to improve safety:

16. **Please tick <u>one</u> statement below to indicate your understanding of how <u>this crossing</u> should be used:**

a. Motor vehicles have priority. If a **vehicle** is approaching the crossing, pedestrians must wait until the road is clear in both directions before attempting to cross. ☐

b. Cyclists on the road have priority. If a **cyclist** is approaching the crossing, pedestrians must wait until the cyclist has passed and the road is clear in both directions before attempting to cross ☐

c. Pedestrians approaching the crossing have priority. If a **pedestrian** is approaching the crossing, vehicles and cyclists must wait until the pedestrian has finished crossing before moving. ☐

d. Pedestrians already on the crossing have priority. If a **pedestrian** has already moved on to the crossing, vehicles and cyclists must wait until the pedestrian has finished crossing before moving. ☐

e. Large vehicles (e.g. **buses and lorries)** have priority. If a large vehicle is approaching the crossing, pedestrians must wait until the road is clear in both directions before attempting to cross. ☐

Non-prescribed zebra crossings at side roads

Technical Annex 2: User surveys at existing sites

As part of a programme of research to investigate the potential use of non-prescribed zebra crossing markings at side roads, user surveys were undertaken at a sample of ten sites in London and Manchester where existing crossings can be found. The surveys investigated how the differences between the "full" (markings and beacons) and "non-full" (striped markings only) non-prescribed zebra crossings would affect the perceptions and intended behaviour of road users. Participants were asked how often they used the crossing, their perceptions of safety, how visible they found it (drivers), who t had priority and, for pedestrians, perceived convenience and how likely they would be to cross the road without using the crossing.

No statistically significant difference in perceived safety were found between 'full' and 'non-full' crossings. The majority of drivers believed pedestrians had priority with both crossing types. Pedestrians rated full crossings as more convenient and were less likely to say they would cross without using the crossing.

Titles in this subject area

PPR1003	Non-prescribed zebra crossings at side roads. Final Report. Jones M., Matyas M. and Jenkins D. 2021
PPR1004	Non-prescribed zebra crossings at side roads. Technical Annex 1: Analysis of collision records at existing sites. Hammond J. and Simms G. 2019
PPR1005	Non-prescribed zebra crossing at side roads. Technical Annex 2: User surveys at existing sites. Verwey L., Novis K., Wallbank C. and Stuttard N. 2020
PPR1006	Non-prescribed zebra crossing at side roads. Technical Annex 3: Effectiveness of alternative markings. Novis K., Hyatt T., Stuttard N. and Wallbank C. and Verwey L. 2020
PPR1007	Non-prescribed zebra crossing at side roads. Technical Annex 4: Road user perceptions and understanding. Blunden A., Gupta B., Matyas M., Mazzeo F., Wallbank C. and Wardle A. 2021
PPR1008	Non-prescribed zebra crossing at side roads. Technical Annex 5: Implications for people with disability. Blunden A., Gupta B., Verwey L., Butler, R. and Wallbank C. 2021
PPR1009	Non-prescribed zebra crossing at side roads. Technical Annex 6: Driver simulator trials. Jenkins D., Ramnath R., Stuttard N. and Chowdhury S. 2021
PPR1010	Non-prescribed zebra crossing at side roads. Technical Annex 7: Observations of conflict and giving-way during on street trials. Greenshields S., Ognissanto F., Lee R. and Macgregor E. 2021

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