

**Evaluating a video-based intervention designed to improve attitudes towards horse riders and cyclists**  
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The  
British  
Horse  
Society

we are  
**cycling**  
UK



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## Executive Summary

1. The British Horse Society and Cycling UK created four videos (2 focused on cyclists and 2 focused on horse riders) with the aim of increasing the empathy that drivers have for horse riders and cyclists. These videos told an emotive story about a main protagonist. In three cases the story focused on their stressful job roles in organisations that are widely supported by public opinion (fire service, NHS), and how horse riding or cycling allowed them to de-stress. A fourth video focused on a father who was concerned about the safety of his children while cycling.
2. We sought to evaluate the effectiveness of these videos in evoking attitudinal change toward horse riders and cyclists. Two studies were set up (one focused on a horse survey and one on a cyclist survey). Respondents were randomly allocated to the horse rider survey or the cyclist survey. The horse rider survey required participants to answer demographic questions, explicit attitude questions (towards both horse riders and cyclists), and two passing behaviour questions (how much distance is safe to leave when overtaking a horse as depicted in a picture, and what is the maximum safe speed to pass). Participants also completed an Implicit Association Test (IAT) to measure implicit attitudes that might not be available for self-report. Respondents saw either the two horse-focused videos, or a control video that had nothing to do with horses or bicycles. Following this, respondents filled in the explicit attitude questions and the passing behaviour questions once again, and then undertook a second IAT. Finally, respondents answered feedback questions about the quality and effectiveness of the videos.
3. For those participants who were randomly allocated to the cyclist survey, the survey structure was very similar. They received the same demographics, and explicit attitude questions, but their IAT and the passing behaviour questions specifically targeted attitudes to, and behaviours around, cyclists. During the survey they were presented with the two cycling videos or the same control video that was used in the horse rider survey.
4. We predicted that all respondents who saw the horse videos would report an improvement in explicit attitudes, implicit attitudes, and passing behaviours towards horse riders, and that this improvement would be greater than that of the control group. We did not expect respondents who saw the horse videos to improve in their explicit attitudes towards cyclists.
5. We also predicted that all respondents who saw the cyclist videos would report an improvement in explicit attitudes, implicit attitudes, and passing behaviours towards cyclists, and that this improvement would be greater than that of the control group. We did not expect respondents who saw the cyclist videos to improve their explicit attitudes towards horse riders.
6. A sample of 344 drivers were recruited for the study. Ages ranged from 18 to 78, with a gender split of 52%/46%/2% for females/males/others.
7. In both the horse rider survey and the cyclist survey, the intervention group (those who saw either the horse or cyclist videos) reported improved attitudes following the intervention. These improvements were significantly greater than any changes that occurred in the respective control groups.

8. Respondents who saw the horse videos did not, however, improve their attitudes towards cyclists. Equally, respondents who saw the cyclist videos did not improve their attitudes towards horse riders.
9. Regarding passing behaviours, the intervention group indicated a larger distance required to be safe when overtaking a horse or cyclist after watching the video. They also reported that they would overtake a horse or cyclist at a lower speed.
10. Free-response comments from individuals revealed an appreciation for the personal stories and a confirmation that these videos would lead to changes in their behaviour. There were however a minority of comments that showed some participants to be set in their ways, and to blame other vulnerable road users (especially cyclists) for the dangers that they perceive on the road.
11. In conclusion, this one-shot intervention study has demonstrated that these videos can change explicit attitudes and intended passing behaviours in a group of drivers, at least in the short term. A longitudinal study is recommended to assess how long these effects last for.

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## 1. Introduction

From 2010 to the start of 2019 there were over 3700 road safety incidents reported by a horse rider. These included over 1000 collisions causing human injury and nearly as many resulting in injured horses (945). There were also 43 human fatalities and 315 horse fatalities (British Horse Society, 2019). Other vulnerable road users (VRUs) face similar problems. The greater prevalence of bicycles on UK roads amplifies the problem for these VRUs with 100 fatalities in 2019 alone, and over 4000 serious injuries (Department for Transport, 2019).

The underlying reasons for these figures are complex, though studies tend to suggest that inappropriate overtaking speed is one of the most common reasons given for such incidents (Schofield et al., 2019). Inappropriate overtaking of horses and cyclists (e.g., Walker 2007) may be due in part to a lack of knowledge of what passing distance and speed is appropriate for different VRUs. This may be partially mitigated by updated guidance in the Highway Code (Department for Transport, 2022) that clarifies the appropriate speed and distance to leave when overtaking cyclists and horse riders:

- when overtaking cyclists at speeds of up to 30mph, you should leave at least 1.5 metres (5 feet) passing distance, and give even more space when overtaking at higher speeds;
- when overtaking horses, you should slow to 10 mph and pass with a gap of at least 2 metres (6.5 feet) of space.

Beyond knowledge however, it is likely that inappropriate passing behaviour is also influenced by negative perceptions of these *out-group* road users (i.e., people whom we perceive to be different to the groups with which we identify, e.g., Gatersleben and Haddad, 2010). In a series of focus groups, Chapman and Musselwhite (2011) noted such feelings towards horse riders from drivers who got frustrated by being held up by riders engaging in, what some might perceive to be, an expensive and niche leisure pursuit. They also found that the legitimacy of horses being on the roads was called into question; a feeling which co-existed with out-group attitudes.

Such lack of empathy towards VRUs has previously been noted in drivers' attitudes towards motorcyclists (e.g., Crundall et al., 2008a,b), and was a focus of the "Think Bike! Think Biker!" Campaign of 2010 (also called the 'Named Biker' campaign). The British Horse Society and Cycling UK have sought to emulate the success of "Think Bike! Think Biker!" by creating four short videos that provide the viewer with an insight into two cyclists and two horse riders. These videos provide the backstory of an individual, focusing on their jobs in three cases (two nurses and one fire fighter) while the story of one of the cyclists focuses on his concern for his young children when they are cycling on the road.

Theoretically, these personal story narratives could have a significant impact on raising empathy levels towards these individual road users, leading to a change in one's views of the wider road user group, and promoting a more inclusive perspective on road sharing. There is evidence that persuasive narratives are better than mere factual approaches as they can provoke emotion and encourage affective engagement (Morris et al., 2019). Specifically, if a narrative is pitched just right, it can raise the oxytocin level in the viewer which has been subsequently linked to generosity to strangers (e.g., Barraza, et al., 2009).

To assess the immediate impact of these videos we undertook an online study with a large sample of drivers (N=344). We assessed drivers' explicit and implicit attitudes to horse riders and cyclists both before and after watching either the two horse-focused videos or the two cycling-focused videos. Attitudes are our tendencies to view a person, group, or even a theoretical construct, in either a

negative or positive light. For these to be explicit, we must be able to verbalise them. Implicit attitudes however exist below the surface of conscious awareness, which we may – in good faith – deny having if asked directly (Greenwald and Banaji, 1995). One recent thesis (Goddard, 2017) found that negative implicit attitudes towards cyclists predicted lower likelihood of checking for cyclists while driving, while a more recent study found implicit attitudes to cycling to correlate with explicit attitudes and to also be associated with travel mode choices (Ledesma, et al., 2019). We have followed Goddard’s methodology and have complemented our explicit attitude questions with the Implicit Association Test to measure any potential sub-conscious biases (Greenwald et al., 1998).

These measures of implicit and explicit attitudes were collected both before participants watched the videos (*pre-intervention*) and after they had seen the videos (*post-intervention*), and were then compared to the same attitudes recorded from a control group (who watched a road safety video that had nothing to do with either cyclists or horse riders). We predicted that the intervention group would display a change in explicit, and possibly implicit, attitudes towards either cyclists or horse riders (depending on which set of two videos they are exposed to).

## 2. Method

An online survey was prepared using Qualtrics survey software (Qualtrics.com). Respondents were randomly allocated to either a horse rider or cycling version of this survey. Following the first four blocks of questions and tests, respondents were randomly allocated to the intervention group or the control group. When the presentation of intervention videos or the control video was finished, respondents then repeated a series of question and test blocks, before being asked to evaluate the videos they had seen (see Figure 1).

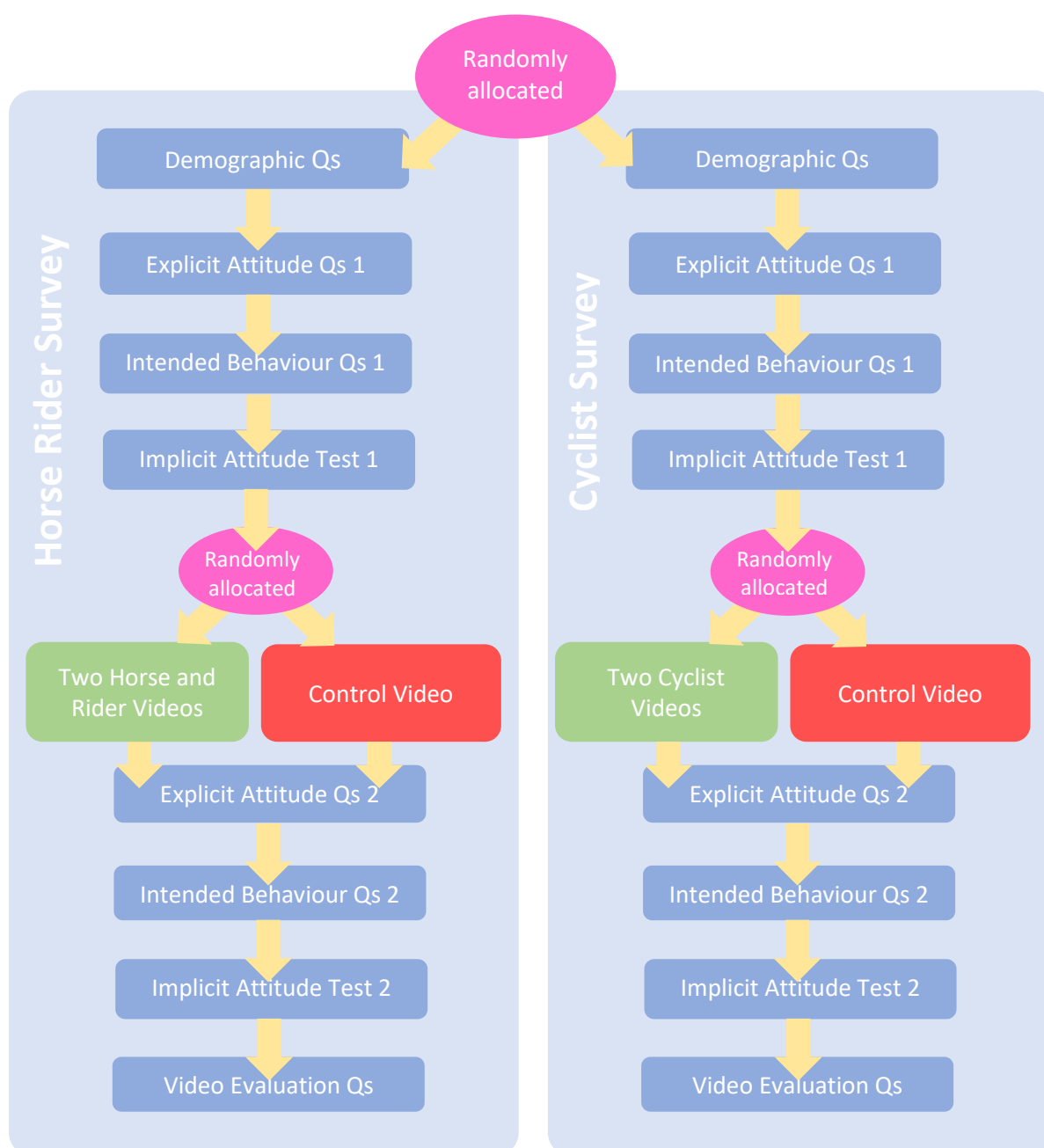


Figure 1. A diagram depicting survey conditions and flow. Participants were randomly allocated to either the horse rider survey, or the cyclist survey. After the pre-intervention blocks, participants were then allocated to either an intervention condition (horse rider or cyclist videos) or a control condition (where they saw a filler video).



Respondents were recruited from two main sources. The first source was the NTU Psychology Research Participation Scheme. This is an in-house platform that recruits psychology undergraduate students for research studies in return for course-related credits. The second recruitment source was Prolific (<https://www.prolific.co/>). This is a data collection service that advertises studies to its database of potential respondents. Each respondent is paid a small amount, equivalent to earning £7.50 per hour.

## 2.1 Demographics

The first block of questions asked respondents to provide basic demographic information including age, gender, driving history (when they passed their test, what roads they drive on, how many miles they drive, how many collisions they've had). Further questions probed their use of different modes of transport for different reasons: commuting, shopping/leisure pursuits, and 'just for the joy of it'.

Finally, respondents were asked how often they encounter a range of road users while driving a car (including horse riders and cyclists), and how frequently they drove on different road types (urban, suburban, rural, and motorway).

## 2.2 Explicit attitudes

For the second block, respondents were given twelve statements to which they had to agree or disagree. These were intended to query their attitudes towards both horse riders and cyclists (six statements each, regardless of whether respondents were assigned to the horse rider survey or the cyclist survey; Table 1). Each statement required a response on a five-point scale ranging from 'strongly disagree' to 'strongly agree'.

*Table 1. Statements given to respondents to gauge explicit attitudes to horse riders and cyclists.*

	Statements	Scoring
1.	Most horse riders behave responsibly when on the road	Positively scored
2.	Horse riders should not be on the roads	Reverse scored
3.	Car drivers should take extra care when passing cyclists	Positively scored
4.	Most cyclists behave responsibly when on the road	Positively scored
5.	Horse riders should move out of the way when I need to overtake	Reversed scored
6.	If cyclists intend to be on the roads, they should be required to take specific training	Removed
7.	Cyclists should not be on the roads	Reverse scored
8.	Cyclists are similar people to me	Positively scored
9.	If horse riders intend to be on the roads, they should be required to take specific training	Removed
10.	Horse riders are similar people to me	Positively scored
11.	Cyclists should move out of the way when I need to overtake	Reverse scored
12.	Car drivers should take extra care when passing horses	Positively scored

## 2.3 Passing behaviours

Two questions probed drivers' 'passing behaviours' when passing either horse riders or cyclists (depending on which survey they had been allocated to). Respondents were presented with an image containing either a horse rider or a cyclist, viewed from behind on a rural road (see Figure 2). A white car was placed next to the horse or cyclist. Respondents were first asked "Assuming that it is safe to overtake, what do you think the minimum distance should be between the horse and the overtaking car?" Underneath the picture, respondents were given a 7-point sliding scale. As they moved the pointer to the left or right of the scale, the car would move closer to the horse or cyclist, or further away, respectively. The second question enquired at what speed they would overtake the horse rider/cyclist. For this they were provided with a sliding scale from 0 mph to 50mph. It should be noted that the image clearly shows that a 40-mph restriction is in place on this road.



*Figure 2. Participants were presented with either a picture of a car overtaking a horse and rider, or a cyclist. A slider allowed participants to move the car to the left or right in the image to reflect their chosen passing distance, and to select a passing speed of up to 50 mph.*

## 2.4 Implicit attitudes

The fourth block consisted of an 'Implicit Association Test' (Goddard, 2017, Goddard et al., 2020, Greenwood et al. 1998; 2003). Separate Implicit Association Tests (IATs) created using the iatgen tool (Carpenter et al., 2019) were given to respondents undertaking the horse survey and the cyclist survey. We will describe the horse survey IAT here, though the cyclist IAT followed the exact same design.

The IAT records response times to two sets of pictures that appear on a screen one at a time. It is important to have two different categories that are pitted against each other. For the horse survey, we compared silhouette pictures of horses and riders to pictures of cars and drivers (see Figure 3). Respondents must press one key as quickly as possible when they see a horse picture, and another key when they see a car picture. Some trials also require respondents to discriminate between positive and negative words using the same two keys that they must use to respond to the pictures. The same positive and negative attributes were used as in Goddard (2017). The positive attributes were 'beautiful', 'happy', 'joyful', 'lovely', 'pleasant', and 'wonderful'. The negative attributes were 'agony', 'awful', 'cruel', 'horrible', 'painful' and 'terrible'.

For instance, on one particular block of trials respondents might be expected to press the 'E' key on a keyboard whenever a negative word appears, or when a horse and rider picture appears. If, however, a positive word appears, or a picture of a car and driver, they should press the 'I' key. On a later block of trials this would be reversed, and respondents would be expected to press the same key for horses and positive words, or for cars and negative words. The theory states that if you have

a negative implicit attitude towards horses, your response times will be faster when you have to press the same key for horse pictures and negative words.

The IAT produces a D-score which is calculated as the difference in time taken to respond to our horse pictures when paired with positive words and car driver pictures paired with negative words, compared to horse pictures that are paired with negative words and car driver pictures with positive words, divided by the pooled standard deviation of those response times (to include a measure of variability). In the current analysis, a D-score that is significantly above zero reflects a positive attitude towards car drivers rather than horse riders. If the D-score is significantly below zero, this reflects a positive attitude towards horse riders instead of car drivers. Scores between 0.15 and 0.35 (or -0.15 and -0.35) are considered to reflect a slight bias. Scores between 0.35 and 0.65 (or -0.35 to -0.65) reflect a moderate bias, while scores above 0.65 (or below -0.65) indicate a strong bias.

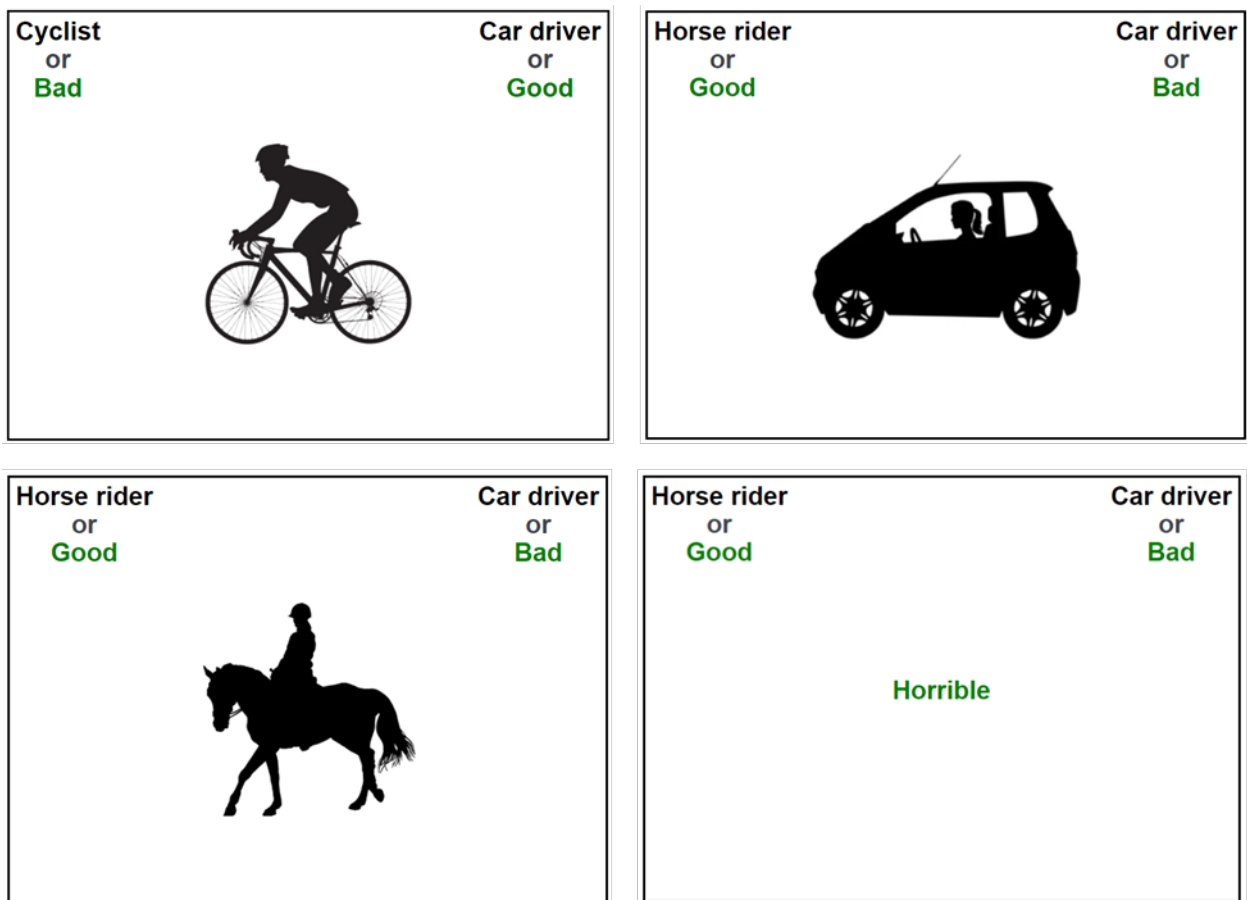


Figure 3. Four different trials within the IAT representing a cyclist trial, a car trial, a horse trial, and a negative word trial (top-left to bottom-right).

## 2.5 The intervention videos

After completing the IAT, respondents in one of the intervention conditions were either shown two cyclist-focused videos telling the stories of 'Duncan' and 'Priya', or two horse-focused videos telling the stories of 'Julie' and 'Laura' (see Table 2). The order the two videos were shown in was randomised between respondents. Control participants instead watched a video on the dangers of using headlights to indicate the intention to give way to another road user. See Figure 4 for some example screen shots taken from the videos.

## 2.6 The video evaluation

Once respondents viewed the videos, they were asked to fill in the explicit attitude questions again, and to undertake the implicit association test for a second time. Following this, all participants were given 6 questions to probe their thoughts on the videos they saw. These questions require a response on a 1-7 scale, with higher numbers reflecting more positive thoughts about the videos. For those respondents in the intervention group, they were asked two final questions regarding the effectiveness of using personal stories to put across a road safety message, and whether they had a preference for one of the intervention videos over the other. The video evaluation questions are listed in Table 3.

Table 2. The intervention and control videos.

Study condition	Main protagonist	Story	Duration
Horse riding	'Julie'	Julie works with the fire service in a stressful role. Horse riding allows her to de-stress at the end of the day.	109 s
Horse riding	'Laura'	Laura is a children's nurse who uses horse riding to de-stress.	63 s
Cycling	'Duncan'	Duncan is a father who wants his children to be safe on the roads while cycling.	96 s
Cycling	'Priya'	Priya is a nurse specialising in care of the elderly. Cycling allows her to de-stress.	66 s
The Control Video	N/A	A fact-based video on the dangers of using headlights to indicate that you intend to give way to another road user	246 s

Table 3. Video evaluation questions.

Statements	Scale
1. How professionally produced do you think the videos looked?	'unprofessional' to 'professional' (1-7)
2. Did the length of the videos feel appropriate for the message?	'too short' to 'too long' (1-7)
3. Did you think the message in the videos was important?	'No' to 'Yes' (1-7)
4. Do you think the video producers put the message across in the best way?	'No' to 'Yes' (1-7)
5. Did the videos add to your understanding of driver safety?	'No' to 'Yes' (1-7)
6. Did the videos change your opinion towards [horse riders / cyclists/ flashing headlights]?	'No' to 'Yes' (1-7)
7. Do you think the personal stories at the beginning of the videos make the road safety message more or less effective?	'Less effective' to 'more effective' (1-7)
8. In regard to the ability of the videos to put across the road safety message, do you have a preference for one over the other? [only given to participants in the intervention groups]	'Strong preference for [Julie/Duncan]' to 'Strong preference for [Laura/Priya] (1-5)



*Remember:*

- Be aware of choke points that prevent vehicles passing
- To look through and around parked vehicles for possible side roads
- Never flash your headlights to indicate your intention to give way
- If someone else flashes their headlights, look out for other road users who may think this signal is for them

*So let's recap.*

Figure 4. Six screen shots from the horse-focused videos (top panels), the cyclist-focused videos (middle panels), and the control video (bottom panels).

### 3. Results

#### 3.1 Respondents' demographics

Demographic information reflects the background of the respondents that reply to a survey. The most common demographic data include respondents' ages, gender, and any other characteristics that may impact on how they answer the survey questions. In this category we also include driving history: when they passed their driving test, their annual mileage, what roads they drive on, what modes of transport they use, and whether they have had any crashes as a driver. These data provide the reader with an overview of the characteristics of our respondents that may influence their answers to later questions in the survey.

##### 3.1.1 Age, gender, experience, and mileage

A total of 344 respondents took part in this study, with 290 from Prolific, 23 from the NTU Psychology Research Participation Scheme and 31 recruited through social media. The average age of the sample was 40.2 years and the distribution of ages throughout the sample can be seen in Figure 5 (ranging from 18 to 78). The gender split was roughly equal with 160 males and 178 females. Six respondents recorded a non-binary gender identity or declined to respond to this question. The age and gender breakdown according to the four conditions (horse intervention group, horse control group, cyclist intervention group, cyclist control group) can be viewed in Table 4.

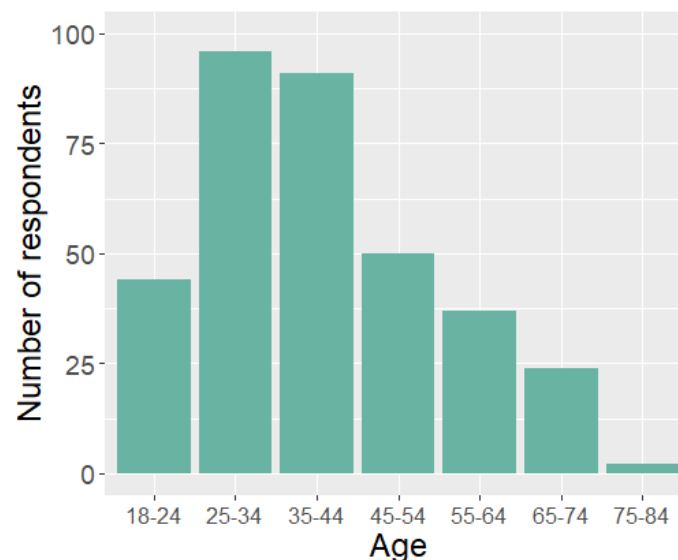


Figure 5. The age distribution of the entire sample (N=344).

Respondents reported passing their driving test at 21 years and 7 months of age on average. As one might expect, there is a strong positive correlation between the age of our drivers and the number of years driving experience they have had since passing their test ( $r_{(342)} = .905, p < .001$ ). Annual mileage did not correlate with either age or the number of years reported since passing the driving test.

### 3.1.2 Most frequently used travel modes

All the respondents were car drivers, with 84% reporting the car to be their main mode of transport. Other respondents primarily relied on walking (9%) and public transport (3.5%), with only 2.6% using a bicycle as their primary source of transport (see Figure 6).

Table 4. The number of drivers in each condition with their mean age and gender distribution.

Group allocation	N	Age	male/female/other	Years since passing test	Annual mileage
Horse Rider survey, Intervention	82	40.8	35/46/1	19.3	4956
Horse Rider survey, Control	80	40.4	43/37/0	18.8	6708
Cyclist survey, Intervention	92	41.6	46/43/3	19.9	5963
Cyclist survey, Control	90	38	36/52/2	16.9	4402

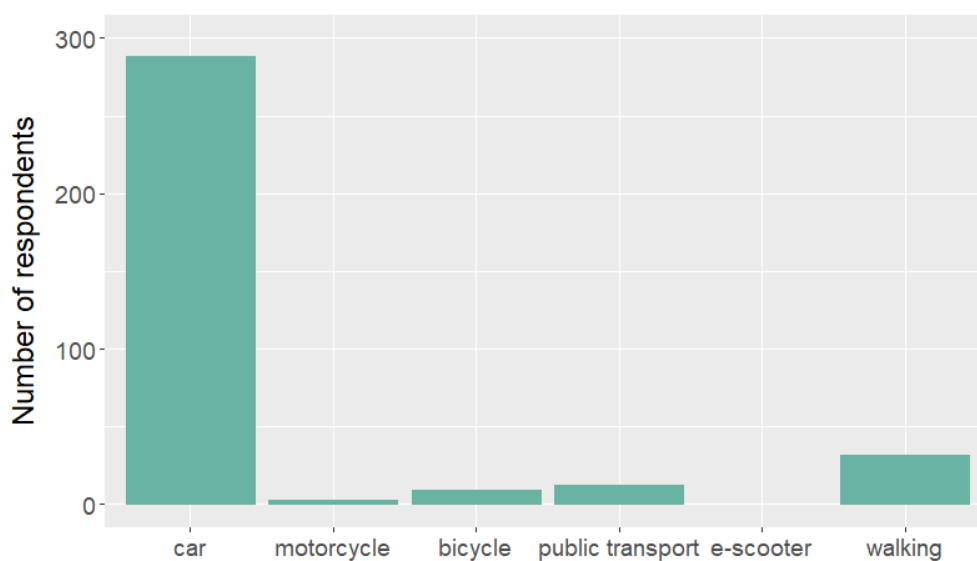


Figure 6. A frequency distribution of primary travel modes reported by respondents.

To further probe respondents' preferred modes, we asked how much they used each travel mode for different types of journey: for work or education, for visiting or travelling to reach entertainment, or simply for the joy of it (Figure 7).

Categorical responses to these modes were recoded as integers (never = 1, seldom = 2, etc.) and then subjected to Friedman tests with post-hoc Wilcoxon tests. When travelling for work or education the reported use of the modes differed significantly, with the car as the most favoured

mode ( $\chi^2_{(6)} = 1007, p < .001$ ). Repeated post-hoc Wilcoxon tests revealed all modal responses to differ ( $z_s < -3.4, p_s < .001$ , even after Bonferroni correction) except for comparisons between bus and bicycle, and between motorcycle and e-scooter.

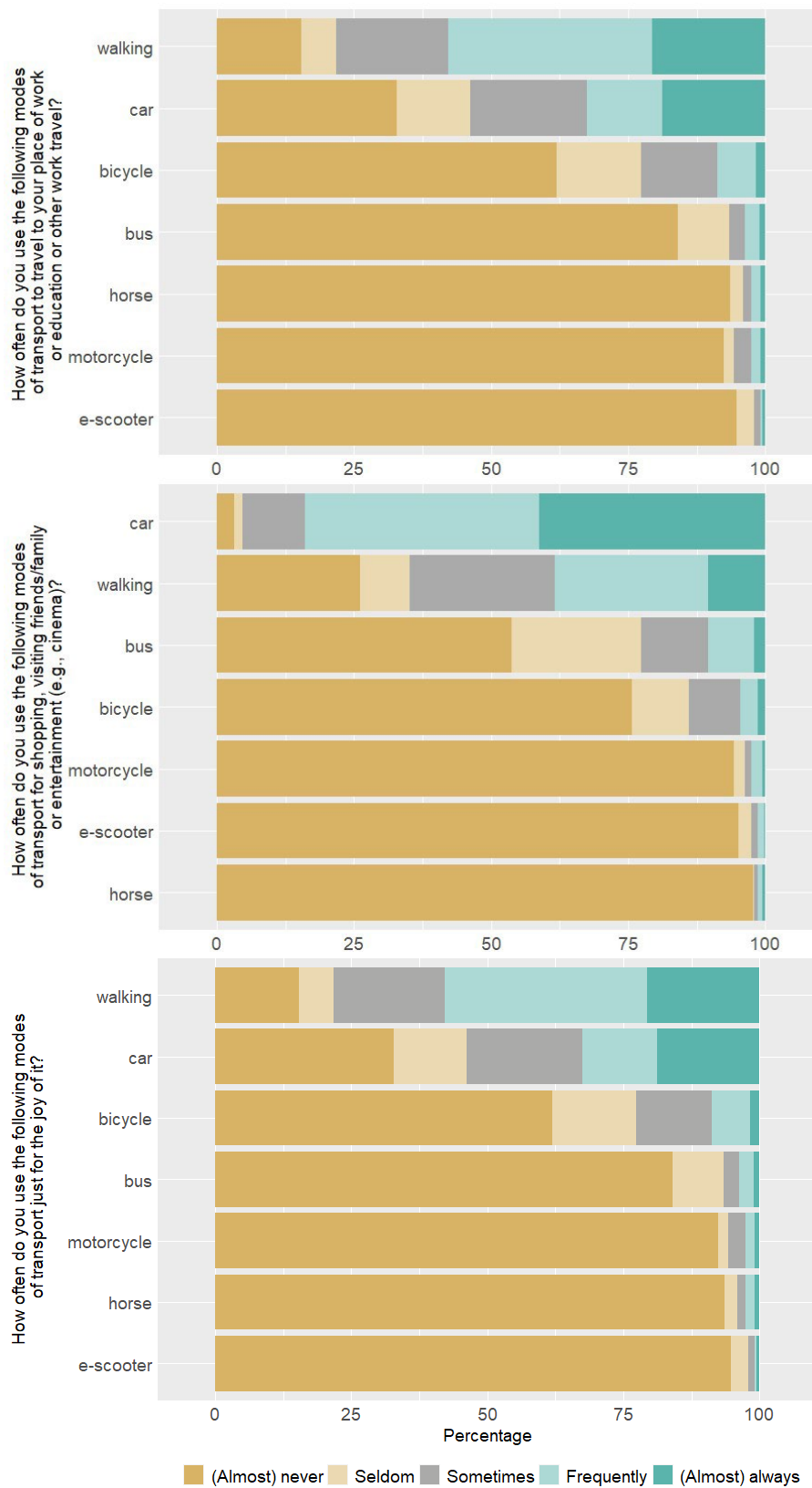


Figure 7. Respondents' reported use of different travel modes across different reasons for travel.



When visiting friends/family or travelling to entertainment, mode ratings also differed significantly ( $\chi^2_{(6)} = 1334, p < .001$ ), with all Wilcoxon comparisons revealing significant differences ( $z$ s  $< -6.1, p$ s  $< .001$ , after Bonferroni correction). Once again, the car was the favoured mode.

When respondents were asked which travel modes they use 'simply for the joy of it', differences were again found across the different modes ( $\chi^2_{(6)} = 1062, p < .001$ ), though walking eclipsed the car as the favourite form of transport in this question ( $z = -6.2, p < .001$ ). The car was however favoured more than the bicycle, which in turn was preferred to the bus ( $z < -3.1, p$ s  $< .005$ ). There was no difference found between preferences for horses, e-scooters, and motorcycles.

These analyses demonstrate the ubiquity of the car, with 76% using a car at least 'sometimes' for work or education, and 95% using it for visiting friends and family, etc. As a joyful pastime however, 78% of people reported walking for fun at least 'sometimes', though the car was still reported to be used at least 'sometimes' for fun by 53.8%. Across all reasons for travel, 25.9% reported using a bicycle at least 'sometimes', while only 4.9% reported riding a horse at least 'sometimes'. This suggests that a significant minority of our sample are likely to have regular experience riding a bicycle, but very few have experience of riding a horse.

### 3.1.3 Exposure to different road types

We asked respondents to report how frequently they drove on different road types: urban, suburban, and rural roads, and motorways. Figure 8 shows their responses. Unsurprisingly, suburban roads appear to be the most driven, followed by urban roads, rural roads, and, finally, motorways. To test whether the difference between these road types was statistically significant, categorical responses were recoded into integers (never = 1, seldom = 2, etc.) and were then compared via a Friedman test. A significant difference was found across the four road types ( $\chi^2_{(3)} = 335, p < .001$ ). Post-hoc Wilcoxon tests revealed the reported frequency of driving on all four road types to be different, with suburban roads frequented more than urban ( $z = -4.6, p < .001$ ), which in turn were used more often than rural roads ( $z = -5.9, p < .001$ ), while rural roads were driven more frequently than motorways ( $z = -7.5, p < .001$ ). These data suggest that our sample has less experience of rural road driving and may therefore be unaware of hazards that are posed when overtaking vulnerable road users on these roads, such as obscuration of VRUs by hedges and blind bends, or the problems posed by narrow lanes.

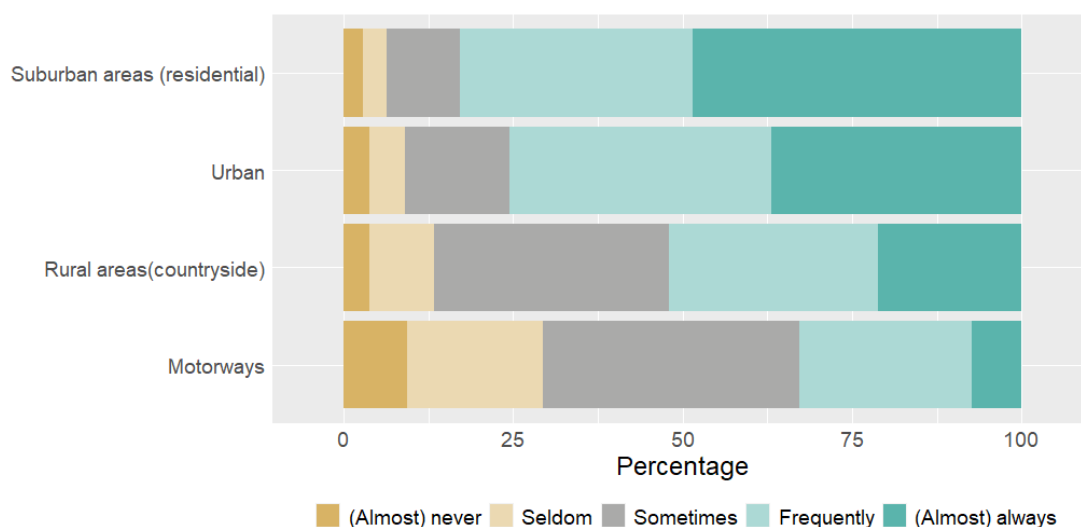


Figure 8. Respondents' reported use of different road types.

### 3.1.4 Exposure to horse riders and cyclists

We asked participants how frequently they encounter different classes of other road users (cars, buses, motorcycles, bicycles, e-scooters, pedestrians and horses; Figure 9). A significant difference was found across the different road users ( $\chi^2_{(6)} = 1406, p < .001$ ). Each of the ranked road users in Figure 8 was found to be different to each other ( $z_s < -3.0, p_s < .005$ ) except for motorcycles and bicycles, which were reportedly encountered with similar frequency, and e-scooters and horses. This confirms that horses (along with e-scooters) are the least likely road users to encounter.

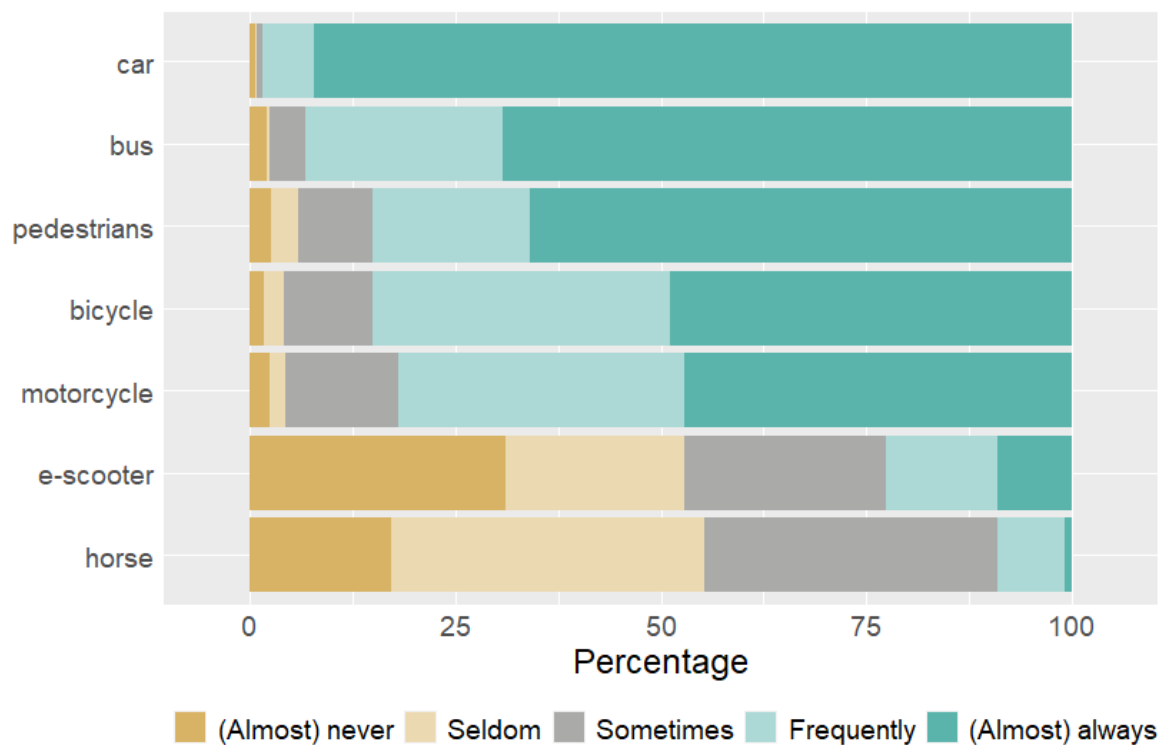


Figure 9. Respondents' reported exposure to different road users.

Table 5. The percentage of drivers who report cycling or horse riding 'sometimes' or more, and who report encountering cyclists and horse riders 'sometimes' or more when driving.

Group allocation	% of drivers who cycle sometimes or more	% of drivers who ride horses sometimes or more	% of drivers who encounter cyclists sometimes or more	% of drivers who encounter horses sometimes or more
Horse, Intervention	23	6	98	49
Horse, Control	31	5	96	46
Cyclist, Intervention	26	5	99	46
Cyclist, Control	23	3	91	39

In Table 5 we can see that those drivers who were allocated to either the horse intervention group or the horse control group are similar regarding the number who engage in horse riding themselves, and in how frequently they encounter horses on the road. Drivers in the cycling intervention and control groups were also comparable regarding their own reported use of bicycles, though there was a slight tendency for respondents in the cycling intervention group to report encountering bicycles on the road more.

### 3.1.5 Reported crashes

Finally, we asked respondents about their crash history. Within our sample, 44.5% reported that they had never had a collision. Of those who did report a collision, when asked to rate the severity of their last crash (Figure 10), the majority (N=105, 54.5%) reported that the crash resulted in damage of less than £500 value. These crashes are likely to be made up of low-speed collisions (e.g., in supermarket car parks) and side mirror damage when passing parked vehicles or vehicles in the contraflow lane. A Chi Square Goodness of Fit analysis, excluding 'prefer not to say responses', revealed significant deviations from chance ( $\chi^2_{(2)} = 89.44, p < .001$ ). Though low severity crashes were reported no more frequently than moderate severity crashes ( $\chi^2_{(1)} = 2.86, p = .09$ ), moderate severity damage was reported more often than fatal or injury collisions ( $\chi^2_{(1)} = 72.43, p < .001$ ).

When asked who was to blame (Figure 11), the overall Chi Square Goodness of Fit analysis again showed a pattern than deviated from chance ( $\chi^2_{(2)} = 54.03, p < .001$ ). Respondents attributed the blame for their last collision to others more often than themselves,  $\chi^2_{(1)} = 17.11, p < .001$ .

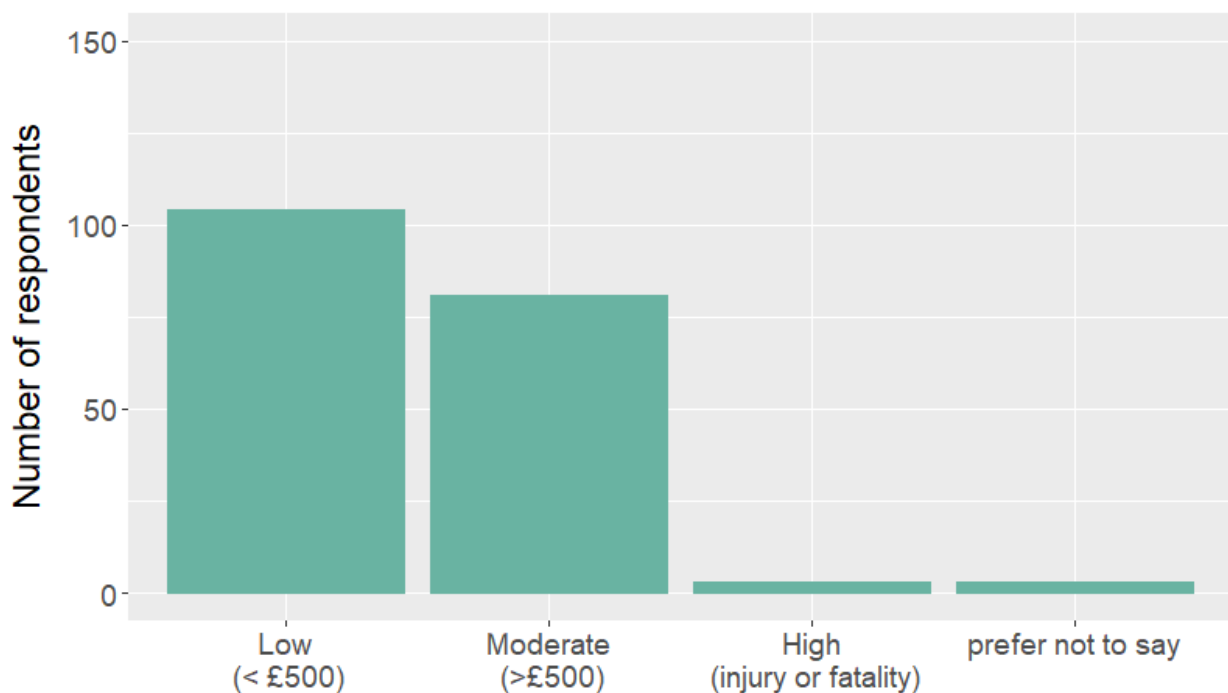


Figure 10. A frequency distribution of the severities of respondents' last reported crash.

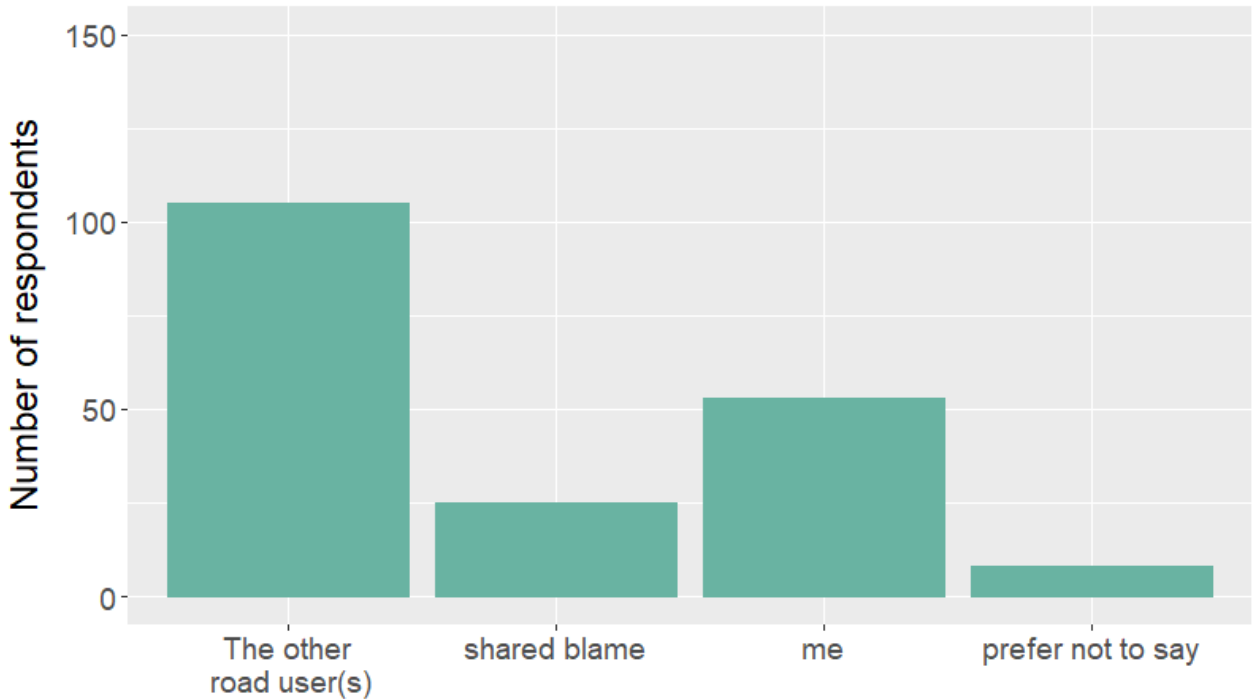


Figure 11. A frequency distribution of blame attribution for respondents' last reported crash.

### 3.2 Attitudes towards cyclists and horse riders

We asked participants to rate their agreement with twelve statements that probed specific attitudes to horse riders and cyclists (e.g., “cyclists should move out of the way when I need to overtake”; see Table 1). Participants recorded their agreement on a 5-point scale from ‘strongly disagree’ to ‘strongly agree’. Ratings of agreement for individual statements are included in Appendix 1. The current section reports on the analysis of a combined rating of positive attitudes towards horse riders, and towards cyclists. To combine ratings from individual items, we first recoded the categorical responses as integers (e.g., “Strongly disagree” = 1, “Somewhat disagree” =2, etc.). We then reversed the scale on 6 items (e.g., “horse riders should not be on the roads”) to ensure that higher scores always reflect more positive attitudes. At this stage we removed one horse question and one cyclist question: “If horse riders/cyclists intend to be on the roads, they should be required to take initial training”. While this was originally conceived of as a negative statement, it became apparent that some respondents could view this as a positive statement, with any criticism being levelled at authorities who should provide this training, rather than at the riders or cyclists themselves. This left five explicit questions whose ratings were summed to create the combined positive attitude score towards cyclists and horse riders (with a maximum positive attitude of 25).

A 2x2 Analysis of Variance (ANOVA) was conducted on the combined positive attitude towards horse riders for respondents who undertook the horse and rider version of the survey. This compared the pre-intervention combined attitude to the post-intervention attitudes across the intervention and control group. The results revealed a significant difference between the pre- and post-intervention attitude,  $F_{(1,160)} = 16.61, p < .001, \eta^2 = 0.01$ , showing that the positive attitude towards horse riders improved during the study. A significant interaction between pre- and post-intervention attitude and whether respondents were in the intervention or control group was also found ( $F_{(1,160)} = 12.04, p < .001, \eta^2 = 0.007$ ). This demonstrated that the improvement in positive attitude was greater for those

participants who saw the two horse rider videos, than for the group who saw the control video (see Figure 12, top-left panel).

A similar pattern was found for the combined attitude towards cyclists reported by respondents who completed the cycling version of the survey. Positive attitude towards cyclists increased after having watched the videos,  $F_{(1,180)} = 43.00, p < .001, \eta^2 = 0.011$ . Once again, a significant interaction ( $F_{(1,180)} = 9.83, p < .01, \eta^2 = 0.002$ ) demonstrated that this improvement was significantly greater for the intervention group who saw the cycling videos (Figure 12, bottom-right panel).

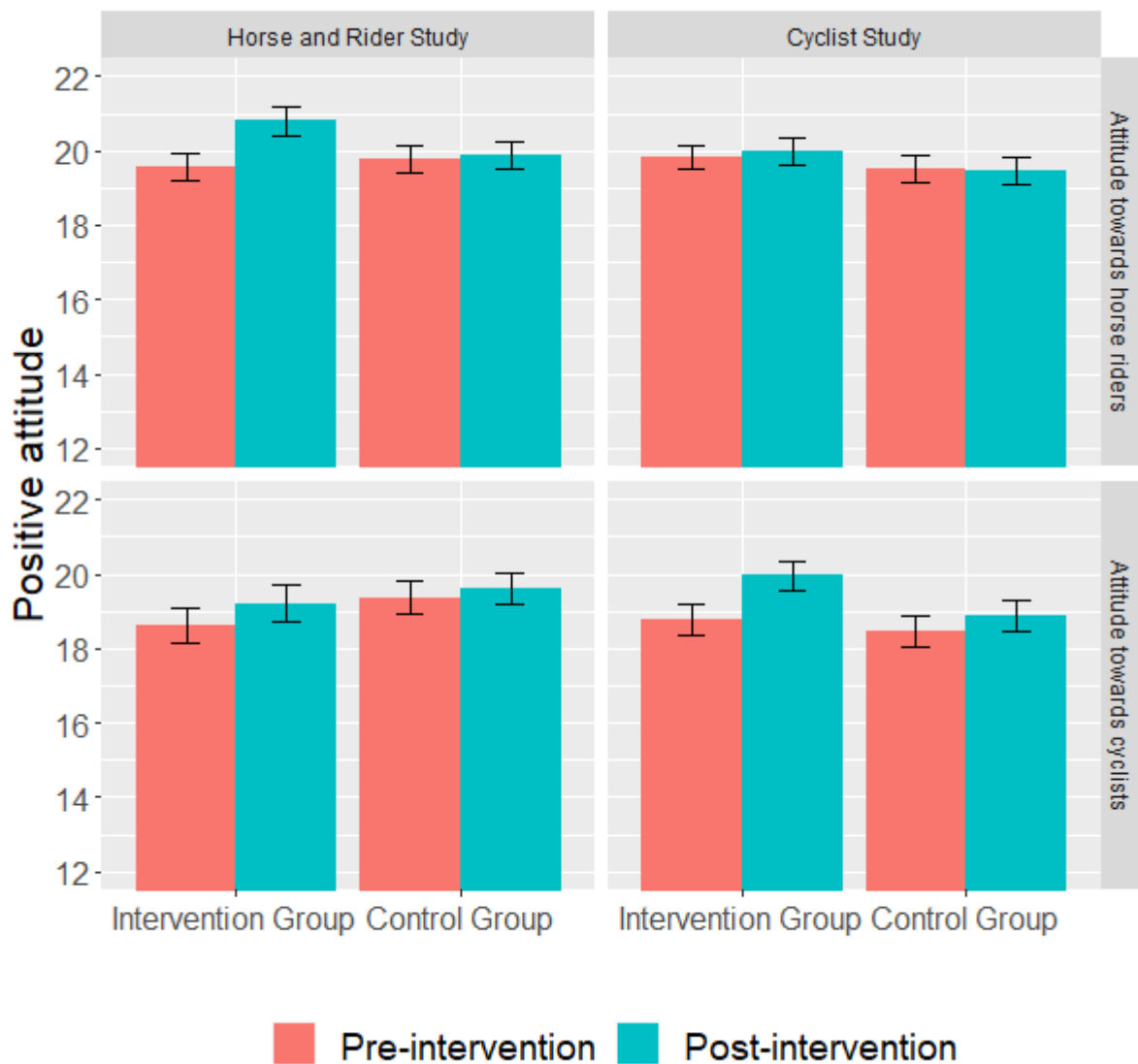


Figure 12. The combined positive attitude of respondents to horse riders and cyclists. The top-left panel shows the pre-intervention and post-intervention attitudes towards horse riders for respondents in the intervention and control groups. The bottom-left panel shows the combined positive attitude towards cyclists for these same groups. The top-right panel depicts the attitudes of those respondents who undertook the cycling survey towards horse riders. The bottom-right panel shows these same respondents' attitude towards cyclists. With standard error bars.

Similar analyses were also conducted on the combined positive attitudes towards the vulnerable road user group that was not the focus of the study. First, we calculated the combined attitude towards cyclists for all respondents who undertook the horse rider survey and compared the pre- and post-intervention attitude across the control and intervention groups. There was a tendency for respondents to have a more positive attitude towards cyclists post-intervention ( $F_{(1,160)} = 14.16, p < .001, \eta^2 = 0.002$ ) but there was no significant interaction with between this and whether participants were allocated to the intervention condition or the control condition (Figure 12, bottom-left panel).

We then calculated the combined attitude towards horse riders for all respondents who undertook the cyclist version of the survey. The same analysis compared pre- and post-intervention attitude across the control and intervention groups. No differences were found (Figure 12, top-right panel).

These results suggest the horse rider videos significantly improved attitudes to horse riders compared to a control group. The horse videos did not improve attitudes towards cyclists beyond any improvement noted in the control group. Similarly, the cycling videos improved attitudes towards cyclists when compared to a control group but had no effect on attitudes towards horse riders. This shows that the videos are successful in changing attitudes towards the specific group of vulnerable road users that they target.

### 3.3 Passing behaviours

Respondents were asked two questions about passing behaviour regarding either a horse and rider or a cyclist (depending on which survey they had been assigned to). The first question asked respondents to select a distance between a car and either a horse rider or cyclist to reflect the minimum gap that they felt should be left when overtaking this vulnerable road user. This was measured on a 7-point scale, where respondents were able to move a car on screen to a suitable distance from the vulnerable road user to provide their answer. The second question asked them to pick a speed at which they would overtake either the horse or cyclist. These questions were asked both before and after presentation of the intervention videos (or control video).

#### 3.3.1 Passing distance

When respondents who undertook the horse rider survey were asked what minimum gap they would leave when overtaking a horse, the intervention group chose a wider gap after they had seen the horse videos compared to the control group. This was confirmed via a 2 x 2 ANOVA producing a significant interaction that shows that the experimental group increased the gap after seeing the horse videos, but the control group did not ( $F_{(1,160)} = 23.18, p < .001, \eta^2 = 0.016$ ; see Figure 13, top panel)<sup>1</sup>.

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<sup>1</sup> Both main effects were also significant: Pre- vs. post-intervention ( $F_{(1,160)} = 36.03, p < .001, \eta^2 = 0.025$ ) and intervention group vs. control group ( $F_{(1,160)} = 4.00, p < .05, \eta^2 = 0.022$ ), though these are less informative than the interaction reported in the main text.

A similar interaction was found with the passing distances recorded by respondents who undertook the cycling version of the survey ( $F_{(1,180)} = 11.03, p < .01, \eta^2 = 0.007$ ; see Figure 13, bottom panel)<sup>2</sup>. This shows that the cycling videos have increased respondents' minimum passing distance that they feel is acceptable when overtaking a cyclist.

The results demonstrate that our respondents choose significantly greater passing distances after exposure to the intervention videos. Participants in the control group do not change their selected passing distances.

### 3.3.1 Passing speed

The pattern of results for passing speed was very similar to that of passing distance. For those respondents who undertook the horse survey we noted a significant interaction ( $F_{(1,160)} = 15.05, p < .001, \eta^2 = 0.006$ ), which reflected a significant decrease in the selected passing speed of those drivers who saw the horse videos compared to those who did not<sup>3</sup> (see Figure 14, left panel).

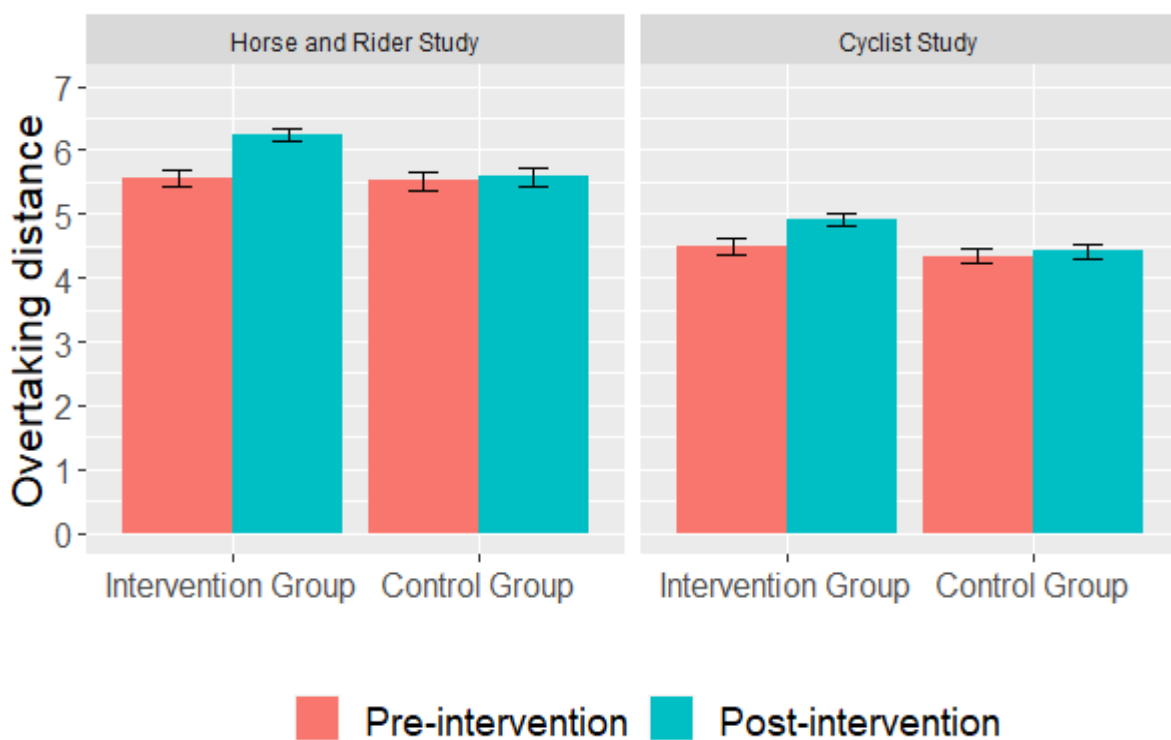


Figure 13. The minimum passing distance that respondents think is safe to overtake a horse and rider (left panel) and to overtake a cyclist (right panel) according to participant group (intervention vs. control) and comparing responses before and after the intervention.

### 3.3.1 Passing speed

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<sup>2</sup> Once again, both main effects were significant: Pre- vs. post-intervention ( $F_{(1,180)} = 23.18, p < .001, \eta^2 = 0.014$ ), and intervention group vs. control group ( $F_{(1,180)} = 4.49, p < .05, \eta^2 = 0.022$ ).

<sup>4</sup> There was also a main effect of pre- vs. post-intervention ( $F_{(1,160)} = 24.89, p < .001, \eta^2 = 0.010$ ) reflecting a general decrease in speed for all respondents, though the interaction makes it clear that the intervention group showed a greater reduction in passing speed.

.001,  $\eta^2 = 0.006$ ), which reflected a significant decrease in the selected passing speed of those drivers who saw the horse videos compared to those who did not<sup>4</sup> (see Figure 14, left panel).

The same pattern was yet again found for those respondents who undertook the cycling survey. A significant interaction confirmed that the chosen overtaking speed was reduced for those respondents who saw the cycling videos compared to respondents in the control group ( $F_{(1,180)} = 9.17, p < .01, \eta^2 = 0.002$ , Figure 14, right panel)<sup>5</sup>.

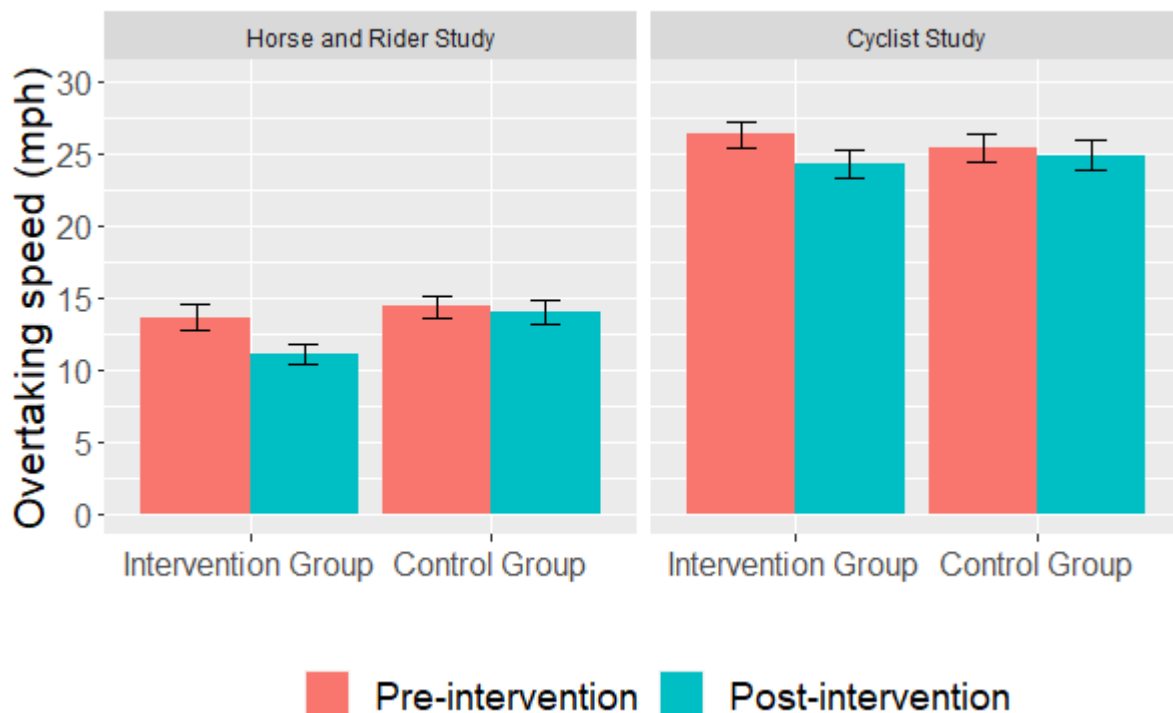


Figure 14. Respondents chosen passing speed for overtaking a horse and rider (left panel) and a cyclist (right panel) according to participant group (intervention vs. control) and comparing responses before and after the intervention. With standard error bars.

### 3.4 Implicit Association Test

IAT data for eight respondents were removed from the analysis due to more than 10% of responses being too short (< 300 ms) in their post-test IAT (of which one respondent also responded too quickly in the pre-test).

<sup>4</sup> There was also a main effect of pre- vs. post-intervention ( $F_{(1,160)} = 24.89, p < .001, \eta^2 = 0.010$ ) reflecting a general decrease in speed for all respondents, though the interaction makes it clear that the intervention group showed a greater reduction in passing speed.

<sup>5</sup> There was also a main effect of pre- vs. post-intervention ( $F_{(1,180)} = 23.05, p < .001, \eta^2 = 0.005$ ) showing all respondents reduced speed in the post-intervention question on average, though again the interaction shows that the cycling videos prompted the greater reduction in passing speed.



One sample t-tests compared the D-scores of our four groups (horse intervention, horse control, cycling intervention, cycling control) across the two periods of measurement (pre- and post-intervention). None of the D-scores deviated significantly from zero indicating that the respondents did not have an implicit attitude bias towards either car drivers or cyclists/horse riders either before or after watching the videos. The D-scores are charted in Figure 15.

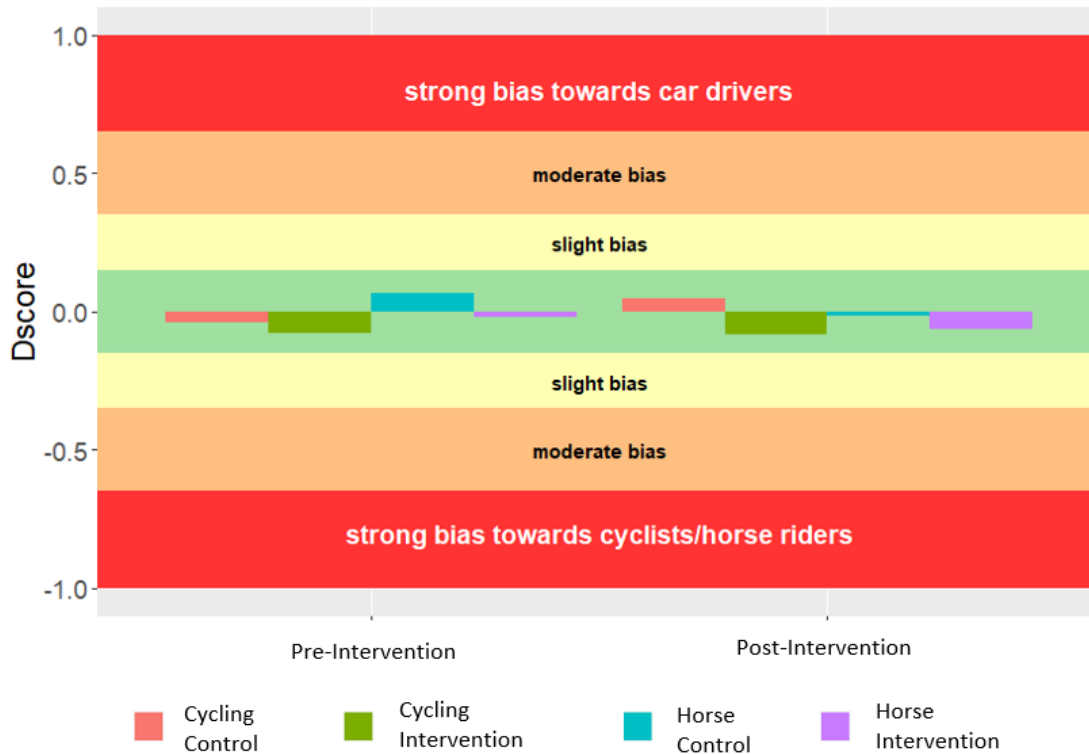


Figure 15. D-scores from the Implicit Association Test for respondents undertaking the cycling survey and the horse survey (for both the intervention groups and the control groups). D-scores do not significantly differ from zero and do even reach the threshold for what might be considered a ‘slight bias’.

### 3.5 Video evaluation

Following the second round of explicit attitude questions and the implicit association test, respondents were asked to rate the videos they had seen (the two horse-focused videos, the two cyclist-focused videos, and the control video regarding the problems of flashing one’s headlights to indicate anything other than a warning). The first seven evaluation questions required participants to respond on a 7-point scale. These responses were recorded as integers (1-7) and analysed with Kruskal-Wallis tests. Significant results were followed up with post-hoc Dunn tests. Following the second round of explicit attitude questions and the implicit association test, respondents were asked to rate the videos they had seen (the two horse rider videos, the two cyclist videos, and the control video regarding the problems of flashing one’s headlights to indicate anything other than a warning). The first seven evaluation questions required participants to respond on a 7-point scale. These responses were recorded as integers (1-7) and analysed with Kruskal-Wallis tests. Significant results were followed up with post-hoc Dunn tests.

### 3.5.1 How professional did you think the videos looked?

Respondents gave answers on a 1-7 scale, with 1 classified as ‘unprofessional’ and 7 classified as ‘professional’. Over 95% considered the videos to be professional (rating them at 5 and above, see Figure 16), with the overwhelming general view that all the videos looked professionally produced. A Kruskal Wallis test indicated there was a significant difference in the distribution of ratings for the three categories of video ( $H_{(2)} = 6.3, p < .05$ ), with the horse rider videos rated as more professional than the other two.

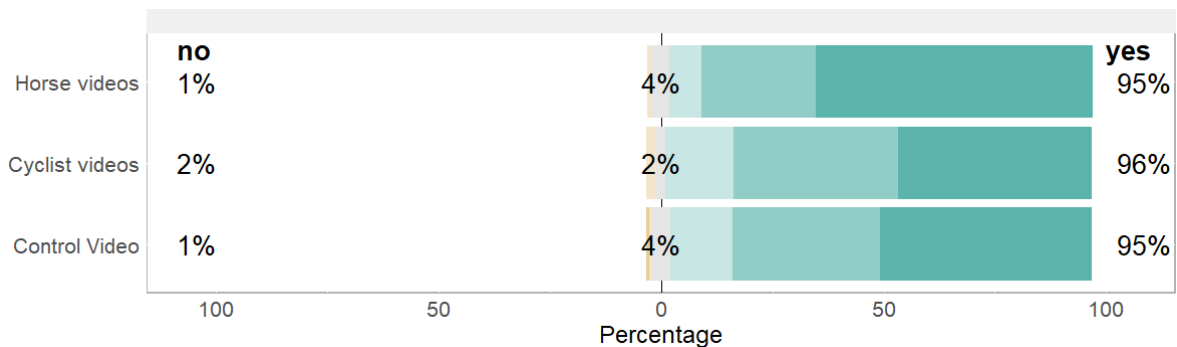


Figure 16. The distribution of respondents’ ratings for the professionalism of the videos, ranging from 1 (unprofessional) to 7 (professional). The coloured segments change from brown through to dark green, representing the increments on the scale from 1 to 7. Neutral scores of 4 are coloured in grey.

### 3.5.2 Did the length of the video feel appropriate for the message?

Respondents gave answers on a 1-7 scale, with 1 classified as ‘too short’ and 7 classified as ‘too long’. Roughly half of the respondents judged the videos as having an appropriate length (selecting the middle of the scale), while 41-57% (depending on the video that had been watched) found the videos too long (Figure 17). There was a significant difference in respondents’ rating of the length of the videos,  $H_{(2)} = 9.78, p < .01$ . Post-hoc tests revealed that respondents rated the control video as ‘too long’, more so than the horse videos ( $p < .05$ ) and the cycling videos ( $p < .01$ ). This reflects the actual length of the videos (Table 2).

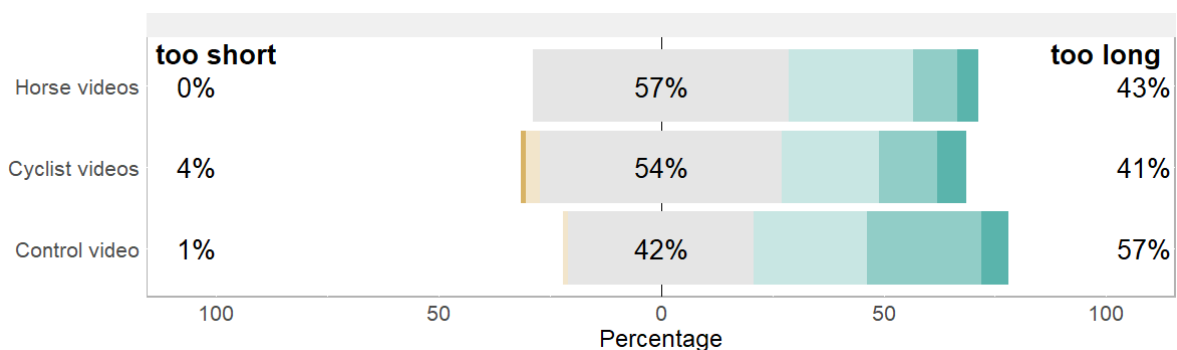


Figure 17. The distribution of respondents’ ratings for the length of the videos, ranging from 1 (too short) to 7 (too long). The coloured segments change from brown through to dark green, representing the increments on the scale from 1 to 7. Neutral scores of 4 are coloured in grey.

### 3.5.3 Did you think the message in the video was important?

Over 95% of respondents reported that all the videos contained an important message (Figure 18). Slight variation in the distribution of responses across the video categories was found to be significant ( $H_{(2)} = 7.31, p < .05$ ). Post-hoc tests revealed that respondents that saw the cycling videos rated their message as more important than the ones who saw the control video ( $p < .05$ ), with the importance of the message in the horse videos falling in-between.

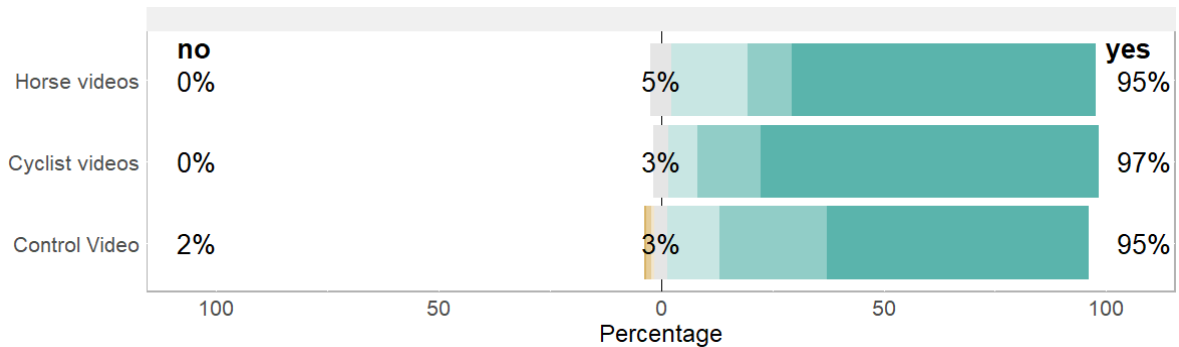


Figure 18. The distribution of respondents' ratings for the whether the message contained in the videos was important, ranging from 1 (No) to 7 (Yes). The coloured segments change from brown through to dark green, representing the increments on the scale from 1 to 7. Neutral scores of 4 are coloured in grey.

### 3.5.4 Did you think the producers put the message across in the best way?

Respondents overwhelmingly endorsed this statement, with 88-89% agreeing to varying levels that the message was put across in the best way. There were no differences in the distributions of these scores across the different categories of video (Figure 19).

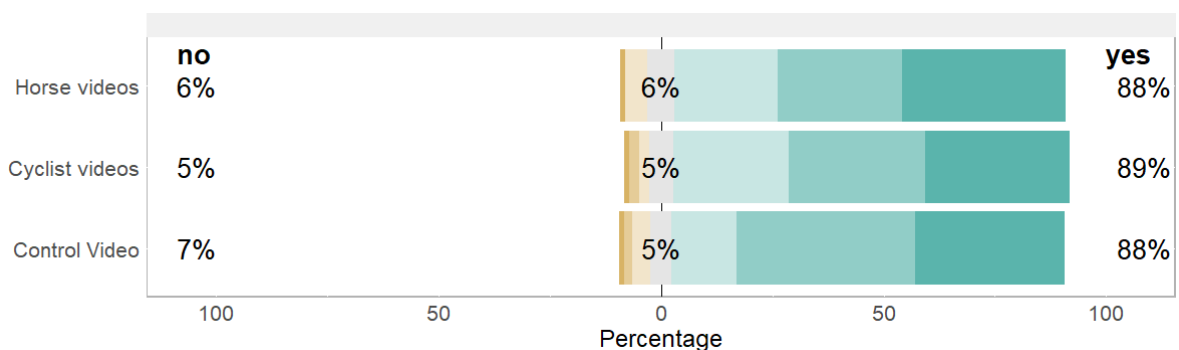


Figure 19. The distribution of respondents' ratings for the whether they thought the producers had put the message across in the best way, ranging from 1 (No) to 7 (Yes). The coloured segments change from brown through to dark green, representing the increments on the scale from 1 to 7. Neutral scores of 4 are coloured in grey.

### 3.5.5 Did the video add to your understanding of driver safety?

Most drivers thought that all three types of video improved their understanding of driver safety (65%+). A Kruskal Wallis test identified a difference in the distributions across video categories ( $H_{(2)} = 7.68, p < .05$ ), with the control video adding more understanding than the cycling video ( $p < .05$ ).

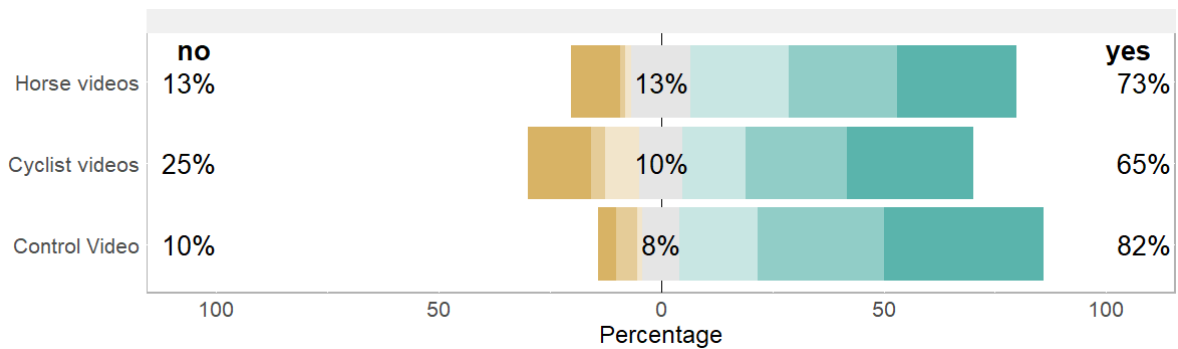


Figure 20. The distribution of respondents' ratings for the whether they thought the video added to the understanding of driver safety, ranging from 1 (No) to 7 (Yes). The coloured segments change from brown through to dark green, representing the increments on the scale from 1 to 7. Neutral scores of 4 are coloured in grey.

### 3.5.6 Did the video change your opinion towards horse riders/cyclists/or the flashing of headlights?

When asked whether the video changed their opinion towards the subject matter, the majority of the respondents that had seen the control video said yes (72%; Figure 21). In contrast, of the respondents that had seen the cyclist and horse videos, only 32% and 38% reported that their opinion had been changed, respectively. A Kruskal-Wallis test confirmed a significant difference between the three videos,  $H_{(2)} = 51.52$ ,  $p < .001$ , with the control video reportedly changing opinions more so than both the cycling and horse rider videos ( $ps < .001$ ). There was no difference between responses to the horse rider and cycling videos.

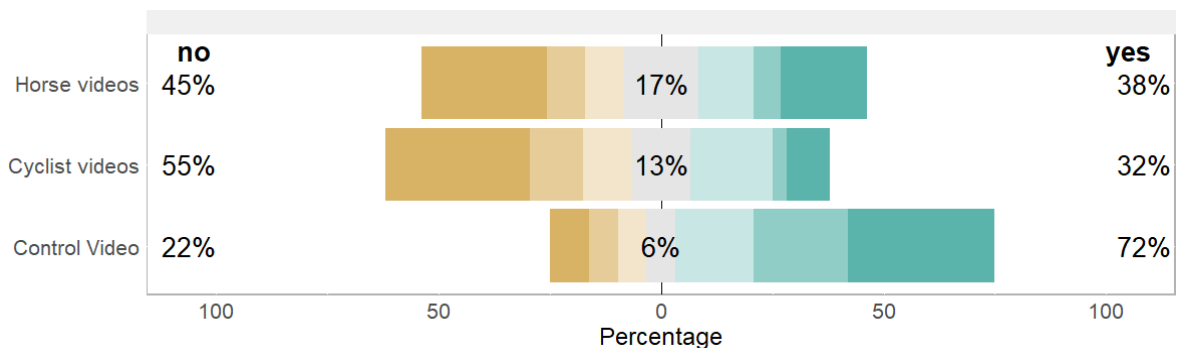


Figure 21. The distribution of respondents' ratings for the videos changed their opinions, ranging from 1 (No) to 7 (Yes). The coloured segments change from brown through to dark green, representing the increments on the scale from 1 to 7. Neutral scores of 4 are coloured in grey.

### 3.5.7 Do you think the personal stories at the beginning of the videos make the road safety message more or less effective?

A large majority of respondents rated the personal stories at the beginning of the videos as making the safety message more effective. No significant difference in the effect of the personal stories was found between horse and cyclist videos.

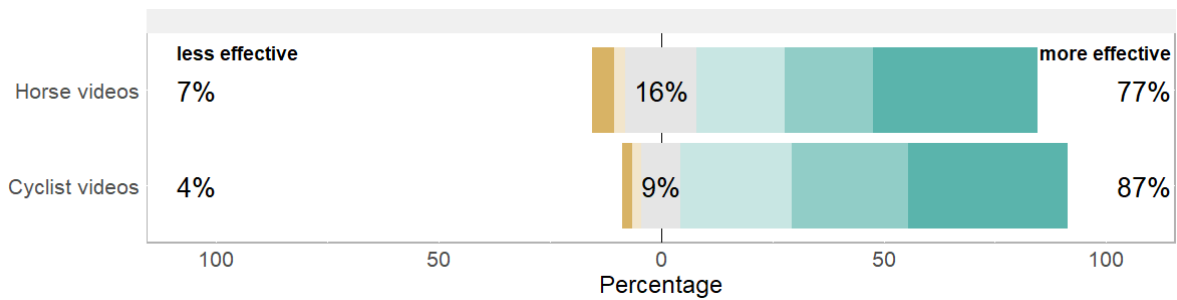


Figure 22. The distribution of respondents' ratings for the effect of the personal stories on the road safety message, ranging from 1 (Less effective) to 7 (More effective). The coloured segments change from brown through to dark green, representing the increments on the scale from 1 to 7. Neutral scores of 4 are coloured in grey.

### 3.5.8 In regard to the ability of the videos to put across the road safety message, do you have a preference for one over the other?

This question was only posed to those respondents who had seen either the horse videos ('Julie' and 'Laura') or the cyclist videos ('Duncan' and 'Priya'). We asked respondents to express a preference for one or the other videos that they saw on a 5-point ranging from 'strong preference for X' to 'strong preference for Y'.

Respondents' views on the horse videos were almost equally split with 21% preferring 'Laura' and 19% preferring 'Julie'. The fact that 60% of the sample stated that they had no preference, suggests that the videos were similar in their appeal.

In contrast, there was a distinct preference of respondents to the cyclist videos, with 52% preferring 'Duncan' over 'Priya'. The notable difference of the 'Duncan' video over all the others is that it focused on children rather than job roles, and this may have resonated more with our respondents.

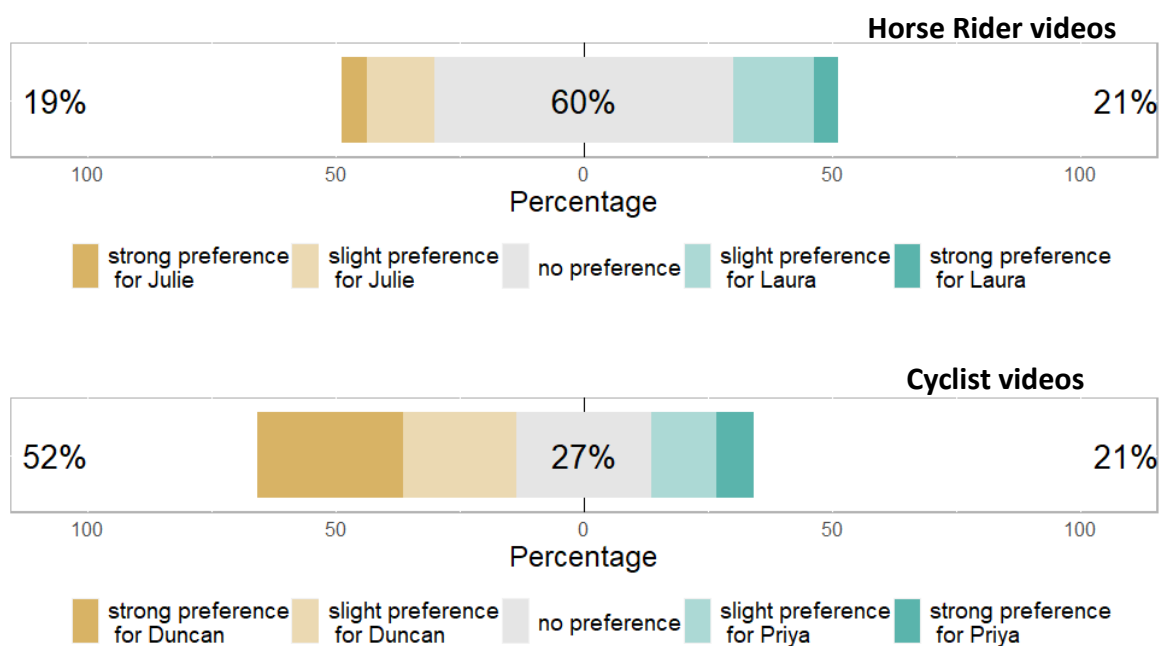


Figure 23. The distribution of respondents' preferences for the two videos they saw, either the horse videos (top panel) or the cyclist videos (bottom panel).

## 3.6 Free response comments

At the end of the study, respondents were asked to add any additional comments in a free-text response box. We received comments on the horse rider videos totalling 4007 words, and comments on the cyclist videos totalling 5319 words. A rudimentary thematic analysis was conducted on the comments.

### 3.6.1 Respondents' comments in relation to the horse rider videos

Regarding comments on the horse videos, 5 themes were identified:

- Previous attitudes
- Empathy
- Knowledge
- Future behaviour
- Kickback

Regarding **previous attitudes** a number of respondents were keen to describe their previously good attitudes towards horses on the road. Several of them related this to having direct or indirect experience of horses:

"I have always respected horse riders on the road as I was brought up in the countryside!"

"I encounter horse riders in my area and always give them plenty of room and pass slowly."

"I have friends who ride horses... so I think I have a good understanding of what measures to take."

"I used to ride a horse as a child so am usually careful when overtaking. I now would give even more space."

These statements demonstrate the importance of personal experience with horses (and horse riders). These participants are therefore less likely to view horse riders as belonging to an *out-group*, supporting the role of empathy in positive road safety behaviours towards these vulnerable road users.

For those respondents who did not have previous experience of horses, many commented on the role of the personal stories increasing **empathy** towards those particular riders, with a possible carry-over effect influencing the way they relate to future riders that they might encounter:

"The personal stories at the beginning of the videos made them more effective as it put a face to the story. It enforced that horse riders are normal people with jobs and should these people be injured from failing it could have tragic effects on their careers."

"I enjoyed the personal stories at the start as they made the people in the video more relatable."

"...very touching and thought provoking."

“I wondered where the videos were going at the start of Julie's, but it made sense, it increased my emotions and really demonstrated Julie as a 'normal' caring person. Made me want to drive responsibly around her.”

“When feeling impatient, it is easier to demonise horse riders by removing their identity and personality. The videos made you be able to identify with horse riders...”

In addition to empathy, respondents commented on new **knowledge** that had been gained because of watching the videos. An insight into why horse riders walk on roads (because they cannot travel across private land to reach off-road areas where they want to ride) was commented on several times:

“...they are very educative and insightful.”

“It made me realise that some people cannot help but ride on busy or fast roads.”

“They changed my opinion when they said that sometimes they have to go on the roads because they can't go through private land... I hadn't thought about this before and did used to find myself wondering why horse riders went on the roads because it isn't particularly nice for the horse and could be unsafe if you get a reckless or speeding driver. I feel more understanding towards the horse riders now...”

Importantly, respondents also acknowledged the impact these videos would have on their **future behaviour**. Some respondents reported that their behaviour was unlikely to change, though most of them caveated this with an argument that they already behaved responsibly around horses. This argument may have been derived from an illusory bias of superiority for some, but others clearly linked this to prior experience of horses in the road. Yet other respondents reported that the videos had prompted a change in their intended future behaviour:

“I think remembering the videos will help me approach horses slowly with care.”

“I will now drive past slower when overtaking horses.”

“The videos just made me realise how much room I should give to horse riders and how slowly I should pass them.”

“I think I am already careful but will now be extra careful and certainly leave more room when passing.”

Inevitably, however, some respondents reacted negatively to the videos. While the analysis of the video evaluation ratings (Section 3.5) suggested that only a small percentage of respondents responded negatively to most of the evaluation questions, it is useful to look at their comments. We have classified these comments under the theme **kickback**:

“My general opinion has not changed, however I am aggravated when riders do not acknowledge and thank you.”

This respondent was quick to identify failings in horse riders that seem an important part of the expected interaction. It may be that this respondent has encountered some distracted or uncommunicative riders, or perhaps the riders do not share the respondent's positive view of their driving behaviour around horses. Regardless of the underlying reason, it is arguably inappropriate to

equate the required safe driving behaviours of car drivers with a socially expected acknowledgement from horse riders. That the respondent raises this issue, suggests that they do not take safety around horses as importantly as they might claim.

“The personal stories were actually the worst part. You are indicating that just because this person is in a job where they are helping others I should in some way value their life more than others. It was actually quite annoying that I was shoved this wholesome person down my throat and being told look how amazing this person is so be nice to them on roads?”

A small number of respondents, such as this individual, recognised the attempt at emotional engagement and this appeared to annoy them (though others also recognised the emotional levers, yet still applauded the attempt).

“My opinions haven't changed. We all should enjoy our roads, but some people are selfish and refuse to pull over when it is SAFE to do so, and this annoys drivers.”

This respondent displays clear frustration at horse riders and is equating their mild inconvenience with the need to behave safely around horses. It is unlikely that such drivers will be influenced by emotional appeals.

### *3.6.2 Respondents' comments in relation to the cyclist-focused videos*

Several of the themes noted in relation to the horse videos persisted in the comments from respondents who saw the cyclist videos. **Previous attitudes** were again referenced by respondents who defended their existing behaviour around cyclists:

“I don't think it changed my opinion as I thought cyclists should be treated fairly and given space before I watched the videos”.

The theme of **empathy** was also apparent in the comments, with several drivers reporting that the personal stories were impactful:

“Nice to see normal everyday people on the video.”

“The personal stories were good, particularly when they talked about thinking about your own family when they're cycling.”

“These videos made me see it from a cyclist's point of view. I liked both the personal stories and enjoyed both of the videos.”

“Helped me see the perspective of cyclists more, especially the line ‘how much space would you want someone to give your own family’.”

While the theme of **knowledge** was noted within comments to the horse videos, knowledge did not feature heavily in the cyclist video comments. Factual information was included in the cyclist videos, but only one respondent commented on this:

“Duncan made a telling point when he said that a cyclist may need to avoid a pothole and ease out just as you are overtaking.”



Fortunately, positive comments regarding drivers' *future behaviour* were also noted, with respondents reporting intentions to behave differently in the future:

"Will give cyclists more space after seeing the videos."

"I will try to be more considerate and give them more space and pass more slowly."

"The videos really changed my perspective on cyclists and made me realize we need to consider them while on the road."

"It did change my mind about cyclists. I do find them annoying however I will be more considerate in future."

This respondent acknowledged negative attitudes towards cyclists. To have this particular individual report an intention to behave more safely around cyclists in the future is perhaps more important than improving the future behaviour of drivers who already report positive behaviour around cyclists.

**Kickback** was however more abundant in the comments regarding the cycling videos. Several comments noted that there are other subgroups of cyclists whom they perceive to act inappropriately on the road:

"[They will] not necessarily change my opinion towards cyclists, as it's just one example, there are many cyclists not behaving well on the road."

"Cyclists are not all the same, just as drivers are not all the same. There are good and bad, and everyone has good and bad days."

"I would love to see videos aimed at responsible cycling as well, as I have oftentimes encountered very reckless cyclists on the roads."

"The videos portrayed nice people out having a ride with family or friends, the type of people who are probably considerate to car drivers and do their best to not hold people up. This is a far cry from the packs of MAMILS [middle-aged men in Lycra] who plague the country roads and hold up car drivers by not moving into file [sic] to allow car drivers to pass. Recent legislation has made this worse as belligerent cyclists will now block the road without any fear of consequences. Cyclists should undergo formal training like the Cycling Proficiency which was taught in schools in my childhood. They should also carry an identifying registration plate and have insurance."

"Neither of the videos were like my regular encounters with cyclists to be honest, where you have queues of traffic behind a cyclist or small group of cyclists on country road where overtaking can only be done, frankly, at risk to both drivers and cyclists."

These respondents tend to like the videos but believe that the personal stories do not tackle the subgroups of cyclists that cause them the most frustration and anger. For these drivers, the leisure cyclists, especially those who ride in packs, are viewed as the problem.

**Kickback** was also noted regarding the use of personal stories. As with the respondents who saw the horse videos, several negative comments were made about the perceived attempt at emotional manipulation. Comments included:

“[The personal story] seemed like a cheap way to gain sympathy.”

“They seemed a bit too dramatic for what they were. A clear message could be portrayed better without a drawn-out story with sad background music.”

“The personal stories were touching, but I don't need a video to remind me that cyclists are people with real lives. And it's slightly patronising to imply that every cyclist is a caring nurse or devoted grandfather.”

“I thought they had a nice emotional angle, but that they didn't really expand a lot on the actual finer details of drivers in regard to cyclists, nor really touch upon the issue of cyclist behaviour. For example, what is the recommended distance to leave between a car and a cycle? Why not say this in the video?”

In addition to *previous attitudes*, *empathy*, *future behaviour*, and *kickback*, the cyclist videos elicited some additional themes. These included:

- Blame shifting
- Similar lives
- Health benefits

With *blame shifting*, some respondents believed that cyclists should take responsibility for their actions. This was especially apparent in relation to the ‘Duncan’s video, as several respondents suggested that the children should not be on the road (rather than agreeing that drivers should behave responsibly around children on bicycles):

“I'm not sure I thought the father was being completely responsible in taking his child to ride on a public road as they cannot be guaranteed to be safe places as a result of some driver's behaviour.”

“Don't take kids cycling on a road unless they have been trained and can deal with traffic. A child could veer into the direction of a car who may not be able to avoid them. Taking kids cycling on the roads is irresponsible.”

“My thoughts on... asking drivers to move out the way of his children was a little one sided. He also has a responsibility to keep them safe by not taking them on the road.”

These defensive comments are natural reactions that occur when people are faced with dissonance (e.g., the conflict between negative attitudes to cyclists and positive attitudes towards child safety). By criticising the decision to allow children to ride bicycles on roads, drivers can reduce uncomfortable dissonance by shifting any blame for putting child cyclists at risk away from themselves and onto the parents.

Other *blame shifting* comments noted that drivers behave inappropriately, though the solution was to impose restrictions on vulnerable road users:

“I am not sure that cyclists or horse-riders have a place on busy urban roads but that is simply because I do not trust all drivers to behave safely.”

A second theme peculiar to the cycling videos has been termed *similar lives*. This refers to comments, both negative and positive, about how successful the personal stories were in impacting on the respondents. Many people commented that one video resonated more with them because it echoed their own lives in some way. Alternatively, a video might have failed to resonate because it was too different from their own experiences:

“I really related to the first video probably because I have young children and would be so worried if they went out cycling on the roads.”

“I preferred Duncan maybe because I interact with more kids on a daily basis than elderly people so that tugged at my heart strings more,”

“I could relate to the gentleman as we both have kids and mine like to go cycling already. I am also a nurse so I can relate to the second video and i like to go out on my bike at times. They are both relatable.

“I haven't got children so although I believe it's important to look out for all cyclists no matter the age I wasn't as personally connected to that video.”

A final theme that emerged from the comments to the cyclist videos was termed *health benefits*. For these respondents, the impact of cycling on health and fitness was intrinsically linked to the appeal of the videos:

“It is a good way to stay fit and exercise and people should be able to go a nice bike ride.”

“I identified with the exercise for stress release and mental health...”

“I liked the focus on health and freedom, especially the advocacy for the young to be using active transport and to be treated with care. It is the best was to break continued car reliance as the default.”

“I thought the video of Duncan talking about benefits for children, fitness, independence, etc. and asking those questions about what if it was your children cycling, was important.”

## 4. Discussion

The results of this study have demonstrated that a series of emotive videos produced by the British Horse Society and Cycling UK to improve attitudes towards riders of horses and bicycles have achieved their aim, at least in the short term.

### 4.1 Explicit attitude questions

Analyses of our explicit attitude questions demonstrated that the horse rider videos did indeed improve reported attitudes when items such as 'Car drivers should take extra care when passing [cyclists/horse riders]' and 'Most [cyclists/horse riders] behave responsibly when on the road' were combined. The improvement in attitudes due to seeing the videos was significantly greater than that of a control group who saw a road safety video that was unrelated to horses or cyclists.

It also appeared that this improvement in attitudes was specific to the vulnerable road user that appeared in the videos. Respondents who saw the horse videos did not show a similar improvement in attitudes towards cyclists beyond that of the control group. Similarly, respondents who saw the cyclist videos did not show an improvement in attitudes towards horse riders. The specificity of these effects removes the likelihood that they have been caused by any generic factor that may have influenced the intervention groups but not the control groups.

Looking into these questions individually, we can see that 24% of drivers rated horse riders as more 'similar to me' following the horse-focused videos, suggesting that 1 in 4 people may receive a boost to empathy. A similar percentage felt cyclists were more 'similar to me' after viewing the cycling video, with 27% recording an increase in this rating.

Another key question noted in the introduction was that of the legitimacy of VRUs. To assess a change in perceived legitimacy we can look at the item that stated '[Horse riders/cyclists] should not be allowed on the roads'. We found 38% of respondents who viewed the horse rider videos reported lower agreement with this statement after the intervention (4 in 10). Following the cycling videos, 26% of respondents also reported lower agreement with this statement.

When asked more generally whether the videos had changed their opinions on VRUs, of the respondents that had seen the cyclist and horse videos, 32% (3 in 10) and 38% (nearly 4 in 10) reported that their opinion had changed, respectively. These numbers may have been curtailed by ceiling effects: If respondents wanted to demonstrate a very safe attitude in the first set of explicit attitude questions (by selecting 5 on the 5-point scale), there was no way for them to demonstrate an improvement in attitudes on the second round of explicit attitude questions. Certainly, the overall attitudes towards horse riders and cyclists in our sample were remarkably positive.

### 4.2 Implicit Attitudes

Scores on the IAT did not differ across the study conditions. All implicit bias scores were close to zero indicating no particular biases. This suggests that our respondents do not have any deep-seated aversion to VRUs that they cannot articulate. Instead, it is perhaps more likely that any negative attitudes are borne out of experiences with these particular VRUs where drivers' goals have been frustrated (e.g., a timely navigation from A to B).

The lack of implicit biases against cyclists and horse riders is beneficial as such implicit attitudes are much less amenable to change (Rydell and McConnell, 2006). While changing negative explicit

attitudes is not necessarily easy, the general consensus is that it should be easier than reprogramming implicit attitudes.

Alternatively, we might question the application of the IAT test to this domain. While the IAT has seen great success in a range of fields (Greenwald et al., 2009), its application to the road safety is nascent. While some results have demonstrated success in tapping into underlying attitudes (e.g., Goddard, 2017; Ledesma et al., 2019), other studies have failed to find D-scores to relate to road safety behaviour (e.g., Goddard et al., 2020). Fortunately, the success of the interventions on other measures, such as the explicit attitudes, renders this question moot.

### 4.3 Passing Behaviours

Two questions asked respondents to rate the distance that they thought they should give either a horse or cyclist when overtaking (depending on the survey they were assigned to) and what speed they would choose. Respondents chose lower speeds and wider passing distances for horses than for bicycles (as recommended by the Highway Code). These responses were also influenced by exposure to the intervention videos. Respondents who had viewed the horse rider videos increased their passing distance and decreased their speed following the videos compared to the control group. The same pattern was also found in those respondents who viewed the cyclist videos.

These results suggest that the videos have influenced intended future behaviour. If carried through, these behaviours should reduce the likelihood of a collision, or near collision, with one of these VRUs.

### 4.4 Video evaluation

Respondents reported the videos to be very professionally produced. The horse videos were considered to be the best produced videos, though all categories of video rated very highly, with only 1-2% questioning the professionalism.

Regarding video length, there was a tendency for respondents to rate them as 'too long'. This was especially the case for the control video (which was over a minute longer than the horse and cycling videos). In the free response comments, several respondents mentioned the length of the videos and offered suggestions as to how these could be reduced. These comments were however contradictory across respondents (e.g., some wanted the personal stories to be shortened, while many more were extremely positive about them). On this basis, it is hard to recommend that these videos should be reduced in length.

The road safety messages were uniformly considered important, and respondents generally agreed that the producers had put across the message in the best way. Respondents also reported that these videos had added to their understanding of driver safety (73% who watched the horse video, and 65% who watched the cycling videos). The surprise increase in understanding for the control video is attributed to the topic (i.e., not flashing headlights other than to warn other drivers), which many respondents admitted to not knowing. The personal stories were also reported to be effective, but the use of children in Duncan's story was perhaps the most relatable message.

#### 4.4 Qualitative analysis of the free-text responses

From the comments, it was clear that many respondents felt they had positive attitudes towards cyclists and horse riders on the road prior to the study. Most of the comments supported the use of the emotive stories, with some respondents being moved, in one case almost to tears. Several comments touched on the humanising role of the videos, showing that these VRUs are 'just like normal people'. These new perspectives fostered a new empathy for the VRUs. A minority of respondents however took umbrage at the perceived emotional manipulation, and some thought that the 'blue light' appeal was a little condescending.

In the comments following the cyclist videos, one of the problems respondents noted with the personal stories was that the individuals featured did not represent the cyclists that cause them problems on the road. Packs of leisure riders were particularly singled out. While these videos might change attitudes towards some cycling sub-groups, they are unlikely to reduce negative attitudes towards these leisure riders.

Respondents valued the knowledge gain from the horse videos (e.g., the reasons why horses have to walk on roads), though the provision of knowledge in the cycling videos (e.g., cyclists may swerve to avoid potholes) was less appreciated. There were also some interesting themes that appeared to be cycling-specific, including a focus on the health and fitness benefits of riding, the reliance on similar experiences for the cycling videos to have an emotional impact, and 'blame shifting' which was especially directed at the video with children: a small minority considered that it was unsafe and irresponsible to take young children cycling on the road.

#### 4.5 Conclusions

The videos have achieved their goal of shifting explicit attitudes towards horse riders and cyclists, though it should be noted that this effect is specific to the VRU depicted in the videos. Furthermore, the intervention changed potential future passing behaviours, with respondents reporting a greater passing distance and lower speed after watching the videos. The free-response comments make it clear that the emotional approach is not suitable for everyone, though with the many statistically robust effects that have been found, there is clear support for the overall effectiveness of this intervention. The preference for the video containing children suggests that, at least for cycling, there may be alternative approaches to the use of job roles that can engage viewers emotionally. These may be worth exploring in future productions.

The current project only allowed for an immediate follow-up of attitudes following exposure to the videos, and it would be useful to undertake a longitudinal study to assess whether the impact of the intervention holds up over time. However, for a one-shot evaluation, the results are persuasive, and we highly recommend the wider distribution and promotion of these videos.

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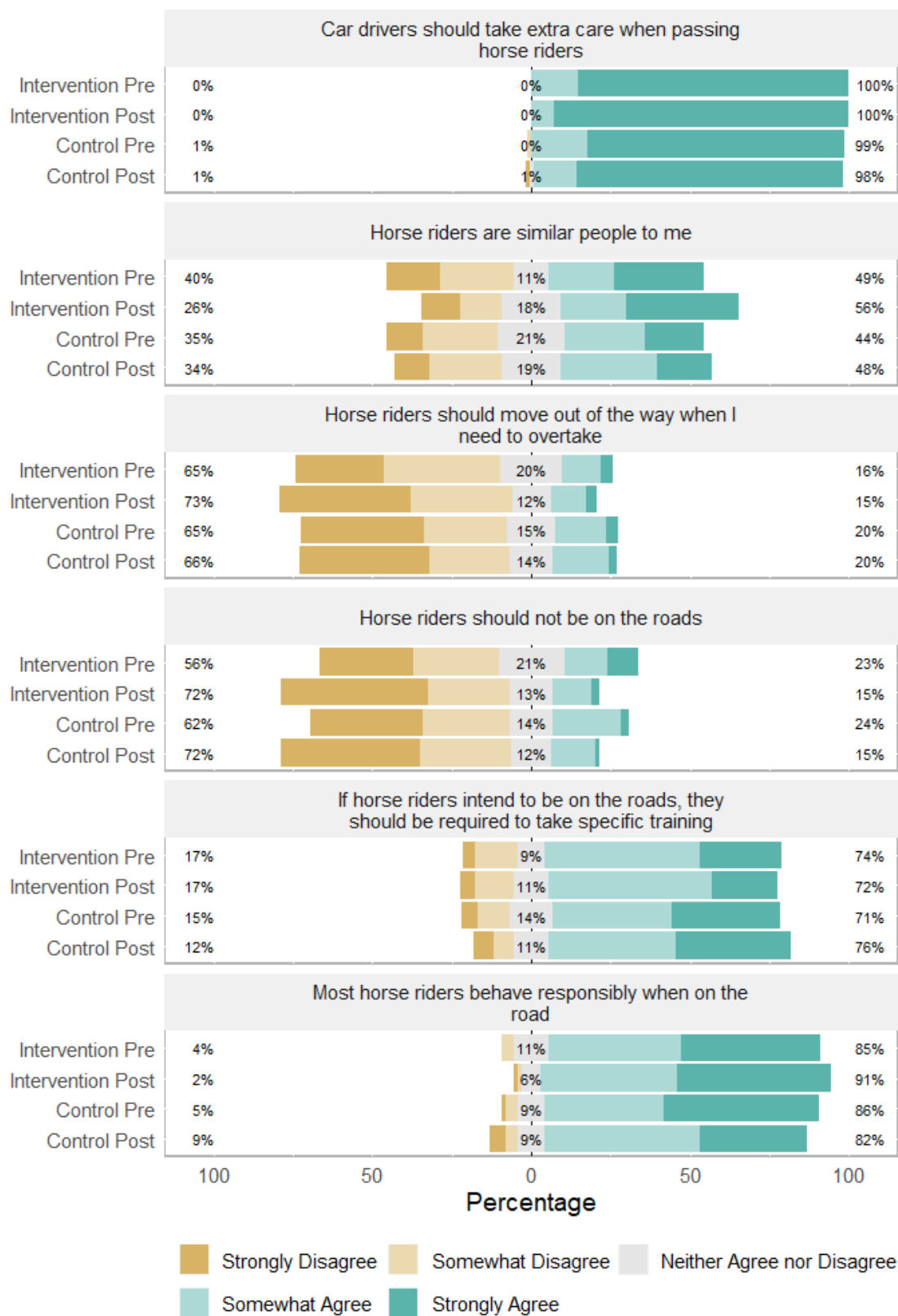
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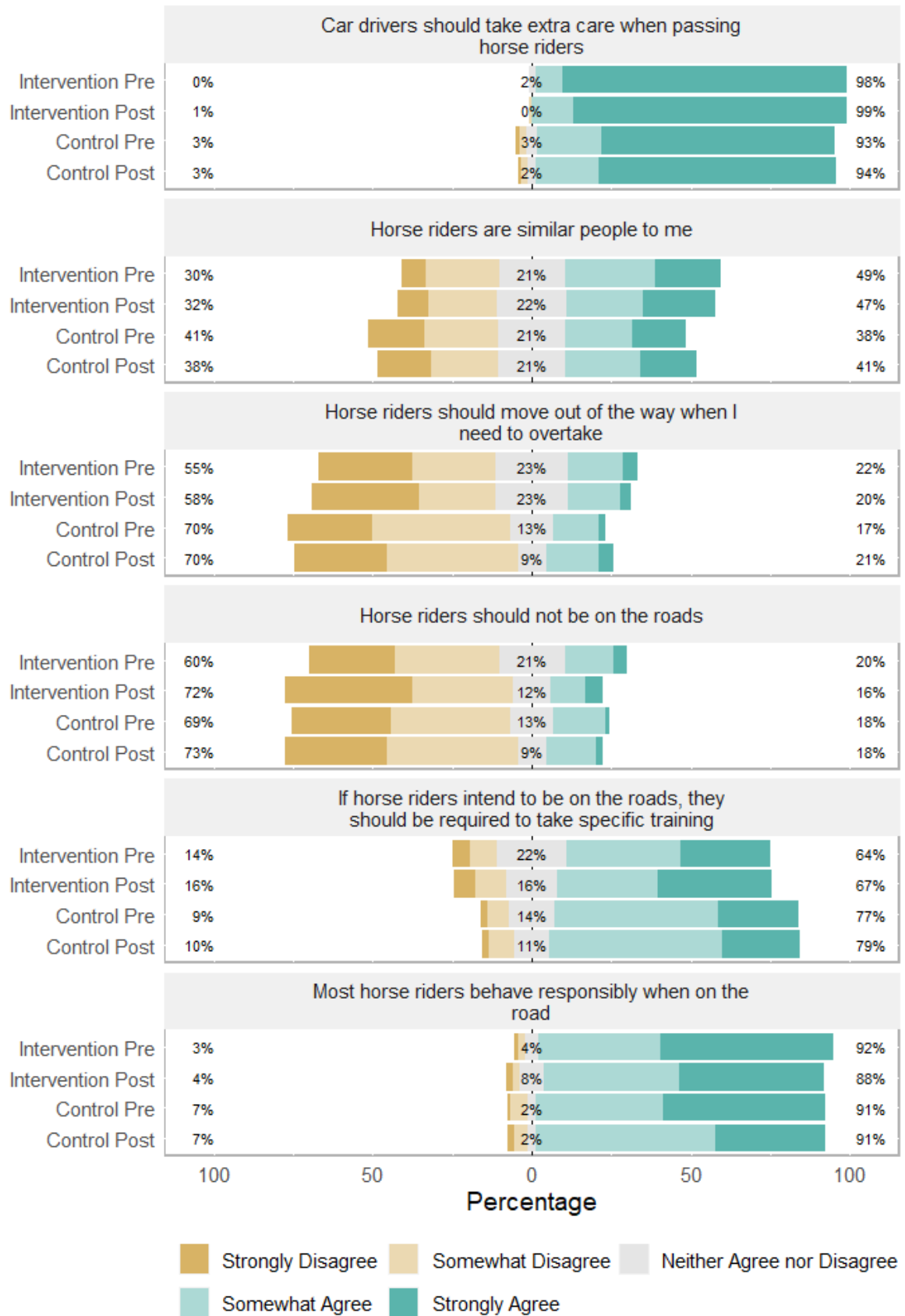
## APPENDIX 1 – Respondents’ ratings for all explicit attitude questions

Respondents were asked to rate their agreement with 12 explicit attitude questions (6 horse rider questions, 6 cyclist questions). The ratings are given here for each of the four groups (horse intervention, horse control, cyclist intervention, and cyclist control).

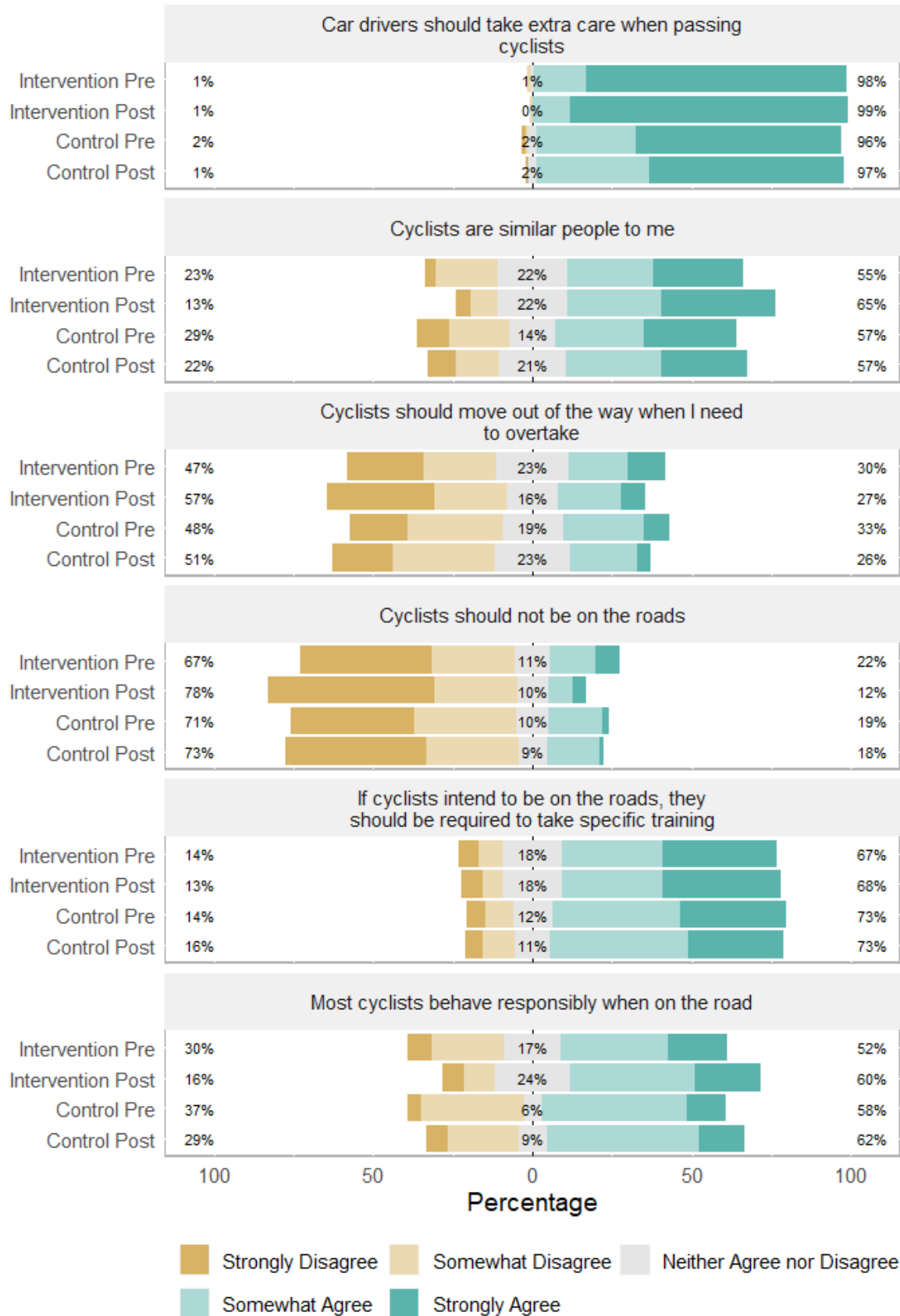
### Attitudes towards horse riders by respondents in the Horse Rider Survey



### Attitudes towards horse riders by respondents in the Cyclist Survey



### Attitudes towards cyclists by respondents in the Cyclist Survey



### Attitudes towards cyclists by respondents in the Horse Rider Survey

