



CLIENT PROJECT REPORT CPR2926

Effectiveness of close following deterrents

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Executive Summary

Driving too close to the vehicle in front ('close following' or 'tailgating') is generally accepted as a hazardous behaviour as it increases the likelihood of collisions occurring. Previous work by TRL has revealed that almost one third of personal injury accidents on the HA network are either wholly or partially a result of close following (Gorrell, Nicholls & Winnett, 2010). Reducing close following has a number of advantages including improved road user safety, reduced congestion, improved fuel efficiency, and a reduced carbon footprint.

There are various means of encouraging drivers to reduce close following, which can be arranged into three categories. First is the provision of advice (e.g. chevron markings on the carriageway along with the advice to 'keep two chevrons apart'). An example of the second category (interactive-deterrent systems) is a vehicle activated sign that presents a message to drivers when their headway is below a certain threshold. There are also enforcement systems (e.g. prosecution on the basis of video evidence). The TailGuardian vehicle decal combines advice and interactive-deterrent systems to encourage drivers to consider the suitability of their following distance.

The effectiveness of the TailGuardian on drivers' self-reported close following intentions was investigated using a self-completion survey. Surveys were completed by drivers at two service stations on the M25, with 227 usable survey responses gathered.

Key findings were:

- TailGuardian exposure and awareness is low relative to that of other signs and vehicle stickers (30% of respondents recalled previously seeing the decal).
- Most respondents recognised that the TailGuardian is a close following deterrent, even if they did not understand its precise meaning.
- On average, drivers reported that they would increase their following distance after seeing the TailGuardian; after reading information about how the TailGuardian works, they reported a greater increase in following distance.
- Drivers who report a high frequency of close following may be more resistant to messages aimed at reducing close following.
- Those with a high tendency to close follow were more likely to hold negative (i.e. unsafe) attitudes towards the behaviour, and reported that they would increase their following distance to a lesser extent than those with a low tendency to close follow.

Based on the findings a number of recommendations are proposed. Focus groups with drivers would improve understanding of why close following occurs, and how it could be discouraged. Providing information to drivers about an intervention appears to be important in ensuring a positive impact on driver behaviour, and so further investigation into the effectiveness of different types of education campaign is recommended, perhaps as part of any focus group research. Finally, other types of vehicle-based and roadside messages should be explored to determine whether some are more effective than others at achieving a reduction in close following.

1 Introduction

1.1 Background

An important part of the HA's business is to improve road safety and reduce journey delays. Driving too close to the vehicle in front (often referred to as 'close following' or 'tailgating') is generally accepted as a hazardous behaviour as it increases the likelihood of collisions occurring. This can be due to a decreased time headway, and the external distraction caused by individuals who are being close followed monitoring their rear-view mirror with increasing frequency, and therefore increasing the time spent with their eyes off the road (Diels, Reed & Weaver, 2009). Previous TRL work revealed that about 29% of personal injury accidents on the HA network are a result of close following (either wholly or partially) (Gorrell, Nicholls & Winnett, 2010).

There are a number of significant benefits associated with the reduction of close following in addition to improved road user safety. These include a reduction in congestion, fuel use and carbon footprint (due to a reduction in the 'start-stop' driving style associated with traffic bunching). Therefore deterring close following behaviour may result in benefits to road safety and reduced journey delays.

1.2 Theories of close following

In a study of close following behaviour conducted at TRL, drivers rated it as the most irritating driver behaviour engaged in by other drivers but was also observed to be the most prevalent unsafe driving behaviour in which they engaged (Diels, Reed & Weaver, 2009).

An unpublished review of psychological influences on close following behaviour carried out at TRL in 2011 summarised the possible mechanisms that result in close following:

- Errors in estimating the distance to the car in front (drivers tend to overestimate this distance)
- Errors in judgement of speed required to maintain a following distance
- Differences in risk perception (i.e. the ability to comprehend the risk posed by close following)
- Differences in risk acceptance/threshold
- Social pressures – pressure to keep up with traffic flow
- Attitudes towards close following
- Aggressive driving

Previous research (Shinar & Schechtman, 2002) has suggested that drivers do not find it easy to estimate following distance accurately, and that adopting time as a measure is more prone to errors than adopting measures of length (metres or car lengths). The authors showed in a field study that providing in-vehicle feedback to drivers on immediate time headway (i.e. the elapsed time between a lead vehicle passing a certain point, and the following vehicle passing the same point) increased their following distance.

Studies have considered static signs advising against tailgating, and have found some positive behavioural changes in response to the signs (e.g. Michael, Leeming & Dwyer,

2000). However no previous research could be found in relation to vehicle-based close following signs.

1.3 Reducing close following

Various techniques to encourage drivers to reduce close following were identified by Gorrell et al. (2010). These fall into three categories:

- Advice, e.g. chevron markings on the carriageway along with the advice to 'keep two chevrons apart'.
- Interactive-deterrent systems, e.g. vehicle activated signs that present a message to drivers when their headway is below a certain threshold.
- Enforcement systems, e.g. prosecution on the basis of video evidence, or using technology to detect following distances.

Gorrell et al. recommended that advice and interactive-deterrent systems should be combined, and stated that enforcement systems should be considered to provide evidence to support prosecution.

1.4 The TailGuardian

A range of interventions to reduce close following have been identified by Palmer et al. (unpublished report), and a cost-benefit analysis was calculated for some; the TailGuardian device was recommended for trialling, and the devices were subsequently rolled out to national fleet operators.

The TailGuardian combines advice and interactive-deterrent elements to encourage drivers to ensure they are driving with an appropriate headway. Palmer and Rillie (unpublished report) provide a full description of the TailGuardian device and previous on-road trials undertaken. These involved the distribution of TailGuardian devices, with 4,470 devices delivered to fleet operators for deployment on their vehicles. This was far fewer than anticipated and insufficient incident data were collected to allow an analysis of the effectiveness of the TailGuardian (Palmer & Rillie, unpublished). It was suggested that a longer trial may be required to collect sufficient collision data to determine any effect. In the current trial another approach was taken; the Highways Agency's Network Operational Solutions Team wished to expand on the work previously undertaken and further investigate the effectiveness of vehicle-mounted decals such as TailGuardian on self-reported close following intentions.

1.5 Report structure

The current report presents findings from a road user survey exploring the impact of close following deterrent devices.

Section 2 describes the method used to distribute the TailGuardian decals and collect the survey data. The results are presented in Section 3, and conclusions and recommendations are given in Section 4.

2 Method

2.1 Survey aims and objectives

The main aim of the survey was to examine the views of road users regarding close following, and in particular the TailGuardian sign.

2.2 Design

The key dependent variable¹ collected in the survey was respondents' self-reported response to the sign in terms of their following distance ('change in following distance'). This was measured both before and after being provided with information about the TailGuardian, with this constituting a repeated measures independent variable. Other questions gathered data on:

- Recalled exposure to the TailGuardian sign (dependent variable).
- Perceived purpose of the TailGuardian sign (open question).
- Attitudes towards close following (used to arrange participants into different groups for the purpose of analysis).
- Self-reported close following behaviour (in terms of percentage of time that respondents knowingly follow the vehicle in front too closely on various road types – used to arrange participants into different groups for the purpose of analysis).
- Demographic information (vehicle type, frequency of motorway driving, annual mileage, years driving, accident history, gender, age).
- Recalled exposure to various messages displayed on the rear of vehicles and to motorway VMS.

2.3 Distribution of decals

At the start of the current project TRL had approximately 1,650 TailGuardian decals available for distribution. It was initially intended that these decals would be circulated among three or four Managing Agent Contractors in the M25 area; however uptake of decals through the MACs was poor. Therefore the criterion for decal distribution was changed to organisations that operated on the Highway Agency Network. A total of 2161 TailGuardian decals were distributed amongst 12 organisations.

¹ Dependent variables are outcomes on which we measure changes associated with the independent variables. For example in our design one independent variable was 'Information about TailGuardian' (two levels – 'before' and 'after'); therefore we can ask the question "Does self-reported response to the TailGuardian change between 'before' and 'after' receiving information on its purpose?". We can also treat group as an independent variable (for example – male and female drivers) and ask if people in different groups react differently to the sign.

The decision to contact fleets was adopted to ensure all of the decals were distributed. Fleets were contacted directly through links TRL already had and through newsletters aimed at fleet managers, describing the study.

It was anticipated that the decals would be distributed to organisations operating on the M25 in the weeks prior to the surveys being conducted, so that survey respondents were more likely to have seen the decal on the road network. Unfortunately this did not transpire, with decal distribution taking place later than expected, and over a wider area. However, as described in Section 3.3, some exposure to the TailGuardian signs was apparent amongst the survey respondents.

2.4 Participant recruitment

Surveys were undertaken with 229 participants at two service stations on the M25 (Thurrock and Cobham). Drivers parking at the service station and approaching the service area were invited to participate by filling out a self-completion questionnaire during their stay at the service area. On completion and return of the questionnaire, they were paid £5 in cash, in line with standard practice on incentivising members of the public to take part in surveys (e.g. Simmons and Wilmot, 2004).

2.5 Materials

The survey is shown in Appendix A.

3 Results

3.1 Responses

A total of 79 surveys were returned at Thurrock; of these, 77 were usable. At Cobham, 150 surveys were returned; all of these were usable. Therefore a total of 227 usable surveys were collected.

3.2 Demographics

Tables showing full demographic data can be found in Appendix B.

3.2.1 Age and gender

As shown in Figure 1, the majority of respondents were aged between 25 and 54 (62% of respondents). Respondents aged 24 or under accounted for 16% of the sample, while those aged 65 or over accounted for 8%. This was due to a low proportion of patrons in this age group at the service stations, rather than a disinclination among this age group to complete the surveys.

Over two thirds of respondents were male; 29% were female.

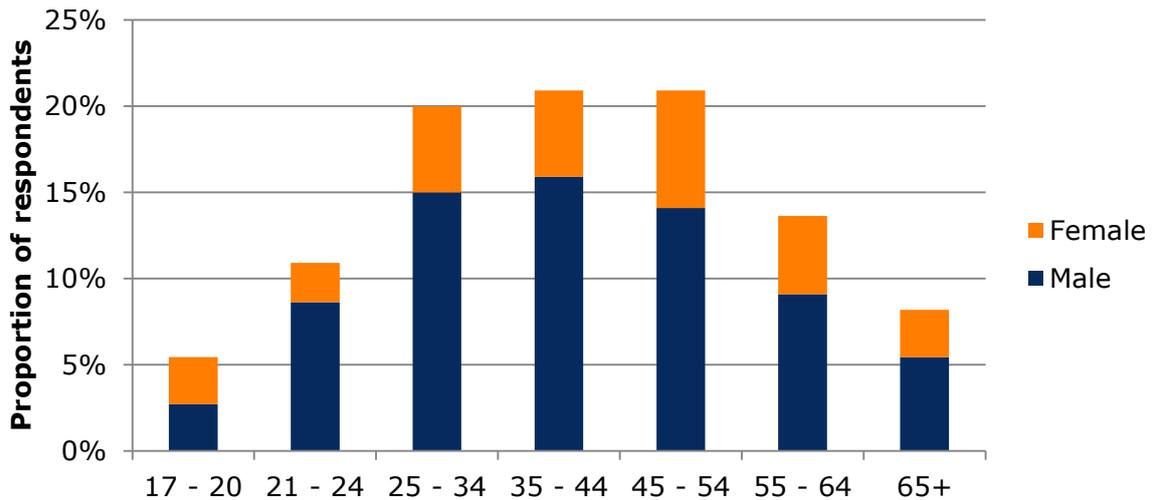


Figure 1. Age and gender of respondents (n=220)

3.2.2 Vehicle driven

Over 80% of respondents were car drivers, as shown in Figure 2. Vans were driven by 14% of respondents, and HGVs by 8%.

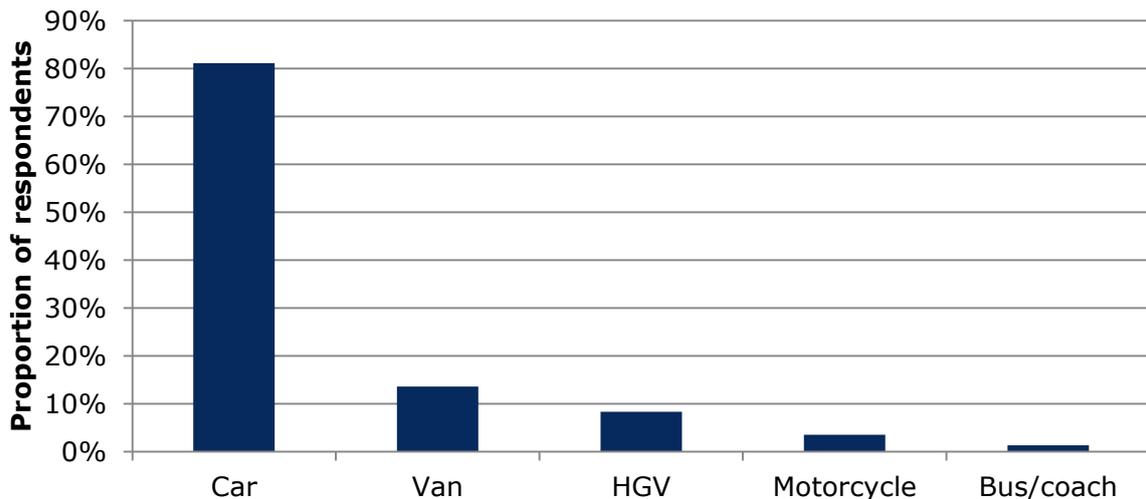


Figure 2. Vehicle driven (n=227)²

3.2.3 Frequency of motorway use

Respondents were asked how often they drive on motorways. Almost a third of the sample (32%) used motorways five or more days a week; in total, 72% used the motorway at least once a week. Around one in eight respondents use the motorway less than once a month, as shown in Figure 3.

² Although respondents were asked to indicate which vehicle they normally drive, some chose more than one option, hence a total greater than 100%.

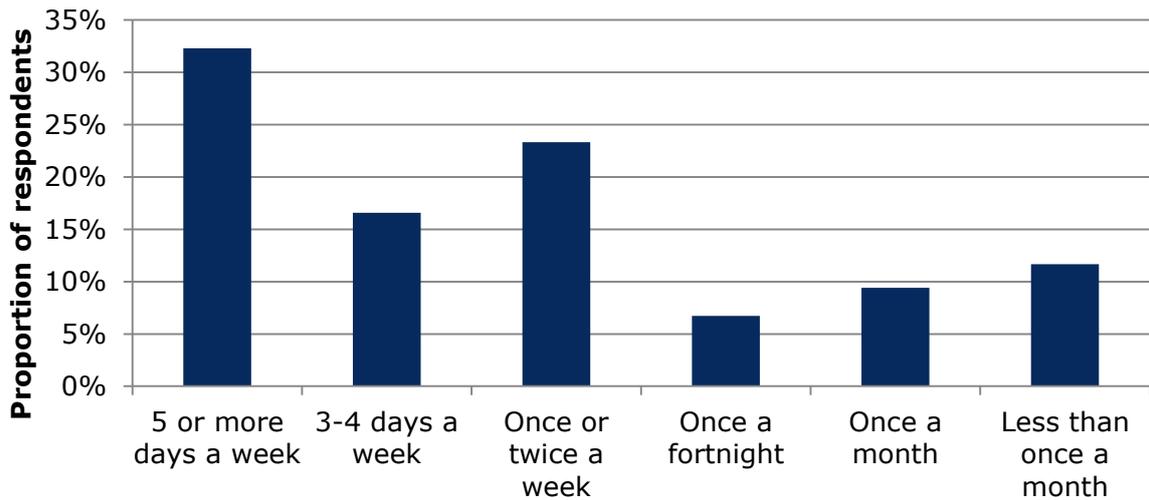


Figure 3. Frequency of motorway use (n=223)

3.2.4 Annual mileage

The most frequently reported annual mileage was 5,001-10,000 miles, with 24% of respondents choosing this option (see Figure 4). Twelve percent of respondents drove under 5,000 miles annually, while more than 20% drove over 25,000 miles.

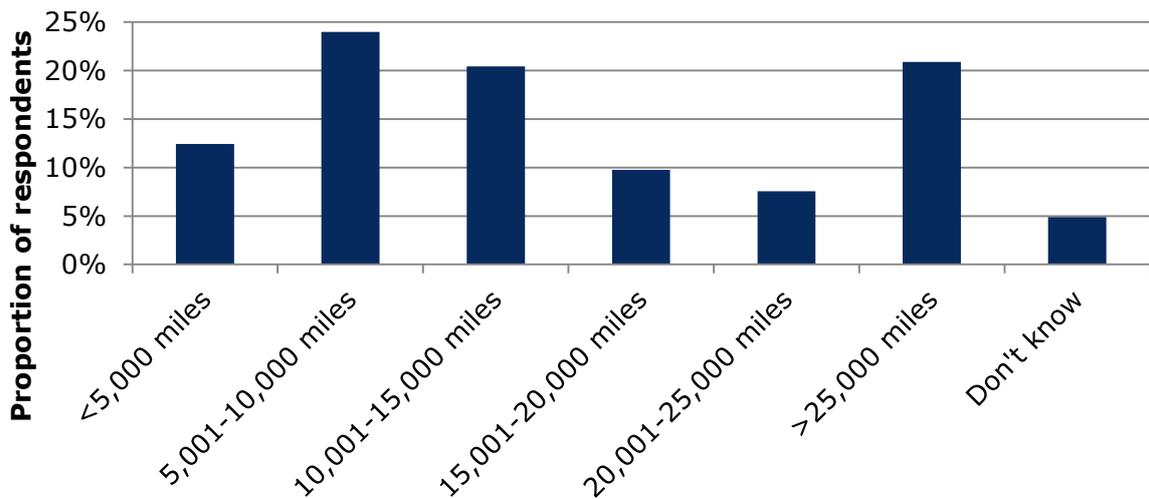


Figure 4. Annual mileage (n=225)

3.2.5 Driving experience

Respondents were asked to state the year they passed their driving test. From this, their driving experience in years was estimated by subtracting the year they passed from 2014. As shown in Figure 5, over half of respondents (53%) had over 21 years of driving experience, reflecting the age demographics of the sample. Twelve percent had been driving for five years or less, and 35% had between five and 19 years' experience.

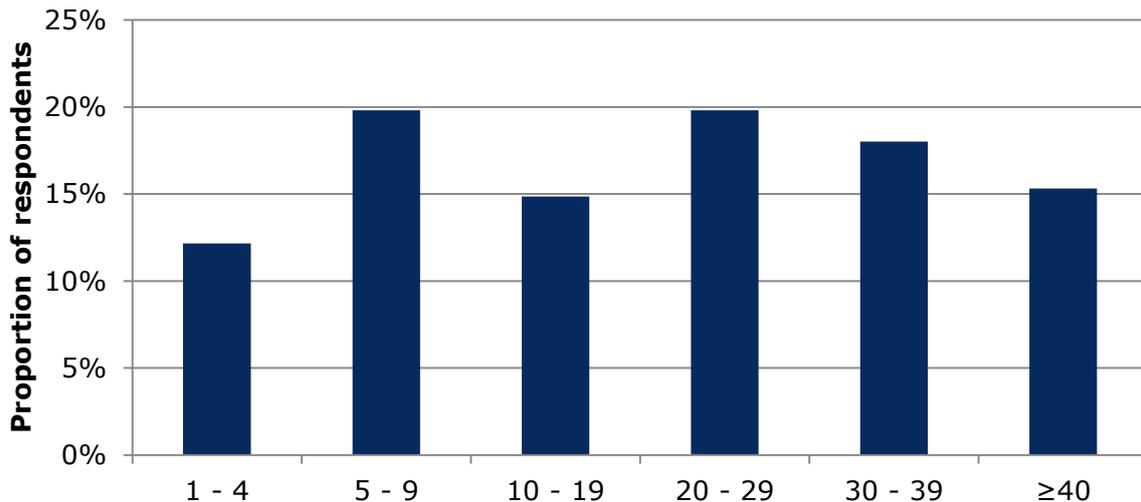


Figure 5. Years of driving experience (n=222)

3.2.6 Accident involvement

Respondents were asked to state the number of road accidents in which they had been involved (regardless of blame) over the last five years. Figure 6 shows that just under two thirds of respondents had not been involved in an accident, while just over a fifth had been involved in one accident. The remaining 12% had been involved in two or more accidents. In total, the respondents had been involved in 112 accidents in the last five years.

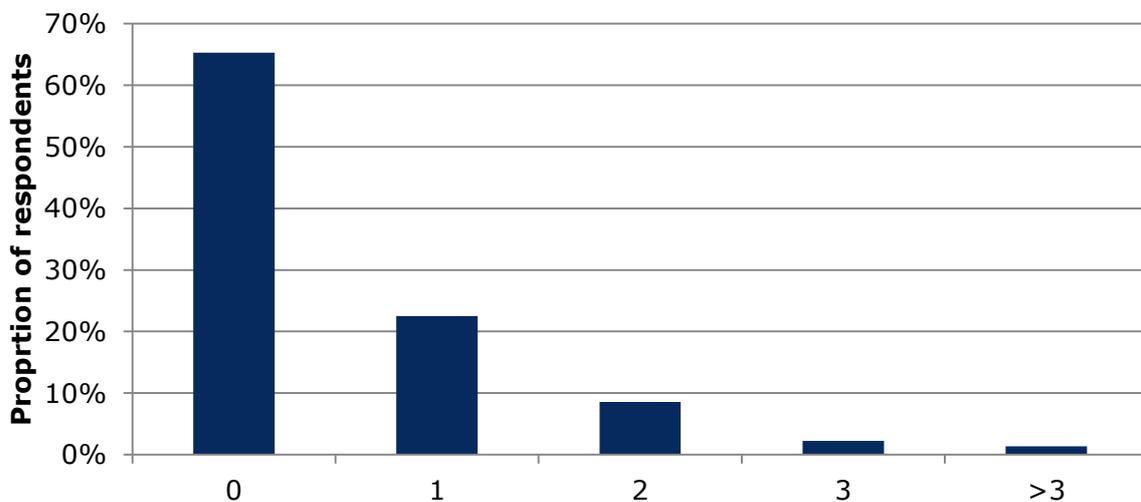


Figure 6. Number of accidents in the last five years (n=222)

To determine whether close following was a potential contributory factor, respondents who had been accident-involved were asked whether any of the accidents involved a shunt into the vehicle in front, or from behind, and whether any of the accidents happened because they or another driver were following a vehicle too closely.

As shown in Figure 7, 10% of the reported accidents involved a shunt and were a result of close following. A further 10% involved a shunt but were not reported to be a result of close following. The majority of accidents (78%) did not involve a shunt or driving too close.

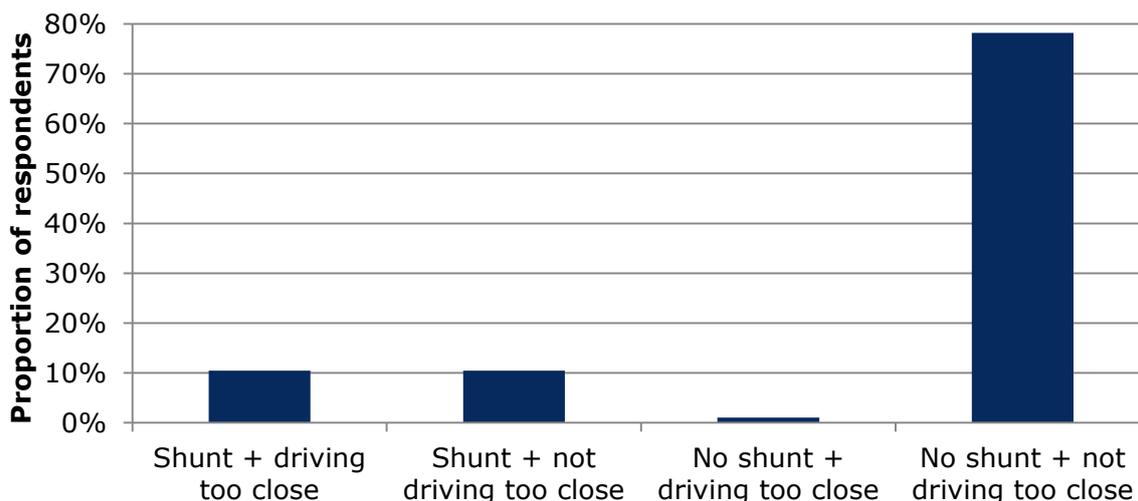


Figure 7. Accident types (n= 202)

3.2.7 Penalty notices and court summons

Respondents were asked to state whether or not they had received a fixed penalty notice and/or been summoned to court for motoring offences in the last five years. Of the 220 respondents who answered this question, 22% stated that they had received a FPN or been summoned to court.

Respondents who had been involved in at least one accident in the last five years were significantly more likely ($p < 0.05^3$) to have received a fixed penalty notice or court summons (31%) compared with those who had not been accident-involved (18%).

3.3 Recalled exposure to TailGuardian and other signs

To understand the participants' recalled exposure to the TailGuardian decal, they were shown an image of the decal, and of the decal affixed to a van, and asked 'have you seen this sign on the back of any vehicles?' Thirty percent claimed that they had, while 70% had not or were not sure (n=214).

It is worth noting that there was a difference in exposure between the respondents from Thurrock service station and those from Cobham. At Thurrock, 43% of respondents stated that they had seen the TailGuardian (n=75), while only 21% of respondents at Cobham stated that they had seen it (n=139). The reason for this is not clear.

Pictures of three common vehicle signs and three motorway variable message signs were also presented to respondents, who were asked whether they recalled ever seeing any of the signs. The purpose of this question was to act as a comparative measure of market penetration of the TailGuardian; the six signs presented are all in use, and the latter three signs in particular act as a useful baseline measure for exposure to signs on the motorway (see Figure 8). Between 88% and 95% of respondents reported that they had

³ Throughout this report we report results as statistically significant if the p-value is below 0.05. A p-value less than 0.05 indicates that there is less than a 5% chance that the pattern of findings arose purely due to random fluctuations in the data.

seen the motorway signs. Between 61% and 91% stated that they had seen the vehicle signs. This indicates that the market penetration of the TailGuardian is still relatively low.

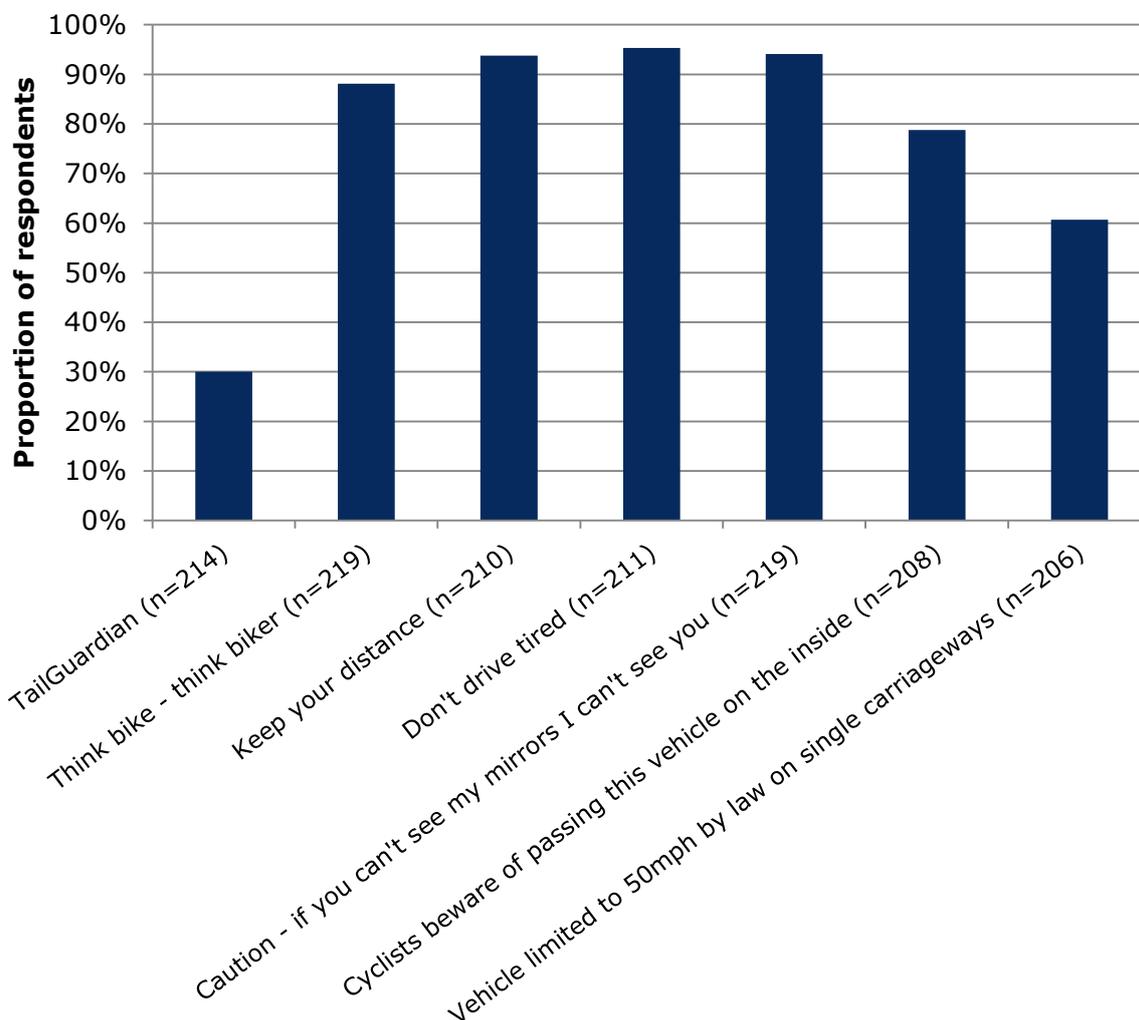


Figure 8. Recalled exposure to TailGuardian and common vehicle and motorway signs

3.4 Understanding of the TailGuardian's purpose

Prior to being provided with any information about the TailGuardian, respondents were asked what they understood the sign's aim or purpose to be. This question had a free text response, which was coded with respect to whether the response mentioned 'distance', 'close following' or another description of the sign's purpose which suggested they had a good understanding.

Twenty-six respondents provided no response to this question. The remaining respondents generally seemed to understand the basic purpose of the sign, as shown in Figure 9, with 35% mentioning 'too close', 39% mentioning 'distance', 2% mentioning both 'distance' and 'too close', and 16% giving other responses that indicated an understanding of the sign's purpose. Of the remaining responses, 4% stated that they did not know what the aim or purpose of the sign was, while 4% had incorrect perceptions of the sign, for example "to raise awareness of speed limits", "not to go

behind them at 70”, “that vans have got to keep to speed” and “the lorry can only travel at that speed, no higher”.

The lower response rate to this question may suggest that some or all of those who did not answer the question did not know what the aim or purpose of the sign was.

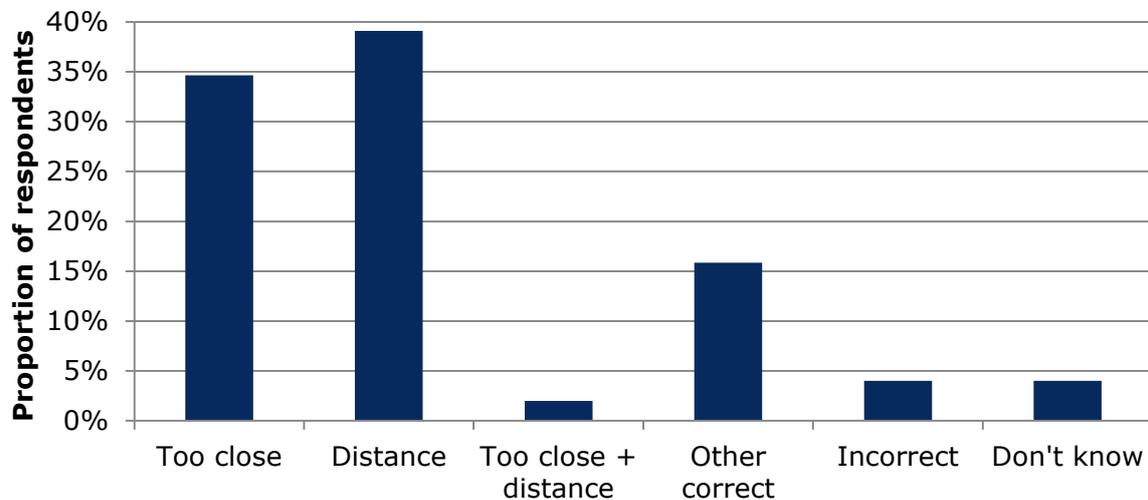


Figure 9. Understanding of the aim or purpose of the sign (n=201)

3.5 Response to the TailGuardian

Respondents were asked to imagine driving on a motorway at 70mph in light traffic behind a lorry displaying the TailGuardian (following at a distance that meant they could read the '70' on the sign). Three questions were used to gauge the response of drivers to the TailGuardian sign, in terms of their intended driving distance. These questions were: 'What do you think...

1. you should do...
2. you would do...
3. other people would do...

...in response to seeing this sign on the rear of a vehicle, when you (they) are able to read the number '70' on the sign?'

A 19-point scale was used whereby respondents were asked to indicate their response from 'increase your following distance greatly (much further from the vehicle) to 'decrease your following distance greatly (much closer to the vehicle). The mid-point was labelled 'stay at the same distance'.

These three questions were asked twice: once prior to providing information on the TailGuardian, and again after respondents had read this information. Please see Appendix A for the information provided.

Figure 10 shows the mean response to the three questions, both before and after reading information about the sign's purpose. It can be seen that after receiving information about the TailGuardian, respondents stated that they should increase their following distance, that they would increase their following distance, and that other people would increase their following distance *more* than before they received the

information. Statistical tests⁴ showed that the change in following distance was statistically different ($p < 0.01$) before and after reading the information for each of the three questions (should/would/others).

Statistical tests⁵ show that the responses for the three questions (should/would/others) are statistically different ($p < 0.01$) both before and after reading the information.

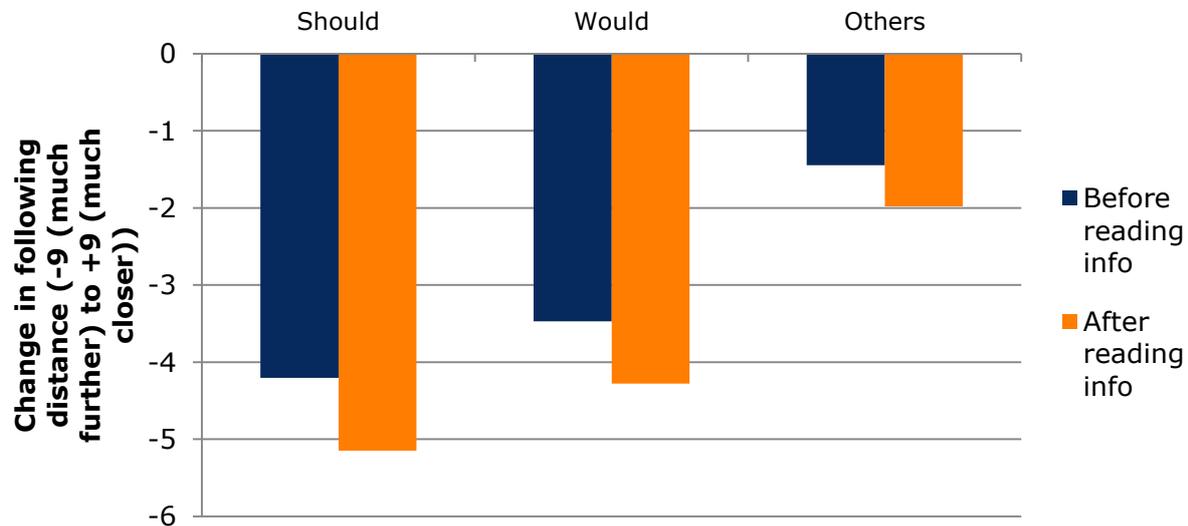


Figure 10. Change in following distance in response to seeing the sign (both before and after being provided with information on the TailGuardian) (n=227)

The same analysis was carried out including a comparison of respondents who reported having previously seen the TailGuardian with those who had not. These data are shown in Figure 11. There were no statistically significant⁶ differences between change in following distance provided by those who had previously seen the sign, and those who had not, either before or after they had received information about the sign, for all three question types (should/would/others).

⁴ Wilcoxon signed rank tests

⁵ Friedman two-way analysis of variance tests

⁶ Confirmed by Mann Whitney tests

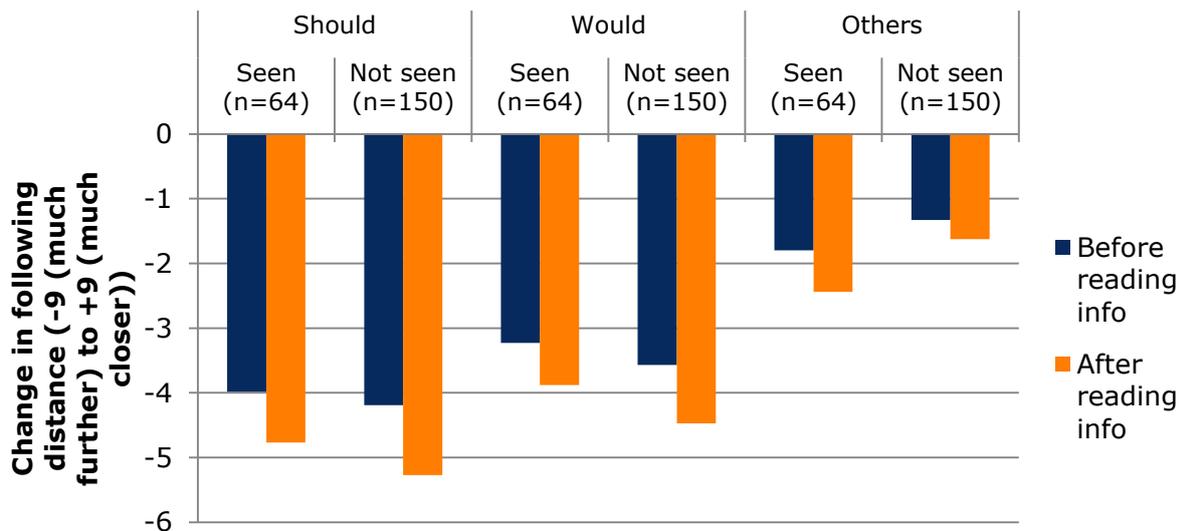


Figure 11. Change in following distance in response to seeing the sign (both before and after being provided with information on the TailGuardian) by previous exposure to the TailGuardian

3.5.1 Gender differences

Figure 12 shows the mean response to the three questions, both before and after reading information about the sign's purpose, by gender. Statistical tests⁷ show that there was no statistically significant difference in the change of following distance given by males and females, for any of the questions.

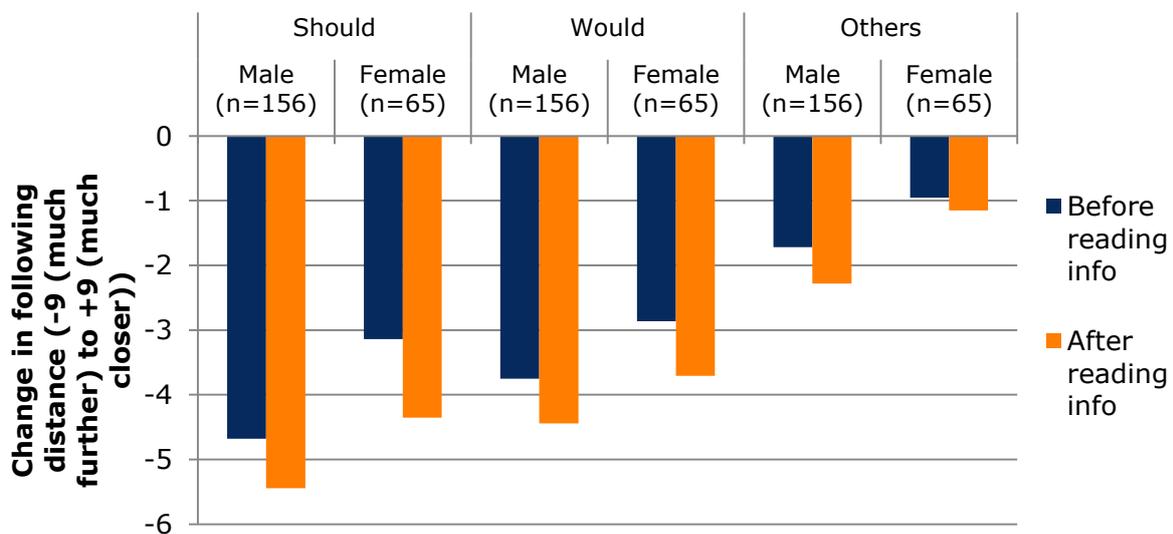


Figure 12. Change in following distance by gender

3.5.2 Self-reported close following differences

Respondents were asked to estimate the percentage of time they knowingly follow the vehicle in front too closely (see section 3.5.3). Figure 13 shows responses to the TailGuardian by self-reported frequency of close following on the motorway. Respondents who reported a low proportion of close following (between 0% and 10%)

⁷ Mann-Whitney tests

tended to state that they would increase their following distance more than those who reported higher proportions of close following. This difference was particularly prominent when responding to the question 'what do you think you *would* do in response to seeing this sign?', and was also more prominent after respondents had read the information about the TailGuardian.

Statistical tests⁸ were used to test whether the groups differed in their change in following distance, separately for the three question types (should/would/others), and separately for before and after reading the TailGuardian information. Analysis showed that the groups did not differ, except for the 'would question' *after* the information had been given about TailGuardian ($p < 0.05$); in this case, the 31% or more group had a lower reported mean change in following distance.

Statistical tests⁹ show that there is a significant difference ($p < 0.01$) between the responses to the 'would' question before and after reading the Tailguardian information in the 0-10% (a mean change in score of 1.64) and 11-30% groups (a mean change in score of 0.72). However, the difference between the before and after responses to the 'would' question for the '31% or more group' were not statistically significant (a mean change in score of 0.17).

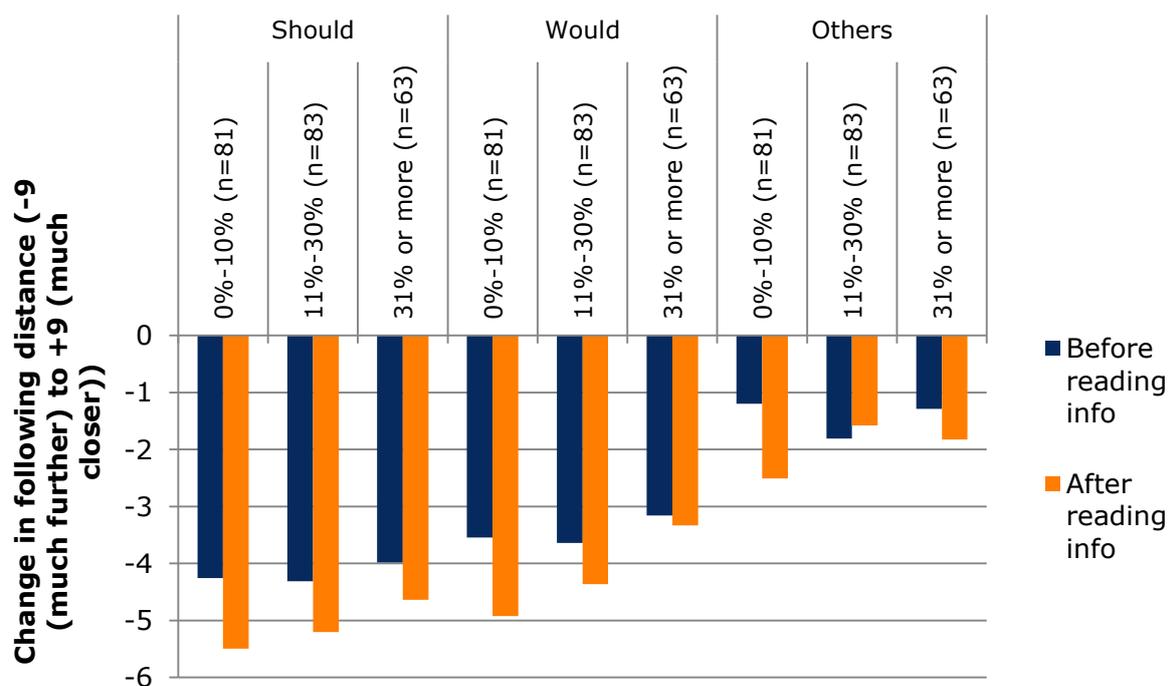


Figure 13. Change in following distance by self-reported close following frequency on motorways

3.5.3 Self-reported frequency of close following and comparison with others

To explore the extent to which people knowingly follow vehicles too closely, and any variation between different road types, respondents were asked to estimate the

⁸ Kruskal-Wallis tests

⁹ Wilcoxon signed rank tests

percentage of time they knowingly follow the vehicle in front too closely (i.e. below the recommended following distance) on different road types by marking a line on a scale from 0% (never) to 100% (always). Responses were grouped as shown in Figure 14.

According to these self-report data, close following is prevalent on all roads. Respondents reported that they were less likely to close follow on country roads and motorways (64% of respondents reported following too closely more than 10% of the time on motorways; 62% on country roads), and more likely to do so on dual carriageways and urban roads (70% and 74% respectively).

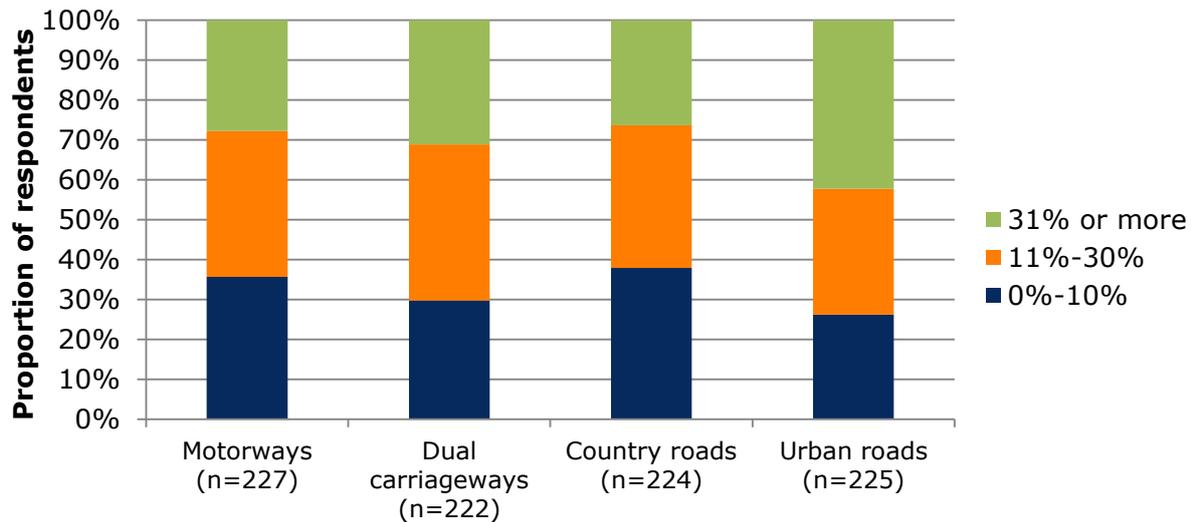


Figure 14. Self-reported close following frequency on various road types, by proportion of the time spent following the vehicle in front too closely

In addition, respondents were asked how often they think they follow vehicles too closely compared with other drivers. A 19-point scale was again used, ranging from 'much less than other drivers' (-9) to 'much more than other drivers' (9), with a midpoint of 'same as other drivers' (0).

Figure 15 shows the percentage of respondents that chose each point on the scale. Seventy-four percent of respondents stated that they follow vehicles too closely *less* than other drivers, while under 10% said that they do so more than other drivers. Sixteen percent felt that they close follow about the same amount as other drivers.

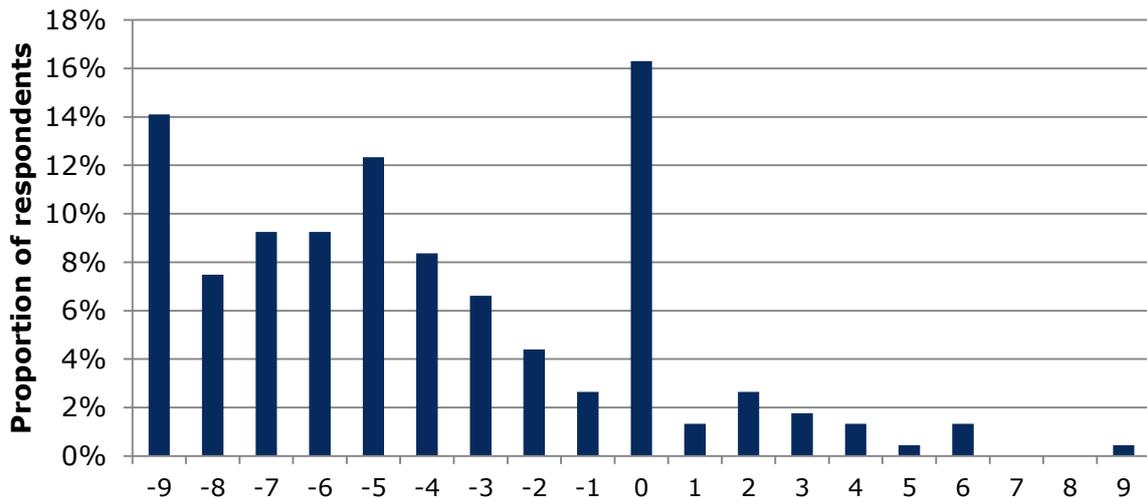


Figure 15. Self-reported close following in comparison to other drivers (from -9 (much less than other drivers) to +9 (much more than other drivers))(n=227)

3.6 Attitudes to close following

Nine statements relating to attitudes to close following were provided, with a response scale from 1 (strongly disagree) to 5 (strongly agree). Five of the questions were taken from the DAQ (Parker, Stradling & Manstead, 1996). The additional four statements were 'I often use the two second rule (or a similar rule) to check my following distance when driving', 'signs like this are easy to understand', 'signs like this would help me to control my following distance', and 'in general I follow other vehicles too closely'.

Sixty-two percent of respondents agreed or strongly agreed that 'signs like this are easy to understand'. A larger proportion (69%) agreed or strongly agreed that 'signs like this would help me to control my following distance'.

The majority of respondents showed negative attitudes to close following (i.e. expressing dislike for the behaviour); however there was less of a distinction between the proportion who agreed/disagreed to the statement 'people stopped by the Police for close following are unlucky as lots of people do it' (50% disagreed with the statement, whilst 35% agreed).

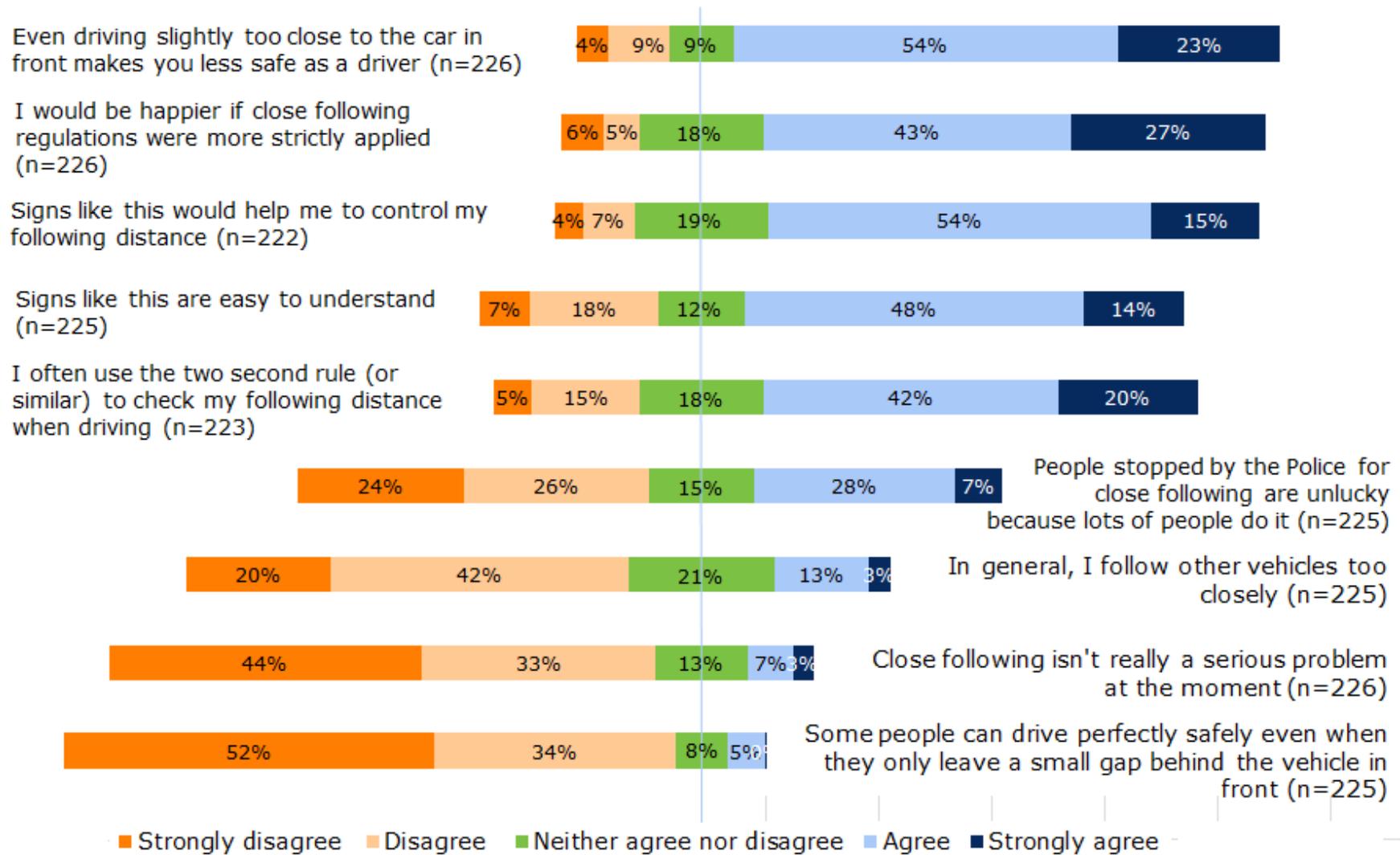


Figure 16. Attitudes to close following (strongly disagree to strongly agree)

3.7 Combining attitudes and self-reported behaviours to close following

To classify respondents into high and low tendency to close follow, cluster analysis was used. This statistical technique groups (or clusters) similar individuals, in this case based on their responses to the five DAQ attitudinal questions (see section 3.6) and the four self-reported behaviour questions (see section 3.5.3).

Before the cluster analysis could be performed, Principal Components Analysis (PCA) was required to condense the five DAQ attitudinal questions down into a smaller number of continuous factors. The PCA identified two important factors which explained 71% of the total variance in the sample. The first of these factors was mostly influenced by the answers to the statements 'close following isn't really a serious problem at the moment', 'some people can drive perfectly safely even when they only leave a small gap behind the vehicle in front' and to a lesser degree 'people stopped by the police for close following are unlucky because lots of people do it'. The second factor was influenced by the statements 'I would be happier if close following regulations were more strictly applied' and 'even driving slightly too close to the car in front makes you less safe as a driver'. These factors indicate that respondents answered differently depending on whether the statement was phrased in a positive way (i.e. such that agreement with the statement indicated a positive attitude to close following) than if it was phrased in a negative way (i.e. such that disagreement with the statement indicated a positive attitude to close following).

The factor scores for the two important factors, along with the self-reported frequency of close following on the four different road types, were included in the cluster analysis. Two clusters, representing high and low tendency to close follow, were obtained. These groups are referred to as the 'high close following' and 'low close following' groups.

Of the 218 respondents analysed, 141 were classified into the low close following group and 77 into the high close following group. The demographics of the high close following group showed that these drivers are typically young (22% were under 25 compared with 13% in the low close following group) males (78% were male compared with 68% in the low close following group) who have passed their driving test fairly recently (20% within the last five years compared with 12% in the low close following group). However, the distribution of annual mileage and frequency of motorway use did not differ between the two groups.

The distribution of accident involvement does not significantly differ between the two groups: 41% of participants in the high close following group were accident involved compared to 32% in the low close following groups. Table 1 shows the average percentage of time the two groups reported they knowingly close follow by road type. Those in the high close following group reported that on average they would close follow twice as often as those in the low close following group.

Table 1: Average percentage of time spent close following by road type and group

Percentage of time you knowingly follow the vehicle in front too closely on...	Low tendency to close follow (n=141)	High tendency to close follow (n=77)
motorways	14%	44%
dual carriageways	16%	46%
country roads with national speed limit	12%	43%
urban roads with 30mph speed limit	24%	47%

Figure 17 shows the responses to the five DAQ questions by group. A higher proportion of the low close following group disagreed or strongly disagreed with the responses to the first three questions: 'close following isn't really a serious problem at the moment', 'some people can drive perfectly safely even when they only leave a small gap behind the vehicle in front' and 'people stopped by the police for close following are unlucky because lots of people do it'. In addition, a higher proportion of low close following group members agreed or strongly agreed with the statements 'I would be happier if close following regulations were more strictly applied' and 'even driving slightly too close to the car in front makes you less safe as a driver'.

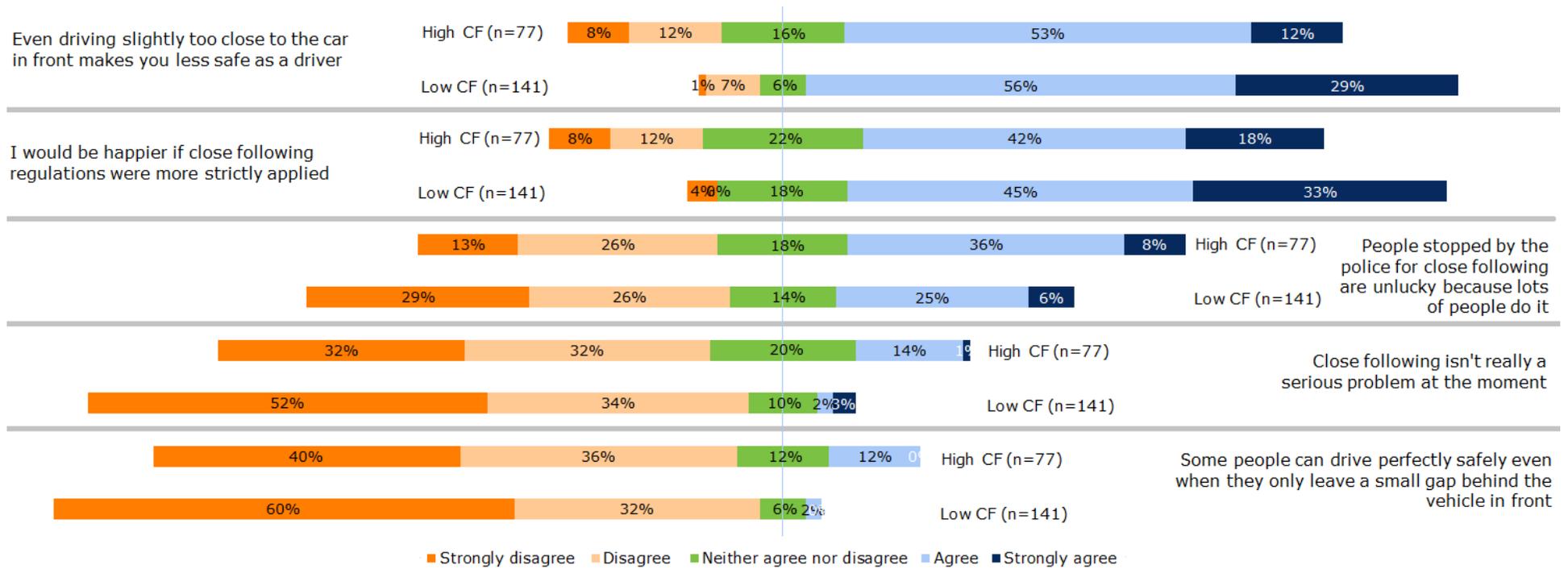


Figure 17. Attitudes to close following by group

Figure 18 shows the mean change in following distance reported for each of the three questions (should/would/others), before and after seeing the information about TailGuardian. Statistical tests¹⁰ were used to test whether the groups differed in their change in following distance, separately for the three question types (should/would/others), and separately for before and after reading the TailGuardian information. Analysis showed that the groups did not differ, except for the 'would' question ($p < 0.05$ 'before' and $p < 0.01$ 'after'); in both cases, the high close following group had a lower reported mean change in following distance.

Statistical tests¹¹ show there is a significant difference ($p < 0.01$) between the before and after responses for the low close following group when asked the 'would' question (a mean change in score of 1.3). However, the difference between the before and after responses to the 'would' question for the high close following group was not significant (a mean change in score of 0.4).

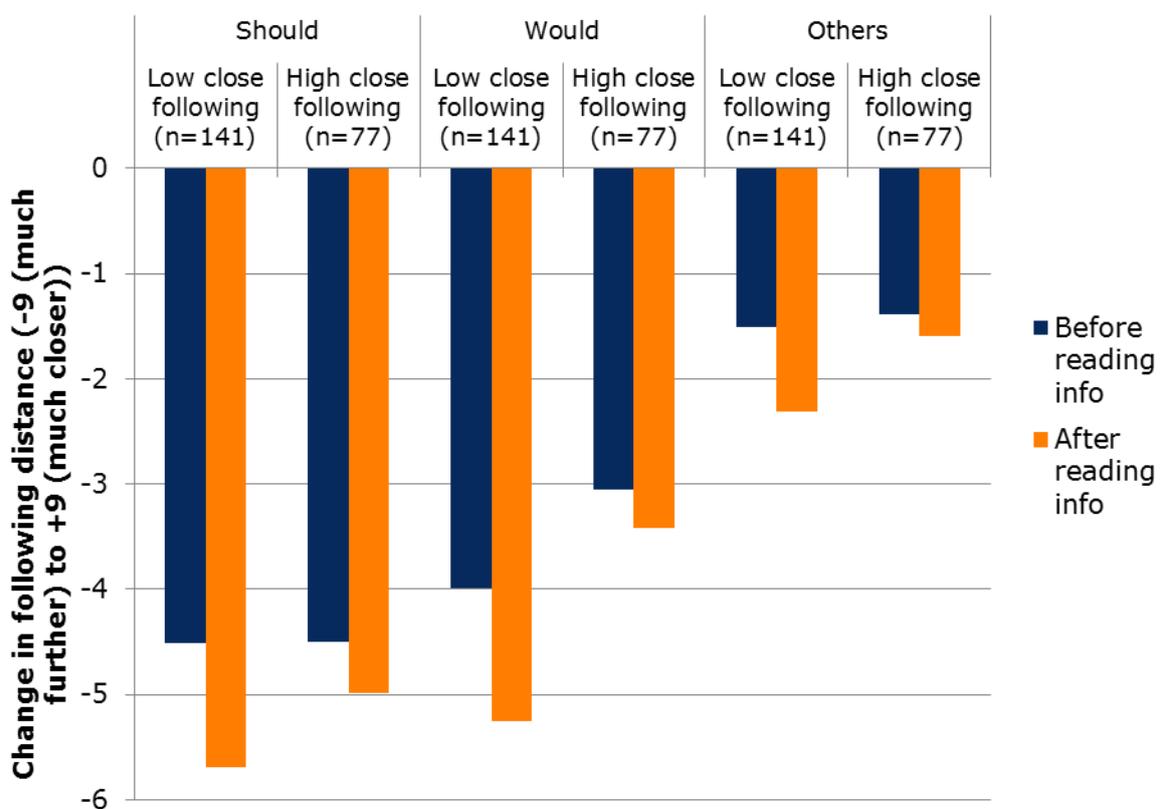


Figure 18. Change in following distance by group

¹⁰ Mann-Whitney tests

¹¹ Wilcoxon signed rank tests

4 Conclusions and recommendations

4.1 Conclusions

Whilst the benefit has not been quantified, the presence of the TailGuardian on the road network **appears to be having a positive impact on behaviour, based on self-reported responses**. The recalled exposure to the TailGuardian was generally low compared with that for other signs encountered on the road. Although the majority of respondents had not previously encountered the TailGuardian, **nearly all understood that it was a device that aimed to reduce the incidence of close following**, through informing drivers that they are too close to the vehicle in front, or encouraging them to think about the distance between vehicles. It is not clear what proportion fully understood the exact mechanism through which the TailGuardian aims to achieve this reduction; however if the device encourages drivers to consider changing their following distance then it has the potential at least to have a positive impact.

In terms of self-reported response to the decals, respondents consistently reported that they would increase their following distance more after they had read the information explaining the TailGuardian, compared with before they read it. This suggests that some **education around the TailGuardian or similar devices would be beneficial to maximise its effectiveness**.

Respondents also consistently reported that they *should* increase their following distance more than they *would*, and that *other* drivers would increase their following distance less – i.e. they felt that they understood and/or would respond to the TailGuardian appropriately, but that other people would not. This was particularly prevalent amongst respondents who reported following too closely on the motorway more than 30% of the time. This suggests that **those who are more inclined to engage in close following may be particularly resistant to messages encouraging a reduction in this behaviour**.

Segmentation of respondents into high and low tendency to close follow provided insights into the type of driver that is more likely to engage in close following (young, male, inexperienced) as well as the attitudes that they are likely to hold (those with a high tendency to close follow were more likely to agree that close following is not a serious problem, and less likely to agree that close following regulations should be more strictly applied). These findings suggest that the **attitudes of close followers should also be addressed in order to bring about a change in behaviour**.

4.1.1 Limitations

The data are all based on self-report techniques, which can be more open to socially desirable responses compared with using unobtrusive observations (e.g. Nederhof, 1985). Socially desirable responding may occur as a means of impression management, or self-deception (i.e. a positively biased but subjectively honest description of yourself; Paulhus, 1984). However it has been shown that surveys that are conducted anonymously reduce impression management bias (Lajuné & Summala, 2003).

4.2 Recommendations

Based on the results of the survey, a number of recommendations are made:

- In order to improve understanding of why close following happens and methods of discouraging it, focus groups should be held with drivers. Since it appears that close following messages affect the people differently depending on their existing behaviour, a survey could be carried out prior to the focus group to establish whether respondents have a high or low tendency to close follow.
- The survey data suggest that providing information about the intervention results in a greater positive impact on drivers' response. Any future close following interventions (or interventions targeting other driving behaviours) would benefit from an accompanying information/education campaign. Further investigation into the effectiveness of different types of campaigns could form part of the focus groups.
- The TailGuardian is only one of a number of possible methods of raising awareness of close following. By providing immediate feedback to drivers on the suitability of their following distance, it aims to reduce close following, but the mechanism by which the TailGuardian provides this feedback is not immediately obvious to all drivers. Despite this, it appears to have the desired effect of increasing (self-reported) following distance intentions. Future research could look at other types of vehicle-based and roadside messages cautioning drivers against close following to determine whether some are more effective than others.

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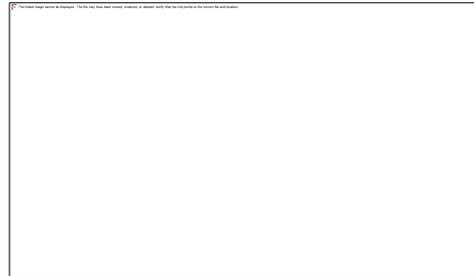
Appendix A Survey

PLEASE ONLY COMPLETE THIS SURVEY IF YOU HAVE DRIVEN/RIDDEN ON MOTORWAYS AT LEAST ONCE IN THE LAST 6 MONTHS.

- This research is being carried out by TRL (Transport Research Laboratory) on behalf of the Highways Agency.
- The research aims to improve understanding of the effectiveness of signs on vehicles.
- This survey is about signs with messages about driving too closely to the vehicle in front ('tailgating').
- We are interested in how drivers interpret these signs.
- There are no right or wrong answers so please respond honestly.
- We do not ask for any personal details so all your answers will be anonymous.
- We would be very grateful if you could finish the survey (it should only take 5 or 6 minutes) but you are under no obligation to do so and you may stop at any time.

IF YOU COMPLETE THE SURVEY, YOU WILL RECEIVE £5 IN CASH WHEN YOU RETURN IT TO US TODAY.

1. Have you seen this sign on the back of any vehicles? (Usually lorries or vans)



- O₁ Yes
- O₂ No
- O₃ Not sure

2. In your understanding, what is the aim or purpose of this sign?

PLEASE READ THIS INFORMATION IN FULL:

This sign is designed so that the '70' only becomes visible to drivers following at a distance that is deemed to be too close for 70mph. Those following at a safer distance will not be able to read the '70'.

Likewise for 50mph and 30mph.

Please do not alter your response to Q2 - Q5 based on this information.



The safe distances are based on the Highway Code's 'Two Second Rule' - "allow *at least* a two-second gap between you and the vehicle in front".

However the signs are calibrated to ensure that drivers with the poorest legal vision are advised in time - meaning that those with corrected or perfect vision are given a three second warning - erring on the side of safety.

Using the 'three second rule', the 'safe' following distances are:

Speed	Safe following distance (feet)	Safe following distance (metres)	Safe following distance (car lengths)
30mph*	75ft	23m	6
50mph	220ft	67m	17
70mph	308ft	94m	23

**30 mph distance is set to the actual stopping distance at that speed*

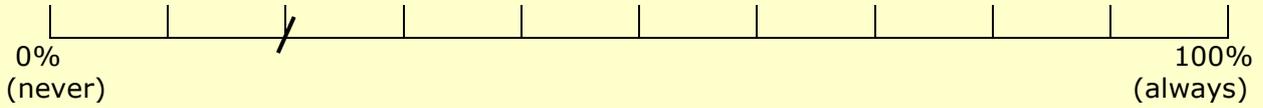
9. To what extent do you agree or disagree with the following statements?

(Please tick one circle on each row.)

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
a. Signs like this are easy to understand	<input type="radio"/> O ₁	<input type="radio"/> O ₂	<input type="radio"/> O ₃	<input type="radio"/> O ₄	<input type="radio"/> O ₅
b. Signs like this would help me to control my following distance	<input type="radio"/> O ₁	<input type="radio"/> O ₂	<input type="radio"/> O ₃	<input type="radio"/> O ₄	<input type="radio"/> O ₅
c. I often use the two second rule (or a similar rule) to check my following distance when driving	<input type="radio"/> O ₁	<input type="radio"/> O ₂	<input type="radio"/> O ₃	<input type="radio"/> O ₄	<input type="radio"/> O ₅
d. People stopped by the police for close following are unlucky because lots of people do it	<input type="radio"/> O ₁	<input type="radio"/> O ₂	<input type="radio"/> O ₃	<input type="radio"/> O ₄	<input type="radio"/> O ₅
e. Close following isn't really a serious problem at the moment	<input type="radio"/> O ₁	<input type="radio"/> O ₂	<input type="radio"/> O ₃	<input type="radio"/> O ₄	<input type="radio"/> O ₅
f. Some people can drive perfectly safely even when they only leave a small gap behind the vehicle in front	<input type="radio"/> O ₁	<input type="radio"/> O ₂	<input type="radio"/> O ₃	<input type="radio"/> O ₄	<input type="radio"/> O ₅
g. I would be happier if close following regulations were more strictly applied	<input type="radio"/> O ₁	<input type="radio"/> O ₂	<input type="radio"/> O ₃	<input type="radio"/> O ₄	<input type="radio"/> O ₅
h. Even driving slightly too close to the car in front makes you less safe as a driver	<input type="radio"/> O ₁	<input type="radio"/> O ₂	<input type="radio"/> O ₃	<input type="radio"/> O ₄	<input type="radio"/> O ₅
i. In general, I follow other vehicles too closely	<input type="radio"/> O ₁	<input type="radio"/> O ₂	<input type="radio"/> O ₃	<input type="radio"/> O ₄	<input type="radio"/> O ₅

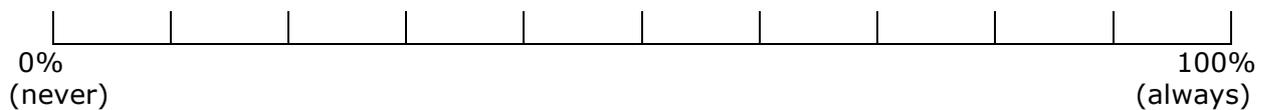
10. Please estimate what percentage of the time you knowingly follow the vehicle in front too closely (i.e. below the recommended following distance) by marking a line on the scale below.

E.g. if you feel you follow the vehicle in front too closely around 20% of the time, you would respond as follows:

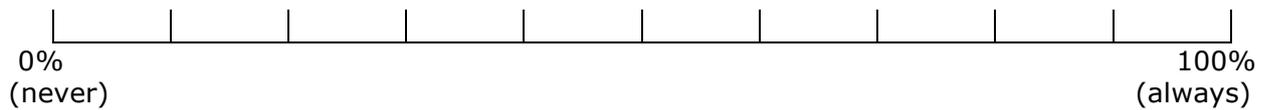


Please estimate what percentage of the time you knowingly follow the vehicle in front too closely...

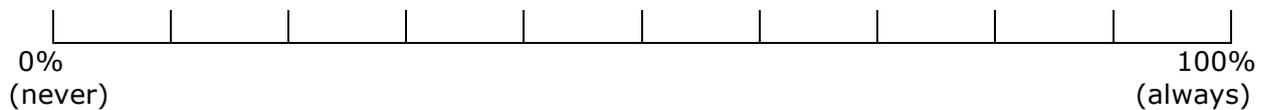
On motorways



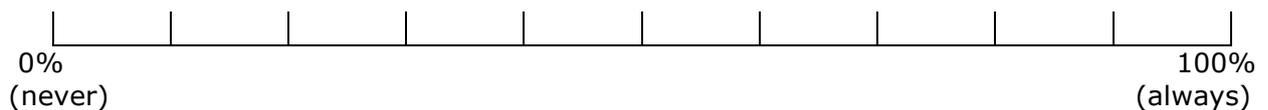
On dual carriageways



On country roads with a national speed limit

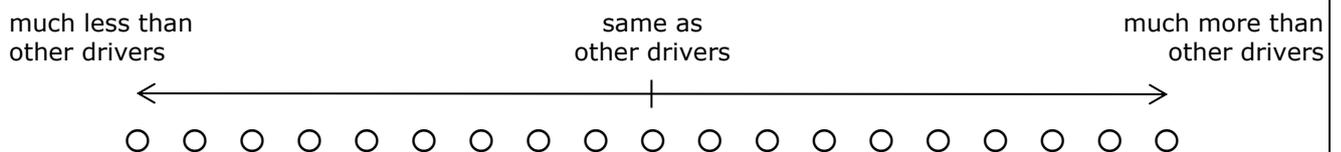


On urban roads with a 30mph speed limit



11. Compared with other drivers, how often do you think you follow vehicles in front too closely?

(Please tick the circle which best indicates how often you think you follow too closely compared with other drivers)



12. What type of vehicle do you normally drive? (Please tick one circle)

<input type="radio"/> Car	<input type="radio"/> Van	<input type="radio"/> HGV
<input type="radio"/> Motorcycle	<input type="radio"/> Bus / Coach	<input type="radio"/> Other (please specify):

13. Typically, how often do you drive on motorways? (Please tick one circle)

<input type="radio"/> 5 or more days a week	<input type="radio"/> 3-4 days a week	<input type="radio"/> Once or twice a week
<input type="radio"/> Once a fortnight	<input type="radio"/> Once a month	<input type="radio"/> Less than once a month

14. How many miles do you personally drive each year? (Please tick one circle)

It may help to think of the number of miles you drive in a typical week, multiply this number by 50 and add the mileages of any extra journeys, e.g. driving on holiday.

<input type="radio"/> Not more than 5,000 miles	<input type="radio"/> 5,001-10,000 miles	<input type="radio"/> 10,001-15,000 miles
<input type="radio"/> 15,001-20,000 miles	<input type="radio"/> 20,001-25,000 miles	<input type="radio"/> Over 25,000 miles
<input type="radio"/> I don't know		

15. Please write the year in which you passed your driving test:

--	--	--	--	--

16. How many road accidents have you been involved in, regardless of blame, in the last 5 years?

By 'accident' we mean any incident on a public road that involved injury to you or another person, damage to property, or damage to any vehicle (even slight damage), regardless of how the accident was caused.

Please write the number of accidents in the box:

17. Did any of the three most recent accidents...

a) Involve a shunt into the vehicle in front or from behind?

b) Happen because you or another driver were following a vehicle too close?

Please leave blank any which are not relevant.

	a) Shunt?		b) Following too close?	
i) Most recent accident:	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> Yes	<input type="radio"/> No
ii) Second most recent accident:	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> Yes	<input type="radio"/> No
iii) Third most recent accident:	<input type="radio"/> Yes	<input type="radio"/> No	<input type="radio"/> Yes	<input type="radio"/> No

Any other comments?

A large, empty rectangular box with a black border, intended for providing additional comments or feedback.

Appendix B Supporting demographic data

Table A1: Gender of respondents (compared to UK driving population)

	n	Sample %	Population (2012) %
Male	156	70.6	53.6
Female	65	29.4	46.5
Total	221	100	100

Table A2: Age of respondents

	n	%
17-20	12	5.5
21-24	24	10.9
25-34	44	20.0
35-44	46	20.9
45-54	46	20.9
55-64	30	13.6
65+	18	8.2
Total	220	100

Table A3: Main vehicle driven by respondents

	n	%
Car	185	75.2
Van	31	12.6
HGV	18	7.3
Motorcycle	8	3.3
Bus/coach	3	1.2
Other	1	0.4
Total	246¹²	100

¹² This is greater than the number of respondents as some chose more than one response option

Table A4: Frequency of driving on motorways

	n	%
≥5 days a week	72	32.3
3-4 days a week	37	16.6
Once or twice a week	52	23.3
Once a fortnight	15	6.7
Once a month	21	9.4
<Once a month	26	11.7
Total	223	100

Table A5: Annual mileage

	n	%
<5,000	28	12.4
5,001-10,000	54	24.0
10,001-15,000	46	20.4
15,001-20,000	22	9.8
20,001-25,000	17	7.6
>25,000	47	20.9
Don't know	11	4.9
Total	225	100

Table A6: Years of driving experience

	n	%
<5	27	12.2
5-9	44	19.8
10-19	33	14.9
20-29	44	19.8
30-39	40	18.0
≥40	34	15.3
Total	222	100

Table A7: Number of accidents in last five years

	n	%
0	145	65.0
1	50	22.4
2	19	8.5
3	5	22.2
>3	4	1.6
Total	23	100

Table A8: Accident types

	n	%
Shunt + driving too close	21	10.4
Shunt + not driving too close	21	10.4
No shunt + driving too close	2	1.0
No shunt + not driving too close	158	78.2
Total	202	100