

Frequency and Severity of In-Vehicle Distractions – A Self-Report Survey

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Abstract

This paper quantifies the prevalence and severity of distracting behaviours undertaken by drivers in the United Kingdom. To that end, an online questionnaire survey was developed. This instrument collected anonymous self-report data regarding; demographic information, accident history, interest in technology, frequency and rated severity of engagement in distracting behaviours, and personality scale scores. The survey was promoted via radio, local electronic media and a professional driver's internet forum. Data was collected from 482 respondents during a two-month collection period. Sixty-seven percent of the respondents were male, average age was thirty nine ($SD = 12.6$) and on average, respondents had nineteen years of driving experience ($SD = 12.1$). Preliminary analysis indicates the three behaviours rated most distracting while driving were associated with cellular telephone use; and were writing text messages, reading text messages, and using the telephone hand-held. The percentage of respondents reporting undertaking these activities while driving was 41%, 62%, and 52% respectively. The three most frequently reported distracting behaviours that resulted in accidents (and near misses) were i) 'interaction with child passengers' 2.1% (7.5%), ii) both, route guidance destination entry with 2% (2.8%) and use of an '...add-on media device, e.g., an iPod' with 2% (3.9%), and iii) the three items 'reading a text message', 'following advice from a route guidance system', and 'interaction with pets', all with 1.7% of respondents reporting an accident when undertaking the activity (with 6.5%, 3%, and 2.2% respectively for near misses). It is clear that when considered together, these behaviours provide insight into widespread engagement in largely unnecessary distracting activities by drivers in the United Kingdom. While respondents appear to consider cellular telephone use to be the most distracting behaviour, many still undertake it when driving. Accident reporting suggests child passengers, route guidance and media players to be larger hazards. The distracting influence of add-on technologies in the vehicle is well reported in the literature, yet there has been little consideration of broader 'social' distractions. Hierarchical regression revealed, Age, Extraversion, and Conscientiousness to be significant predictors of increased engagement in distracting behaviours. When individual factors were controlled for in the model, Penalty points, Mileage, and Accidents (in which blame was accepted) were all found to be significant predictors of engagement in unnecessary distractions. Limitations must be recognised in analysis of sensitive self-report data, e.g., under-reporting seems likely. However, even considering this, the magnitude of distracting behaviours being undertaken on UK roads is concerning, and provides some insight into areas that may be targeted to reduce the potential risks from such behaviour.

Introduction

The driver distraction research community have suspected for many years that inattention or inappropriate distractions are responsible for substantial proportions of the accidents on our roads. There have been several reviews of the literature in recent years (Basacik & Stevens, 2008; Regan, Lee, & Young, 2008; Wallis, 2003; Young, Regan, & Hammer, 2003). Empirical work has been undertaken since the late sixties to develop our understanding of the role of our attentional mechanisms in the driving task (Senders, Kristofferson, Levison, Dietrich, & Ward, 1967). The development of additional traffic, information and control technologies in the vehicle prompted research in the eighties and nineties in the evaluation of such systems (Wierwille, 1993; Zwahlen, Adams, & DeBald, 1988). During this period market penetration of these devices was relatively low, but progressively rising. In the last twenty years, the widespread use of cellular telephones and affordable route guidance systems, has led to an enormous increase in the potential for 'additional unnecessary' distractions in the vehicle. The much-cited one hundred-car study (Dingus, Klauer, Neale, Petersen, Lee, Sudweeks, Perez, Hankey, Ramsey, Gupta, Bucher, Doerzaph, Jermeland, & Knipling, 2006) provided some naturalistic data on the prevalence of distraction-related accidents, and has inspired numerous other studies internationally. Findings suggest that some seventy eight percent of all vehicle crashes involve 'driver inattention to the roadway' (Neale, Dingus, Klauer, Sudweeks, & Goodman, 2005). However, such studies do not seek to identify which specific behaviours are rated most distracting by drivers, nor how these may be related to the individual driver's characteristics. Further, such empirical approaches do not lend themselves to gaining insight or introspection regarding potential distractions, actual behaviours or potentially questionable or illegal activities.

Some surveys have considered the respondents views regarding driver distractions (Royal, 2002). The Highways agency in the UK, undertook a questionnaire survey as part of a project investigating driver distractions, e.g., roadside advertising. Findings primarily consider external to the vehicle distractions, and complex or changing images were highlighted as the most distracting features by respondents. Ninety six percent of respondents indicated that their visual attention had been distracted by advertising when driving (Speirs, Winmill, & Kazi, 2008). This finding is comparable with another study undertaken by the Privilege Insurance Company who report 83% of drivers have been distracted by roadside advertising (Privilege Insurance, 2006).

An Australian survey reports the most common distracting activities (from the previous journey) as 'lack of concentration' (72%), adjusting in-vehicle equipment (69%), and other people, objects or events (68%). The authors state that from self-reported data, for five percent of the respondents, one in five accidents were attributed to driver distraction (McEvoy, Stevenson, & Woodward, 2006). Another study from the RAC in Australia report a survey identifying the nine most dangerous driver-derived distractions and the nine distracting behaviours most frequently undertaken (RAC Motor Insurance, 2009). The top three behaviours were i) reading or sending text messages, ii) attending to children, and iii) reading maps, for the most distracting behaviours; and i) consuming food and drink, ii) handling CDs, and iii) adjusting car controls, for most frequent behaviours undertaken respectively.

The findings reported in this paper, cover an investigation into contemporary behaviours, subjective ratings, personality, and the self-reported accident involvement of United Kingdom drivers.

Method

An online questionnaire survey was developed. This instrument collected anonymous self-report data regarding; demographic information, accident history, interest in technology, frequency and rated severity of engagement in distracting behaviours, and personality scale scores.

Procedure

The survey was promoted on BBC Radio Scotland on 16th March 2009 and in electronic media (Heriot-Watt University, School of Life Sciences web site and in a staff electronic newsletter), and on a professional driver's internet forum 'Trucknet.uk'. Respondents to the web site hosting the survey were initially presented with an informed consent. Subsequently, there were five sections to the survey, i) demographics (12 items), ii) rating and engagement with distracting behaviours (16 items, with 'I haven't done this while driving' and a likert scale '1' - not distracting to '5' - very distracting) for each item, iii) a frequency of distracting behaviours (16 items, with 'I haven't done this while driving' and an ordinal scale, with 'daily', 'weekly', 'monthly', and 'yearly' options for each item); iv) associated accidents/near misses (16 items, 'Yes, I've had an accident', 'No, but I've had a near miss', 'No', and 'I don't know' for each item), v) the fifty item version of the International Personality Item Pool (Goldberg, Johnson, Eber, Hogan, Ashton, Cloninger, & Gough, 2006) plus a field for any additional comments and feedback. The Heriot-Watt University, School of Life Sciences Ethics Committee, had previously approved the study.

Respondents

Data was collected from 482 respondents during a two-month collection period, between March & April 2009. Sixty-seven percent of the respondents were male, average age was thirty-nine (SD = 12.6) and on average, respondents had nineteen years of driving experience (SD = 12.1). Average mileage was twelve thousand miles per year (n = 403, SD = 5.79). Interest in technology was elicited via a five point likert scale (very disinterested, disinterested, neutral, interested, very interested, 1 – 5 respectively). Mean score for scale was 3.95 (n = 478, SD = 1.02.)

Results

Preliminary analysis indicates the three behaviours rated most distracting while driving were associated with cellular telephone use; and were writing text messages, reading text messages, and using the telephone hand-held. The percentage of respondents reporting undertaking these activities while driving was 41%, 62%, and 52% respectively. The three most frequently reported distracting behaviours that resulted in accidents (and near misses) were i) 'interaction with child passengers' 2.1% (7.5%), ii) both, route guidance destination entry with 2% (2.8%) and use of an '...add-on media device, e.g., an iPod' with 2% (3.9%), and iii) the three items 'reading a text message', 'following advice from a route guidance system', and 'interaction with pets', all with 1.7% of respondents reporting an accident when undertaking the activity (with 6.5%, 3%, and 2.2% respectively for near misses).

For behaviours undertaken when driving, ratings for distraction are presented in Table 1. The three activities rated to have the highest distraction were all cellular telephone-related, i.e., writing text messages, reading text messages, and using the telephone hand-held. The percentage of respondents reporting undertaking these activities while driving was 41%, 62%, and 53% respectively, see Figure 1.

Table 1. Distraction ratings and percentage of drivers engaging in the behaviour

Behaviour	Mean Rating 1 (low) – 5 (high)	Drivers undertaking behaviour (%)
Writing a text message	3.85	41
Reading a text message	3.57	62
Using a telephone hands-held	3.45	53
Entering a new destination on a route guidance system	3.06	36
Using car controls you are unfamiliar with	2.69	73
Interaction with child passengers	2.62	71
Using car displays you are unfamiliar with	2.50	63
Using an add-on media device, e.g., an iPod	2.43	39
Interaction with pets	2.35	35
Using a telephone hands-free	2.29	53
Following advice from a route guidance system	1.96	57
Using the in-car entertainment system	1.93	96
Interaction with adult passengers	1.81	100
Eating	1.78	83
Drinking	1.77	82
Other behaviours*	0.48	29

* including, in descending frequency: personal considerations (11), smoking (10), other in-car (6), advertising (5), road signs (5), road and traffic-related (5), make-up (4), map reading (4), and other (4).

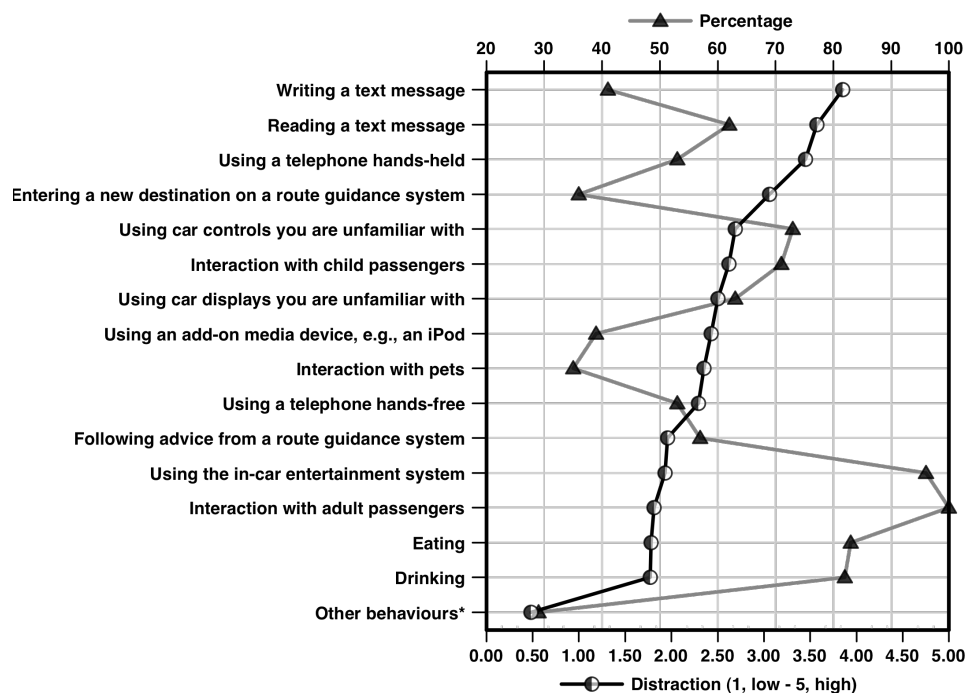


Figure 1. Distraction ratings and percentage of drivers engaging in the behaviour

In Table 2, the frequency of undertaking distracting behaviours is presented. The three most frequently undertaken activities, on a daily or weekly basis, were use of the in-car entertainment system (91%), interactions with adult passengers (81%) and drinking (not specifically alcohol, 51%).

82.9% of respondents reported no penalty points on their license ($n = 479$). For those with penalty points, 13.2% had three points, 0.4% four points, 2.9% six points, 0.2% seven points, and 0.4% nine points. For accident occurrence, 63.9% of contributors reported no accidents within the previous five years ($n = 482$), 25.5% one accident, 7.1% two accidents, 2.7% three, 0.6% four, and 0.2% (one participant) five or more accidents. Behaviours resulting in accidents and near misses are presented in Table 3 and Figure 2. Excluding, the various features identified as ‘Other behaviours’, the three behaviours resulting in most accidents (and near misses) were i) ‘interaction with child passengers’ 2.1% (7.5%), ii) both, route guidance destination entry with 2% (2.8%) and use of an ‘...add-on media device, e.g., an iPod’ with 2% (3.9%), and iii) the three items ‘reading a text message’, ‘following advice from a route guidance system’, and ‘interaction with pets’, all with 1.7% of respondents reporting an accident when undertaking the activity (with 6.5%, 3%, and 2.2% respectively for near misses). Considering near misses and accidents together (and excluding ‘other behaviours’), the three most distracting behaviours were; interaction with adults, interaction with children, and reading text messages while driving.

Table 2. Frequency of engagement in distracting behaviours ($n = 482$).

Behaviour	Time Period				Drivers undertaking behaviour daily or weekly (%)
	Daily	Weekly	Monthly	Yearly	
Using the in-car entertainment system	80.9	10.0	3.1	1.2	91
Interaction with adult passengers	28.4	52.1	15.6	1.2	81
Drinking	23.4	27.8	24.3	4.4	51
Eating	18.5	27.4	29.3	5.0	46
Interaction with child passengers	14.5	19.7	19.1	14.3	34
Using a telephone hands-free	18.3	14.1	13.1	6.2	32
Reading a text message	8.5	16.4	19.7	13.1	25
Following advice from a route guidance system	11.4	13.7	18.7	10.4	25
Using an add-on media device, e.g., an iPod	13.1	10.6	11.2	2.1	24
Using a telephone hands-held	3.5	9.5	14.5	17.2	13
Entering a new destination on a route guidance system	5.0	6.8	12.2	7.7	12
Writing a text message	6.0	7.9	11.6	10.4	14
Other behaviours*	8.9	5.0	4.6	3.1	14
Interaction with pets	3.5	6.4	9.3	13.9	10
Using car displays you are unfamiliar with	1.2	2.9	15.6	40.0	4
Using car controls you are unfamiliar with	2.3	1.9	17.8	45	4

* including, in descending frequency: personal considerations (11), smoking (10), other in-car (6), advertising (5), road signs (5), road and traffic-related (5), make-up (4), map reading (4), and other (4).

Hierarchical multiple regression was undertaken to investigate the ability of driver behaviour-related variables (mileage, penalty points, self-reported accidents accepting blame) on the propensity to engage in distracting activities when driving, after controlling for the influence of personal factors (age, extraversion, agreeableness, conscientiousness, emotional stability, and intellect). Engagement with distracting behaviours was defined using an index calculated from the self-reported frequency of undertaking the distracting behaviours outlined above. Ordinal values were assigned to generate a summative score for each respondent’s activity, corresponding to ‘1’ for yearly, ‘2’ for monthly, ‘3’ for weekly, and ‘4’ for daily for each behaviour, e.g., reading text messages on a weekly basis would accrue an item score of ‘3’. These values were added for each of the sixteen behaviours described previously to generate each respondent’s distraction index. Inspection of the data indicated no violation of the assumptions of normality, linearity, multicollinearity, and homoscedasticity.

Personal factors were entered at Step 1, explaining 13.1% of the variance in distracting behaviours. After entry of driver behaviour variables at Step 2, the total variance explained by the model was 25.3%, $F(9, 358) = 13.46, p < 0.001$. The driver behaviour variables explained an additional 12% of the variance in the distraction index, after controlling for personal factors, $R^2 \text{ change} = 0.122, F \text{ change}(3, 358) = 19.49, p = 0.001$. In the final model, all variables were significant, with ‘mileage’ having the highest beta value ($\beta = 0.28, p < 0.001$), next ‘penalty points’ ($\beta = 0.15, p < 0.001$) and ‘self-reported accidents accepting blame’ as the lowest contributor ($\beta = 0.10, p < 0.05$). Beta weights and significance values are shown in Table 4.

Table 3. Distractions resulting in accidents and near misses in the previous five years (frequencies, $n = 482$).

Behaviour	Accident Frequency	Near Miss Frequency	Overall Percentage
Interaction with adult passengers ($n=472$)	1.5	11.4	12.9
Other behaviours* ($n=411$)	3.2	7.1	10.3
Interaction with child passengers ($n=469$)	2.1	7.5	9.6
Reading a text message ($n=462$)	1.7	6.5	8.2
Writing a text message ($n=461$)	1.5	6.7	8.2
Using car controls you are unfamiliar with ($n=468$)	1.5	5.6	7.1
Using the in-car entertainment system ($n=471$)	1.3	5.7	7.0
Using an add-on media device, e.g., an iPod ($n=458$)	2.0	3.9	5.9
Using a telephone hands-held ($n=460$)	1.5	4.3	5.8
Entering a new destination in route guidance system ($n=458$)	2.0	2.8	4.8
Following advice from a route guidance system ($n=460$)	1.7	3.	4.7
Drinking ($n=466$)	1.5	3.	4.5
Interaction with pets ($n=462$)	1.7	2.2	3.9
Eating ($n=469$)	1.3	2.6	3.9
Using car displays you are unfamiliar with ($n=466$)	1.3	2.4	3.7

* including, in descending frequency (from 54 additional information responses): personal considerations (11), smoking (10), other in-car (6), advertising (5), road signs (5), road and traffic-related (5), make-up (4), map reading (4), and other (4).

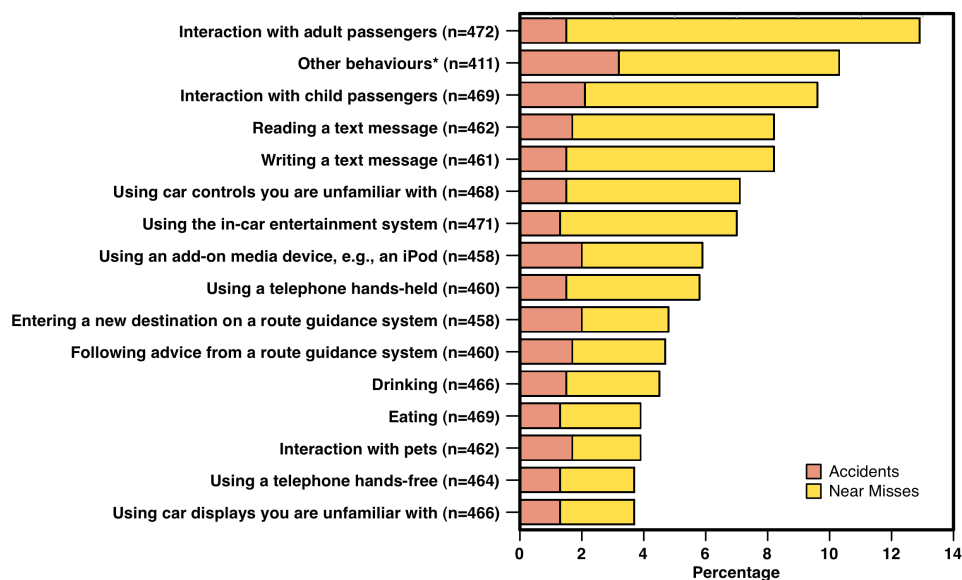


Figure 2. Frequencies of accidents & near-misses

Discussion

Findings from the survey reported in this paper, make it clear that many, many people are engaging in distracting activities while driving, self-control is not working. Some of these activities, e.g., navigation device destination entry or composing text messages have been shown empirically to be highly distracting activities to undertake when the vehicle is in motion.

Considering the behaviours with higher than average distraction ratings, these were dominated by mobile telephone tasks. All three of the tasks rated most distracting would be considered to be prosecutable under the dangerous driving legislation in the United Kingdom, i.e., reading or writing a text message, or using the telephone hands-held. However, 41% of drivers admitted to writing texts, 62% to reading texts, and 53% to hands-held use of their telephone while the vehicle is in motion. At least, only two in five drivers reported being prepared to write a 'text' while driving. However, three in five drivers would read one. It is possible, if rather unlikely, that some drivers do not realise these are hazardous and illegal activities, which are potentially punishable with up to five years imprisonment. More interestingly, from a system design perspective, is why people feel the temptation to undertake these tasks. What factors are responsible for the seductive attraction of interaction with our friends, families, and colleagues? How can we support and protect drivers from these temptations? Perhaps, through management of the telephone's interaction with the vehicle and user, e.g., diversion of calls and texts while the vehicle is in motion, such distractions may be minimised. Other activities that were rated as highly distracting included navigation device destination-entry, use of unfamiliar car controls, and interactions with child passengers. Thirty-six percent of respondents reported undertaking 'destination entry' with the vehicle in transit. Even for this highly distracting task, one in three drivers reported undertaking it. 'Use of unfamiliar car controls', or 'interactions with child passengers', were not rated as so highly distracting, but were reported as being experienced by over 70% of respondents. Data available from the survey makes it difficult to diagnose the specific nature of which car controls respondents reported experiencing difficulties with. Further work is planned to consider this finding in more detail. The distracting influence of children in the vehicle, while probably no surprise to parents, this has only emerged in the literature in a limited fashion (RAC Motor Insurance, 2009) as a potential hazard. The author is aware of no funded research seeking to mediate this user-derived highly distracting hazard.

Table 4 – Beta values and significance levels for two-step hierarchical regression

Variable	Model 1 [†]	Model 2 ^{††}
Age	-.272***	-.278***
Extraversion	.166**	.142**
Agreeableness	-.122	-.131
Conscientiousness	-.115*	-.063
Emotional stability	.001	-.012
Intellect	-.027	-.036
Mileage		.282***
Penalty points		.151**
Accident frequency assuming responsibility		.096*
Adjusted R ²	.131***	.253***

*p < 0.05, ** p < 0.01, *** p < 0.001.

[†]Model 1 $F(6, 361) = 9.05, p < 0.001$, ^{††}Model 2 $F(9, 358) = 13.46, p < 0.001$.

Clear differences were found between the frequencies which drivers undertook the various candidate distraction tasks. Considering the tasks undertaken on a weekly or daily basis, many of these had been previously rated as being low level distracters, therefore (presumably) drivers were more prepared to undertake these frequently. For example, use of the in-car entertainment system, eating or drinking. However, several of the more highly rated distractions were reported as being undertaken surprisingly frequently by respondents. One in four drivers reading text messages or using an add-on entertainment device in a typical week. One in ten drivers undertaking destination entry on their route guidance system in a typical week.

Three distracting behaviours reported as resulting in actual accidents more frequently than any others were: interactions with children, route guidance destination entry, use of add-on media devices (2.1%, 2% and 2% respectively). These were followed by three distractions, reading a 'text', following route guidance, and interacting with pets, all with 1.7% of respondents reporting having an accident while engaging in these behaviours. When considering the near miss reporting too, one in ten drivers report an accident or near miss when interacting with children in during driving. While less actual accidents have been attributed to interactions with adults (1.5%), the combined near miss and accident percentage was 12.9%. 23% of drivers reported having either had an accident or had a near miss as a consequence of social interactions with other passengers. In terms of mediating activity, it seems clear that more attention needs to be paid to reducing the distraction-inducing components of our passenger interactions. For example, this may be achieved by training drivers to recognise and avoid potentially distracting scenarios, or provision of incentives for the passengers to mediate their own behaviours. The distraction risk from interactions with add-on devices, including route guidance systems have been well reported, and are substantiated here in both the actual reported accidents and associated near miss data. Use of 'texting' while driving accident results support the subjective ratings of the seriousness of these activities reported above. It is concerning that 3.2% of drivers report having an actual accident when either writing or reading a text. In the United Kingdom, with 36,726,463 registered drivers as of 16th March 2009, this would equate to over a million drivers (DVLA, 2009). Clearly, our accident statistics do not report this. Perhaps, the technologically literate respondents with a mean value of above average for interest in technology, are more likely to be involved in technology and distraction related accidents. The relatively large proportion of the sample categorised as 'Other behaviours', was reported by 10.3% of respondents and may represent a substantial but difficult to address range of minor and varied attentionally challenging activities, e.g., smoking or applying make up.

To identify opportunities to reduce driver distractions, a hierarchical multiple regression was performed on respondent's data. The theoretical rationale behind variable entry was to bifurcate variables into i) inherent individual characteristics, and ii) potentially modifiable, driver behaviours. Therefore, individual personality variables were entered in Block 1 of the regression model, to control for their effects. Block 2 comprised the remaining behaviour rather than trait variables. The dependent variable 'distraction index' was calculated from the self-reported frequency of engagement with distracting behaviours. Results indicate, that although the only 12% of the variance was controlled by the behavioural variables, after accounting for the individual trait features, the model significantly predicts increases in distracting behaviours. Therefore, it would appear that there is scope to mediate these

behavioural actions to reduce the distraction risk for the driver. Mileage and penalty points were the variables with the highest beta values, and thus research effort may be well invested in seeking opportunities to reduce the drivers need to use the vehicle (decreased exposure), and improve their socially-mediated skill (mediate behaviour).

Trait variables reveal interesting underlying characteristics with respect to engagement with distracting behaviours. In both models, age was found to be negatively prediction of engagement in distracting behaviours, i.e., as the drivers age, they would appear to be less inclined to interact with potential distractions. It may be that the younger drivers have unrealistic, or perhaps realistic, estimations of their capability to successful undertake potentially distracting tasks, e.g., sending a text message. Accident statistics would appear to support this hypothesis, particularly for young males. Alternatively, they may be disregarding of authority and social/highway 'rules'. The significance of conscientiousness in Model 1 supports this interpretation. Further, the significantly positive relationship of extraversion and engagement with distractions, may lend further support to this view in that, some aspect of 'showing off' or demonstration of presumed capability may be influencing the drivers propensity to attempt unnecessary distracting behaviours.

It must be recognised that survey data of this type will inherently be biased. It seems highly likely that respondents would have been conservative in their reporting of their behaviours. Further, it seems reasonable they may have had concerns regarding the confidentiality and potential scope for abuse of honest reports. No data was collected that could identify respondents as individuals for the survey, but inevitably it is assumed this may have influenced response rates and the quality of answers. However, the frequency of reporting of 'socially undesirable' and illegal activities, lends some support to substantial frank reporting of respondent's views. Subsequent follow-up survey work will address the scope of external (to the vehicle) distractions, frequency of smoking, and may consider the introduction of honesty and social desirability scales, to control for these potential confounds.

Conclusions

This survey has built on existing survey work looking at driver distraction. It adds detail regarding the severity, frequency, and accident association of various common distracting activities. The survey undertook to investigate the implications of driving behaviours, personality, and demographic features to identify how much these factors are responsible for engagement with candidate distractions. Results suggest drivers are frequently, and repeatedly conducting highly distracting, and in many cases illegal tasks while driving (in the United Kingdom). Hierarchical multiple regression data revealed several trait variables that were predictive of increased preparedness to undertake distracting activities. Further, the inclusion of driver behaviour-related variables significantly increased the predictive value the model. These variables offer scope to mediate the behaviour of those drivers who are more inclined to engage with distracting activities. It is hoped this study i) provides some benchmarks for actual levels of engagement in distractions by UK drivers, ii) indicates the relative severity of these, in terms of accidents and near misses, and iii) provides some insight into factors which may be exploited to reduce the likelihood of undertaking potentially distracting activities.

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