

What do police reported crashes tell us about driver distraction in New Zealand?

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This paper summarises the results of an analysis of police reported crashes involving driver distraction contained in the New Zealand Crash Analysis System between 2002 and 2003. Approximately 2000 crash reports that included the attention diverted codes (350-360) associated with internal and external sources of driver distraction were reviewed in order to provide more detailed information on the type of behaviour, actions and/or objects involved. While internal distraction sources (such as cell-phones, food-drink and other objects inside the vehicle) will be discussed much of the focus of the paper will be on external distraction sources (such as scenery or people/traffic outside the vehicle). The results presented will outline the different kinds of objects/ behaviours that are reported to be involved in driver distraction related crashes, how they are related to other contributing causes (such as alcohol or speed) and the type of crash/movement types involved.

Subject Area: Driver distraction

Keywords: Driver distraction, crashes

Introduction

Driver distraction is considered to be a subset of the broader problem of inattention, and is estimated to be a contributing factor in a significant number of traffic crashes (i.e. Stutts et al, 2001; Young, Regan and Hammer, 2003). United States research for example estimates that driver distraction is involved in 13% of traffic crashes, approximately half of all inattention crashes (Stutts et al, 2001). Distraction has been described by Regan (2005) as occurring “when a driver engages, willingly or unwillingly, in a secondary activity which interferes with the performance of the primary driving task”. This engagement in secondary activity tends to involve diverting some degree of attention away from driving, to an event, object or task, inside or outside of the vehicle, and which negatively affects the drivers’ ability to drive or respond to changes in the driving context.

Distraction involves an interaction between conflicting task demands, information load, the limits of human cognition and capabilities and the breakdown or poor application of control level processes such as feedback, forward planning and ‘event’ prediction (Lee, 2005). A road user can be distracted in a number of ways, from visual, auditory and cognitive sources, and from the physical manipulation of objects/devices (Young et al, 2003). A ‘distracting’

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behaviour often involves multiple forms of distraction at the same time or over the duration of the performance of the behaviour. For example, consider the repertoire of behaviour and forms of distraction involved in responding to a hand-held cell-phone ringing, subsequent conversation and replacing the cell-phone.

The phrase driver distraction encompasses a wide variety of behaviours, activities and objects, refer for example to Stutts et al (2003, 2005 in press), for in-vehicle observational research on ‘distracting’ behaviours performed by drivers. The United States National Highway Traffic Safety Administration (NHTSA) outlines thirteen sources of driver distraction (Stutts et al, 2001). The New Zealand Crash Analysis System (CAS) is a database of police reported crashes. The CAS contributory factor codes that best relate to the types of distractions outlined by the NHTSA are the group of ten sub-codes (351-360) under the general ‘Attention diverted by’ 350 code. Table 1, provides a comparison of the CAS contributory codes and the NHTSA sources.

The CAS coding structure tends to provide more detail on the nature of the outside the vehicle distractions, but less detail on the inside the vehicle distractions. For example, some codes, such as 358: Cigarette, radio, glove box etc are used to capture a wide variety of behaviours and objects. cursory examination of the information contained under the CAS codes showed that in order to provide more detailed information of the behaviours and objects involved the content of the traffic crash reports (TCRs) needed to be examined. As a result, the Ministry of Transport, as part of a project investigating driver distraction, undertook an analysis of police reported crashes involving distraction related contributory factors in order to provide information on the potential size of the problem in New Zealand and specific information on the kinds of behaviour and objects involved.

Table 1. Comparison of distraction contributory codes in CAS and the thirteen NHTSA driver distraction sources

CAS Contributory Factor Codes	NHTSA Sources
<i>General distractions</i> 350: Attention diverted by (general)	<i>General distractions</i> Other distraction Unknown distraction
<i>Inside-the-vehicle distractions</i> 351: Passengers 354: Animal or insect inside vehicle 357: Emotionally upset 358: Cigarette, radio, glove box etc 359: Cell-phone or communications device	<i>Inside-the-vehicle distractions</i> Eating and drinking Adjusting radio, cassette, or CD Other occupants in vehicle Moving object in vehicle Smoking related Talking or listening on mobile phone Dialling mobile phone
<i>Outside-the-vehicle distractions</i> 352: Scenery or persons outside the vehicle 353: Other traffic 355: Trying to find intersection, house number, destination 356: Advertising or signs 360: Driver dazzled	Using device/object brought into vehicle Using device/object integral to vehicle Adjusting climate controls <i>Outside-the-vehicle distractions</i> Outside person, object or event

Methodology

The CAS contributory factor codes that best capture driver distraction are the ten specific codes (351-360), under the general group code ‘Attention diverted by’ (code 350) (see Table 1.). The content of traffic crash reports in 2002 and 2003 that included these contributory

codes as a factor in the crash were examined. As the current CAS contributory factor codes do not provide sufficient precision, a scheme was developed for re-classifying each incident into different sources of distraction with additional information on the specific types of objects and specific behaviour involved. The classification provided separate categories for the object involved and the behaviour involved (the broad source classification scheme is provided in the Appendix). This allowed flexibility in grouping the information for analysis purposes and for comparison with international research. The key determinant for where a distraction source would be placed was with respect to the object involved. For example, if the object involved was a cell-phone, it would be coded under telecommunications whether the behaviour involved was using/dialling or moving/searching for the cell-phone. Where multiple distraction sources were involved in the same crash, each source of distraction was coded, with a marker code to indicate that there were multiple distraction sources involved in the same crash. The development of this classification scheme was guided by the NHTSA scheme (Stutts et al, 2001), observational work conducted in the United States on frequency and types of driver distraction behaviour that occurred (Stutts et al, 2003) and preliminary analysis of samples of the content of the traffic crash reports.

Results

In 2002 and 2003 driver distraction was considered to be one of the main contributing factors in 1964² police reported casualty crashes in New Zealand. There were also 31 crashes where a pedestrian or cyclist was the person who was distracted in some manner. Table 2, provides a summary of the number of crashes by worst injury sustained and the number of casualties by severity. Overall, based on the police crash report data, driver distraction appears to be involved in at least 9.5% of all crashes in 2002 and 2003. Of the distraction involved crashes that contained sufficient information to classify the broad source (as inside or outside the vehicle), approximately 50% were classified as inside the vehicle distractions. These estimates are similar in size to the United States overall distraction involvement estimates (13%) for police reported crashes, though the proportion of inside the vehicle distraction involvement is lower than the United States estimate of between 60-70% (Stutts et al, 2001).

Table 3 provides separate summaries and rankings (by crash involvement) of the relative proportion of involvement for specific inside the vehicle and outside the vehicle sources of distraction. An overall summary and ranking of involvement in crashes for specific sources of distraction is provided in Table 4. Overall, the top three sources of distraction are related to the driver being distracted by sun strike (13%), distracted by passengers in the vehicle (12%) and being distracted by or focusing on vehicles or direction when checking for traffic (11%). If only inside the vehicle distractions are considered, the top source is passengers followed by telecommunications, entertainment systems and the driver being emotionally upset or pre-occupied (all at the same level). For outside the vehicle distractions, the top three were driver dazzled by sun-strike, distracted while checking for traffic, and distracted by other road users in vehicles.

The use of technology (if defined as telecommunications devices, entertainment systems and vehicle controls/devices) is involved in one third of inside the vehicle distractions. If the role of technology is considered within the context of all distraction sources (inside and outside

² In 2002 and 2003 there were a total of 2021 crashes under the 'attention diverted by' codes (350-360). Of these, in 1964 crashes a driver of a vehicle was distracted and in 31 crashes a pedestrian or cyclist was distracted. The remaining 26 crashes were not related to distraction.

Table 2: Number of crashes by worst injury sustained and number of casualties involving driver distraction in 2002 and 2003

Distraction Source (2002-2003)	Worst Injury involved in Crash				Number of Casualties by Severity			
	Fatal	Serious	Minor	Total	Fatal	Serious	Minor	Total
<i>Driver Distraction</i>								
Inside the Vehicle Distractions	26	159	710	895	32	210	1083	1325
Outside the Vehicle Distractions	15	142	750	907	15	159	1044	1218
Multiple Sources - Both Outside and Inside the Vehicle Distractions	1	4	29	34	1	5	36	42
General Distraction - Source Not Defined	7	27	94	128	7	33	158	198
<i>Total Driver Distraction Related Crashes</i>	<i>49</i>	<i>332</i>	<i>1583</i>	<i>1964</i>	<i>55</i>	<i>407</i>	<i>2321</i>	<i>2783</i>
Pedestrian-Cyclist Road user Distraction	2	7	22	31	2	7	26	35
<i>Total - All Distractions</i>	<i>51</i>	<i>339</i>	<i>1605</i>	<i>1995</i>	<i>57</i>	<i>414</i>	<i>2347</i>	<i>2818</i>
Total - All Crashes - All Contributory Factors (2002 and 2003)	770	4152	15856	20778	866	5178	23112	29156

Notes: Driver includes light vehicles, heavy vehicles, motorcycles and powercycles. Each crash is only counted once, even if multiple distractions were involved.

Table 3: Proportion of involvement for specific distraction sources for inside the vehicle and outside the vehicle distractions

Inside the Vehicle Driver Distraction Source	% of all inside distraction involvement	Outside the Vehicle Driver Distraction Source	% of all outside distraction involvement
Passenger/s	26%	Driver Dazzled - Sun Strike	28%
Telecommunications	12%	Checking for Traffic	24%
Entertainment Systems	12%	Other Road users - Vehicles	14%
Emotionally Upset or Preoccupied	12%	Trying to Find Destination/Location/Something	8%
Personal Effects	10%	Scenery - Persons	6%
Vehicle Controls-Devices	10%	Police-Emergency Vehicles-Crash Scenes etc	5%
Food-Drink	7%	Scenery - Landscape/Architecture	4%
Smoking	5%	Other Road users - Pedestrians/Cyclists etc	4%
Animal-Insect Inside Vehicle	4%	Driver Dazzled - Headlights	3%
Sneezing-Coughing-Itching	1%	Animal Outside Vehicle	2%
General Distraction - Inside	6%	Other External Event	1%
		Advertising-Signage	1%
		General Distraction - External	4%

Table 4. Driver distraction source involvement in crashes in 2002 and 2003

Source	Vehicle Driver Distraction Source	Number of crashes involving the source by worst injury sustained in crash					Number of casualties by injury severity involved in crash by source				
		Fatal	Serious	Minor	Total	% of distraction involvement	Fatal	Serious	Minor	Total	% of distraction involvement
Outside	Driver Dazzled - Sun Strike	4	46	208	258	13%	4	47	285	336	12%
Inside	Passenger/s	8	53	168	229	12%	11	83	312	406	15%
Outside	Checking for Traffic		27	193	220	11%		28	256	284	10%
Outside	Other Road users - Vehicles	2	25	101	128	7%	2	28	138	168	6%
Inside	Telecommunications	7	14	87	108	5%	9	20	129	158	6%
Inside	Entertainment Systems		15	89	104	5%		17	126	143	5%
Inside	Emotionally Upset or Preoccupied	6	19	78	103	5%	6	21	97	124	4%
Inside	Personal Effects		14	77	91	5%		15	99	114	4%
Inside	Vehicle Controls-Devices	2	19	70	91	5%	2	23	112	137	5%
Outside	Trying to Find Destination/Location/Something	2	17	53	72	4%	2	24	85	111	4%
Inside	Food-Drink	3	8	53	64	3%	4	10	72	86	3%
Outside	Scenery - Persons		7	46	53	3%		9	69	78	3%
Outside	Police-Emergency Vehicles-Crash Scenes etc	2	5	40	47	2%	2	6	62	70	3%
Inside	Smoking		10	36	46	2%		12	57	69	2%
Outside	Scenery - Landscape/Architecture	2	6	28	36	2%	2	7	46	55	2%
Inside	Animal-Insect Inside Vehicle		3	33	36	2%		3	48	51	2%
Outside	Other Road users - Pedestrians/Cyclists etc	1	2	30	33	2%	1	2	41	44	2%
Outside	Driver Dazzled - Headlights	3	5	20	28	1%	3	5	24	32	1%
Outside	Animal Outside Vehicle		1	20	21	1%		1	26	27	1%
Inside	Sneezing-Coughing-Itching		1	11	12	1%		1	14	15	1%
Outside	Other External Event		1	10	11	1%		1	12	13	0%
Outside	Advertising-Signage		1	7	8	0%		1	9	10	0%
Inside	General Distraction - Inside	2	9	45	56	3%	3	14	65	82	3%
Outside	General Distraction - External		4	33	37	2%		6	45	51	2%
Undefined	General Distraction - Source Not Defined	7	27	94	128	7%	7	33	158	198	7%

Notes: As multiple sources of distraction were present in some crashes, involvement refers to the number of crashes that the specific distraction source was present as a contributing factor. Refer to Table 2 for the total number of crashes where one or more distraction sources were present as a contributing factor.

the vehicle) then technology based distraction appears to be involved in around 15% of distraction related crashes.

Inside vehicle distractions

A summary of the broad source classification scheme (used in Tables 3 and 4) is provided in the Appendix and can be further sub-divided into the specific behaviour involved and the types of objects involved.). For example, with respect to telecommunications devices, the device involved was mainly mobile phones (93%), pagers (2%) and radio-telephones (5%). In terms of the behaviours involved, 41% involved reacting to an incoming call or message, 21% using or manipulating the device (not in conversation but includes texting), 15% involved reaching for or moving the device, 13% involved conversation, with the remainder suspected usage or other behaviours. A more detailed preliminary analysis of inside the vehicle distraction sources and the types of behaviours and objects involved is provided in Gordon (2005a).

Inside the vehicle distraction related crashes were also examined in terms of the typical crash types and movements involved for different speed zones (Gordon, 2005b). In 50km/h speed zones the crash pattern was spread across a variety of types including loss of control (on straight or cornering), collisions with obstructions, rear-ends and intersections/driveways (where the vehicle was turning versus the same direction or crossing). In comparison to the crash movements involved for all contributory factors, inside the vehicle driver distraction seemed to involve proportionately more loss of control on the straight, collision with obstruction and rear-end crashes. In 100km/h speed zones, the crash pattern for inside the vehicle distractions was basically loss of control (on the straight and cornering) which accounted for 72% of all crashes. For both speed zones where inside the vehicle distraction was a contributing factor, the proportion of loss of control on the straight type crashes was considerably higher than for all contributing factors over the same period. This crash pattern fits with the type of crashes one would expect given the types of performance detriments (in terms of lane keeping, hazard detection, reaction time) associated with distractions such as cell-phone use (i.e. Caird et al, 2004).

Outside vehicle distractions

A summary of the broad source classification scheme (used in Tables 3 and 4) is provided in the Appendix. These distraction sources can also be broken down further into the types of objects and/or behaviours involved. Four sources are discussed in more depth to illustrate some issues relating to what counts as distraction and to provide further information on the types of behaviours and/or objects that were involved.

With ‘driver dazzled (by sun strike)’ the typical situation was that the drivers’ vision was impaired by the sun. Given Regan’s (2005) definition of distraction, is there secondary activity present that counts as distraction? Behaviourally, when confronted by sun-strike, the driver is probably trying to compensate or engage in activity to improve their vision, such as looking away, restricting their vision to parts of the road they can see more clearly, pull down sun-screens, clean or wash the windows, shading eyes with one hand etc. The content of the traffic crash reports in many cases confirmed or suggested such behaviour in response to sun-strike. Such behaviour, while apparently related to the primary task of driving, may not strictly be secondary activity, but is probably still distracting in the sense of involving visual, cognitive and/or physical forms of distraction. For these reasons, driver dazzled has been included as an outside the vehicle distraction source.

‘Checking for traffic’ incidents typically involved the driver in the act of checking for traffic at intersections, free-turns, merging lanes, or were related to lane changing. Again, this behaviour appears to be related to the primary task of driving, and may not strictly be a secondary activity, but the driver would nevertheless appear to be cognitively or visually distracted. The distraction occurs in the sense that the driver is focusing on either a location/direction of traffic (i.e. looking for a gap) or a specific vehicle (i.e. watching to see what they are doing) to the detriment of the primary driving task by not keeping aware of the surroundings in their direction of travel. Of the 220 crashes involving this source, 39% of the drivers were focusing on/looking at a specific vehicle, 35% were focused on a specific direction, (for example, focusing on finding a gap in the traffic on their right when intending to turn/ move left), 18% were checking their mirrors, 1% were panicked or reacted to drivers behind them (i.e. honking their horns) and 7% were suspected of this type of distraction.

‘Other road users – vehicles’ refers to the driver being distracted by incidents that are not covered under ‘checking for traffic’ that involve other vehicle road users. Of the 128 crashes involving this source, in 42% the driver was focusing on a vehicle that related to the driving task (i.e. a vehicle in front or behind them) but to the detriment of their awareness of the wider situation, and in 40% the driver was vehicle watching (i.e. looking at another vehicle as it was interesting). The remainder consisted of the driver looking at a variety of other vehicle objects (11%) or they were suspected (7%) of this type of distraction.

The ‘Police-emergency vehicle-crash scene etc’ source of distraction essentially encompasses rubber-necking, that is the driver was watching or looking at police or emergency vehicles, crash scenes or breakdowns. Of the 47 crashes, 11% were for breakdowns on the side of the road, 15% for a crash scene with or without emergency vehicles present, 11% for emergency vehicles (fire or ambulance) going about their business and 64% were for police going about their business (i.e. dealing with motorists, travelling, assisting motorists with potential hazards and so forth).

Discussion and Conclusions

Distraction encompasses a wide variety of behaviour and objects, and is not just restricted to drivers. The examination of the crash reports for example showed that any road user (pedestrians and cyclists for example) can be distracted, though the range of potential distractions may be limited for some road users. While comparatively few pedestrians and cyclists are recorded as being distracted in police reported crashes, this may be a reflection of coding or reporting practice and focus rather than an indication that distraction is not an important road safety issue to these road users. Definitions of distraction could easily be expanded to include non-vehicular based road users.

The analysis of the crash reports provides an indication and more detail on the different types of behaviour and estimates of prevalence as contributing factors in distraction related injury crashes. Based on the police reported crash analysis, driver distraction appears to be involved in at least 9.5% of police reported crashes in New Zealand (in 2002 and 2003), with approximately a 50-50 split between inside and outside the vehicle distractions. The term ‘at least’ with regards to the overall estimate of involvement (10%) is used because the estimate is likely to be an underestimate as this study only examined the ‘attention diverted by’ codes (350-360) that best captured the kinds of behaviours discussed under the phrase ‘driver distraction’. The CAS coding system includes other inattention related codes that on closer examination of the content in the traffic crash reports may also include some distraction related contributory factors.

Overall, the top three sources of driver distraction were distraction sun strike, passengers and distraction related to the act of checking for traffic (i.e. focusing on a direction or specific vehicle). For New Zealand, the majority of the driver distraction involved in the police reported crashes were not technology based. Technology based distraction, defined as telecommunications devices, entertainment systems and vehicle controls/devices, appears to be involved in around 15% of the crashes examined. Examination of the kinds of crashes occurring, suggests that at least for inside the vehicle related distraction there is a distinct pattern of crashing when compared to the crash types of all contributory factors, and that the pattern varies for different speed zones (50km/h and 100km/h). This pattern of crashes is consistent with that expected from the types of driving performance decrements observed in research for distraction related activity such as use of a mobile phone while driving.

If Regan's (2005) definition of distraction is considered, the 'attention diverted by' codes that are related to outside the vehicle distractions include a variety of behaviour that appears to be more akin to the primary driving task rather than a secondary activity. Examples include the behaviour of the driver when affected by sun strike and checking for traffic sources of distraction. The actions involved in these behaviours however would still suggest that the driver is undergoing various forms or types of distraction i.e. visual, cognitive, physical and/or auditory. For this reason these sources have been considered as distraction in the analysis. Further refinement of what is secondary activity and whether primary driving task related behaviour can also involve distraction may be useful, especially when discussing outside the vehicle sources of distraction or inattention.

These findings are based on police reported crashes and as a result care should be taken in interpreting risk, exposure or prevalence from this information for specific distracting behaviours. The analysis represents a summary of what people involved in crashes stated were the contributing factors in the crash, and/or information that was inferred or ascertained by the Police Officer on examination of the scene, participants and witnesses.

Because of the wide variety of potential behaviour, distraction is difficult to address as a single issue or with a single approach. In many instances the behaviours are ones that may be difficult to legislate against or they are behaviours that may have driving benefits, thus we do not necessarily want to stop or prevent them. Some sources of potential distraction could be prevented through better planning, such as restraining animals when in a vehicle or secure placement of personal effects. Other sources could be prevented through improved decision making and behavioural strategies on when and how to perform them while driving, such as don't answer the phone when it rings, as a message will be taken; rather, when convenient, pull over and devote your entire attention to the conversation. Providing information on how distraction works and the risks associated with specific behaviours could at least raise awareness, and could be combined with concrete behavioural-solution based advice for specific distractions, such as the examples above. A mix of training, education, awareness raising initiatives and/or environmental encouragement such as legislation or enforcement would provide part of the approach. Such solutions aim to prevent the distraction occurring in the first place or improve decision-making when they occur.

Other solutions such as engineering (road environment or vehicle design) could assist in minimising harm in the event of a distraction-related incident (such as removing roadside hazards, improved vehicle crash worthiness) or preventing the consequences of being distracted (such as median barriers to prevent lane drifting). Telematic-based solutions, if well-designed, could also minimise the occurrence of or consequences of some driver

distraction issues, however these solutions themselves need to be minimally distracting to the driver. However, the driver and/or passengers can always bring in objects and devices into the vehicle, or pay attention to events outside the vehicle which can influence the task of driving. As a driver we may need reminding what the primary task involved is; when we add tasks or divert attention, we add complexity, and sometimes it catches us out.

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Appendix: Summary of basic classification scheme for inside and outside distractions

Inside the vehicle distraction source	Source Description
Passenger/s	Related to, involving or in response to one or more passengers actions
Telecommunications	Object involved relates to a cell-phone, pager, radio-telephone or other communications device and any related actions to use them
Emotionally upset-preoccupied	Related to the driver, where they are upset, angry, crying or similarly emotionally upset, or cognitively pre-occupied, such as thinking about something (day-dreaming, planning the day etc). If the emotional state relates or indicates an intention to crash, then not considered as distraction
Food-drink	Object involved relates to food or drink objects or containers and actions to use them
Personal effects	Object involved relates to items brought into vehicle such as books, bags, tissues, briefcases, etc and includes adjusting items on the driver such as clothing and glasses
Smoking	Object involved relates to smoking (pipes, cigarettes, lighters etc) and actions to use them
Entertainment systems	Object involved relates to the entertainment system of the vehicle (currently stereo, CD, radio, cassettes, mini-disks) or similar items brought into the vehicle for the same purpose, and actions to use them
Vehicle controls/devices	Object involved relates to controls/ devices or gauges integral to the vehicle (other than entertainment). Also includes physical adjustments to mirrors and the windscreen etc
Animal or insect inside vehicle	Object involved relates to animals or insects in the vehicle and their or drivers actions in relation to them
Sneezing-coughing-itching etc	Related to the driver, and the actions are related to sneezing, coughing, itching, stretching or similar activity
General distraction - inside	Where enough information is provided to assign the distraction as inside the vehicle but there is insufficient information to categorise the object or behaviour involved further
Outside the vehicle distraction source	Source Description
Driver dazzled – sun strike	Where the driver is distracted by or their vision affected by sun, and any resulting activity associated with dealing with the problem
Checking for traffic	Where the driver is focusing in a specific direction or at a specific vehicle or road user when merging, changing lanes or at an intersection
Other road users - vehicles	Where the driver is looking at another vehicle (not covered under checking for traffic or police-emergency vehicles))
Trying to find destination, location,	Where the driver is searching for a specific destination/location, person or animal or for information/signs to indicate where they are/direction
Scenery - persons	Where the driver is attending to a person or persons outside the vehicle that are not part of the traffic environment or trying to get their attention when driving
Police-emergency vehicles, crash scenes	Where the driver is looking at police or emergency personnel, crash scenes or breakdowns. Essentially rubber-necking
Scenery – landscape, architecture	Where the driver is looking at landscape or buildings/property
Other road users – pedestrians, cyclists	Where the driver is looking at, focusing on other road users such as pedestrians or cyclists, where they are interacting with the road space
Driver dazzled - headlights	Where the driver is distracted or their vision affected by the headlights of another vehicle, and any resulting activity associated with dealing with the problem
Animal outside the vehicle	Where the driver is looking at or attending to an animal outside the vehicle. Might be animals as part of the scenery or an animal interacting with the road space
Advertising or signage	Where the driver is looking at advertising or traffic information such as electronic traffic information
Other external event	Other external event not already classified
General distraction - external	Where enough information is provided to assign the distraction as outside the vehicle but there is insufficient information to categorise the object or behaviour involved further