

DRIVER DISTRACTION FROM ROADSIDE ADVERTISING:

The clash of road safety evidence, highway authority guidelines and commercial advertising pressure

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ABSTRACT

This paper examines possible driver distraction from billboards and other 3rd party roadside advertising - including both electronic/digital and traditional static advertising signage. It considers three conflicting data sources/stakeholders: road safety evidence produced by the research community, the role of road authorities to develop balanced, defensible and robust guidelines to regulate advertising (often such advertising is also revenue raising for the authorities), and the role of commercial advertisers and advertising bodies who seek to maximize the exposure of their billboards.

Where it exists, the research literature has generally found that such advertising in the road environment has negative safety effects. Despite this, there is still a lack of conclusive research evidence upon which to form comprehensive guidelines or standards about how much distraction from advertising is 'safe'. This might explain why the situation regarding roadside advertising restrictions around the world is very variable, ranging from complete bans, to little regulation.

Given the lack of both comprehensive research evidence and international regulatory agreement, road authorities may therefore be justified in using the best research information available (albeit incomplete) coupled with engineering judgement. Different guidelines from selected countries around the world are reviewed, and the current and draft guidelines in the Australian State of Queensland are considered in more depth as a case study. Finally, it is argued here that more emphasis should be placed on advertisers to prove that a roadside advertisement is safe, rather than on road authorities to have to prove it is unsafe. Equally, more independent research to help better inform roadside advertising policy and guidelines is sorely needed.

INTRODUCTION

This paper focuses on driver distraction caused by billboards or other 3rd party advertising information. The 3rd party advertising of interest here includes billboards (both static and electronic/digital) that visually advertise companies, products, events or services that do not take place at the physical location of the advertisement. As such, 1st party advertising of, for example,

a shop having a large sign at their premises or a trucking company advertising their services on the side of their vehicle are not directly considered here.

As Horberry and Edquist [1] recently noted, the amount of visual information in most road environments is increasing due to factors such as progressively higher traffic densities, more complex traffic management and roadway maintenance practices, increased commercial roadside development, and more commercial pressure on road authorities to permit (and often receive revenue from) advertising next to large roads. Therefore, these factors mean that many road environments are increasingly prone to producing information that may distract a driver. The ever increasing number of older drivers remaining mobile may be of particular concern, as this group is often more found to be more susceptible to distraction by advertising and visual clutter [2, 3].

Indeed, as would probably be expected in the advertising field, the whole area of roadside advertising is constantly changing. Not only are there more electronic billboards, but the technologies are becoming more sophisticated and often interactive. As recently noted by Wachtel [3] new advertising technologies include trucks, vans and trains fitted with LED advertising signs and 'Interactive' advertising by means of, for example:

- cameras mounted near the advertisement that measures where the driver is looking
- interacting with an upcoming sign by means of mobile phone text messages
- billboards that tailor their messages to be matched to the radio frequency the driver is listening to.

Clearly then, this whole area should be of key interest to the road safety community. However, as will be seen below, there has been little research into how and to what extent roadside advertising can cause driver distraction.

THE EFFECTS OF 3RD PARTY ADVERTISING ON DRIVING PERFORMANCE

Unfortunately, with reference to distraction from external sources such as 3rd party advertising, there is a lack of independent research evidence. Furthermore, as Molino et al [5] recently stated, the whole area is difficult to study due to differences in billboard types, drivers, roads, traffic etc. For electronic advertising, key future research areas Molino noted include: 'safe' message change intervals, sign illumination at night, proximity of advertisements to legitimate highway signs, entrance/exit ramps or lane merges, information amount and exactly what information is displayed. Despite that, some evidence does exist; this will be briefly reviewed below.

'Classic' studies

Early research in Australia to investigate the effects of advertisements on driver behaviour was undertaken by Johnston and Cole [6]. They undertook a series of laboratory based experiments in which subjects used a joystick to track objects on a screen, while distracting advertisements were occasionally presented just above the target objects. They concluded that distractions from

advertising billboards did not affect vehicle control (as simulated by the joystick tracking task) but might affect hazard detection (as simulated by a peripheral target detection component).

Eye tracking

The attention-grabbing property of their products is often a major selling point for the outdoor advertising industry [1, 2, 3]. It might therefore be hypothesised that such advertisements would distract attention from the driving task. A small collection of research evidence supports this.

Over the past dozen or so years eye-tracking equipment has better developed to allow researchers to more easily investigate how much time drivers spend looking at advertising billboards as they are driving past. For example, in a driving simulator and eye movement study, Horberry [7] found that if an advertisement or other form of visual clutter (that is, objects not relevant to the driving task, such as graffiti) is in a road scene, then it is often looked at for a quite large proportion of the time (over 14% of the total driving time on average).

Work by Beijer, Smiley and Eizenman [8] analysed eye glances at advertising signs on a Canadian expressway. Advertising signs with moveable displays or components made up approximately 50% of signs, but received 69% of glances, and over 75% of glances that lasted more than 0.75 seconds. This 0.75 second figure is often considered to be the minimum perception-response time for a non-alerted driver to react to a braking vehicle [1], so if eyes are taken off road for longer than 0.75 seconds there is a significant increased risk that they will not detect sudden onset, unexpected roadway hazards.

More recently, Crundall et al [9] recorded eye movements as subjects watched videos of driving past advertising signs. These signs could be situated at street-level (SL) or raised. SL advertisements were fixated by participants more often and for longer, but this did not result in better recognition on a subsequent memory task. Indeed, memory for SL advertisements was worse than that for raised ones. Participants who were instructed to look for hazards actually fixated on SL advertisements more than those who were instructed to specifically remember advertisements for the subsequent test. Crundall et al speculated that this was because advertisements at street level fall into the driver's usual search zone for potential hazards, and so capture attention. Participants rated the videos containing SL advertisements as more hazardous than those containing raised advertisements. To some extent this would imply that raised signs may be more memorable (a positive attribute for an advertiser) yet less visually demanding (a positive attribute for road safety). Of course, not all road environments allow for raised advertising signage. However, this is an area warranting further investigation.

Simulator studies

In an advanced driving simulator in Australia, Edquist [2] recently undertook a study examining the behavioural and safety effects of advertising. The results obtained suggested that advertising billboards had significant effects on:

- Driver ability to follow directions on road signs that required a driver to change lanes. When advertising billboards were present, drivers took longer to change lanes in response to road signs. Also, more lane change errors occurred.
- Speed maintenance. Drivers drove more slowly when advertising billboards were present compared to when they were absent, and were less able to maintain a target speed of 70km/h at these times. The effect on speed could be because drivers are aware that they are visually distracted and are deliberately compensating for this by driving more slowly, or because drivers are simply paying less attention to the speed at which they travel. In either case, unexpected decreases in speed may cause difficulty for following drivers.
- Eye movements. Billboards also increased the proportion of time spent looking at roadsides, at the expense of the amount of time looking at the road ahead and lead vehicles when present. It seems likely that reduced observation of lead vehicles due to billboards might lead to a delayed response when the lead vehicle brakes. Such billboards may be particularly dangerous when they are at a large visual angle from the road ahead.

Older drivers were especially affected by visual clutter in this study (as previously found by Horberry et al [10] in the same simulator). The older driver group made more lane change errors overall, but particularly when billboards were present (Edquist [2]). While much research remains to be done (particularly on dynamic/digital billboards), this experiment demonstrated that simple billboards can affect vehicle control as well as responses to road signs in a high-fidelity simulated driving task (Edquist [2]).

Similarly, in the UK, Young and Mahfoud [11] undertook a simulator study in this area. Their results demonstrated that the presence of roadside advertising has a clear detrimental effect on vehicle lateral control, increases driver mental workload and eye fixations. Also, on some roads roadside advertising can draw attention away from more relevant road signage. Their paramount conclusion was that extreme care should be exercised when authorising or placing roadside advertising.

In combination, these above-mentioned studies provide evidence that some advertising may attract drivers' attention at inappropriate times, and hold it for long enough such that drivers might be unable to avoid a crash should a critical incident occur.

Naturalistic studies

Naturalist studies of driving and drivers are becoming increasingly popular. So far, the most important naturalistic study is the 100 Car naturalistic study undertaken in the USA recently by Klauer, Dingus et al [12]. For the topic of interest to this paper, the study indicated that the time drivers spent with their eyes off road due to external to the vehicle distraction or inattention was estimated to contribute to more than 23% of all crashes or near misses that occurred in their research study [12]. Equally, extended times of eyes off road (2 seconds or longer) increased by 3.7 times the likelihood of a crash [12]. Clearly, future naturalistic studies that focus on external distraction will be able to build on these initial findings; however, the 100 Car naturalistic study does certainly illustrate the role of external distraction in crashes and near misses.

Other reviews and meta- analyses

Most of the recent reviews of the literature on the presence of roadside advertisements and the number of crash rates conclude that these two factors are correlated. In this vein, Cairney and Gunatillake [13] reviewed studies correlating crash data with advertisement location and found that greater density of advertisements tends to correlate with a higher crash rate, especially for changeable-message advertising signs. However, no formal meta-analysis was possible due to the wide range of methods and analysis techniques used. Despite this, they concluded that regulation of roadside advertising was often justified on safety grounds.

Farbry and colleagues [14] concentrated on the effect of electronic billboards on crash rates. Of the nine studies they reviewed, most found that electronic billboards were associated with higher crash rates.

One recent study in the USA by Tantala and Tantala [15] (funded by the advertising industry) analysed accident rates near digital billboards in Ohio and failed to find high correlations between billboards and accident rates. However, the analyses given did not control for various key factors (such as traffic volumes) and no statistics were reported.

However, a Scottish study not funded by the advertising industry (Wallace [16]) suggested that higher crash rates were associated with the presence of roadside advertisements in two situations:

- at intersections: where roadside advertisements can function as visual clutter and interfere with the driver's ability to comprehend important traffic signs; and
- on long monotonous stretches of road, when drivers may be surprised by the sudden appearance of a roadside advert, or fixate upon it as the brightest object in their visual field.

Wallace concluded that more research should be performed into the situations in which billboards can dangerously interfere with the driving task. Similar points were made by Hatfield [17, 18], in which she concluded:

“On balance, the available literature suggests a small impact of advertising installments on crash rates, particularly if they feature bright lights or motion, and are located at intersections or in otherwise complex road situations. Unfortunately, it is in such sites that advertising installments are likely to be located.” Hatfield [17].

Finally, a major recent review by Wachtel [3] focused purely on electronic advertising signage. It usefully divided the research evidence into independent scientific research and research sponsored by the outdoor advertising industry. It found that independent scientific research regularly demonstrates that the presence of roadside advertising signs (eg digital billboards) contributes to driver distraction at levels that impact upon driving performance. However:

“The research sponsored by the outdoor advertising industry generally concludes that there is no adverse impacts from roadside digital billboards, even when, in one case, the actual findings of such research indicate otherwise” Wachtel ([3], p5)

Taken together, the above reported studies indicate that advertising in the road environment almost certainly has negative safety implications in some situations.

Advertising content

Surprisingly, one feature of roadside advertising that has not been studied by the road safety community in much detail is their actual content. Other than the effect of location, advertising content is an obvious issue (because, as advertisers know, drivers are more likely to look at content that in some way interests them), yet it is difficult to study empirically.

A 2005 study suggested that billboards containing emotive images could be more distracting than others (Most, Chun and Widders [19]). Subjects in their study watched a rapidly changing series of photographs, looking for a target one that was rotated. Subjects were less accurate at responding to the target when it occurred just after an emotive picture. In a similar vein, Hatfield [17] stated that advertising was more likely to maintain attention if it was complex (difficult to understand or ‘crowded’).

Certainly more road safety research is needed here. However, it will be a difficult task to make the images in roadside advertisements salient, interesting or otherwise attention grabbing to all drivers in a study [1]. As noted earlier, the advertising industry is attempting to do this by means of more interactive advertisements.

Summary of the research evidence

The research literature thus far has found that the presence of advertisements in the road environment can result in them being looked at by drivers for a comparatively large proportion of time, and consequently that the time spent looking at driving-related information in the forward roadway is reduced. Similarly, their presence can impair hazard detection by drivers, and can impair drivers’ ability to both react to and follow the instructions given in traffic signs (especially if the colour contrast between the advertisement and sign is low). Higher crash rates associated with the presence of advertisements around intersections have also been found. Older drivers seem to be especially affected by the presence of billboards. One aspect not considered enough by the road safety community is the actual content of the advert; from the limited research performed in this area, it would seem that the content on billboards makes a significant difference - emotive advertisements, or something of particular interest to the driver could be the most distracting.

However, there is still a lack of comprehensive research evidence upon which to form guidelines or standards about how much distraction from outside of the vehicle is ‘safe’ [1]. A recent review in the UK of the driver distraction literature (in-vehicle and external distraction) by Basacik and Stevens [20] produced similar conclusions, and recommended that further work to examine driver distraction due to the presence of advertising billboards and similar is a high priority. At the time of writing, similar research initiatives in the area of possible distraction caused by roadside advertisement are also taking place in the USA [3, 5]. However, until complete, the regulation of some types of information (e.g. billboards and other 3rd party advertising) in the road environment cannot be fully evidence-based. That so, the emphasis should be placed more on advertisers to prove that a potential roadside advertisement is safe, rather than purely on road authorities to prove it is unsafe.

REGULATION OF ROADSIDE ADVERTISING

In some ways, 3rd party advertising is one of the easiest objects in the road environment to control. Although as will be seen below, their precise regulation varies across highway authorities around the world, most authorities do at least have some measure of control over them. However, advertisers and the owners of the land upon which these advertisements are located often have significant financial incentives to make billboards as conspicuous as possible. Highway authorities often receive revenue from such advertising- often in the form of both an initial roadside advertising application and an annual renewal fee. Of course, once installed, most advertising signs (especially the more traditional static billboard types) have a limited life-span. As such, annual approval permits are often a good idea- so road authorities or researchers can yearly assess the impact of the advertising (eg if it is associated with more accidents at a location).

Roadside 3rd party advertisements by their nature tend to be large, bold, brightly coloured and placed as near the road as the advertisers can achieve. It might therefore be reasonably expected that they might divert attention from the driving task in some situations. For Shinar [21], there is a paradox confronting researchers in this area: billboards are designed to attract visual attention, and it is expected that they would be a source of distraction; indeed, as seen above, many studies do show that drivers direct their visual attention to them as they drive. But such studies have often found little impact upon driving performance. This might be due to ‘spare’ driver visual capacity- when a driver’s cognitive demand increases then they might look less at the advertisement [21]. However, such advertisements are often placed at high workload situations (eg junctions) where the advertiser is expecting more eyes to look at them [3, 21]. Also, not all drivers are willing or able to switch their attention away from such distractions when needed, or cannot accurately anticipate how much cognitive load is required or how much spare capacity they have at different times [3]. This is a problem for younger/less experienced drivers (who have less skill and poorer risk perception) and especially for older driver (who generally have less capacity and are more easily distracted) [2, 10]. Sadly, there is no real research evidence of looking less at advertising when drivers are under higher cognitive load [3] - hence regulation is certainly needed.

As Wachtel noted [3], a ‘criteria’ problem exists for road safety authorities: how much knowledge and certainly must they have before they can be confident about issuing guidelines and regulations about roadside advertisements? Proof of advertisements causing crashes is rarely obtainable, but, for Wachtel, the converging validity of the negative impacts of advertisements from independent research over the last 10 years makes a progressively strong case for regulation.

The issue is further complicated by the continued development of roadside advertising technology and advertising methods. The fast pace of the advertising industry is rarely matched by either the highway authorities or the research community [3]. As such, there is often a lag between the advertisers and the researchers, and also to a smaller extent between the actual research findings and their incorporation into official guidelines/policy:

“Potential research, even now, is years behind the implementation of the types of signs that are the subject of the research”. Wachtel ([3], p179).

CURRENT (AND PROPOSED) WORLDWIDE GUIDELINES

As noted above, the presence of billboards and other 3rd party advertising devices in the road environment has several safety disbenefits. However, the lack of absolutely comprehensive research findings, the revenue raised, and the commercial benefits of such advertising means that road authorities often only consider restricting advertisements on motorways and other major roads in some instances (e.g. at junctions or at locations with a high crash history) but not others (undemanding stretches of road that have little prior accident history).

Because of the lack of relevant research, road authorities often develop their guidelines around the visual appearance of the road and roadside environment based largely on engineering judgement, conventions and international standards. These roadside advertising guidelines are often challenged (especially by outdoor advertising associations). This is particularly the case where guidelines are being updated and or tightened; road authorities have been asked to provide evidence to defend their assumption that additional visual stimuli could impair driving performance.

Main Roads Queensland (Australia) current guidelines (from December 2002)

The Department of Main Roads, Queensland, Australia current set of guidelines seeks to minimise the possibility for 3rd party roadside advertisements to distract drivers from processing traffic signals especially in situations requiring particular driver concentration and manoeuvres [22].

Regarding 'Category 1' advertising (billboards), the main form of this is longitudinal placement controls. 'Clear zones' are mandated on either side of road for a certain distance around traffic signs and areas requiring merging. On normal roads, no advertisements are permitted within a circle with a radius of $1.2 \times V$ metres around important traffic signs (where 'V' equals the velocity or speed environment of the road - such as 100km/h on a motorway); on state motorways this is extended to $2.5V$. In addition, advertisements are not permitted for a distance of $5V$ upstream of an on-ramp and $7.5V$ upstream of an exit from a motorway to attempt to prevent negative effects.

The guidelines do retain some flexibility, and further restrictions may apply in situations that require additional driver attention and decision-making. Examples are:

- on large high-speed roundabouts,
- at complex intersections such as where several roads come together,
- where a divided multi-lane motorway becomes a two-way road,
- on sections of road displaying legitimate traffic control devices that (singly or in combination) are complex and require additional time to read and interpret,
- on pedestrian crossing facilities,
- or on sections of road with a vehicle crash history higher than average.

Main Roads Queensland proposed guidelines (from 2009)

To build on, and potentially replace parts of, the 2002 guidelines, Main Roads Queensland are currently considering additional ‘safety in design’ restrictions. This is a driver-centred approach, based on the conditions drivers are likely to experience at different areas of a motorway. In summary these are:

1. On Approach to a Motorway Interchange.

Generally an advance direction sign is located about 1km from the Off Ramp (exit) location.

- A Viewing zone restriction of 2.5V before the sign.
- An Extension zone of 2.5V after the sign for reading and sign comprehension without distraction from advertising signs.

2. Area Between the Direction Sign and the Off Ramp (where direction signs are not present). Advertising signs may be permitted.

3. Off Ramp Area.

- A Turbulence Zone (where drivers may change lanes or prepare for leaving the motorway) restriction of 4.5V.
- A Conflict Zone (where drivers can leave the motorway) of up to 5V.
- An Extension zone of 2.5V after the off ramp, to ensure drivers are not distracted by advertising.

4. Area Between the Off Ramp and the On Ramp (where direction signs are not present). Advertising signs may be permitted.

5. On Ramp Area

- A Preview Zone (where drivers on the Motorway are first able to identify vehicles on the On Ramp) restriction of 3.5V.
- A Conflict Zone (where drivers can enter the Motorway) restriction of up to 5V.
- A Turbulence Zone (where driving gradually returns to the normal free flow of the Motorway) of 4.5V.

6. Motorway Mid-Block Locations (away from Interchanges, Overtaking Lanes, Signs etc).

Advertising devices are permitted where placed away from traffic control devices (and other advertising devices). The minimum spacing between advertising devices is 2.5V (e.g. 250m or approx 9 seconds of travel at 100km/h).

However, it should be noted that these proposed changes/additions do not yet consider:

- Known locations with high accident rates (blackspots)
- Curves/bends and hills
- Advertising content
- Road works

Given the focus on the locations that previous work [18, 3, 16] has found to be particularly susceptible to advertising (e.g. intersections), then these draft suggested changes seem to be broadly based on the current research evidence.

Other guidelines and restrictions around the world

A brief review of known current guidelines and restrictions on billboards and other 3rd party advertising devices around the world is presented below. Overall, this presents a mixed picture, in which the above mentioned Queensland, Australia guidelines probably sit somewhere in the middle. Given this range, it is difficult to state a single image of world's best practice.

USA

The restrictions on billboards and similar advertising devices are controlled on a state by state basis. This creates a very fragmented picture. Four states currently have a total ban (old and new) on billboards: Alaska, Hawaii, Maine, and Vermont (some States and cities have additional restrictions on electronic billboards). This is in contrast with Nevada, where full-motion billboards are allowed on the Las Vegas Strip.

This whole area is currently the subject several research projects [3,5], and Wachtel recently proposed a comprehensive set of guidelines (based on the research literature and associated human factors principles) for digital advertising signs [5].

Brazil

In 2007, the city of Sao Paulo banned billboards. A similar law was also passed in Tehran, Iran in 2007. However, most likely such bans were undertaken as a reaction against consumerism, rather than on road safety grounds.

UK

Regulations and guidelines attempting to control roadside advertising do exist (e.g. the Highways Agency's 1989 Design Manual for Roads and Bridges, and the Town and Country Planning (Control of Advertisements) Regulations 1992).

In the UK, roadside advertisements are now controlled as part of the planning permission system. Currently the display of an advertisement without consent from the Planning Authority is a criminal offense liable to a fine of £2,500 per offence. All of the large UK outdoor advertisers have numerous convictions for such crimes. However, local planning authorities are currently not obliged in law to enforce any aspect of planning control, merely to have 'appropriate arrangements in place for enforcement' (Town & Country Planning Act 1990) - as such, enforcement of illegal billboards around the UK is variable.

Indeed, the issue was debated in the UK parliament in 2005. The UK House of Commons Hansard written answer was:

Mr. Jamieson: *Studies have been carried out into the effect of the presence of roadside advertisements and other potential distractions to road accidents. It is, however, difficult to derive a direct causal relationship because accidents are often the result of several factors. Studies have also monitored the duration of drivers' eye movements from the*

road to roadside distractions, including signs, which provides an indicator of accident potential.... It is for local planning authorities to use their enforcement powers to remove unlawfully displayed advertisements.

(<http://www.publications.parliament.uk/pa/cm200405/cmhansrd/vo050406/text/50406w15.htm>)

This argument does appear to be flawed. As, in this vein, it could be similarly argued that it is difficult to isolate any factor, like speed, fatigue and drink driving, as a causal factor because there are invariably other contributing factors.

Canada (Quebec)

The Roadside Advertising Act states that no commercial advertising sign visible from a highway may be displayed within 300 metres of the highway. Further, restrictions apply within 600 metres of the entrance or exit ramp of an autoroute, measured from the head of the ramp.

Roadside 3rd party advertising are further restricted:

- 1) in a school zone, school crosswalk zone, pedestrian crosswalk zone, children's playground crosswalk zone or narrow crossing zone indicated by a road or traffic sign erected pursuant to the Highway Safety Code;
- 2) on a curve where a road or traffic sign signals reduced speed.

South Africa

South African National Roads Agency Limited (SANRAL) regulations 2000 states that no advertisement can exceed six bits of information on freeways (as quoted by Wachtel, [3]).

The Netherlands

At the time of writing, the Netherlands are currently developing decision criteria for visual distracters such as roadside advertising that present non driving related information. Eventually it will lead to software that road inspectors can use to audit advertisements. The draft criteria include [3]:

- no moving objects,
- amount of information depending on available reading time based on a reading time formula ($T=N/3+2$),
- no distractions at intersections, merges, exits/entrances, close to road signs or on curves,
- no telephone numbers in advertisements,
- no fluorescent colours used,
- no ambiguity in advertisements,
- no controversial information displayed, eg sex, violence or religion,
- and, advertisements not mimicking legitimate road signs

CONCLUSIONS

Given the lack of both comprehensive research evidence and international regulatory agreement, road authorities around the world may therefore be justified in using the best research information available (albeit incomplete) coupled with engineering judgement for the development of 3rd party advertising guidelines. As a side issue, it is worth noting that very little is also known about the effects of adverts placed on the sides of buildings, backs of buses and taxis, and other moving objects (i.e. 1st party advertising); more research on this topic is surely needed, as these adverts are in some ways more complex because they do not always remain in static locations.

In terms of the Australian case study presented, the Main Road Queensland ‘safety in design’ approach to restricting advertising billboards around intersections seems to be based on the best information available. It is in line with the recent recommendations of Hatfield [18] who stated:

“...advertising signs should only be located in road conditions that do not require frequent driver response to driving-relevant stimuli. For example, installation on a straight freeway without extremely dense traffic is least likely to result in crashes. Proximity to traffic entry points, intersections, and pedestrian crossings, should be avoided.” [18]

It is therefore suggested that the Main Roads Queensland draft revisions are taken further, and that additional advertising restrictions are recommended around other known areas of high driver workload. These include locations with high accident rates (blackspots), non-junction related lane merges, curves/bends, hills and road works/ abnormal traffic flows. This is broadly in line with Wachtel [3] who recommended a restriction of advertisements at times when driver decision, action points and cognitive demand are greatest – such as at freeway exits/entrances, lane reductions, merges and curves. Although useful for all road users, such restrictions would be of specific benefit to older drivers.

More broadly, there is a continuing need for countermeasures for better road design to minimize driver distraction. As Regan et al note [23], these include the need for road safety audits that include criteria for the identification and assessment of roadway objects (such as advertising signs) that could distract drivers; the need for the development of a taxonomy of things on or near the roadway with potential to distract (including a taxonomy of 1st, second and 3rd party advertising material); the need for methods and metrics for quantifying the impact on driving of distractors; and the need for the development of reference tasks, which induce “acceptable” levels of distraction against which the impact of distractors (eg advertising material) on driving performance can be assessed.

Finally, it should be noted that perhaps road safety researchers and regulators will always be playing catch-up with advertisers in this field. Equally, it seems likely that there will always be some degree of tension between these different groups - in part due to the nature of their roles (ie promoting trade, marketing and commerce vs. maintaining a safe road system). However, continued independent research efforts and the development of evidence based guidelines should help produce highway environments that are safe, and yet not unnecessarily restrictive for advertisers.

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