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SWOV Fact sheet

Distraction caused by roadside advertising and information

Summary

Roadside advertising and information billboards can distract a driver from the driving task. Particularly billboards with moving parts, affect-laden roadside advertising, billboards placed in the central field of vision and billboards resembling traffic-relevant information draw the driver's attention and can therefore endanger road safety. In the Netherlands directives have been formulated for placing advertising and information billboards alongside roads supervised by the Directorate-General for Public Works and Water Management.

Background and contents

Roadside advertising is intended to draw the attention of passing motorists, which may therefore cause them to pay less attention to the actual traffic situation. Also, information billboards intended to improve road safety could distract drivers from the driving task, and could thus have an unintended negative effect on road safety. This fact sheet provides an overview of what is known about distraction by advertising and information billboards. Consecutively, it will be discussed what is known about its effect on driving behaviour, which types of message draw most attention, what is known about the effect on the number of crashes or the risk, and, finally, which directives are available for roadside advertising and information. The SWOV Fact sheets [Use of the mobile phone while driving](#) and [Attention problems behind the wheel](#) discuss other types of distraction in traffic.

What are the effects of advertising billboards on the driving task?

In recent years, the way in which drivers react to roadside advertising has been studied thoroughly. Aspects such as vehicle control (e.g. lateral position, speed and headway distances) as well as observation behaviour and reaction times have been examined. The studies often consisted of laboratory studies by means of a computer or a driving simulator. Occasionally, experiments were also carried out on the road.

Kettwich, Klinger & Lemmer (2008) had subjects drive around in a car and used eye-tracking devices to study how often and how long drivers looked at certain roadside advertising billboards. Nobody turned out to look at roadside advertising longer than one second while driving. Other studies compared the observation behaviour of motorists in the presence or the absence of advertising billboards. A simulator study by Edquist et al. (2011) indicated that drivers look at the road less often when advertising billboards are found along the road. Also in a simulator study, Young et al. (2009) found that advertising billboards may result in distracting drivers' eyes from the road more often, but not for a longer duration. Furthermore, this study found that, after the test, the subjects more frequently recalled the last advertising billboard than the last traffic sign. According to the researchers, this could imply that looking at advertising billboards goes at the expense of noticing traffic signs. This corresponds more or less with the findings of Edquist et al. that in the presence of an advertising billboard, motorists react more slowly to traffic signs (indicating a lane switch).

Advertising billboards also happen to influence other aspects of driving behaviour. For instance, driving simulator studies show that motorists tend to swerve more often in the presence of roadside advertising billboards (Bendak & Al-Saleh, 2010; Young et al., 2007). Furthermore, motorists make more errors in switching lanes (Edquist et al., 2011) and more often cross dangerous intersections more hazardously (Bendak & Al-Saleh, 2010) in the presence of advertising billboards. It has also been found that advertising billboards have a clearly increasing effect on the self-reported task load (Young et al., 2007) measured on the six sub-scales of Hart & Staveland (1988), among which mental task load, (driving) performance, effort and frustration level. Moreover, the study by Edquist et al. showed that elderly motorists were more affected by advertising billboards than younger and, subsequently, middle-aged motorists.

Which roadside advertisements draw the most attention?

A number of studies examined the effects of different types of advertising billboards. They show that moving billboards and affect-laden roadside advertising in particular draw attention. The same applies to advertising billboards placed in the central field of vision.

Moving versus static billboards

A few decades ago it was already established that moving objects, objects that suddenly appear and objects with rapid changes in luminous intensity are difficult to ignore in traffic (Cole & Hughes, 1988; Cole & Jenkins, 1984; Luoma, 1986). This corresponds with theories about selective attention (see, for instance, Wickens et al., 2003). Research into advertising billboards indeed shows that moving roadside advertisements are more distracting than static ones. For example, it showed from a study conducted in the road (Beijer, Smiley & Eizenman, 2004) that drivers look at billboards with moving parts more often and for longer periods (video and rolling billboards, in which the roadside advertisements change every few seconds) than to static billboards. Chattington et al. (2009) also found this in a driving simulation study in which video advertising billboards were compared with static billboards. Moreover, they found that subjects swerved more often and drove at slower speeds with moving advertising billboards than with static billboards. It also showed from this study that the moment drivers had to brake, for instance because of a pedestrian crossing, they brake more abruptly in the presence of a moving billboard. Based on a field study in Toronto, Smiley et al. (2005) reported that moving (video) advertising billboards do not result in drivers noticing traffic signs less. Yet, some drivers turned out to look at moving advertising billboards for a longer period (1.5 seconds) and/or to keep a shorter headway distance (1 second or less). An exception to these findings is the study by Edquist et al., 2011, in which no difference in effect between static and moving billboards was found. The moving billboards in this study were of the type that changes from one to another advertisement and subjects were confronted with no more than one change. This may be less distracting than with the images of advertising billboards changing frequently.

Centrally versus peripherally placed billboards

Also the location of advertising billboards determines to what extent a motorist is visually distracted. Motorists look more often at advertising billboards that are placed in the central visual field than at billboards in the periphery (Chattington et al., 2009). Furthermore, billboards placed at the driver's eye level draw attention more often and for longer periods than billboards at greater height (Crundall, Van Loon & Underwood, 2006).

Affect-laden versus neutral billboards

A third relevant factor has to do with the tone of voice of the message: 'affect-laden' advertising billboards are more distracting than 'neutral-laden' billboards. The affect-laden message of billboards is again more distracting when it is negative (for instance, showing mutilations due to a crash) than when it is positive (with romantic pictures, for instance). This shows, for example, from a motorcycling simulator study by Megías et al. (2011) for which subjects with a motorcycle driving licence had been selected. They looked at billboards that called up negative or positive emotions more often and for longer periods than at neutral billboards. In the presence of affect-laden, and in particular, negative affect-laden advertising billboards, they also looked less often at relevant aspects of the road environment. The difference also shows from the reaction time: when they suddenly need to brake (for example, because of an unexpected cyclist) they brake harder in the presence of an affect-laden and especially a 'negative' advertisement than in the presence of a neutral advertising billboard.

Roadside advertising versus traffic-relevant information

General observational research has shown that relevant visual information is harder to find when other, irrelevant, similar-looking information is also present. This also shows from a laboratory study by Holohan, Culler & Wilcox, (1978) that revealed that it takes more time to localize a traffic-relevant traffic sign (a stopping sign in this case), when the advertising billboards in the road environment resemble a traffic-relevant object in terms of colour. Furthermore, in an environment with much complex visual information it is difficult to find relevant billboards anyway (Boersema, Zwaga & Adams, 1989).

What is the effect of roadside advertising on road safety?

It actually shows from behavioural studies that the effects of advertising billboards are rather strong. Nevertheless, not much is known about its implications for the number of crashes and the risk. Researching this is methodologically complex. In theory, a preliminary and follow-up study should be

carried out, in which it is determined whether more crashes occur after one or more advertising billboards have been placed, compared to the earlier situation. Since crashes are rare events, a very large-scale and long-term study would be necessary to gather sufficient data. For this reason, correlational research is often carried out, in which the safety of roads with and without advertising billboards is compared. However, such a correlational study can merely show a correlation, no causal relation.

Tantala & Tantala (2005) carried out a correlational as well as a preliminary and follow-up study. The conclusion was that roadside advertising billboards have no statistically significant effect on the occurrence of crashes. In a preliminary and follow-up study, Smiley et al. (2005) only looked at the effect of moving advertising billboards. As has been indicated above, they have a greater distracting effect than static advertising billboards. However, there were no findings that moving advertising billboards also result in more crashes than static advertising billboards. Very recently, a before-and-after study was carried out in Sweden (Dukic et al., 2011). The preliminary period measured 7 years and the follow-up period 1 year. Considering the small number of registered crashes (41), it was not possible to test the data statistically. It showed from qualitative analyses that the crash data from the period prior to the placing of the advertising billboards were comparable with the crash data from the year after placing them. In police reports, no advertising billboards were ever mentioned as a factor in the occurrence of the crashes that took place in the environment of the advertising billboards.

Young et al. (2007) and Backer-Grøndahl & Sagberg (2009) used more indirect methods to study the link between advertising billboards and crash rate. Young et al. carried out a driving simulator study and, other than the previously mentioned studies, they found an indication that more crashes would occur in the presence of advertising billboards. However, as was equally the case in the study by Dukic et al., the data could not be statistically tested, due to the small numbers. Backer-Grøndahl & Sagberg (2009) carried out a questionnaire study from which it showed that looking at an advertising billboard highly increases the risk of a crash (by a 16.95 factor). Drivers involved in a crash in the previous year filled in an on-line questionnaire about possible distraction during this crash (due to advertising billboards among other things) and who was at fault, they or the other party. Next, the data of the drivers who themselves claimed that they had caused the crash was compared with the data of the drivers who reported not to be at fault, in order to be able to determine a 'relative crash rate'. Determining the relative rate was carried out for each source of distraction (and thus also separately for distraction by advertising billboards). It was surmised in this study that 'drivers 'not at fault' are representative for the total population. However, it remains to be seen whether this is true. Neither is the allocation of liability very reliable, because of it being based on self-reporting.

All in all, we have to conclude that the research into the effect of advertising on road safety in general does not yield unambiguous results in terms of crashes. It may occasionally be possible in individual cases to link a crash and the presence of an advertising billboard. For instance, Finnish in-depth research indicated that in 6 out of 405 fatal crashes that took place between 2000 and 2001, advertising played a role in the occurrence of those crashes, one way or another (Finnish Road Administration, 2004). In four cases it concerned billboards that stood in the way and literally obstructed the view. Two other crashes were (partly) caused by the distracting effect of advertising. All six crashes took place at intersections.

Do these effects also apply to roadside information billboards?

In addition to commercial advertising, roadside advertising also occurs for road safety purposes. Although these information billboards are intended to improve road safety, they could, just as much as advertising billboards, distract drivers and have an unintentional, negative effect on road safety. As far as known, research into such unintentional effects has never been carried out. On the other hand, a number of examples are known of studies into, for example, recalling information billboards (see Verhoeff, 2009). However, as yet there is no reason to assume that different principles apply to information billboards than to (other) roadside advertising, namely that they distract more unintentionally when they consist of moving parts, show an affect-laden message, when they are placed in the central field of vision and resemble traffic-relevant information. Incidentally, information billboards are not only concerned with information about safety, but also with (public) information about traffic flow or congestion built-up, for instance on 'drips': dynamic route information panels (see for example De Craen & De Niet, 2002). For more information about public information and road safety see SWOV Fact sheets [Public information about road safety](#) and [Fear-based information campaigns](#).

Which are the directives for the placement of advertising and information billboards?

The Ministry of Infrastructure and the Environment has formulated clear directives for placing roadside advertising and information billboards. Recently, the directive *Assessment of objects along roads and motorways* was published, containing a number of criteria that roadside advertising billboards, among others, have to meet (Merkx-Groenewoud & Perdok, 2011). With this directive it can be measured whether a negative effect of roadside advertising on road safety can be expected. The directives are based on research, among other things on distraction in traffic, as described in this fact sheet. Thus, for example, moving advertising billboards are not permitted, neither are advertising billboards containing offensive information (such as violence, sex, weapons) and thereby drawing attention for too long. Neither are advertising billboards permitted that resemble traffic-relevant information. Next, the directive recommends extra reservations about placing roadside advertising near locations with a high driving task load (for instance, before and after exiting and merging). A minimum distance from the road (13 m) applies to advertising billboards to prevent them from being placed in the central field of view. This minimum distance does not apply to information and motto billboards aimed at the driving task and intended to improve road safety, such as billboards to support road safety campaigns and information billboards about roadworks. However, these motto and information billboards should meet the other criteria, in order to prevent unnecessary distraction.

The directive mentioned solely applies to the national road network, but not, for instance, to provincial or municipal roads. In this case the province or municipality on whose territory the billboard is placed determines whether or not the billboard is permitted or not. Each province or municipality is entitled to its own directives and they do not need to correspond with those for national roads.

Conclusion

Roadside advertising and information billboards are intended to draw the attention of drivers, so that they may have less attention for the actual traffic situation. Studies into behavioural effects of roadside advertising billboards have indeed established that advertising billboards have a negative effect on the observation behaviour of drivers (their eyes lose track of the road more often and for longer periods), their reaction time (in the vicinity of advertising billboards drivers react more slowly to relevant issues) and on vehicle control (drivers more often fail to stay in lane in the vicinity of advertising billboards). These effects occur to a larger extent when it concerns advertising billboards with moving images, which are found in the central field of vision, which contain a (negative) affect-laden message and which resemble a billboard with traffic-relevant information. Also in busy environments with a great deal of complex visual information, it is difficult to detect traffic-relevant billboards.

However, a causal relation between roadside advertising and the number of crashes has never been established directly and unambiguously. Such research is methodologically difficult to carry out, because a very long period before and after placing advertising billboards is required to be able to observe sufficient crashes for statistical analysis. Indirectly there are some indications for a (correlational) connection between the presence of advertising billboards and crashes. No research has been carried out into a possibly unintentional distracting effect of road safety messages along the road, but for as yet, there is no reason to assume that the effect of this type of information has completely different characteristics than the effect of advertising billboards.

The national government applies directives for placing advertising and information billboards alongside national roads. The most recent directives date from October 2011; they take current relevant knowledge into account. There are no general directives for provincial and municipal roads.

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