BRSI

Does handsfree phoning reduce our alertness on the road?

Results of an eye tracking study on the highway

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Summary
Does handsfree phoning reduce our alertness on the road? Results of an eye tracking study on the highway

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Ce rapport est également disponible en français sous le titre: Téléphoner avec un kit mains-libres diminue-t-il notre aptitude à être alerte sur la route ? Résultats d'une étude de mouvements oculaires sur l'autoroute.

Dit rapport is eveneens beschikbaar in het Nederlands onder de titel: Vermindert handenvrij bellen onze alertheid op de weg? Resultaten van een oogbewegingsstudie op de autosnelweg

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SUMMARY

Goal and methodology

Research clearly shows that phoning while driving is detrimental for traffic safety. It leads to more accidents, a slower hazard detection and it influences the position on the road and speed (for example: Caird et al., 2008; Dingus et al., 2016). Although the general idea might be that handsfree phoning is safer than handheld phoning, a number of studies failed to find differences between the effects on traffic safety during handsfree and handheld phoning (e.g., Ishigami & Klein, 2009). Multiple sources of distraction are at play while phoning in the car. During a handsfree phone call, visual and physical forms of distraction are reduced because the operation of the device is less complicated. However, the cognitive distraction (the division of attention between the phone call and the monitoring of the traffic situation) is equally present during handsfree as handheld phoning.

The purpose of this study was to study the effects of handsfree phoning on the driver's attention. We did this by means of an eye-tracking study on the road. Eyemovement patterns are strongly influenced by attention (Posner, 1980) and are thus a good measure to study drivers' attentional processes.

Thirty participants drove consecutively two rides of ca. 14 km on a highway with three lanes. During one of these two rides they received a handsfree phone call (testride). During the other ride they did not receive any call (controlride). While they drove, participants wore eye-tracking glasses and their eyemovements towards 7 areas of interest were registered. Moreover, we investigated how much and how long participants fixated traffic signs, the rearview mirror, the left side mirror, the right side mirror, the road, other vehicles and the speedometer.

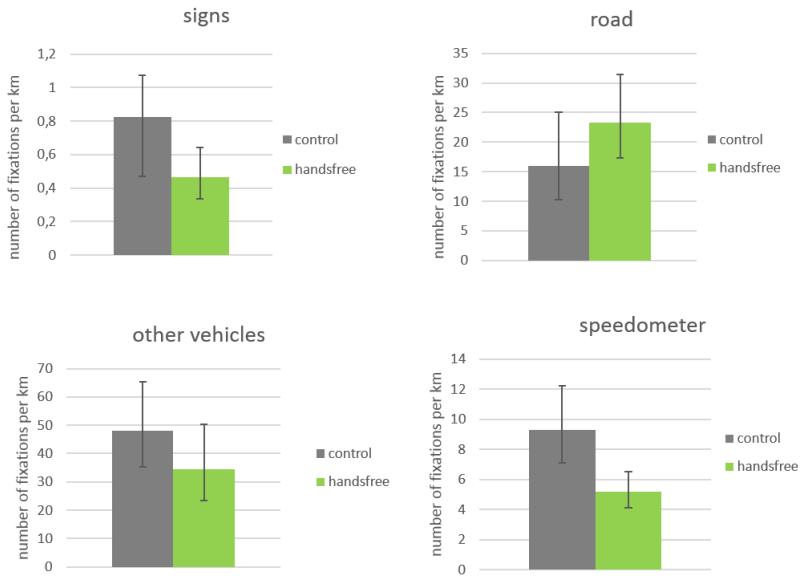
Further, the sequential pattern of fixations – or the visual scanpattern – during the 2 rides was investigated. More specifically, we examined if handsfree phoning led to a visual narrowing. The visual scanpattern was operationalized by means of two variables: the saccadetime and the density of the x- and y- coordinates of the fixations. The saccadetime is the time elapsed between two consecutive fixations. Shorter saccadetimes represent smaller distances between consecutive fixations and imply a more focused scanpattern compared to longer saccadetimes. Second, we studied the densities of the x- and y-coordinates of the fixations. Higher densities represent a more focused scanpattern in comparison with lower densities.

Finally, we compared 4 driving variables for both rides: the mean speed, the time spent on each of the 3 lanes, the number of lane changes, and the overtakingdistance.

Key results

We observed a reliable difference in the number of fixations during the testride (handsfree) and the controlride for 4 of the 7 areas of interest. Participants fixated less on signs, other vehicles and the speedometer while making a handsfree call. On the other hand, the road was fixated more during a handsfree call than during the controlride. Figure A shows the effect of the ride on the number of fixations.

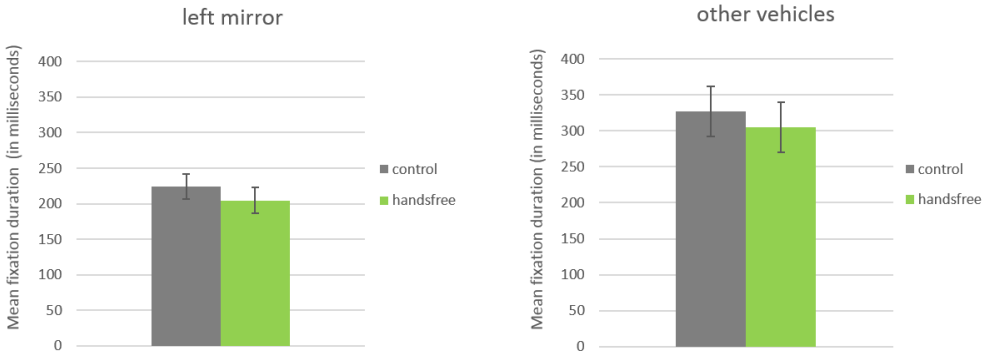
Figure A. The number of fixations per km on the areas of interest for which a reliable difference between the testride and the controlride was observed.



Errorbars represent the 95% confidenceintervals.

Further, we found a difference in fixationduration for 2 areas of interest. Figure B shows that the fixations at the mirror at the side of the driver (left side mirror) were shorter during the testride than during the controlride. In addition, we observed a trend in the same direction for the mean fixationduration related to other vehicles: during a handsfree phone call the fixations at other vehicles were shorter than during the controlride.

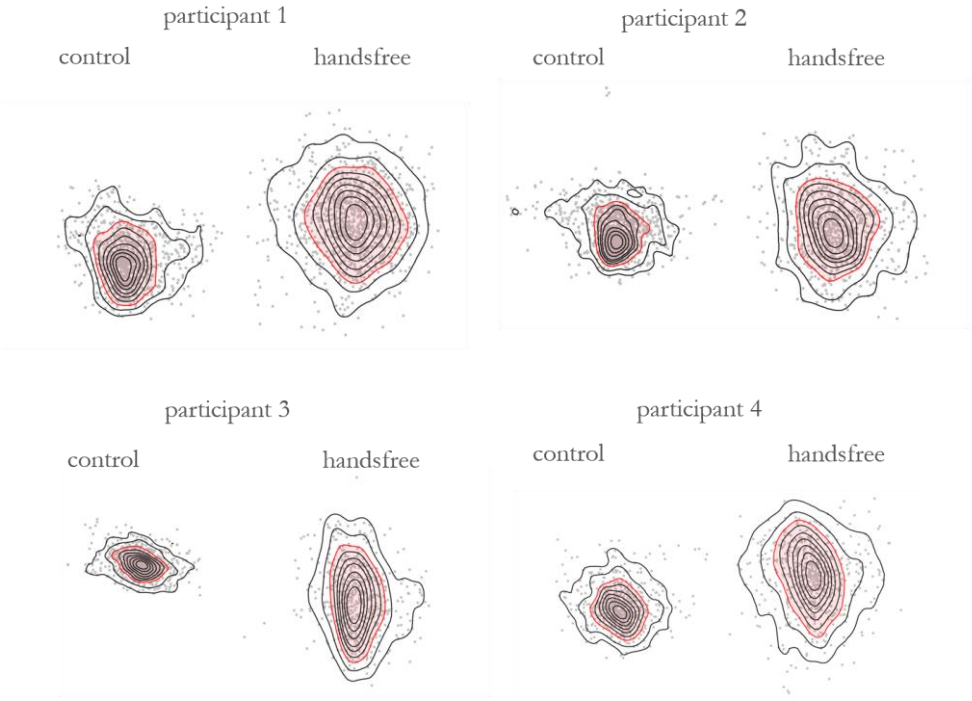
Figure B. Mean fixationduration for the areas of interest where a reliable difference between the test and the controlride was observed.



Errorbars represent the 95% confidenceintervals.

The results concerning the visual scanpatterns indicate that participants scan a more extensive part of their visual field while phoning handsfree. First of all, we observed longer saccadetimes during the testride compared to the controlride. Secondly, the densities of the x- and y- coordinates of the fixations showed a less focused pattern during handsfree phoning. To illustrate this latter finding, Figure C shows the density plots for 4 participants. We thus obtained no evidence for a visual narrowing during handsfree phoning but evidence for the opposite pattern.

Figure C. Density plots during the testride and the controlride for 4 participants.



Black lines represent density contours. Every contour comprises a certain proportion of fixations. In the graphs, the density contours comprise the following proportion of fixations (from the inner contour to the most outward): 0.10, 0.20, 0.30, 0.40, 0.50, 0.60, 0.68 (in red), 0.70, 0.80 and 0.90. The coloured surface represents the surface comprised by the p = 0.68 contour and is compared between both conditions (handsfree and control) in this report.

Finally, the comparison of the driving variables showed no difference in speed, the number of lane changes, and the overtakingdistance. However, we observed a trend towards more driving on the middle and less driving on the left lane during the testride in comparison with the controlride

Conclusions and key recommendations

The results of this study show that handsfree phoning has a clear influence on driving behaviour. First of all, during handsfree phoning there are less and shorter fixations at a number of areas relevant for traffic safety.

Second, the analyses of the saccadetimes and the density plots show that the visual scanpattern is different for the testride and the controlride. The duration of the saccades is longer during the testride than during the controlride. It indicates that participants inspect a larger part of their visual field while phoning handsfree. This is further confirmed by the inspection of the density plots. These plots clearly show that participants scan a more extensive part of their visual environment during the testride than during the controlride. One could argue that this is beneficial for traffic safety: drivers inspect a larger part of their visual surroundings during handsfree phoning. However, this fixation pattern does not necessarily imply a better processing of the information. This relates to the difference between “look” and “see”. Although eyefixations indicate where somebody is looking at, this does not mean that this information is consciously processed. If we look at something while we are thinking of something else, chances are large that we miss the relevant information.

In short, the results of this study show that eyefixations are more spread over the visual field during handsfree phoning and that there are less and shorter fixations at a number of traffic related areas. This suggests that during handsfree phoning the gaze behaviour is less directed to the traffic situation. Concerning the driving variables, we found a trend towards more driving on the middle lane and less driving on the left lane during handsfree phoning. This confirms that drivers are less involved in traffic during a handsfree phone call.

Does this mean that we have to prohibit handsfree phoning? Because it is difficult and almost impossible to control if someone is making a handsfree phone call in the car, such a measure cannot be enforced. The BRSI is thus no advocate of a total prohibition of phoning while driving. However, the BRSI thinks that drivers should be sufficiently informed about the potential risks associated with handsfree phoning and supports the need to make people aware of the principle "car in = phone out".

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