

# Visual distraction of paper map and electronic system based navigation

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## **Abstract**

This report presents the findings of a comparison of three navigation methods in terms of visual behaviour. The study employed a repeated-measures design where participants drove three routes in real traffic, under three different conditions: electronic system navigation with auditory instructions; electronic system navigation without auditory instructions and paper map based navigation. Participants were all experienced drivers and users of the navigation system. Drivers eye movements, participants subjective ratings of workload and trip time were collected as measures of distraction, workload and performance.

The aim of this work was to examine the visual behaviour of drivers using a paper-map and a navigation system in a real-world situation and results are interpreted in this context. Analysis of visual behaviour suggests that neither the map nor the navigation system is a major source of visual distraction if used responsibly by experienced users. The results did not provide convincing evidence that using a paper map is more visually demanding than using an electronic navigation system. Mean glance times to the map and system were less than a second in all conditions.

## **Introduction**

The distracting effect of In-Vehicle Information Systems (IVIS) is a growing source of concern as more systems and functions become available. The primary concern is with visual distraction. Mapping navigation systems in particular require the driver to look at a display that may contain complex information. The time spent looking at a system is "eyes-off-road" time and this may result in potential failure to detect lethal hazards.

In-vehicle navigation systems are generally considered as an alternative, or a supplement, to paper maps. For this reason several studies have conducted a direct comparison between system navigation and paper-based map navigation. Parkes, Fairclough and Ross (1991) compared navigation using a paper map to navigation using an electronic text-based system, on the road in an area unfamiliar to the participants. The key differences between the methods were: the presentation method (i.e. diagrammatic versus text); the level of automation and the organisation of the information. The electronic system presented the instructions automatically and in

In D. de Waard, K.A. Brookhuis, R. van Egmond, and Th. Boersema (Eds.) (2005), *Human Factors in Design, Safety, and Management* (pp. 23 - 34). Maastricht, the Netherlands: Shaker Publishing.