

The effect of experience, relevance, and interruption duration on drivers' mental representation of a traffic situation

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Abstract

While driving a great amount of information has to be attended to, interpreted, and integrated into a coherent representation of the current situation within very limited time constraints. Processing this amount of information exceeds the capacity of working memory (WM). The theory of long-term working memory (LT-WM) describes a mechanism to overcome WM limitations (Ericsson & Kintsch, 1995). According to this theory it is assumed that experienced drivers possess a more differentiated knowledge base of relevant traffic situations allowing them to encode relevant information more reliably than novice drivers. The assumptions were tested in a driving simulator study (n=40). During each drive the participants were interrupted repeatedly and were asked for the number of cars around them. A mixed factorial design was used with experience as between-subjects factor and interruption duration, cuing, and relevance of queried information as within-subject factors. The results indicate that LT-WM might be involved in the construction and maintenance of situation awareness in driving.

Introduction

Performance in dynamic situations is highly influenced by how well the operator knows what is currently going on around him and how well he can predict the development of the situation in the near future. The processes involved in constructing and maintaining such a mental representation of the current situation that forms the basis for the operator's decisions and actions are described in the concept of situation awareness (Endsley, 1995). According to Endsley (1995) situation awareness entails "the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future" (p. 36). This concept was successfully applied in the last decade to human factors issues in aviation, nuclear power generation, or military combat systems. Only recently it has been introduced to the analysis of driving behaviour (Baumann & Krems, 2007; Gugerty, 1997; Matthews et al., 2001). This was at least in part driven by concerns that have been raised about the effects of

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