Warning drivers of approaching hazards: the importance of location clues and multi-sensory cues

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Abstract

Research in experimental psychology has examined in depth the benefits to target detection through the provision of a warning signal, the optimum warning intervals, and has proposed mechanisms such as increased arousal and expectancy that underpin these effects. The rapid acceptance of in-vehicle technologies necessitates examination of these issues to ensure that the anticipated safety benefits are in fact realised. This research set out to measure driver responses to an advisory warning – the context of this examination was detection of emergency vehicles (EV). Using an advanced driving simulator we examined the effects of an advisory warning device (AWD) on driving performance in scenarios known to be high risk for EVs. Each event contained a combination of scenario type (adjacent-lane, turning-across, car-following) and warning condition (control, standard, advisory). For adjacent-lane and turning-across events the AWD was associated primarily with reductions in mean speed. The advisory warning allowed the drivers to react more quickly once the EV was detected, resulting in a lower vehicle speed at the intersection, which is a measure of increased safety. Response priming emerged as a likely mechanism underpinning these benefits and is generalisable to other settings where an advisory warning is presented before the threat is perceived. Recent research shows that performance can be enhanced further by providing information about the target location within the warning signal, and/or by using multi-sensory modalities to present threat information to drivers. These developments provide further avenues for exploring the optimal configuration of warning systems.

Introduction

Technologies are being increasingly used to support road users in achieving safe use of the road transport system. These fall into two broad categories: infrastructure-based and in-vehicle. While the application of both of these is growing, in-vehicle technologies, in particular, are being incorporated within modern vehicles to enhance driver performance and safety. Examples of in-vehicle systems include Intelligent Speed Adaptation Systems, Adaptive Cruise Control, Forward Collision Warning Systems, Rear Collision Warning Systems, Seat Belt Reminders, Lane Departure Warning Systems, Lane Keeping Assistance Systems, and Brake Assist/Forward Collision Mitigation.

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