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# Attraction without distraction: Effects of augmented reality cues on driver hazard perception

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## Abstract

**Introduction:** Collision warning systems use alerting cues to enhance awareness and response to hazards (Ho & Spence, 2005; Scott & Gray, 2008). These cues are meant to attract attention, yet may be distracting due to masking. This study evaluated effects of: 1) *static* visual cues (solid shape) and 2) graded *dynamic* visual cues that converged around approaching targets. We hypothesized that cues would reduce RT required to recognize potential hazards (e.g., pedestrians).

**Methods:** Six young drivers (Mean=25 years, SD=5; males=3, females=3) drove five simulated straight rural roadways under three conditions (static cued; dynamic cued; uncued). We examined RT from when a potentially hazardous target event (90 trials) first

appeared to when the driver detected it. Subjects were also tested on detection of non-target (peripheral) objects (60 trials) that appeared on the roadside opposite the targets (forced choice questions).

**Results:** There was a main effect of condition on the RT (seconds) to perceive potential hazards ($F(2,22)=6.02$) and no effect on periphery accuracy ($F(2,22)=0.23$). The RT for the uncued condition (Mean=3.18, SE=0.41) was faster than the static condition (Mean=4.79, SE=0.52, $p = 0.002$), but was not different from the dynamic condition (Mean=3.44, SE=0.52, $p = 0.59$). The RT was lower for the dynamic condition versus the static condition ($p = 0.03$).

**Conclusions:** Results did not show direct RT benefits for the tested AR cues. In fact, static AR cues increased RT for detecting hazards. This was likely due to local (lateral) masking or obstruction. AR cues did not impair perception of non-target objects in the periphery. The study was limited due to task simplicity and excessive cue salience. A follow up study is addressing these limitations using a more difficult (dual) task and more ecologically congruent AR cues.

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