

# The Effects of Visual and Auditory Information Processing in Simple and Complex Driving Scenarios

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## Abstract

This study compared the effects of text-based (visual) information exchange and hands-free cell phone (auditory) ‘conversation’ on driving performance under low and high workloads. Performance was compared across four conditions created by crossing Presentation Method (Text vs. Cell) with Driving Complexity (Urban vs. Rural). Driving consisted of (a) maintaining speed and lane position in a medium-fidelity driving simulator, (b) responding to visual probes, and (c) braking in response to unexpected events. The secondary (‘conversation’) task was 20 Questions, which required the participant to answer Yes/No questions by either listening to the experimenter and making a verbal response over a hands-free headset in the Cell condition or by reading and pressing a button on an in-cabin touch screen in the Text condition. For most measures, driving performance was significantly worse in the Text condition than in the Cell condition under both high (Urban) and low (Rural) driving complexity scenarios, thus indicating that using text-based interfaces impairs driving more severely than talking on a hands-free cell phone. Moreover, for at least one driving performance measure (i.e., detecting visual probes), an interaction between Driving Complexity and Presentation Method was observed. The difference between the number of visual probes missed in the Text and Cell conditions was significantly greater in the high (Urban) Driving Complexity condition than in the low (Rural) Driving Complexity Condition.