

## Shifting attention across spaces while driving: are hands-free mobile phones really safer?

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**Abstract** It has been often reported that the use of hand-held mobile phones is associated with a degraded driving performance. However, the mechanisms underlying such a negative effect have been rarely addressed. Here we report results of three experiments aimed at investigating whether attentional and conversational factors contribute to impairing performance of drivers that use mobile phones. Indeed, during a conversation through a hand-held phone drivers have to shift continuously their attention between the personal space (wherein the conversation takes place), and the peripersonal and extrapersonal spaces (wherein most of the driving tasks are executed). It may be hypothesized that such a shifting contributes to the cost of using a hand-held phone while driving, as it is known that shifting attention across spaces is associated with a cost in target detection tasks. Also, in a mobile-phone conversation the person outside the vehicle is not aware of what is happening on the road, and that might make more difficult to adjust the conversation (e.g., through an appropriate turn taking) to the traffic environment requirements. In three experi-

ments (run in both real and simulated driving conditions), we compared the performance on a target detection task of subjects engaged in a conversation with hand-held, hands-free (through earphones), hands-free (through external loudspeaker), road-environment aware passenger, and road-environment unaware passenger. Results consistently showed that reactions times to targets were slower in the hand-held and hands-free (through earphones) conditions than in the hands-free (through loudspeakers) condition, suggesting that shifting attention across different spaces contributes to the negative effects of mobile-phone conversations while driving. Instead, the awareness of the road-environment affected only marginally the reaction times to targets, suggesting that conversational factors have more variable and less consistent effects. Results of the present study will be discussed in terms of their theoretical and applied implications.

**Keywords** Driving • Attention shift • Hands-free • Hand-held

