



The influence of music on mental effort and driving performance

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ABSTRACT

The current research examined the influence of loud music on driving performance, and whether mental effort mediated this effect. Participants ($N=69$) drove in a driving simulator either with or without listening to music. In order to test whether music would have similar effects on driving performance in different situations, we manipulated the simulated traffic environment such that the driving context consisted of both complex and monotonous driving situations. In addition, we systematically kept track of drivers' mental load by making the participants verbally report their mental effort at certain moments while driving. We found that listening to music increased mental effort while driving, irrespective of the driving situation being complex or monotonous, providing support to the general assumption that music can be a distracting auditory stimulus while driving. However, drivers who listened to music performed as well as the drivers who did not listen to music, indicating that music did not impair their driving performance. Importantly, the increases in mental effort while listening to music pointed out that drivers try to regulate their mental effort as a cognitive compensatory strategy to deal with task demands. Interestingly, we observed significant improvements in driving performance in two of the driving situations. It seems like mental effort might mediate the effect of music on driving performance in situations requiring sustained attention. Other process variables, such as arousal and boredom, should also be incorporated to study designs in order to reveal more on the nature of how music affects driving.

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1. Introduction

Imagine that you are driving in a very quiet neighborhood, listening to one of your favorite bands and singing along with the music. Suddenly you realize that you are approaching an intersection and the traffic is getting busy. There are traffic lights, pedestrians and other vehicles that you should monitor all at the same time to avoid possible accidents. You stop singing along, but the music is still playing. You may have encountered this kind of situation many times while driving, but what would you do? Would you feel like the driving task is more effortful due to the music? Would you turn off the music? In this paper, we aim to explore to what extent music influences drivers' mental load and performance in different situations, and whether drivers are able to cope with task demands in the presence of music.

Driving is executed along with secondary tasks, distracters or stressors most of the time, such as talking to a passenger, tuning the radio, attending to irrelevant on-road stimuli like advertisements or talking on the cell-phone (Haigney et al., 2000; Horberry et al., 2005; Crundall et al., 2006; Drews et al., 2008), all of which may significantly affect task demands and driving performance. Listening

to music or the radio is among the most common auditory stimuli that drivers are exposed to on the road (Dibben and Williamson, 2007). Indeed, listening to music is often a habitual behavior that accompanies driving and is perceived as helping drivers to easily pass the time (North et al., 2004). As a result of this habitual use of music, drivers seldom find music as distracting as talking to passengers or talking on the mobile-phone, and therefore do not tend to perceive music as a distracter that would impair their driving performance (Dibben and Williamson, 2007). Do self-reports of drivers reflect the reality however? Or does music have an influence on mental load and task performance while driving?

In previous investigations of this issue, researchers have tended to use two main methods: computer-based tasks that measure variables related to driving skills (e.g. reaction-time, brake response time) or simulated driving tasks which allow for directly observing the impact of music on driving (Brodsky, 2002; North and Hargreaves, 1999; Beh and Hirst, 1999; Turner et al., 1996). In simulated driving studies, the focus has been mainly on general driving behavior parameters such as speed, rather than specific measures of driving performance such as brake response or reaction time. In one particular driving simulator study, music that was high in arousal potential (i.e., high tempo music played at a high volume) resulted in longer lap times and therefore decreases in speed as compared to music that was low in arousal potential (North and Hargreaves, 1999). In this case highly arousing music was also associated with

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