Event-related Potentials and Secondary Task Performance During Simulated Driving

Utrecht Institute for Pharmaceutical Sciences, Department of Psychopharmacology, Utrecht University,
PO BOX 80082, 3508 TB, Utrecht, the Netherlands

Inattention and distraction account for a substantial number of traffic accidents. Therefore, we examined the impact of secondary task performance (an auditory oddball task) on a simulated driving task (lane keeping).

Twenty healthy participants performed two 20-minute tests in the Divided Attention Steering Simulator (DASS). A secondary (distracting) oddball task was presented in isolation and simultaneously with the driving task, to assess their mutual interference. In addition to performance measures (lane keeping in the primary driving task and reaction speed in the secondary oddball task), brain activity, i.e. event-related potentials (ERPs), was recorded. The secondary oddball task was presented in an active version (n = 10), which means that the participant had to respond to the deviant target stimuli, or passive version (n = 10), which means that no response was required.

Driving performance was not affected by the secondary auditory task, not during the active oddball task (F(1,9) = 1.21, n.s.), nor during the passive oddball task (F(1,9) < 1, n.s.). Performance parameters on the active secondary oddball task did not differ between performance of the oddball task in isolation and simultaneous performance of the oddball task with the driving task. However, when the oddball task and driving task were performed simultaneously, reaction time variability increased in the secondary oddball task (F(1,9) = 7.58, p <.05). Analysis of brain activity indicated that ERP amplitude (P3a amplitude) related to the passive secondary oddball task, was significantly reduced when the task was performed simultaneously with the driving test (F(1,9) = 32.12, p <.001).

This study shows that when performing a simple secondary task during driving, performance of the driving task and this secondary task are both unaffected. However, analysis of brain activity shows reduced cortical processing of irrelevant, potentially distracting stimuli from the secondary task during driving.

Keywords: Simulated driving, Attention, Secondary task performance