The Effects of Secondary Tasks on Naturalistic Driving Performance

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Data from 36 drivers involved in a naturalistic driving study were analyzed to determine the frequency and conditions under which drivers engage in secondary behaviors and to explore the relationship these behaviors might have with driving performance. A random selection of 1,440 five-second video clips of the drivers’ faces was coded for the occurrence of specific secondary behaviors and the frequency and duration of glances. Corresponding performance data from the instrumented vehicles was used to calculate variability of steering angle, mean and variability of lane position, mean and variability of throttle position, and variability of speed. Contextual factors were also examined, including road type, road curvature, and road condition.

Drivers were observed engaged in secondary behaviors in approximately 34% of the clips. Conversation with passengers was the most common secondary behavior (15.3%), followed by grooming (6.5%) and using cellular phones (5.3%). Younger drivers were most likely to engage in secondary behaviors overall (42%). All categories of secondary behavior were associated with significantly higher variability in steering angle. The results for other performance measures were mixed. Cellular phone use, eating/drinking and grooming, resulted in increased steering variance, but did not affect lane position or speed variance. Cellular phone use was associated with the smallest percentage, and shortest mean duration, of glances away from the forward scene, but fewer glances could negatively affect scanning of the roadway environment. However, conversations with passengers showed higher variability in steering angle, increased deviation for both lane position and distance from center of the lane.

In general, secondary behaviors are neither equal in frequency of occurrence nor in their effect on driving performance. Drivers appear to perform differently when taking part in different tasks, and appear to engage selectively in secondary behaviors according to traffic/roadway conditions. In naturalistic conditions, when drivers can freely choose whether or not to engage in secondary tasks, drivers may be performing secondary tasks when their driving skills are least needed and the traffic environment tends towards being less challenging based upon a driver’s own assessment. These findings highlight the importance of conducting naturalistic studies, as it appears that controlled studies cannot always account for the full effects of driver choice and perceived risk associated with immersion in actual traffic/roadway environments.