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Psychophysiological Studies of Real-World Driving 1993–2018: A Bibliography

by Theodric Feng

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Psychophysiological Studies of Real-World Driving 1993–2018: A Bibliography

by Theodric Feng

Human Research and Engineering Directorate, ARL

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14. ABSTRACT This report provides a bibliography that tries to bridge the gap between psychophysiological lab studies of driving and naturalistic driving studies of real-world behavior. The former are experimental in nature, while the latter are observational. Due to advances in instrumentation (wearable sensors) and analysis (classification techniques) researchers, in recent years, are better able to measure driver activity (psychophysiological and behavioral) on-the-road. The listed studies cover various behavioral and physiological states that can lead to incidents and accidents (workload, sleepiness/fatigue, distraction/vigilance, and stress), and characteristics that can affect driving performance (vehicle autonomy and driver’s visual attention). All these studies collected data from subjects driving on roads, as opposed to lab simulation. They employed a variety of measurement techniques, such as electroencephalography, heart rate monitoring, galvanic skin response or electrodermal activity, and eye tracking. Another list of references is given for more background on real-world driving studies, the differences between real-world and simulation driving, and more overviews of measuring drivers’ behavioral and psychophysiological states. Given the dearth of research on military driver psychophysiology and behavior under real-world conditions and situations (driving off-road, wearing night vision goggles, etc.), a “military conditions” list of references can only provide some background to studying the relevant issues.					
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1. Introduction

This report provides a bibliography that tries to bridge the gap between psychophysiological laboratory studies of driving and naturalistic driving studies of real-world behavior. The former are experimental in nature, while the latter are observational.

These two types of driving studies are at opposite ends of the spectrum not only when it comes to the setting where they take place (indoors vs. outdoors), but also the scope of instrumentation. With naturalistic driving studies, drivers had devices installed in the vehicles to record vehicle data (e.g., speed, acceleration, GPS position, radar, steering wheel angle) and video of the driver and road. With psychophysiological studies of driving, not only have similar sets of data been recorded, but also driver brain activity, visual attention, heart rate, and more. This latter group of data are mostly a result of sensors placed on driver subjects.

In recent years, due to advances in instrumentation (portable sensors) and analysis (classification techniques), researchers are able to measure driver activity on the road (psychophysiological and behavioral) more accurately.

This report, for the most part, collects those studies that have brought driver data collection out of the lab and onto the road. The studies are sorted in various ways that have meaning to human factors and psychophysiological research. The main categories cover behavioral and physiological states whose variation can lead to driving incidents and accidents (i.e., workload, sleepiness/fatigue, distraction/vigilance, and stress). Another list of studies focuses on driver visual attention or gaze. Finally, a study of psychophysiological responses to adaptive cruise control (a vehicle state of semiautonomy) is included.

All of these studies collected data from subjects driving on roads, as opposed to lab simulation. They employed a variety of measurement techniques, such as electroencephalography, heart-rate monitoring, galvanic skin response or electrodermal activity, and eye tracking.

Another list of references is given for more background on real-world driving studies, the differences between real-world and simulation driving, and more overviews of measuring drivers' behavioral and psychophysiological states.

The final list of documents attempts to address military concerns. Given the dearth of research on military driver psychophysiology and behavior under real-world conditions and situations (driving off road, wearing night-vision goggles, sleep deprivation, etc.), this list of references can only provide some background to

relevant issues. Inevitably, the research will develop and one of the goals will likely be to identify psychophysiological parameters for peak and sustainable performance for vehicle crews (driver, gunner, and commander).

2. Workload

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