

# Assessment of driver's mental effort while driving roads of different complexity

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## Abstract

The study was composed of two experiments. Experiment 1 focused on physiological strain induced by driving compared to rest. Experiment 2 focused on assessing driver strain while driving two roads of different complexity. In experiment 2 three assessment techniques were used: subjective, performance-based measures and physiological.

Five subjects participated in the first experiment. The results showed that heart rate variability was significantly lower during driving compared to rest, mainly due to a decrease in power of the high frequency band.

Eleven professional drivers participated in experiment 2 of the study. Two simulated roads were designed, a 'Low demand' straight monotonous road and a 'High demand' winding road. On two of the five subjective measures (lack of energy and sleepiness) there were significant differences between the two roads. In spite of the differences in road complexity and driving demands, the drivers were able to maintain a constant level of performance throughout each road. However, the differences between the demands of the road were manifested in the physiological measurements. While HRV increased during the drive using the 'Low demand' road, it remained significantly lower than rest and decreased during the drive while driving the 'High demand' road. These results could indicate an increase of physiological strain in order to maintain good performance.

## Introduction

Driving requires a high psychological awareness that induces mental workload. This workload can be attributed to various factors such as road complexity, which can enhance overload or underload situations (Desmond and Matthews 1998, De Waard and Brookhuis 1997, De Waard *et al.* 1995). A high information rate, intersections, crossings, heavy traffic, bad road conditions, curves and slopes can

In D. de Waard, K.A. Brookhuis, J. Moraal, and A. Toffetti (2002), *Human Factors in Transportation, Communication, Health, and the Workplace* (pp. 195 - 203). Maastricht, the Netherlands: Shaker.