What are they Thinking? Using Neurofeedback to Train Drivers to be More Attentive and Responsive to Changing Conditions

Abstract

Driver attention and ability to perceive and react to changing roadway conditions is examined in this study using bio and neurofeedback. Raw Electroencephalogram (EEG) and Electrodermal Response (EDR) data are used to assess driver attention and perception of roadway hazards and conditions. The correlations between changes in EEG and EDR with changes in the observed crash rate are estimated. Previous studies have shown EDR and crash rate to be highly correlated. A positive but less strong correlation between EDR and crash rate is found in this study. Similar correlations between changes in driver alertness and attention with changes in crash rate are also found. These findings suggest that safety may be improved by increasing the driver's ability to quickly switch between levels of low and high attention. The potential to use neurofeedback to train drivers to improve their attention response is then examined to determine the amount of training required to improve attention response and the longevity of training effectiveness. The study shows that providing drivers with relatively short periods of neurofeedback training can be an effective means to improve driver's ability to move into and out of highly focused mental states and their ability to react to rapidly changing conditions. These benefits are long-lived and can persist with little or no additional training. This research suggests that providing in-car systems to monitor driver attention and provide inattentiveness alerts could help train drivers to maintain focus and improve their safety.

1.0 Introduction

Safety professionals focus on driver, vehicle or roadway (environment) factors in assessing safety and countermeasures. The focus of this paper, as was the focus of two relevant papers that preceded it, is on the driver. The rationale for this approach is that driver error is the predominate factor leading to roadway crashes and reducing the potential for error must involve at some point a consideration of the driver. Much of driver research is objective in that is be based on observations of the driver by an “observer”, and not from the perspective of the driver. When the driver's perspective is considered, often this has involved self reporting of driver state.

2.0 Neurofeedback Overview

3.0 Research Design

4.0 Data Collection

5.0 Analysis

6.0 Findings

7.0 Conclusions and Further Research