

Title: Enhancing our understanding of hazard perception

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Hazard perception is a term used to describe the ability to predict dangerous situations on the road. It is a critical skill that is directly related to safety outcomes. As there is no perfect objective measure of danger within a driving scene, hazard perception is based on subjective appraisal by the driver.

IMRA Europe commissioned TRL, the UK's Transport Research Laboratory, and NTU, Nottingham Trent University, to utilise their hazard perception expertise to develop a method to assess danger locations and levels within video footage. One objective of the study was to establish whether physiological measures (of non-conscious arousal) can add value to the validation of danger identification and level.

Twenty two drivers with over ten years of driving experience were recruited by TRL to view video footage of day-to-day driving from the driver's perspective. Forty one-minute clips and 40 dynamic-stills covered four hazard types: no hazard, precursor not leading to a hazard, precursor leading to a hazard and immediate hazard. Synchronised eye tracking data and physiological measures such as galvanic skin responses (GSR) were recorded while drivers viewed the footage. Drivers were asked to identify the most hazard area of specific scenes and provide a cognitive rating of risk for each video. Finally, drivers were asked to complete a self-reported driving style questionnaire.

Analysis of the dataset involved clustering techniques such as hierarchical clustering and k-means using bootstrapping to cluster eye tracking data and click location; factor analysis of survey data in order to identify specific driving styles in the sample; and exploratory analysis of GSR by hazard types. A reverse regression model was applied to determine if physiological measures can act as a proxy for determining the level of danger present in a scene and add value to the validation protocol.

The data are currently being analysed and the results will be used to inform the development of future research and technology to improve road safety.