

# Effects of auditory warnings on driving behaviour

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Nicola Fricke<sup>1</sup> & Mònica De Filippis<sup>2</sup>

<sup>1</sup>Technische Universität Berlin

<sup>2</sup>Deutsches Zentrum für Luft- und Raumfahrt

Braunschweig

Germany

## Abstract

Designing crash avoidance warning systems seems a promising starting point for active driver assistance in enhancing driver safety. The aim of this study is to design semantically enriched warnings which not only alert the driver but provide additional information about the critical situation and thereby assist the driver in dealing with the imminent collision. This is implemented by displaying spatial auditory icons (SAIs), which convey information on the identity and the location of the collision object.

In a driving simulator study, several auditory icons were tested in collision scenarios to assess realistic driving behaviour. The main focus of the study was to compare SAIs with spatial tonal warnings and conventional non-spatial tonal warnings. To provide a stable measure for the effects of the different warning systems, a no-warning condition was also implemented. Dependent variables included number of collisions, distance to collision object, reaction time and reaction patterns for braking behaviour.

Results revealed that all warnings prevented a considerable proportion of collisions compared to the no-warning condition. Also, simple, non-spatial tonal warnings evoked strong reactions and prevented collisions more often than SAIs. However, simple tonal warnings led to more reactions before the collision object was even seen, compared to the SAIs. These reactions consisted of stereotypical strong brake-reactions which were initiated before participants knew about the criticality of the situation after having experienced the first scenario. Such premature behaviour could provoke overreactions and be inappropriate in some situations. Overall, the present study suggests that SAIs should be further investigated in comparable realistic situations before concluding whether they can really prevent inappropriate, overhasty reactions and are therefore more useful for collision warnings compared to simple tonal warnings.

## Human factor aspects in driver warnings

Increasing safety is one important aspect in human factors research, especially in the driving domain, where many accidents endanger health and life of those involved.

In D. de Waard, F.O. Flemisch, B. Lorenz, H. Oberheid, and K.A. Brookhuis (Eds.) (2008), *Human Factors for assistance and automation* (pp. 117 - 128). Maastricht, the Netherlands: Shaker Publishing.