Drivers' visual behaviour at cycle crossings

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Abstract

Two field studies on drivers' ability to detect cyclists and cycle crossings have been carried out. In the first study, the night-time visibility distances of cyclists and of cycle crossings along straight road stretches were investigated. It was found that cyclists were detected at a significantly longer distance than cycle crossing markings. In wet weather, the visibility distance of cycle crossing markings was significantly shorter than in dry weather. No such effect was seen for the visibility distance of cyclists. In the second study, drivers' gaze behaviour at cycle crossings located immediately after right turns was investigated. A cyclist approached the cycle crossing from the same direction as the participant. The visibility of cycle crossings during night-time was rated lower compared to daytime. The cyclist was detected by all participants. Gaze parameters such as dwell time, maximum duration length was higher and the number of glances was lower at night. No statistically significant differences in the gaze parameters were found between the daytime and night-time condition.

Introduction

More than 90 % of the information required for driving is obtained through the visual system (Fastenmeier, 1994). At night, visibility can be severely degraded. Nevertheless most car drivers are not aware of their visual impairment at night (Owens, 1999). Thus risky situations may arise, for example when crossing pedestrians or cyclists are not detected in sufficient time.

Visual processes can be divided into central and peripheral vision. Central vision is mainly used for target detection and identification, whereas the peripheral vision is associated with lane keeping and lateral control (Mourant, 1972; Summala, 1996). Some main functions of target detection, like the perception of contrast, distance and depth, are severely restricted at night, whereas peripheral vision is less affected (Leibowitz, 1977). Amongst other things, gaze behaviour depends on velocity (Weise, 1997), traffic volume, road geometry and surface as well as time of day (Diem, 2004; Gut, 2011).

In urban areas, street lighting is often present, which partly compensates for the absent daylight. But even on roads with street lighting, visual conditions can be poor, either because of insufficient street lighting (Lundkvist & Nygårdhs, 2007) or because of other light sources that cause glare or make the environment visually

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