



Recognisability of different configurations of front lights on motorcycles

Lars Rößger^{a,*}, Katharina Hagen^a, Jens Krzywinski^b, Bernhard Schlag^a

^a Dresden University of Technology, Traffic and Transportation Psychology, Hettnerstrasse 1, 01069 Dresden, Germany

^b Dresden University of Technology, Center for Industrial Design, August-Bebel-Strasse 20, 01219 Dresden, Germany

ARTICLE INFO

Article history:

Received 15 June 2010

Received in revised form

30 November 2010

Accepted 3 December 2010

Keywords:

Motorcycle safety

Motorcycle conspicuity

Recognition pattern

Frontal light design

ABSTRACT

One often discussed reason for motorcyclists' high risk of accidents is that they are less conspicuous to other road users than are other motorised vehicles. The present paper aims to identify a front signal pattern created by additional light sources that would make motorcycles clearly and quickly distinguishable from other vehicles, and that would therefore facilitate localisation and identification of motorcycles. Results of a laboratory experiment have shown that motorcycles with a T-shaped light configuration are more quickly identified, particularly when the motorcycles are in visual competition with other motorised road users. Furthermore, analysis of gaze behavior showed that they were faster fixated by the subjects in the experiment, and the mean duration of fixations was shorter. The practical implications of this experiment and the need for further research are discussed.

© 2010 Elsevier Ltd. All rights reserved.

1. Introduction

Next to single accidents, collisions with other motorised road users are the most frequent reported accident types for powered two wheelers (PTW). The predominant collision opponents in such accidents are passenger cars. Results of the MAIDS study (ACEM, 2004) showed that 64.1% of all reported accidents in urban areas were passenger-car-to-PTW collisions. For rural areas, this percentage decreased to 46.7%. However, passenger-car-to-PTW collision remained the most frequent reported class of accidents in rural areas as well. The MAIDS case control study also indicates that human failure plays a crucial role as primary contributing factor to an accident (87.9%). The findings furthermore suggest that the collision opponents are more likely to be responsible for causing accidents than the PTW riders: In 50.5% of all cases, failures of the other vehicle driver were coded as the primary accident contributing factor whereas in 37.4% of all cases the PTW rider was seen as primarily responsible. Similar results were reported for Switzerland (Walter et al., 2009): In collision accidents from 2003 to 2007 the drivers of the other (motorised) vehicles were primarily at fault in about half (53%) and PTW riders were at fault in one third of registered collisions. For Germany, even stronger differences have been found for car–PTW accidents. According to a report of the ADAC (2009), this type of accident was caused primarily by car drivers 72% of the time.

This means that faulty action paths on the part of collision opponents in the course of their interaction with PTWs constitute a critical portion of PTW riders' risk. Perception and recognition failures in particular seem to contribute to the risk of encounters between PTW riders and other vehicle drivers. The MAIDS study indicated that the largest percentage (36.6%) of all PTW accidents arose from the inability of the other vehicle driver to adequately see the PTW rider. According to analyses of 212 motorcycle-to-other-vehicle accidents in the UK (McCarthy et al., 2007), traffic scan errors by the other-vehicle drivers contributed to accident causation in 67% of cases ('looked-but-failed-to-see' errors). Such accidents typically occur at crossroads or T-junctions and involve right-of-way violations by the other vehicle driver or situations in which vehicle drivers perform a U-turn despite an approaching PTW (e.g. Thomson, 1982; Kramlich, 2002). Based on analyses of 1508 motorcycle accidents, Williams and Hoffmann (1979) concluded that the conspicuity of the front of the motorcycle is an essential factor in car–motorcycle accidents. As the primary reason for the fact that PTWs run a greater risk of being seen too late or not at all, Rumar (2003) pointed out their poor conspicuity resulting from their small frontal surface. Difficulties in estimating the speed of PTWs and difficulties in identification due to the non-distinctive fronts of several PTW categories (e.g. 'slow mopeds vs. fast motorcycles', Rumar, p. 25) were noted as further reasons.

2. The role of frontal lighting for PTWs' safety

According to Engel (1976), two aspects of conspicuity can be distinguished. The *visual conspicuity* of an object describes the degree to which an object is capable of attracting the attention

* Corresponding author. Tel.: +49 35146336591; fax: +49 35146336513.
E-mail address: roessger@verkehrspsychologie-dresden.de (L. Rößger).