

The role of perception and expectation of lead-car speed changes in drivers' distance-keeping behaviour

*Monique van der Hulst
Centre for Environmental and Traffic Psychology
University of Groningen
The Netherlands*

Abstract

One of the basic safety margins in driving is the time-headway drivers preserve with respect to cars ahead. In order to maintain this headway, drivers have to detect decelerations of the lead car. Both perceptibility of the deceleration and expectations of the driver may influence the detection of a deceleration. This paper describes an experiment in a driving simulator in which the effects of these two factors on maintenance of time-headway were investigated. Perceptibility of the deceleration did not affect maintenance of headway. Drivers react faster to decelerations that are easily perceptible, but they approach the lead car just as closely as when perceptibility is low. When drivers expect the lead car to decelerate, response time is shorter. Furthermore, drivers increase their headway before the lead car has actually decelerated. This anticipatory behaviour allows drivers to preserve their preferred headway in a comfortable manner.

Introduction

Safety margins reflect the time drivers allow themselves in the interaction with other road users and the environment. During driving, drivers have to judge the speed and distance to other vehicles and decide, e.g., whether there is enough time to overtake or to merge. In steering and distance keeping, drivers maintain simple safety margins with respect to road markings and cars driving ahead of them. Summala (1988) states that safety margins can be defined in terms of the spatial or temporal distance of an agent to a hazard. In the field of traffic safety research, several authors have mentioned the importance of the study of safety margins. According to Summala (1988), risk control during driving is based on maintaining safety margins. Thus, drivers do not consciously adjust risk during driving, they simply adjust and maintain safety margins, which can be done in a largely automated way. Brown (1990) points out that small safety margins lead to high time pressure and therefore an increased frequency of errors. Moreover, the possibilities to recover from errors will also suffer when safety margins are inadequate. When little time is available, people may choose erroneous correction strategies, and time may be insufficient to carry out corrections effectively. As Ranney (1994) points out, safety margins may provide a connection between the motivational and the information-processing approach to driver behaviour modelling. Therefore, safety margins are promising criterion measures in the prediction of individual accident involvement and situational determinants of safety margins are a potential focus for roadway safety research (Ranney, 1994).