

Summary:

Age differences in car drivers' hazard perception skills

A synthesis of results from two studies using a video-based test

Results from a video-based hazard perception test developed by TØI were compared between three groups of car drivers. Drivers aged 35-55 years responded faster to traffic hazards than both drivers above 65 years and young learner drivers. The results indicate that both driving experience and visual skills are important for quick detection of traffic hazards. This type of test may be useful both in driver training and as part of the driver licensing examination.

In order to drive safely car drivers must be able to detect potentially dangerous traffic situations early enough to take adequate action. They must have sufficient safety margins for braking, stopping or making avoidance manoeuvres. The importance of hazard perception for traffic safety is the topic of this report. We ask whether hazard perception skills vary between drivers, whether this is a skill that develops gradually with driving practice, and whether it can be improved by special training procedures. The main focus is on possible ways of measuring hazard perception skills.

Research on hazard perception in traffic has been carried out since the mid-1960s, and the concept has been defined and measured in different ways. One has investigated *which* situations drivers consider hazardous, *how hazardous* various situations are judged to be, or *how fast* drivers react to different kinds of hazardous situations. These variables have been investigated by a variety of methodological approaches, including questionnaires, still pictures, film, video, driving simulator, and driving in real traffic.

Several studies have shown that young or inexperienced drivers are less able to react adequately to traffic hazards, compared to more experienced drivers. Concerning the relationship between measures of hazard perception and crash involvement risk, the research results are somewhat mixed.

It is therefore still uncertain to what extent various tests of hazard perception are valid instruments for predicting crash involvement risk. In spite of this, some countries (Great Britain, Australia) have implemented hazard perception testing as a mandatory part of the driver licensing test.

In addition to the driver licensing test, a hazard perception test could possibly be used even for driver training, both as a training tool and as an instrument for assessment of the effects of various types of training.

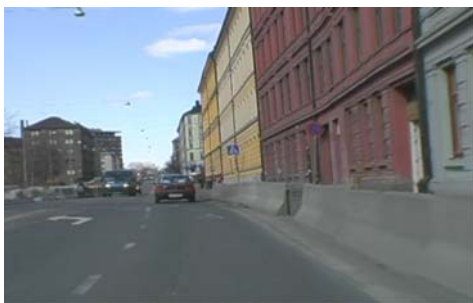
Research has shown that hazard perception skills can be improved by training, but it remains to be seen whether this results in a concomitant reduction in crash risk.

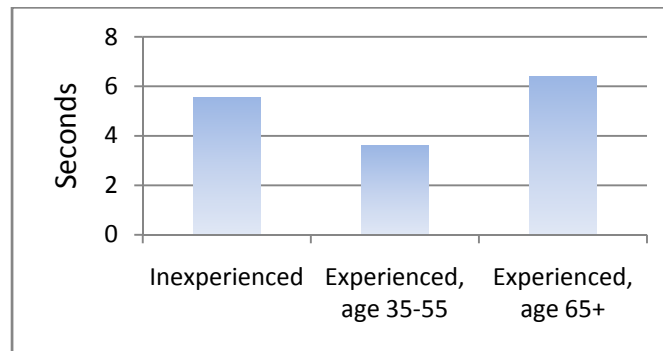
The Institute of Transport Economics has developed a test of hazard perception as part of a research project. A laboratory version of the test has been used in a study of traffic skills among novice drivers with varying amount of driving experience. With the first version, the drivers were tested in groups, and the video clips were displayed on a large screen. More recently a DVD version of the test has been developed, for administration on a standard PC. The present report is a synthesis of two studies using the PC version of the test. Together, the two studies comprise three groups of drivers, differing in age and experience, making it possible to see if young and inexperienced drivers on the one hand and elderly drivers on the other differ from experienced middle-aged drivers regarding hazard perception skills.

The test video consists of traffic scenes recorded by a camera at driver's eye position, to simulate as closely as possible the traffic as seen by a driver. The task of the drivers is to watch out for possible developing hazards, i.e., traffic situations that may require abrupt braking or an evasive manoeuvre, and to push a key as soon as they detect such a situation. The video lasts for about 8 minutes and contains 13 predefined hazards. For each hazard, the reaction time is measured as the duration from the appearance of the first cues of the situation and until the driver responds. Cases of non-responding to a hazard were also recorded.

The first study focused on elderly drivers and involved a comparison between a group of drivers above 65 years and a group aged between 35 and 55 years. The second study was intended to compare learner drivers at different stages of driver training. However, due to practical problems, sufficient data are available only for stage 1 learner drivers, which means participants in the mandatory basic course that must be completed before starting on-road driver training.

The results showed that the oldest age group on the average had the longest reaction times for 10 of the 13 hazards, and the 35-55-year group had the shortest reaction times for 10 hazards. There was also a tendency for the youngest and the oldest groups to respond to fewer hazards than the middle-aged group.





Source: TØI report 1015/2009

The figure above shows reaction times for the three groups in one of the test situations. The hazard was some pedestrians entering a zebra crossing some distance ahead. Due to an oncoming van they were out of sight for the test person for a while, before appearing behind the van. The figure shows that the experienced drivers in the age group 35-55 years on the average responded about two seconds earlier than the two other groups. Those who responded most quickly identified the hazard at the time when the pedestrians entered the crossing (left-hand picture), whereas the slowest responders identified the hazard only after the pedestrians appeared behind the van and were in the middle of the road.

This indicates that both the very inexperienced drivers and the older drivers on the average tend to have poorer hazard perception skills compared to experienced drivers between 35 and 55 years. For the older group partial explanations may be generally impaired motor reactions, and/or impaired vision. For the younger group, however, a more likely explanation is poor visual search behaviour, resulting in less efficient perception of relevant hazard cues.

There was considerable variation between the hazard situations regarding differences in reaction times between the driver groups. There is therefore a need for further investigations to find out if there are common elements between traffic situations that are suitable for detecting effects of age and or driving experience. Possibly, hazard perception skills can be decomposed into various composite skills, which may bear different relationships both to age and experience on one side and to crash involvement risk on the other.

On the basis of the experiences with hazard perception testing so far, it is recommended that one awaits further validation studies, both with the tests in practical use abroad and with our newly developed test, before considering its use as part of driver licensing.