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do the 'eyes' have it

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The issues raised by the question of *'Who should be allowed to drive a motor vehicle?'* are complex. These issues need to be considered in the context of the political reality that restricting licenses is not popular, as a general rule. Also, many people may suffer a significant reduction in their quality of life or lose their livelihood as a result of losing their driver's licence.

My views on human perception and learning were established by the early 1970's when I completed my PhD at Sydney University. My interest in road safety began in the late 1970's when I was placed in charge of the human factors aspects of the Fairfield On-Scene Study of Collisions. This was a large study of road accidents in the Western ▶

Sydney region involving on-scene and in-depth analysis by teams of traffic and mechanical engineers, behavioural scientists and a medical officer. It is the only study of its kind conducted in New South Wales and was carried out by the (then) Traffic Accident Research Unit (T.A.R.U.) of the Department of Motor Transport (now incorporated into the Roads and Traffic Authority of New South Wales). Thus, although I am currently a practising optometrist, the following views do not necessarily represent those of the optometry profession. These insights are the consequence of my interest in vision and road saftey accidents formed many years ago.

Where the T.A.R.U. multi-disciplinary team considered that visual problems could have been involved, objective measurement of some visual factors was carried out using a commercially available vision tester. This is not usually done in these sorts of road accident studies. The reason vision was chosen for inclusion was that, like blood alcohol levels, it is possible to obtain reasonably objective measures of some visual performance factors. However unlike blood alcohol levels, there are many possible aspects of vision that may contribute to a road accident. Which do we measure? Intuitively visual acuity, which is our ability to see detail, should be important and this is presumably why static visual acuity is the mainstay of visual licensing requirements.

The modern motor vehicle is becoming more and more insular with smooth suspension, air-conditioned closed window environment, elaborate sound systems, mobile phone, GPS systems, anti-radar and other devices. Vision, which traditionally is considered to account for 90% of our input while driving, probably currently accounts for as much as 95% of the information required for safe driving. Moreover the level of visual ***agility*** required is getting greater with complex signage and roadside advertising outside the vehicle and operation of an increasing array of gadgets needing visual input within the vehicle. In other words, the visual distractions are increasing at the same time that visual input from the road environment is becoming more important.

The evidence for the importance of vision in driving

Although on-scene studies have rarely measured visual performance, there have been many survey studies that have attempted (largely unsuccessfully) to link poor static visual acuity with poor road safety records. This large body of research will not be reviewed here. However it is important to note that when ***dynamic*** visual acuity is measured, a correlational link has been demonstrated. The difference between static and dynamic acuity, as their names imply, is that the former measures how well you can see a stationary number plate, for example, from a stationary car, while the latter applies to vision when movement is taking place. Poor dynamic visual acuity is not directly related to poor static visual acuity, as measured for licensing, but it ***is*** correlated to poor road accident records.

"Poor dynamic visual acuity is correlated to poor road accident records."

The ability to see clearly in conditions of low light, glare and other less than perfect lighting conditions is clearly called for in some driving circumstances. The ability to identify potential hazards out of the corners or peripheral areas of our visual fields is also clearly intuitively important in a variety of driving situations. The inability of some colour deficient persons to see red colours clearly has been shown to be a predictor of greater likelihood of certain collisions.

These 'facts' have been known for over 30 years but do not seem to have greatly influenced the vision requirements for the licensing of non-commercial road users.

Returning now briefly to the people whose vision I tested during the 'Fairfield On-Scene Study of Collisions'.

- These persons had been assessed as having a visual problem that could not be explained by distractions or something obscuring their view just prior to the accident. Poor static visual acuity alone was not the usual finding. In fact, all these people probably passed the binocular test required to obtain a licence.
- Nor was there any significant failure to wear corrective lenses where needed. Occasionally glasses were observed to be unusually dirty to an extent that may have played a role in a significant reduction in vision and which, in turn, could have contributed to the accident. It is worth noting that this sort of in-depth on-scene study is much more likely to uncover these sorts of problems than the usual police investigation.
- Poor stereopsis and unusual phorias were more common visual problems found with the vision tester in this study.
  - Stereopsis is the ability of the visual system to use the slightly different images received by each eye to perceive depth.
  - Phorias measure the tendency of the eyes to move away from fixation when cues for fusion are reduced. If this happens under normal viewing conditions, it is called a tropia or a manifest eye turn or a squint or strabismus.
- At the time I was not trained in testing for these specific conditions but some were noticeable even to the untrained eye and, in other cases I did ask if they had had any visual problems. An alarming number of these road users said that they had had glasses or exercises or patching as a child, but no longer believed they had a problem. I say alarming since the only information I could find about such childhood eye problems indicated that they were fairly rare. In my small group of

people who appeared to have a visual problem contribute to a road accident, this sort of background was reasonably commonplace.

Although there was no research to confirm it at the time, and there has been none done since to my knowledge, it seems possible that these people may have scored very poorly on a test of ***dynamic*** visual acuity.

As we have seen ***dynamic*** visual acuity is a worthwhile predictor of road accident risk, whereas static acuity is not. My observations provided a possible explanation. Road authorities were not receptive to the testing of this hypothesis. It seemed that there was a concern that more accurate visual criteria for licensing would lead to more people being excluded, and that this would be politically unpopular.

My general hypothesis at the time was that it was visual problems of which the road users were unaware that caused the greatest threat to safe road use. In most cases making people aware of these potential problems or corrective training was what was indicated, rather than the removal of licences. Nevertheless the research to test this hypothesis was never approved.

In the recent Austroads guidelines for health professionals and their legal obligations, "Assessing Fitness To Drive" (1998), our road authorities have taken an exclusion approach to some visual problems in addition to the traditional static visual acuity criteria. They have placed the legal responsibility for identifying these problems on health professionals and their patients. This strategy seems unlikely to work in the area of visual problems, especially if lack of awareness of the problem is an important factor.

In subsequent articles I will consider in more detail the visual implications of both the "Assessing Fitness To Drive" and its companion booklet, "Medical Examination of Commercial Vehicle Drivers". In the meantime perhaps a legal analysis is called for by someone more informed than myself in this area. It remains a mystery to my non-legal mind that road authorities continue to require the majority of road users to pass a vision test of binocular static acuity, which has been shown to be unrelated to predicting safe driving. To the lay person they seem to be saying 'If you can see those letters (on the 6/12 line) your vision is good enough for you to drive safely, if you cannot identify them correctly your vision is not good enough'. Clearly some degree of visual acuity is required to use the road system safely, but it is equally clear that other visual abilities are more important. Ironically, it is people with poor binocular static acuity who are most likely to self-regulate their road use (although most optometrists have stories of patients with very poor binocular static acuity who continue to drive for a number of reasons, including lack of awareness of the problem). PL