

## VISION AND OCULAR FUNCTIONS IN THE OLDER DRIVER

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### Abstract

*The driving ability of the older driver is often controversial and many driver licencing bodies recheck the vision of older drivers prior to renewal of their drivers licence. Currently in Victoria, the vision of drivers is not rechecked routinely on renewal of a drivers licence. This study presents information on the visual status of 201 older drivers in Victoria using an automated vision screener. It was found that 91.5% of those screened had an unacceptable result to one or more of the tests of ocular function. By examining the incidence of ocular dysfunction in this group, the acceptability of the present Victorian regulations will be considered.*

**Key words:** Vision screener, driving, vision, ocular function.

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### INTRODUCTION

Recent demographic trends indicate that the number of aged people is increasing in some countries. Accordingly, the number of older drivers on the roads is also increasing. It has been discussed by Klein<sup>1</sup> that advancing age, particularly after the age of 50, brings about a number of physiological changes including the decline of vision and other ocular functions. As a result of these changes Klein further points out that there is continued need to evaluate the affect of declining visual performance and driving ability, given the high relationship between road accidents and older drivers.<sup>1</sup> These links have caused many driver licencing authorities to consider ways in which the licencing of older drivers can be regulated.

A worldwide review of visual standards for drivers conducted by Charman<sup>2</sup> in 1985, revealed that many countries recheck the vision of older drivers as a means of regulating the renewal of licences. In Australia, except for Victoria and the Northern Territory, the vision of drivers over the

age of 70 is tested prior to renewal of a licence. Currently in Victoria drivers of a private vehicle are only required to have 6/12 vision in the better eye and 6/60 vision in the worse eye. It is the responsibility of the driver to report to the licencing body any physical changes, such as reduced or impaired vision.

When attempting to calculate the accident risk for drivers a number of factors need to be considered such as the drivers age, the number of accidents and the number of miles driven. Research by Waller<sup>3</sup> and Barr<sup>4</sup> indicates that the accident risk for the older driver is higher than for any other group of drivers. This is despite the fact that older drivers avoid demanding driving situations such as heavy traffic or night driving. Keltner and Johnson<sup>5</sup> found that the driver over age 65 presented with the highest risk value. Barr<sup>4</sup> further found that an increase in the likelihood for injury, or for a fatality following an accident, occurs in the elderly driver.

Research into the vision of drivers has found that many drivers have a level of vision that is less

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than the recommended level and that age is linked to this decline. Guest and Jennings<sup>6</sup> surveyed Victorian drivers presenting to optometric practices and found that 12.3% could not reach the recommended visual standard and that 32.2% of those over the age of 70 were below the standard. A survey of the vision of some 503 Brisbane drivers attending specialist, but not eye outpatient departments, performed by McConnell et al<sup>7</sup> found that 8% failed to meet that states vision requirement and that 55% in this unsatisfactory group were aged between 56-75 years.

However when attempting to determine the visual capacity of drivers it is preferable to survey a population of drivers with no bias towards possible dysfunction as might be the case in these studies. For this reason, it was decided to study a group of older drivers in a non-clinical setting using an automated vision screener to test a range of ocular functions including visual acuity. The value of vision screeners when examining ocular functions in a large population is widely accepted and according to Unger<sup>8</sup> they are used in many countries to assess the visual capacity of drivers. The aims of this study were:

1. to provide information on the visual status of a group of drivers over the age of 50 using the automated Keystone View VS 11 Vision Screener
2. to determine if the visual capacity of these drivers complies with the standard recommended for drivers in the state of Victoria
3. to consider if re-assessment of older drivers vision should be performed at the time of licence renewal
4. to identify the incidence of ocular dysfunction in this age group as detected by a vision screener.

## METHOD

### *Subjects*

All volunteers screened on the vision screener were over the age of 50. They held a current Victorian drivers licence for a private vehicle and had driven in the week prior to testing.

### *Apparatus*

All candidates were screened using the Keystone View VS II Vision Screener. This instrument

allows screening of the following ocular functions:

- visual acuity, right, left and both eyes together
- heterophoria, horizontal and vertical
- fusional ability
- stereopsis

Each of these functions were tested for near (40 cm) and far (6 m). This instrument also assesses colour vision and horizontal peripheral visual fields. A description of this vision screener has previously been outlined.<sup>9</sup>

### *Procedure*

The drivers were screened at one of five venues, which were either a metropolitan bowling club or Senior Citizens club. One tester operated the instrument at all locations and testing took between 10-15 minutes for each individual. The testing was performed between June and August 1992. Candidates were tested with glasses if they drove with their glasses, even if this was not a condition of their driving licence.

## RESULTS

Two hundred and one drivers were assessed on the screener, 109 males and 92 females. Their ages ranged from 50 to 87 years, the average age being 66.9 years. Table 1 shows the age profile of those screened.

### *Vision*

Vision was tested monocularly and with both eyes open at 6 m and 40 cm. It was found that 53 subjects (26.4%) had 6/6 vision in the right eye and 56 subjects (27.9%) had 6/6 vision in the left eye. With both eyes open 77 subjects (38.3%) demonstrated 6/6 vision. Seventy eight subjects (38.8%) had 6/6 vision in at least one eye.

TABLE 1  
Age profile of sample  $n=201$

Age	Number	%
50-59	46	22.9
60-69	72	35.8
70+	83	41.3

The testing of near vision revealed that 37 subjects (18.4%) had 6/6 equivalent in the right eye and 33 subjects (16.4%) in the left. With both eyes open 45 subjects (22.4%) had 6/6 equivalent.

### Heterophoria

The test of heterophoria type and measurement revealed that 184 of those screened (91.5%) were within the normal limits for horizontal heterophoria for far, and 183 (91%) for vertical heterophoria.

At near, 166 candidates (82.6%) were within normal limits for horizontal heterophoria and 174 candidates (86.6%) for vertical heterophoria. Table 2 shows the types and numbers of heterophoria found on those screened.

TABLE 2  
Number and types of heterophorias

	Far		Near	
Horizontal phoria	eso	20	eso	8
	orthophoric	129	orthophoric	58
	exo	35	exo	100
	suppression	14	suppression	11
	eso >6Δ	3*	eso >4Δ	3*
	exo >4Δ	0	exo >6Δ	21*
Vertical phoria	R/L	1		
	orthophoric	107		82
	L/R	75		91
	suppression	14		11
	>1ΔR/L	1*		1*
	>1ΔL/R	3*		15*

\*Unsatisfactory.

### Fusion

A capacity for fusion was demonstrated in 171 candidates (85.1%) for far, and for near in 142 candidates (70.6%).

### Stereopsis

Stereopsis for far was within the acceptable range for 75 candidates (37.3%) and for near in 47 candidates (23.4%).

### Colour

The results to the colour discrimination test were acceptable for 159 candidates (79.1%) for red/green and for 137 candidates (68.2%) for blue/violet.

### Horizontal Peripheral Vision

The assessment of horizontal peripheral vision screens up to 85° on the temporal side and 45° on the nasal side and was satisfactory in 167 candidates (83%).

### Suppression

A group of 20 candidates (9.95%) exhibited suppression during testing in one or more tests. In this group 18 candidates (90%) had unacceptable fusion results. Unacceptable levels of stereopsis were found in all candidates with suppression, 14 candidates (70%) having no detectable stereopsis for near and far.

### SUMMARY OF RESULTS

A review of the vision results and the performance to each ocular function test was undertaken to ascertain the significance of the results in these older drivers. The results to distance vision testing were examined to see how many of those screened were driving with a level of vision that was below the VicRoads recommended standard. It was found that 18 subjects (8.9%) had less than 6/12 vision in their better eye. Consequently, it could be suggested that these drivers should not be driving as they would in all probability fail a VicRoads eye sight test. The results of vision testing for the three major age groups showed that of those who had a level of vision below that recommended for a drivers licence in Victoria, 16 candidates (88.8%) were over 60 years of age. These results support the fact that the older the driver the greater the need to monitor the level of vision (see Table 3).

A review of the drivers performance to each test of ocular function shows that 184 of those screened (91.5%) had unacceptable results in one or more tests. In this group, 160 candidates (79.6%) had unacceptable results in two or more tests and 130 candidates (64.6%) had unaccept-

TABLE 3  
Age of drivers failing vision standard

50-59	2	11.2%
60-69	8	44.4%
70+	8	44.4%
	18	100%

able results in three or more tests. Furthermore, 66 candidates (32.8%) had unacceptable results in half or more of the ocular tests.

A comparison between the results in this study to those found in young learner drivers highlights the poor performance of these older drivers<sup>9</sup> (see Table 4). The previous study screened 727 driver licence applicants using the same automated vision screener and a comparison of the two sets of data shows that the number of unacceptable results is much greater in the older drivers. The results of all tests of ocular function as tested on the automated vision screener show that the numbers of drivers in this older age group who had unsatisfactory results is much higher.

The findings in this study regarding the visual status of older drivers are of concern as they indicate that the majority of those screened had evidence of visual and ocular dysfunction that could contribute to difficulties when driving. Further research into the effects of reduced visual and ocular performance on driving need to be carried out. The results provide support for the introduction of retesting of drivers vision on renewal of a drivers licence, particularly for those drivers over the age of 60.

TABLE 4  
Number of drivers with unacceptable test results

	Older Drivers n = 201	Younger Drivers n = 727
≤ 1 test	184 (91.5%)	20.4%
≤ 2 tests	160 (79.6%)	14%
≤ 3 tests	130 (64.6%)	4.1%

## CONCLUSION

The results of screening a group of older drivers with an automated vision screener showed:

- that the majority of drivers, 61.7% did not have 6/6 vision in at least one eye

- that 8.9% of those screened demonstrated a level of vision below the standard recommended to hold a drivers licence
- that in this fail group, 88.8% were over 60 years of age
- that assessment of drivers vision should be performed at the time of renewal of a drivers licence. The results indicate that the vision re-test could be required only in drivers over the age of 60 as this group represents those with the greatest level of reduced vision
- that the incidence of ocular dysfunction in this group of older adults was considerably high, with 91.5% exhibiting an unacceptable result to one or more tests of ocular function
- that licencing authorities could consider the value of examining a wide range of ocular functions in drivers.

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