



# VISUAL ACUITY OF DRIVERS VERSUS NON-DRIVERS AGED OVER 55 YEARS DETERMINED UNDER CONDITIONS OF HABITUAL CORRECTION

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## INTRODUCTION

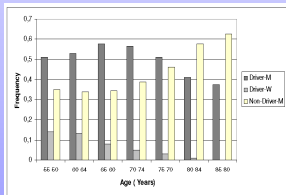


Driving is a complex task in which processing of visual information is extremely important and requires good visual sensorial function, as well as a capacity for responding adequately. Limitations can produce changes in an individual's driving habits, such as avoiding difficult traffic situations, not driving at night, and even avoiding driving altogether (Ball et al. 1998; Stutts 1998; Gilhotra et al. 2001; West et al. 2003; Satariano et al. 2004).

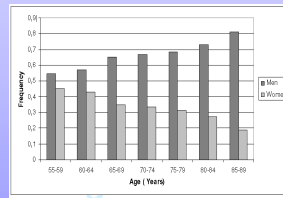
## METHODS

### Sample

In a retrospective study, we examined the visual skills of a random sample of 2449 healthy adult subjects aged 55 - 89 years. 62.60% of the subjects were drivers (86.56% men and 13.44% women).



Figures 1 & 2. Characteristics of the study sample. Note the increase in non-drivers with age shown in Figure 2.



### Materials



Figure 4. The Ergovision® instrument (Essilor)

The subjects' visual skills were assessed by determining monocular distance VA under photopic and mesopic illumination conditions. To avoid bias between the eyes of the same subject, only the VA of the right eye was included, since the difference between eyes is not usually significant (Pointer 2008b).

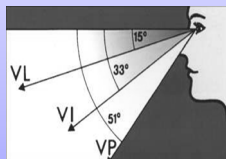


Figure 5. Angles of gaze

VA was measured by looking at a chart inside the Ergovision testing device. Acuity is expressed on a decimal scale and to compare it with those reported in other studies it was converted into logMAR (LogMAR = -log(VAdec)).

## RESULTS

Table 2 shows the distance VA results obtained with the subjects' habitual correction under both photopic and mesopic conditions by age range. The mean decimal photopic VA for the whole sample was  $0.63 \pm 0.25$  (95% confidence interval CI: 0.61 - 0.64). The overall mean decimal mesopic VA was  $0.26 \pm 0.10$  (95% CI: 0.25 - 0.26).

Age Range	PVA ± SD	95% CI	MVA ± SD	95% CI
55-59	0.68 ± 0.25	0.64-0.73	0.29 ± 0.13	0.26-0.31
60-64	0.67 ± 0.26	0.64-0.70	0.28 ± 0.12	0.26-0.29
65-69	0.63 ± 0.25	0.61-0.66	0.25 ± 0.10	0.24-0.26
70-74	0.60 ± 0.25	0.58-0.63	0.24 ± 0.09	0.23-0.25
75-79	0.56 ± 0.24	0.52-0.60	0.23 ± 0.07	0.21-0.24
80-84	0.52 ± 0.21	0.46-0.58	0.21 ± 0.05	0.20-0.23
85-89	0.34 ± 0.16	0.25-0.43	0.20 ± 0.00	0.20-0.20

95% CI = 95% confidence interval

Table 1: Mean habitual distance visual acuity and its confidence interval (CI) at 95% for photopic (PVA) and mesopic (MVA) conditions and the standard deviation (SD).

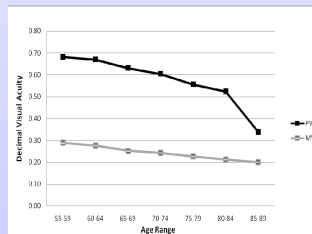
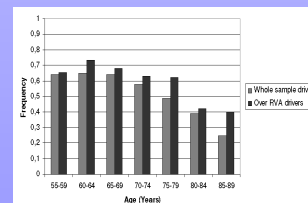
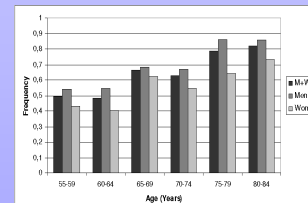


Figure 6. Habitual VA by age range for photopic and mesopic illumination conditions

The mean VA values for each age range obtained by other authors Elliott et al. (1995), Rubin et al. (1997), Haegerstrom-Portnoy et al. (1999), Bergman & Sjostrand (2002), and Lott et al. (2005) are shown in Table 3.

Age Range	BinoVA	MonoVA	75% of MonoVA	All MonoVA	Women MonoVA	Men MonoVA
55-59	1.25	1.00 (-20%)	0.75	0.68	0.67	0.69
60-64	1.10	0.88 (-20%)	0.66	0.67	0.63	0.70
65-69	1.05	0.79 (-25%)	0.59	0.63	0.64	0.64
70-74	0.96	0.72 (-25%)	0.54	0.60	0.56	0.63
75-79	0.81	0.57 (-30%)	0.43	0.56	0.48	0.61
80-84	0.71	0.50 (-30%)	0.37	0.52	0.45	0.55
85-89	0.51	0.36 (-30%)	0.27	0.34	0.30	0.35

Table 2. From left to right: binocular visual acuity (BinoVA) averages from the results of other authors and estimated monocular visual acuity (MonoVA) obtained as a percent reduction of the value obtained for BinoVA.



MonoVA was estimated by reducing the best binocular VA by 20% to 30% to obtain an approximate value for each age range.

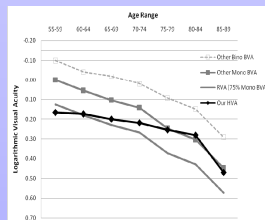


Figure 7. Comparison between our results and those of other authors. Solid line = legally required VA (75% MonoVA); diamonds = our habitual VA; squares = MonoVA reported by others; dashed line = BinoVA reported by others

Figure 8a shows the frequency of men and women whose correction was considered good or whose VA was in keeping with the criterion used in the present work. The frequencies of drivers in the whole sample and in the subgroup with good VA are provided in Figure 8b.

Figure 8a and 8b. Frequencies of men and women whose correction could be considered good

VAs were recorded for the whole sample in five-year age intervals divided into drivers and non-drivers in both photopic and mesopic conditions, and the differences between the two subject groups determined. In all cases, we provide the p value, which indicates whether there is a significant difference between drivers and non-drivers or not. Figures 9a and 9b illustrate this variation. The mean decimal photopic VA for drivers was  $0.67 \pm 0.25$  (95% CI: 0.65 - 0.68); and  $0.62 \pm 0.26$  (95% CI: 0.59 - 0.64) for non-drivers. The mean decimal mesopic VA for drivers was  $0.26 \pm 0.11$  (95% CI: 0.25 - 0.27); and  $0.25 \pm 0.11$  (95% CI: 0.24 - 0.25) for non-drivers.

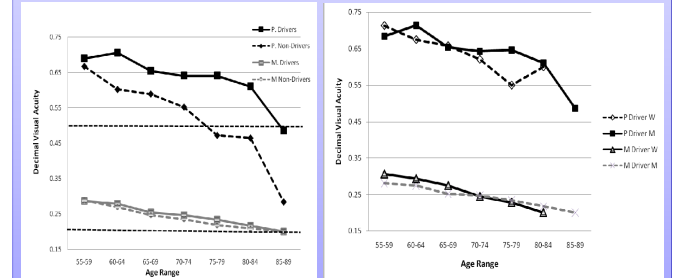


Figure 9a and 9b. Differences between genders in photopic and mesopic VA among drivers and non-drivers.

Key to 9a: Squares = PVA in drivers; diamonds/dashed line = PVA in non-drivers; rectangles/grey line = MVA in drivers; dashed/grey = MVA in non-drivers.

Key to 9b: Diamonds/dashed = PVA in driver W; squares = PVA in driver M; triangles = MVA in driver W; grey/dashed MVA in driver M.

## CONCLUSIONS

Using their habitual corrective lenses, about 35% of the participants in this study showed a lower VA than those reported for others in their age range. This visual impairment could be easily avoided through the use of appropriate correction. The drivers' habitual VA was about 11% better than that of non-drivers in each age range and differences were significant for both photopic and mesopic VA.

## ACKNOWLEDGEMENTS

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