VISUAL FIELD SIZE AND REDUCED MOBILITY
Jan Lovie-Kitchin, Russell Woods, Shirin Hassan, Grace Soong
Centre for Eye Research, Queensland University of Technology, Brisbane, Australia
Schepens Eye Research Institute, Boston, USA

ABSTRACT
We investigated the relationship between kinetic visual field size and mobility performance in 99 subjects with normal and low vision. Mobility was assessed as walking speed and number of errors on a 79 m indoor obstacle course. These measures were transformed to Percent Preferred Walking Speed (PPWS) and Log Error Score (LES). The performance levels that best discriminated between subjects with normal and low vision were: PPWS < 45% and LES < 1.7 (1 error). These corresponded to a visual field size of approximately 42° diameter. Safe and efficient mobility begins to be compromised at a critical visual field size of 85° diameter. Further research is required to determine the visual field size at which mobility is seriously impaired.

PURPOSE
A number of studies1-5 have shown that the extent of the remaining visual field has a major impact on the mobility performance of people with visual impairment. However, the degree of visual field loss at which mobility first becomes impaired is not known. We examined the mobility performance of subjects with normal and low vision in an attempt to determine the visual field size for safe and efficient (“normal”) mobility.

METHODS
Subjects - 79 subjects with low vision from a range of ocular diseases, aged between 25 and 90 years; 20 age-matched subjects with normal ocular health and vision.

Binocular visual fields - Kinetic program of Humphrey Field Analyser 630 using a 1V 4 E target.

Mobility assessment - Preferred walking speed (PWS) measured on an unobstructed corridor. Walking speed and number of errors measured on a 79 m, obstacle-rich, indoor course (Figures 1 & 2).

DATA ANALYSIS
Visual field extent was converted to a solid angle and expressed as a percentage of a sphere.2

Mobility performance was scored as Percent Preferred Walking Speed (PPWS) and Log Error Score (LES) (Log10[100/(1+No. Errors)].

Sensitivity (% low vision subjects failed) and Specificity (% normal vision subjects passed) were calculated to determine the performance levels that discriminated between normal and low vision.

RESULTS
PPWS of < 45% on our indoor course discriminated best between the low vision and normal vision subjects at a sensitivity and specificity of 74% (Figure 3a). Similarly, LES of < 1.7 (1 error) discriminated between low vision and normal vision subjects at a sensitivity of 71% and specificity of 75% (Figure 3b).

DISCUSSION
There were strong relationships between visual field size and mobility measures, as has been found previously.6 Visual field size was a stronger predictor of mobility errors (LES) than of walking speed (PPWS), as others have reported7 (Figure 4). The results of this study suggest that when the visual field is reduced to about 85° diameter, mobility performance starts to be compromised. Interestingly, this is slightly smaller than the horizontal visual field diameter considered safe for driving. In Australia a visual field diameter of 120° is required for the issue of a private driver’s licence (140° is required for commercial vehicles; the reason for the difference is not known). Statutory authorities in the US and Australia accept a visual field extent of 20° diameter as indicating severe impairment which warrants welfare assistance. At some point between 20° and 85°, mobility performance will be impaired sufficiently to warrant orientation and mobility training. Further research is required to determine the visual field size at which mobility performance is seriously impaired.

REFERENCES

THE BOTTOM LINE
For people with low vision, safe and efficient mobility begins to be affected when their visual field size is reduced to about 85° or less.

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