Which Objective Visual Measures are Associated with Driving Exposure among Older Drivers with Bilateral Cataract?

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Abstract

This cross-sectional study analyses the association between objective visual measures and naturalistic driving behaviour in older drivers with bilateral cataract. Participants completed a questionnaire and underwent testing for visual acuity, contrast sensitivity and stereopsis. Naturalistic driving behaviour was measured with an in-vehicle monitoring device. General linear models were used to analyse the association between objective visual measures and overall/ day time/ night time driving exposure. After controlling for potential confounding factors, only binocular contrast sensitivity, gender and age were significantly associated with overall and day time driving exposure. No objective measures of vision were significantly associated with night time driving exposure.

Background

There has been an increase in the number of older drivers on the roads due to the ageing population, (Bureau of Infrastructure, Transport and Regional Economics, 2014). As driving is a complex task which depends heavily on visual functioning (Owsley & McGwin, 2010), there is increasing evidence that cataract has a negative impact on driving behaviour while waiting for first eye cataract surgery. This study tested the hypothesis that overall driving exposure and day/night time driving exposure would be influenced by the level of visual impairment.

Method

A sample of 111 drivers aged 55+ years with bilateral cataract and waiting for first eye cataract surgery were recruited into the study. Data collection involved a researcher-administered questionnaire, the Mini Mental State Examination (MMSE) as well as visual acuity, contrast sensitivity and stereopsis. An in-vehicle monitoring device with data logger and GPS receiver was used to measure naturalistic driving behaviour for the cohort one week prior to first eye cataract surgery.

Results

The 111 participants (53% of males and 47% of females) were aged 55 to 91 years with a mean age of 73.66 (SD= 8.52) years. The mean number of years driving was 51.84 years (SD=10.31). Regarding the measures of vision, the mean ETDRS visual acuity in both eyes was 0.14 logMAR ±0.16, contrast sensitivity in both eye was 1.65 log units ± 0.15 and mean stereo-acuity was 2.31 seconds of arc ± 0.72. Drivers typically drove an average of 15.56 trips during the week (SD=10.51) and a distance of 115.77 km (SD=98.97). During the day, participants drove an average of 14.04 trips (SD=9.15) and a distance of 101.27km (SD=87.45). At night, participants drove an average of 1.52 trips (SD=3.49) and a distance of 14.84 km (SD=29.47). Eleven percent of participants had at least one episode of hard braking while travelling and 26% at least one episode of hard acceleration. No participants had a crash during data collection.

General linear models were used to analyse the association between objective visual measures and overall/ day time/ night time driving exposure. After controlling for potential confounding factors, only binocular contrast sensitivity ($p<0.05$), gender ($p<0.05$) and age ($p<0.01$) were significantly associated with overall driving exposure. Contrast sensitivity ($p<0.05$), gender ($p<0.05$) and age ($p<0.01$) were also significantly associated with day time driving exposure. Participants with better contrast sensitivity scores drove more kilometres in the week prior to cataract surgery than those who had poorer contrast sensitivity scores. Also males drove more kilometres than women and younger drivers drove more kilometers than older drivers prior to cataract surgery. No objective visual measures of vision were significantly associated with night time driving exposure.

Conclusion

The results found that older drivers with cataract do appear to self-regulate their driving exposure based on poorer visual function. Contrast sensitivity appears to be an important visual measure to consider when determining the impact of cataract on driving behaviour. A better understanding of the role of contrast sensitivity in driving and driver self-regulation practices is required.

References

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