Author's response to reviews

Title: Driving patterns in older adults with glaucoma

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Author's response to reviews: see over
Author's covering letter for initial submission

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Comments: see over
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Editorial board, *BMC Ophthalmology*

To the editorial board:

We are submitting a revised version of our manuscript, “Driving patterns in older adults with glaucoma” for publication in *BMC Ophthalmology*. We appreciate the comments of our reviewers. Please see below for a point-by-point response to the concerns that they raised.

Sincerely,

Pradeep Y. Ramulu, MD MHS PhD
Corresponding author

Point-by-point response to reviewers’ comments

Reviewer #1 (Kooijman)

Though the manuscript is clearly written I would prefer that some more practical data were added in addition to the statistical analyses.

1. (discretionary) For example, at page 7, last paragraph, “Among glaucoma subjects, ... (OR=2.0 for each 5 DB decrement .. (Figure 2)”. What means OR=2 in relation to the number of subjects that ceased driving. In figure 2? I can see that comparing at 10 and 30 dB decrement about 4 times more subject with 30 dB decrement ceased driving. Thus 20 dB extra loss correspond with 4 times: 5 dB correspond with about 1.4 times more subjects that stop driving. That’s what I would tell someone if I had to explain the data. How does it relate to an OR = 2?
This might apply to other statistically significant results.

The OR of 2 indicates that the odds of reporting driving cessation doubles with every 5 dB decrease in mean deviation. The reviewer is pointing out the differences between odds and probabilities, which are different, and best illustrated in Figure 2. The results section was edited to make the language clearer (pp. 6-8).

Other remarks to improve the manuscript:
2. (major compulsory) Page 7, 3rd paragraph: “Glaucoma subjects also had a greater mean number of driving limitations. (Figure 1), but in figure 1 I see no comparison between glaucoma suspects and glaucoma subjects, only a visual field loss scale. As glaucoma subjects and suspects both are allowed to have a visual field loss defect in the range 3-5dB this figure does not indicate a clear separation between the two groups. The mean level in the severe group is not visible in the figure. This was an error – I have now referenced that figure later in the results with more appropriate text. The median number of driving limitations is equivalent to the third quartile for the severe visual field loss group, so it is indistinguishable in the figure (I have clarified this in the figure legend.)

3. (minor) Page 9. Paragraph title: Discussion and conclusions
4. (minor) Page 11. 7 lines from below: remove 1x “than better”
These two changes were made.

Reviewer #2 (Crabb)

Abstract
- The second sentence of the Abstract introduction could be made clearer with the addition of the word "age": "...in this age group..."
This change was made.

Introduction
- Given that driving cessation is a definite state (one is unlikely to repeatedly stop driving), I suggest that the wording of the first sentence of the abstract conclusion be changed from "...more frequent driving cessation..." to "higher likelihood of driving cessation".
This change was made.

Methods
- I was a little perplexed by the sentence beginning: "Most glaucoma subjects had 24-2 VF tests within the 15 months prior to enrolment...". Some more detail is needed here. Especially in those where a VF had not been taken.
I explain in the next sentence - individuals whose most recent fields were 24-2 VF's [not 24-2s] were also included, in which case their better-eye MD was defined using the last recorded 24-2
VFs. Our rationale was that patients in our clinic with the most severe VF loss are monitored using 10-2s, so excluding them would leave out an important group.

- It is not clear (to me at any rate!) what the questionnaire referred to at the beginning of the "Evaluation of Driving" section is. Only three of the nine driving limitations are referred to in reference 17 and it is not clear that the questionnaire has been standardised there either. This is a good point – the questionnaire we used was based on the driving questionnaire used in the Salisbury Eye Evaluation Driving Study (SEEDS), and was a “next generation” version of the questionnaire used in the Salisbury Eye Evaluation (SEE), which used a more limited driving questionnaire (reference 17). These questionnaires have been described to some extent in the references provided, but are fully described here. We have kept reference 17 and added a reference which partially describes the SEEDS questionnaire used. We have also further explained the sources of the questionnaire at the bottom of page 3.

- Furthermore, for limitation [9] 5000 miles rather than 3000 miles (as in then aforementioned Freeman paper) is used for one of the standards and an explanation for this is necessary. The reviewer is correct that this does represent a change from the previous criteria used in previous papers. A 5,000 mile cutoff was used here as this cut-off is employed by the Maryland Department of Motor Vehicles as a criterion to exempt senior citizen from needing vehicle emissions inspection tests on the basis of restricted driving. We have emphasized the reason for this 5,000 mile standard in the methods section.

- What was the rationale behind selecting the 4 states for limitation [1] (it's hard to judge as an Englishman, but New Jersey seems to be almost near to Baltimore as the Virginia border, whilst West Virginia is a neighbouring state). Would patients regard the District of Columbia as being inclusive in this 4 state region? Again, this was taken from SEEDS, and was chosen there as this region corresponds with the Mid-Atlantic region. Our patient population is centered on the Baltimore-Washington area. People from this region may go to PA (1 hour drive away), VA (1 hour away), or DE (1.5 hour away) on a fairly regular basis. NJ is a farther drive (2+ hours away) and is less socio-culturally connected. Patients were instructed to include DC in the region (this has been clarified.)

- It would be helpful to use different parentheses around the limitation numbers, so they are distinct from the references. This change was made.

- Has the limitation list undergone a Rasch analysis to assess the suitability of adding them together for a representation of limitation, as utilised in the analysis? Please reference the psychometric study of the questionnaire’s properties if so, or perhaps mention this as limitation in the discussion. We did conduct a Rasch analysis of the limitation questions and found the results to be inconclusive (there were not enough data to scale the items properly). We ended up not analyzing the limitations as a scale, rather forming three groups as described. I think further work is necessary to create a scale suitable for Rasch analysis.
At the end of the "Measurement of vision and covariates" section, is the questionnaire referred to the General Health Questionnaire or the same one as described previously (i.e. the Freeman questionnaire)? A little more clarity regarding what questionnaires were used would be helpful. The manuscript is a little confusing here

We thank the reviewer for their careful attention to detail. We have adjusted the references in the manuscript, which will hopefully alleviate the confusion.

Tables and Figures

Judging by the IQR, the distribution of MD values in Table 1 do not appear to be normally distributed, so this variable should either be transformed to use the t-test or else a non-parametric test such as the Wilcoxon should be used (this is unlikely to affect the results).

We agree that either test is likely fine (we had consulted a statistician at our institution, who said that our sample size was large enough such that a t-test was appropriate even for non-normally distributed data on the basis of the central limit theorem). Given that both tests provide similar results, we have revised the paper such that it uses the Wilcoxon test instead (top of p. 6).

In Figure 1, it is unclear where the median is located (is it equal with the upper quartile or the lower quartile?). Furthermore, the text where the figure is referenced does not correspond with the figure itself. The figure shows the "Number of driving limitations by severity of better-eye visual field loss", whilst the text suggests that: "Glaucoma subjects also had a greater mean number of driving limitations (2.0 vs. 1.1, p=0.004) (Figure 1)". In other words, the text refers to a control-patient comparison, whilst the figure itself is geared towards severity of loss for that patient group. Furthermore, it is unclear why the groupings of VF defects differ from those used in the study (gaps of -5dB as opposed to 0--3, -3--6, -6--12 and under -12 groupings). Given the fact that the medians for each group look very similar (should the median equal the lower quartile in the under -12dB group), the authors may decide that including this figure is not worth including in the paper. I think if the authors want to keep this figure, then they should reference the results it presents in the Results section (namely stating that those with more driving limitations tend to have more advanced visual field defects).

The figures were mislabeled in the results section, and this has been corrected. Regarding the box plot, the median value is equal with the upper quartile for the severe group, and this has been clarified in the figure legend.

I would be interested to know why decrements of 5dB were used instead of a continuous measure of MD for VF loss in the study. This does not matter a great deal, but it would be interesting to know given that Figure 2 seems to have utilised MD as a continuous measure.

The regression analysis was done using MD as a continuous variable. We expressed the ORs for the 5 decibel decrease because we felt it would be more clinically relevant – the difference that a 1 decibel change in visual field would be negligible to a patient, whereas a 5 decibel decrease could represent a substantial impairment.

Results
- It would perhaps be worthwhile to remind the reader what is being adjusted for in the multivariate analysis within the Results section itself.

*This has been addressed (p. 6, last paragraph).*

- Table 2 – Why not round up the % values to whole numbers, especially since the sample size is small.

*This change was made.*

**Discussion**

- The sentence at the bottom of page 9 states: "The discrepancies between different studies suggest that driving adaptations to VF loss may be different across different age groups or in different driving environments (i.e. urban vs. rural)." It would be helpful if this point was elaborated on. Is this judgement based upon these factors not being adjusted for in studies that show affirmative results or, more likely, the fact there has been no explainable difference between studies with different results other than study location and age demographic? The later – the fact that there has been no explainable difference between our study and the SEE may be because of location and demographic. *This has been clarified in the manuscript (p. 9, 1st paragraph).*

- It would benefit the discussion if the authors expanded the middle paragraph on page 10. I would like the authors to state why they believe that glaucoma nor severity of loss did not predict driver deference in the study. I would guess that the explanation would simply be that they aren't related, so perhaps the following could be added to the end of the last sentence: "...current study, which may imply that glaucoma is not a factor influencing deference outside of other more significant factors such as gender..." etc. Alternatively, the authors may feel that any effect caused by glaucoma may be small, which means that more patients would be required to have the power to find such an effect. *This paragraph has been changed in the manuscript along the lines put forth by the reviewer (p. 9, last paragraph).*

- In the discussion it would be very useful to add a paragraph about other ways in which driving performance in patients with glaucoma has been assessed of late. For example, it would be good if the authors very briefly discussed some of these


*We added this paragraph (p. 10, last paragraph.)*

I’d also like to see a little discussion about the advantages (and problems) of measuring the binocular VF and its association with driving performance or legal fitness to drive....And the potentials to predict what drivers might have a problem given their progression characteristics in the clinic

Some useful refs to consider and briefly discuss should include:
We now mention this issue in the penultimate paragraph of the discussion, and added some additional discussion in the concluding paragraph.

There are also a few typographical errors worth mentioning:
- the use of the word "asses" instead of "assess" in the Abstract and Manuscript Discussion.
- I think the last word of the introduction should be "severities" instead of "severity".
- The "Subjects" section of the methods.
- There is a typo in the Discussion and Conclusions heading: "Disucssions..."
- The last sentence of the first paragraph on page 10 should either begin "Additional studies are needed..." or "An additional study is needed", rather than "Additional study is needed".
- I changed this sentence above to “Further study is needed” (using study as a verb.)
- There is a full stop missing in the sentence: "Females were more likely to limit their driving[14,16,17]."

The above typographical errors have been addressed.