Author's response to reviews

Title: Driver self-regulation and depressive symptoms in cataract patients awaiting surgery: A cross-sectional study

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Author's response to reviews: see over
Reviewer 1

Minor Essential Revisions:

Q  Page 10: Please clarify what is meant by "better depressive symptom scores" – do you mean less depressive symptoms?
A  Yes, this has been changed to “significantly less depressive symptoms”

Q  Methods: For the vision measures, did the authors consider testing peripheral visual field sensitivity? Cataracts create a generalised depression in the sensitivity of the peripheral visual field, and visual field measures have been linked to driving restriction and cessation in previous studies (e.g. Keay 2009).
A  Unfortunately due to the expense of an instrument to measure visual field, we were unable to include this in the study. This has been added as a limitation to the discussion section (p.14) “In addition, we were unable to assess other visual measures including visual field in this study.”

Q  Was any consideration given to collecting data on recent motor vehicle crashes, given the possible links between MVCs and driving restriction?
A  Since crashes are rare events and the sample size of the study was 99, we did not collect information on motor vehicle crashes. We agree that this would be a very interesting topic for further study with a larger sample size.

Q  Methods: Please specify testing distance for the ETDRS and Pelli-Robson charts, as well as the scoring procedure used.
A  The following information has been added to the methods (p.8). Visual acuity: “The chart was calibrated for a three meter distance and scored using a letter by letter method”. Contrast sensitivity: “The test was administered at a distance of one meter and scored using a letter by letter method”

Q  Discussion, 3rd para: While the present study did not find any association between self-regulation and older age or gender, the sample size of the present study is rather small, when compared the larger population studies which did find these significant differences. As such, limited conclusions can really be drawn from the small sample presented in the current study.
A  Agreed, this sentence has been changed (p. 12). “For cataract patients, neither of these factors were significantly associated with driver self-regulation, however, this may be due to the small sample size of this study.”

Q  Discussion, 4th para: Are the authors suggesting that the self-regulation measured in the present study is an "involuntary" restriction of driving?
A  We believe that the self-regulation captured by the questionnaire was involuntary regulation as it was specifically due to their poor vision. The methods section specifies (p.8-9): “If participants responded that they had stopped driving in that situation due to their vision, they were considered to self-regulate on that item. If they responded otherwise or did not drive in that situation for reasons other than
their vision, they were considered to not self-regulate on that item.” A clarification has been added to the discussion (p.13) “This suggests that involuntary restriction of driving for reasons such as cataract, even temporarily, may impact on the psychological health of older adults.”

Q Discussion, 6th para: It is more likely that the study design, rather than the sample size, meant that longitudinal changes in self-regulation and depression could be addressed.

A The sentence has been changed to reflect this (p.14) “The cross-sectional design of the study could not determine cause and effect between driver self-regulation and depressive symptoms or examine how changes in self-regulation relate to depressive symptoms over time.”

Q Also, can the authors provide any support for the comment relating to the over or under-reporting of the DHQ items?

A There is currently no information available on this. The discussion has been modified to reflect this (p.14) “The Driving Habits Questionnaire was also self-reported making it potentially vulnerable to biases including recall and social desirability bias. To date, the Driving Habits Questionnaire has not been validated against actual self-regulation behaviors.”

**Major Compulsory Revisions:**

Q Introduction: Please comment on the ability of older adults to appropriately self-regulate their driving. For example, drivers with poor vision who don't self-regulate may be considered dangerous, while those with better vision who overly self-regulate may be overly cautious. The issue of appropriate self-regulation is less likely to occur among those with any cognitive impairment.

A The following paragraph has been added to the introduction (p.5) “It should be noted that it has not been established whether older drivers are able to recognize their need for self-regulation and make changes that are appropriate for their actual driving ability, without resulting in dangerous on-road situations or over-restriction of driving [14]. In particular, those with cognitive impairment may lack the ability to appropriately self-regulate their driving [15].”

Q Statistical analysis: For the linear regression models, it is assumed that the confounding variables were included in the multivariate analyses regardless of their statistical significance. Given the small sample size, it may have been prudent to minimise the confounding factors to those which due actually potentially confound the relationship between depression and driving self-regulation. Also, given that the visual function measures are generally highly inter-correlated (particularly the central vision measures of visual acuity and contrast sensitivity), I would suggest selecting one or two visual function measures, rather than enter them all into the model. The current model suggests that reduced visual function in this cohort is not related to their depressive symptoms.
Yes, all potential confounders were included in the model. We agree that it was important to consider reducing confounding factors due to the sample size. However, we tested various linear regression models including only the socio-demographic variables that were significant in univariate analyses or reached a certain p value. However, all variations gave the same results in terms of significant variables and very similar coefficients and p values. We therefore believe it is appropriate to maintain all possible confounding factors from the literature in the model.

In terms of the visual variables, we also tested models using binocular measures of visual acuity and contrast sensitivity instead of better and worse eye measures. Binocular VA and CS were not significant in the model. We also added each visual measure to the model individually, but no measure was significantly associated with depressive symptoms. We believe however, since the sample were cataract patients, it is important to consider vision in the model and retain the visual measures as they are.

The following information has been added to the methods to clarify (p.9) “The model was tested using either binocular measures or better/worse eye measures. None of these visual measures were significantly related to depressive symptoms and it made little difference to the model whether binocular or better/worse eye measures were included. The model presented in this paper contains the visual variables: worse eye visual acuity, better eye visual acuity, worse eye contrast sensitivity, better eye contrast sensitivity and stereopsis.”

The following information has been added to the results (p.11) “None of the visual measures were associated with depressive symptoms score in the linear regression model. It should also be noted that none of the visual measures were significantly associated with depressive symptoms score in univariate analyses. If the regression model was tested with the driver self-regulation status variable removed, there was still no significant association between the visual variables and depressive symptoms score.”

Discussion, 2nd para: I disagree with the authors’ statement that the data presented shows that older drivers with visual impairment may be aware of visual problems, and hence appropriately self-regulate. Given that there were very little differences in vision measures between the two groups (and importantly, no differences in the binocular vision measures, which are more likely to represent driving vision), then there is no indication in the data to suggest that greater vision loss, or greater awareness of vision loss, is associated with greater self-regulation in this cohort.

A We accept the reviewer’s point and have removed the statement.

Discussion, 3rd para: More discussion is required relating to reduced contrast sensitivity and self-regulation. There is no mention of the fact that neither the better eye, nor binocular measures of contrast sensitivity were significantly different between the two groups. Keay 2009 reported significant findings using
the better eye measures (which are generally highly correlated with binocular eye measures), and found that CS was a significant predictor of driving restriction/cessation, yet this wasn’t found in the present study.

The following paragraph has been added to the discussion (p.12). “However, these studies reported an association between binocular [30] or better eye [31] contrast sensitivity and driving cessation/reduction. Among cataract patients, Owsley et al. reported that contrast sensitivity was the only independent predictor of crash involvement in the previous five years [37]. They also found that the relationship was stronger for worse eye contrast sensitivity than better eye [37]. While current evidence suggests that contrast sensitivity may influence driver self-regulation, as well as other driving outcomes, further research is required to understand the relationship with the worse eye, better eye and binocular measures.”
Reviewer 2

Compulsory revisions

Methods:
Q1 Page 6 second paragraph: the study design is well chosen with interesting data (page 6-8) collected a week before first eye cataract surgery. However, a direct influence on the depressive symptoms (if caused by driving cessation or restriction of driving due to visual symptoms) must be the time waited, i.e. the time surgery was “necessary” based on visual symptoms but subject spent on the waiting list. Here it is necessary to include the time waited for first eye surgery and the stage of cataract of both eyes (e.g. LOCS III scale (see pdf attached), Lens densitometry (grey level http://www.cnpg.com/Video/flatFiles/1462/index.aspx), C Quant straylight meter) when describing the participants and when discussing the results later on. Page 10 first sentence of discussion also needs to mention the length of time waited.

A1 Time on the waiting list and stage of cataract were not collected for this study. This has been included as a limitation in the discussion (p.14). “Collecting variables including time spent on the cataract surgery waiting list and cataract severity may be useful in future studies of depressive symptoms among cataract patients.”

Q2 Page 7 first paragraph: Please present a comparison of subjective answers of the questionnaire with objective data obtained from the medical records reviewed. This not only validates the questionnaire used for other studies in future where those hard facts/ objective data is not often available (impact of the current manuscript), but it also underlines subject’s subjective answers on the other instruments employed.

A2 Medical records were only reviewed to obtain information on co-morbid medical conditions and other ocular conditions. No comparison of this information with self-report was performed. We have elaborated on this (p.7). “Participants’ medical records were also reviewed to confirm co-morbid medical conditions and to obtain information on other ocular conditions.”

Q3 Page 7 third paragraph: please explain the MMSE by highlighting the data obtained and how it could be of use to the research question, e.g. how were the results later used in the analysis. Especially as this is an Ophthalmology Journal the reader may not be familiar with this instrument.

A3 The following information has been added to the methods (p.8). “This instrument contains questions relating to orientation to place, attention, calculation and recall. It can be used as a screening tool for cognitive impairment but cannot be used to diagnose dementia or other cognitive disorders. Responses on the test were totaled to produce a score between zero and 30 points, with higher scores representing better cognitive ability [34]. Since cognitive ability may affect driver self-
regulation, the MMSE was used to control for cognitive ability in this study and was analyzed as a continuous variable.”

Q4. Page 8 thirds paragraph: there is a correlation between binocular visual acuity and binocular contrast sensitivity with the same measurements taken of the better eye. This is an important finding and although it is logical to most eye care practitioners it would be helpful to state some of the statistics here to back it up as this finding would be beneficial for citation in quality of life studies. Additionally, the current manuscript needs to build on this finding by including references to the better eye in the calculations as this is what influences perception of the subject overall. Therefore, if the better eye deteriorates further this might be an indicator for a jump in depressive symptoms, a connection to be looked at in longitudinal studies (which this manuscript could highlight in the conclusions) as this may help current movements to promote earlier cataract surgery (see EVER symposia 2012 and 2013 both organised by Ralph Michael), improving quality of life.

A4 The correlation data has been added to the methods (p. 9). “Binocular measures of visual acuity and contrast sensitivity were highly correlated with visual acuity \( r=0.88, p<0.001 \) and contrast sensitivity \( r=0.79, p<0.001 \) in the better eye.”

Better eye values are included in our main linear regression model. While it would be an interesting area for future study, neither better eye visual acuity or contrast sensitivity was associated with depressive symptoms in this study. A sentence has been added to the discussion section (p. 14) “Interestingly, none of the visual measures were associated with depressive symptoms in the current study. While few studies have examined the association between visual measures and depression among cataract patients, poorer binocular visual acuity was found to be associated with depressive symptoms, measured using the Hospital Anxiety and Depression Scale, among elderly women with bilateral cataract [38]. Change in depressive symptoms after surgery was not found to be associated with changes in any visual measures [38]. It is important for larger longitudinal studies to examine whether deterioration of particular visual measures while waiting for first eye cataract surgery is associated with increased depressive symptoms. Such information would allow cataract patients at risk of depression to be identified and prioritized for surgery.”

Q5 Page 9 Table 1: Please include into the table the time waited for cataract surgery of the first eye and a measure describing the cataract severity (e.g. LOCS III scale (see pdf attached), Lens densitometry (grey level http://www.cnpg.com/Video/flatFiles/1462/index.aspx), C Quant straylight meter).

A5 See A1
Conclusion

Q6  Page 13 second paragraph: Very interesting study and important conclusion! Just one more question to incorporate in earlier sections perhaps: is it possible that depression is associated to decrease in vision and not related to driving restriction? If depressive symptoms were grouped for “vision of better eye” would the results show that subjects with worse vision were at the lower end of the depressive scale independent of driving experience? What about a comparison sample of non-drivers with equal vision restriction?

A6. We agree it is important to establish that the relationship we observed between driver self-regulation and depressive symptoms is not simply a relationship between vision and depression. We examined the association between all visual measures and depressive symptoms and found no significant relationships in univariate analyses (p= 0.804) for better eye visual acuity and p=0.392 for better eye contrast sensitivity). See also response to Q7.

Unfortunately non-drivers were not included in our study. This has been added to the discussion as a study limitation (p.14). “There was also no comparison group of non-drivers with similar visual impairment to compare depressive symptoms to.”

Q7 Table 2: Would regression analysis look differently if cataract severity based on independent measure was introduced into the analysis. Alternatively subjects can be looked at grouped based on their cataract status (based on some independent measure). Can a separate analysis be done to look at the effect of vision loss on depression directly, independent of self-regulating driving?

A7 As mentioned above, cataract severity data, other than visual measures were not collected. The following information has been added to the methods to clarify (p.9) “The model was tested using either binocular measures or better/worse eye measures. None of these visual measures were significantly related to depressive symptoms and it made little difference to the model whether binocular or better/worse eye measures were included. The model presented in this paper contains the visual variables: worse eye visual acuity, better eye visual acuity, worse eye contrast sensitivity, better eye contrast sensitivity and stereopsis.”

The following information has been added to the results (p.11) “None of the visual measures were associated with depressive symptoms score in the linear regression model. It should also be noted that none of the visual measures were significantly associated with depressive symptoms score in univariate analyses. If the regression model was tested with the driver self-regulation status variable removed, there was still no significant association between the visual variables and depressive symptoms score.”

Essential revisions:

Background:
Q1 Page 4 second paragraph: It is not obvious why stereopsis should be influenced by cataract (unless one eye has end stage and the subject becomes monocular?), please include a reference why stereopsis can be affected by moderate forms of cataract (i.e. prior to surgery in western nations).

A1 The following information has been added (p.4) “Stereopsis, a type of depth perception, may be affected prior to cataract surgery as it is influenced by binocular measures of visual acuity and contrast sensitivity as well as differences in vision between the two eyes” Comas et al. (2007) found that difference between eyes in visual acuity had a marked negative effect on stereopsis when it was higher than 0.4 logMAR units. They also found that stereopsis improved overall after first and after second eye surgery.

Q2 Page 4 second paragraph: Please include the reference for the statement that cataract may lead to difficulty when driving at night, or explain it further

A2 The McGwin et al. (2000) reference has been provided [5].

Q3 Page 4: end of second paragraph. It is not clear from your sentence whether this refers to waiting for surgery of the first eye, or waiting for surgery of the second eye (see also later comment on visual acuity of the better eye influencing binocular vision, regarding page 8 third paragraph and comment regarding table 2 and regarding conclusions).

A3 “First eye surgery” has been specified (p.4)

Q4 Page 5 third paragraph: please include a half sentence after reference 25 is quoted to briefly describe by what means this was established in the cited paper, otherwise the relationship top the current manuscript is unclear. The reader cannot be asked to search for all the cited work before being able to make this connection

A4 This information has been added (p.6) “The USA-based study involved drivers aged 70 years and older and used multinomial logistic regression to examine how driving reduction contributed to increases in depressive symptoms, measured using the abbreviated Center for Epidemiological Studies Depression Scale (CES-D)”

Q5 Page 5 fourth paragraph: Include a sentence to alert the reader that it is important to adjust for depressive symptoms based on other factors or confounding factors such as age.

A5 This information has been added (p.6). “Currently, little is known about whether cataract patients self-regulate their driving while waiting for surgery or whether self-regulation is associated with increased depressive symptoms after controlling for potential confounding factors such as age among this group.”

Methods:

Q6 Page 7/8 final/first paragraph: very good description of the driver self-regulation behaviour.
Q7 Page 8 third paragraph: “co-morbid eye condition”: please explain the difference between this sentence and page six final paragraph where you stated that “other significant ocular conditions” were excluded. Which of the ocular conditions were allowed into the study sample and therefore were controlled for as confounders?

A7. This has been clarified in the methods section (p.7) “Fourteen (14.1%) participants had co-morbid eye conditions including glaucoma macular degeneration and diabetic retinopathy, however, it was confirmed by an Ophthalmologist the condition was either controlled or non-advanced and that cataract was the principal reason for vision loss.”

Discussion

Q8 Page 10 second paragraph: analogue to Page 6 second paragraph: please include statement on ”time waited for cataract surgery”.

A8 See Q1

Q9 Page 10 second paragraph: include information from the methods here again “…,measured at one week prior to first surgery, …”

A9 This has been included

Q10 Page 10 third paragraph: reference 13 and 34 present important findings, please include a half sentences each on which measures were used there and if they are therefore comparable to the current manuscript.

A10 This has been added (p.12) “In contrast, two previous studies that used a modified version of the DHQ, found low levels of avoidance of challenging driving situations in the general older population [14,36]” (reference numbers have now changed).

Q11 Page 11 second paragraph: data of the current manuscript presents a correlation of poorer contrast sensitivity in the worst eye with self-regulating in the tested subjects. How significant is this, though, as the better eye’s vision relates to binocular visual status. Please state the influence of the worst eye with respect to the research question more clearly. Reference 28 and 29 indeed identify contrast sensitivity as an important measure for driving reduction, however, this however may relate to the better eye (independent of visual attribute investigated, it is always the better eye which relates to the result found in binocular vision, which is why binocular vision can be regarded as an adequate screening tool for quality of vision related to quality of life).

A11 The following paragraph has been added to the discussion (p.12). Note – reference numbers have changed. “However, these studies reported an association between binocular [30] or better eye [31] contrast sensitivity and driving cessation/reduction. Among cataract patients, Owsley et al. reported that contrast sensitivity was the only independent predictor of crash involvement in the previous five years [37]. They also found that the relationship was stronger for worse eye contrast sensitivity than better eye [37]. While current evidence suggests that contrast sensitivity may influence driver self-regulation, as well as
other driving outcomes, further research is required to understand the relationship with the worse eye, better eye and binocular measures.”

Q12 Page 11 third paragraph: confounding factors: please include in methods how potential confounding factors were controlled for
A12 “Potential confounding factors controlled for using regression modeling were…” has been added to the methods (p.9)

Q13 Page 11 thirds paragraph: how did references 11,17,125 measure negative psychological effects, possibly include half sentence “…with comparable measures to the current study protocol.”
A13 The references in this sentence relate to the first statement in the sentence and have been repositioned to reflect this. The statement about negative psychological effects is based on the theories discussed in reference 24 and this has been added (p.13).

Q14 Page 11 third paragraph: Is cataract perceived as such involuntary restriction of driving?
A14 We believe that the self-regulation captured by the questionnaire was involuntary regulation as it was specifically due to their poor vision. The methods section specifies (p.8-9): “If participants responded that they had stopped driving in that situation due to their vision, they were considered to self-regulate on that item. If they responded otherwise or did not drive in that situation for reasons other than their vision, they were considered to not self-regulate on that item.” A clarification has been added to the discussion “This suggests that involuntary restriction of driving for reasons such as cataract, even temporarily, may impact on the psychological health of older adults.”

References:
Q15 Page 15 ref 11 Charlton et al: is this published? If yes, where, Vol, pages?
A15 Thank you, this reference has been corrected (now reference 12)