Reviewer’s report

Title: Association of Photopic and Mesopic Contrast Sensitivity in Older Drivers with Risk of Motor Vehicle Collision Using Naturalistic Driving Data

Version: 0 Date: 08 Oct 2019

Reviewer: Bradley Dougherty

Reviewer's report:

This submission describes a study of the relationship between contrast sensitivity and future crashes. More specifically, it uses data from a large study of naturalistic driving recordings to determine whether scotopic or mesopic contrast sensitivity is predictive of crashes and at-fault crashes. Rather than letter chart contrast sensitivity testing, this study uses contrast sensitivity functions, with peak contrast sensitivity and area under the curve as potential predictors of crashes. The authors report that mesopic, but not scotopic, contrast sensitivity is a predictor of crashes and at-fault crashes.

This is a well written and straightforward account of the study. The SHRP data are a great resource, and the findings have direct relevance to public safety agency screening test choices.

The authors could provide more description of the Optec 6500 test. What is the subject asked to do during this test? How do values obtained with this test compare to values obtained using other testing setups?

Other studies generate contrast sensitivity functions using different stimuli, staircase procedures and more trials. Does this matter when considering how CSFs generated with this test might compare to CSFs created with those other testing methods?

It is not entirely clear to me what you mean when you say that you confirmed that the template-fit strategy yielded a reasonable fit to the CSF data across subjects and viewing conditions.

Are there other papers that have specifically tested whether the area under the contract sensitivity function is predictive of driving outcomes? The authors could be more specific about why they think this might be a useful predictor that's superior to peak contrast sensitivity.

It would be helpful to see a bit more about how the VTTI staff determine fault than the one sentence that’s in the manuscript. It appears that fault could not be determined in some cases.

Why not use near-crashes in the analysis as well, given that other studies have found to be a useful surrogate for crashes, and crashes being rare makes statistical inference more difficult?

Why choose quartiles to analyze the AUC data rather than a continuous analysis?
One of the most exciting aspects of naturalistic recording methods is the ability to know something about how much the subjects drives, where to, in what situations etc. This submission could say more about these elements when considering the link between contrast sensitivity and crashes. For instance, in the Discussion the authors discuss the fact that it is known that reduced photopic contrast sensitivity results in drivers avoiding complicated situations and reduce their exposure. But there is very little discussion of the conditions in which crashes occurred, or how contrast sensitivity affected the driving space, traffic conditions and roadway illumination, or mileage of drivers in this study. For instance, the authors’ hypothesis about mesopic tests being useful predictors for day and night crashes due to the wide variety of light conditions encountered both day and night could perhaps be explored, given that there is video of all of the crashes and presumably one could say something about the light levels in the preceding time period.

Driving exposure is accounted for in the use of log of miles driven as the offset in the regression models, but I would urge the authors to provide more explanation of this. Something of this much importance deserves more attention than the GLM terminology used, which is not particularly accessible to most readers, I would guess.

How did contrast sensitivity predict exposure in this group of subjects?

Generally, my opinion is that the manuscript would be improved by more discussion of how contrast sensitivity affected other outcomes that can be observed in naturalistic recordings in this study. Perhaps the authors feel that the sample size is not large enough, effective analysis methods do not yet exist, or they plan to report on these relationships later?

Second paragraph of Discussion: remove apostrophe from "Driver's"

Second to last paragraph of the Discussion, last sentence: I would advise against the use of "this study" as I found it initially confusing whether you meant the study being cited or the study that is the subject of your manuscript.

Are the methods appropriate and well described?
If not, please specify what is required in your comments to the authors.

Yes

Does the work include the necessary controls?
If not, please specify which controls are required in your comments to the authors.

Yes

Are the conclusions drawn adequately supported by the data shown?
If not, please explain in your comments to the authors.

Yes
Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review?
If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

I am able to assess the statistics

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