

Peer Review File

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Reviewer Comments

This manuscript summarizes several contrast sensitivity tests that are available in the market for clinical use and describe the concept of CFF and TMTF.

Comments:

1. In the Abstract, it says “This paper aims at revising the psychophysical principle of contrast sensitivity and its application to clinical practice”. This aim might be a bit too ambitious. It is not obvious how the manuscript could revise the psychophysical principle of contrast sensitivity and its application. What is the psychophysical principle it is aimed to revise?

Reply 1: in effect, the sentence “This paper aims at revising the psychophysical principle of contrast sensitivity and its application to clinical practice” is misleading or, even better, definitely wrong. We can talk about the principle of psychophysics, that is measuring the response of a sensorial system to a stimulation but the “psychophysical principle of contrast sensitivity” is a non-sense. So, we have changed the statement as “This paper aims at considering contrast sensitivity and its application to clinical practice”.

Changes in the text: (in the Abstract) “This paper aims at considering contrast sensitivity and its application to clinical practice”.

2. The manuscript discusses CSF, CFF and the magnocellular and parvocellular visual pathways. A few comments related to the relationship between the pathways and CSF and CFF tests are:

a. All the contrast sensitivity tests discussed in the manuscript measure contrast sensitivity on the overall perceptual level, there is no evidence showing any of these tests is able to measure the contrast sensitivity at visual pathway level, magnocellular or parvocellular visual pathway. Both magnocellular and parvocellular visual pathways are very likely involved in all these CS tests. This should be clarified in the manuscript as not to mislead readers.

Reply 2a: in accordance with the reviewer, even if some tests described in the paper are focused to a specific range of spatial frequencies, none target, i.e. isolate, the magnocellular or the parvocellular contrast sensitivity function. Both magnocellular and parvocellular visual pathways are very likely involved in all these CS tests. The clarification has been added according to the suggestion of the reviewer.

Changes in the text: (after the HACSS paragraph): “As highlighted by an anonymous reviewer, it is worth recalling that all the tests discussed so far measure contrast sensitivity at an overall perceptual level. Even if some of them are focused to a specific range of spatial frequencies, none target, i.e. isolate, the

magnocellular or the parvocellular contrast sensitivity function; due to the wide overlapping of the P- and M- function, indeed, both are always involved in the CS estimates”.

b. In the conclusion, the manuscripts says, “In the spatial domain, high contrast stimuli, used for measuring visual acuity, recruit only one (or part) of these channels: the parvocellular pathway”. This may not be necessarily true. The magnocellular pathway may contribute significantly in visual acuity test as well. There have been studies demonstrated the important of the magnocellular pathway in text perception and recognition tasks.

Reply 2b: we admit that in our sentence the term ”visual acuity” has been used erroneously, as a synonym of “minimum separable” or detection acuity. In its wider acception we are in complete agreement with the reviewer: the magnocellular pathway has a consistent role in visual acuity testing as a recognition task. For this reason, the conclusion section has been rephrased.

Changes in the text (in the conclusion section): “In the spatial domain, high contrast stimuli, used for measuring central visual acuity, recruit mainly the parvocellular pathway. As a consequence, estimating visual acuity may not yield a comprehensive overview of the functional status of the visual system: as a matter of fact, there are pathological conditions that affect preferentially the magnocellular system. In these cases, a decline in contrast sensitivity, both in the spatial and temporal domain, takes place in the face of a normal capacity to discriminate and identify fine details. The importance of measuring contrast sensitivity relies upon this basis, and is demonstrated by the considerable number of psychophysical procedures proposed so far for its assessment as a complement to visual acuity. It is likely that, among those reported in this paper, there is not a technique that should be preferred to the others, since each of them has its pros and cons, some are more suitable for screening purpose, others are more suitable for evaluating the effect of this function on specific tasks like, for example, reading.

It is recommendable that contrast sensitivity testing should be adopted as a standard procedure in the clinical practice, like visual acuity and perimetry, to improve the diagnosis and follow up of patients suffering from ophthalmological diseases.”

3. The manuscript describes the different contrast sensitivity tests. It would be more helpful for readers if some of the pros and cons of the tests are discussed, such as the repeatability of the tests. These tests have been in the market for a while and there have been many studies used these various tests. It would be more helpful to provide some summaries on how reliable these tests in measuring contrast sensitivity and aid in diagnose or manage diseases.

Reply 3: following the suggestion of the reviewer, we have added a paragraph that summarizes the pros and cons of adopted stimuli, response methods and psychophysical procedures.

Changes in the text: a new paragraph titled “which is the best CS measurement?” has been added before the paragraph on critical fusion frequency.

4. Line 52-55 and Table 1: in the text, it seems to indicate that Table 1 is to illustrate “the sensation is proportional to the log contrast of the stimulus”, but Table 1 really just shows the log calculation and the reciprocal relationship between threshold and sensitivity, which does not have much added value to the manuscript.

Reply 4: after reconsidering the sentence, we agree with the consideration of the reviewer. So, table 1 has been removed and the sentence modified accordingly.

Changes in the text: table 1 has been removed and the sentence in brackets removed: “i.e. the sensation is proportional to the log contrast of the stimulus, Table 1).”

5. Line 109-110, 10 Hz: 7, what does this mean? Is the 7 a citation?

Reply 5: “7” is a citation.

Changes in the text (10 Hz:7) has been changed as “..(10 Hz, where Hertz (Hz) is the measure unit of the temporal frequency, and corresponds to the number of events per time unit)(7).”

6. Did Figure 2 and Figure 3 come from the literature? What are the citations of the results in these figures or the figures themselves?

Reply 6 Figure 2 represents the classical contrast sensitivity function as commonly reported in textbooks. It is a work art not published in literature.

Figure 3 is a modified version of the figure in the paper of Skottun, 2000, published on Vision Research. The permission is attached to the mail sent to the editor of AES.

Changes in the text: in the legend of figure 3 added: ”Modified reprint from Skottun, 2000, with permission of Elsevier”.

7. Line 125: should it be “in charge of” or “in charge by”? Is the word “in charge” too strong?

Reply 7-Changes in the text “in charge of” has been replaced with “responsible” and “carried out” in two passages of the manuscript.

8. In the footnote on page 7, missing an “is”. It should be “it is more likely”.

Reply 8-Changes in the text: corrected

9. In the footnote on page 10, incomplete sentence “Like in the Pelli-“.

Reply 9- Changes in the text: corrected

10. Line 259-260: what does it mean by “their luminance profile is technically simpler to be generated than square waves?”

Reply 10: “....sinusoidal stimuli (their luminance profile is technically simpler to be generated than square waves)”: In effect, this statement sounds strange because it is

referred to a period in which sinusoidal targets were generated via oscilloscopes or costly computerized devices. However, we have removed the sentence as it is not necessary.

Changes in the text: the sentence has been removed.