AES ANNALS OF EYE SCIENCE
AN OPEN ACCESS, PEER-REVIEWED JOURNAL COVERING BASIC AND CLINICAL RESEARCH IN OPHTHALMOLOGY

Peer Review File

Article information: https://dx.doi.org/10.21037/aes-22-25

Reviewer A

The study presents a complete evaluation of the most adopted adaptive or non-adaptive psychophysical procedures to investigate the functional state of the eye, discussing necessary control parameters for carrying out visual acuity measurements.
Comment 1: I suggest that the authors discuss visual acuity more intensively and terms such as campimetry and acuity in moving stimuli as well as the reproducibility of visual acuity in different neuropsychiatric and neurological conditions.

Reply 1: even if the aim was not deepening the different facets of visual acuity but discussing the underlying psychophysical principles, for sake of completeness we have added these missing pieces of information as suggested by the reviewer.
Changes in the text (underlined in yellow): the term "perimetry" in the introduction has been explained in brackets (page 2). A brief paragraph about acuity in moving stimuli (dynamic visual acuit) has been added at the end of the manuscript, before the conclusion section (page 20). We added some information on the reproducibility of visual acuity estimate in neurological conditions (page 18).

Comment 2: In addition, as psychophysical measures can be observed from the point of view of neurosciences and more objective measures, such as the measurement of visual acuity through electrophysiology.

Reply 2: the measurement of visual acuity through electrophysiology has been introduced in the manuscript.
Changes in the text: objective VEP-acuity estimation has been added (page 18).

Reviewer B

Comment 1: The authors provided a very good review on the psychophysics of visual acuity. The article is well written and easy to read. The authors did a good job in explaining the difference between resolution task and recognition task. On the topic concerning Teller acuity, it is important to mention that we are actually measuring grating acuity. Would this then tend to over/under-estimate visual acuity in children? Since tests such as Teller acuity chart are typically done in one orientation only, how would that impact situations in testing a child with astigmatism? It is interesting that the authors mentioned about oblique effect in the footnotes, but it should also be explain in the main text. Would oblique effect be observed in both children and adults? The section on FrACT is very brief and can be expanded. I look forward in

reading the revised article.

***Reply 1**: no doubt we will mention in the manuscript the study on grating acuity the anonymous reviewer is referring to as soon as he or she provides us with its reference. Information about preferential looking over/underestimation of visual acuity and its effect on astigmatism has been added. The oblique effect has been mentioned also in the main text. Finally, the section on FrACT has been expanded.*
***Changes in the text**: we mentioned the grating acuity in the Teller procedure paragraph (page 16); information about visual acuity over/underestimation of preferential looking and its effect on astigmatism has been added (page 17); we discussed the oblique effect also in the main text (page 16). Finally, we extended the paragraph about FrACT at page 14.*

Reviewer C

Summary
This article summarises widely-used methods for measuring visual acuity, and relates these to psychophysical methods. It is a good fit to Annals of Eye Science. I thought the sections on preferrential looking and optokinetic nystagmus responses were a really nice addition. Although there is nothing really new here, the framing may be of interest to clinicians who want to understand more about psychophysical techniques and how these relate to the methods used in clinical practice. With this audience in mind I have some suggestions about explaining technical concepts such as spatial frequency in more detail, especially early on (see below). I also have a concern about potential commercial interests relating to the first author.

Specific points
Comment 1. The first author has developed the Oktotype method, which is referred to with a trademark (TM) suffix, and is described positively in the paper. Presumably if the author owns the trademark, he has a financial interest in this method being used, and so its mention in this article could potentially result in a financial benefit. However the conflicts of interest footnote states that the authors have no conflicts of interest – surely this cannot be true.

***Reply**: 1 the suffix ™ has been erroneously used in this context, and we apologize for this. We reported the term "oktotype™" (with the ™) with the purpose to make clear the term, unlike "optotype", is not referred to a conventionally accepted procedure, but it is a brand new name we have coined on purpose. The oktotype has been devised and evaluated a few years ago in two exploratory studies, and so far it remains no more than a prototype. In no way could it be used or has it been used for commercial purpose. CR has no conflicts of interest at all while the conflicts of interest of CA, that we have now accurately reported in the dedicated section, are not related to this manuscript.*
***Changes in the text**: "Oktotype™" has been replaced with "Oktotype"; complete ICMJE disclosure form has been filled in. The author Carlo Aleci declares no relationships/ activities/ interests related to the content of the manuscript.*

2. Much of the argument on the first few pages relies on the distinction between high and low spatial frequencies. But spatial frequency may not be familiar to all readers, so I think it need a brief sentence or two to introduce the concept.

***Reply*: a brief introduction to the concept of spatial frequency has been provided.**
***Changes in the text*: spatial frequency definition has been added in the introduction and "e.g." in brackets has been deleted (page 3).**

3. Also, the suggestion that the lowest spatial frequency is important for initial stimulus detection is only approximately correct; one could envisage stimuli where it is not. If the lowest frequency were in the falling left hand part of the contrast sensitivity function, some intermediate frequency (near the peak) would be more detectable.

Reply: we acknowledge Reviewer 3 for this noteworthy consideration. The caveat has been added as a footnote.
Changes in the text: added footnote (page 8): "For sake of precision, as recalled by an anonymous reviewer, if the lowest frequencies are in the falling left hand part of the contrast sensitivity function, some intermediate frequency, closer to the peak, would be more detectable."

4. I think visual angle might also need explicitly introducing.

***Reply*: the concept of "visual angle" has been explicitly introduced.**
***Changes in the text*: a brief explanation has been added at the beginning of the introduction and "Formally" has been deleted (page 2).**

5. The footnote on page 2 draws a distinction between detection and discrimination tasks. But what is actually being described is the difference between a single interval (yes/no) and a two-interval (e.g. 2AFC) task. It is perfectly possible to run a detection-style task with two presentations (in one of which the target is absent), or to run a discrimination task with a single stimulus (e.g. orientation discrimination against an implicit standard such as vertical). So I think this needs rewording. More generally, these are signal detection issues, so it might help to introduce them with reference to some of the fundamentals of signal detection theory.

***Reply*: the footnote on page 2 has been changed, removing the misleading references to the y/n and n-AFC response models and introducing the fundamentals of SDT.**
***Changes in the text*: (footnote on page 2)"A second type of threshold is discrimination threshold. Discrimination threshold measures the ability to differentiate a state of stimulation from another state of stimulation (1). Discrimination threshold is therefore the just noticeable difference between two different states of stimulation. For example, given as the**

independent variable the width of the gap of a Landolt "C", discrimination threshold is the just noticeable difference between "Cs" with slightly different gap width (the other characteristics of the stimulus are kept constant). In sum, in a discrimination task a comparison is made between different states of stimulation, in a resolution task this is not the case. Signal detection theory is a valid approach to these issues. According to signal detection theory (SDT: Green & Swets, 1966), discrimination (and detection) thresholds results from the capacity of the visual system to extract the signal from noise. In other terms, detection and discrimination thresholds depend on the sensory evidence of a signal (the stimulus), that is given by the signal and by a certain amount of noise intrinsically intermingled to it, and a subjective criterion (SC), unconsciously set by the observer. The subjective criterion can be more "liberal", when the observer is more inclined to answer "yes, I see it" or "yes, I discriminate it" for signals producing a relatively low degree of sensory evidence, or more "conservative", when he or she is more inclined to answer "no, I do not see it" or "no, I don't discriminate it" for signals producing a relatively high degree of sensory evidence. The importance of this approach is that, in computing a threshold (be it detection or recognition), SDT assumes that the strength of sensory evidence for a signal as well as the subjective criterion of the observer may change from trial to trial and across individuals.

5. Letter charts are referred to as a 26-AFC task. But some charts have fewer letters, for example the Sloan chart has 10 letters, and the Snellen chart usually has 9. So even if the participant is not aware of this, the possible subset of choices is usually less than 26.

Reply: N-AFC, in its implicit version, assumes that the observer knows what are the possible alternatives so to decide which one of these alternatives matches the displayed stimulus. Even if the possible subset of choices in the Sloan and Snellen chart is 9 and 10, respectively, the observer is not informed by the operator that the presented stimuli will not be selected from the whole pool of 26 letters of the alphabet. So, the alternatives for the observer remain 26.
Changes in the text: this clarification has been added as a footnote on page 10.

6. Crowding is mentioned on line 358. I think it might help to introduce and define it earlier as a factor that can limit acuity.

Reply: crowding has been recalled as a factor that limits visual acuity of non-isolated stimuli.
Changes in the text: a brief footnote has been added on page 5.

7. Line 436 – what is a 'bulkhead'? Some sort of screen?
Reply/changes in the text: the term "bulkhead" has been replaced with "panel"

Minor errors/typos

Abstract: “Stimuli are electromagnetic waves that interact with the eye and elicit a sensation” – change to ‘Visual stimuli’, since the previous sentence covers other senses.

Reply/changes in the text: turned "Stimuli" into "Visual stimuli"

Line 343: adjoining (implies touching each other) □ adjacent (means next to each other)

Reply/changes in the text: the term "adjoining" has been replaced with "adjacent"