Author’s response to reviews

Title: Paediatric vision screening by non-healthcare volunteers: Evidence based practices

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Author’s response to reviews:

Note: the following is also contained in the 'cover letter' file in our submission.

Reviewer 1:

1. The authors of this manuscript are well aware of the needs in this field, as well as the AAPOS recommendations and the major recent publications. They have done a good job by exploring the opportunity of engaging non-healthcare volunteers in pediatric vision screening. The study design is correct, including the training of the vision screeners and the role of the optometrist (whose findings I consider for simplicity to be precise enough in order to serve as a gold standard).

We thank Dr. Gramatikov for his positive feedback and have taken into consideration his comments that the findings of the optometrist are precise enough to use as gold standard. To address this, we have removed Phase I from the text and have changed the names of Phases II and III to Phases I and II respectively, to reflect this throughout.

Reviewer 2:
1. The Introduction opens with 'the first years of a child's life are integral to the development of good vision.' Then 'prevalence of common causes of visual impairment among children in developed countries such as Britain and Australia to be as high as 22.6% for myopia, 11% for astigmatism, and 10.6% for hyperopia'. Do these figures for prevalence relate to the first years of children's lives? I suspect not, so the information is misleading for the reader.

We thank Dr. Woodhouse for this comment. We have updated the first sentence of the introduction to more clearly reflect the following references. The updated sentence is as follows: “Adequate childhood vision is key for physical, emotional, and social progress throughout the lifespan.” (page 3, line 2-3)

2. Screening by distance visual acuity alone, which is, in effect what the researchers are concentrating on in most of the analysis, is unlikely to pick up hyperopia, so the introduction is not appropriate for the study.

We thank Dr. Woodhouse for this comment. In order to address that VA does not pick up hyperopia, we have added the following: “Additionally, it is important to note that the visual function tests included in the screening process will not detect all possible causes of impaired vision such as moderate or high hyperopia.” (Page 12, line 14 – 16)

3. Following parental consent each child received both a full eye examination by the study optometrist and vision screening by one of the eight volunteer examiners. The paper goes on to describe screening by the optometrist, not full eye examinations. Which is correct? and “Did the optometrist conduct screening tests or did the optometrist carry out full eye examinations ‘including dilated fundus examination and refraction'? And if it was full eye examination, how could the order be randomly changed? How could a volunteer screen the child after dilated fundus examination? and “Here again, we appear to have the study optometrist conducting screening. Can you explain exactly what took place? The volunteers conducted screening and THEN the optometrist conducted a full eye exam?”

We thank Dr. Woodhouse for these questions regarding the study process and manuscript syntax. The optometrist gave a full eye exam to each child, not a screening. We have clarified the text throughout to reflect this. We have also added the following sentence to explain how the randomization process interacted with the dilation/examination process: ‘If the optometrist was randomly designated to examine the child first, they performed all tests exclusive of dilated fundus examination and refraction, then completed that portion of the exam after the child had been screened by the volunteers.’ (page 5, line 19-20)
4. If the optom did a full eye examination, presumably it included the screening tests that the volunteers were doing? If so, what was the purpose of doing the full eye examination?

We thank Dr. Woodhouse for her question regarding the purpose of the full eye exam performed by the study optometrist. We have added the following to the manuscript to respond to these questions: “Full eye exams were provided by the optometrist, rather than screening, as an added benefit to study participation to increase consent rate.” (page 4, line 19-20)

5. 'In order to ensure internal measurement consistency, an acceptable level of agreement between the study paediatric ophthalmologist and the study optometrist was established'. The paediatric ophthalmologist does not appear to play any part in the study whatsoever, so why was this included? And “The paediatric ophthalmologist did not take part in the study. Optometrists receive more training and gain far more experience in measuring visual acuity, stereopsis and colour vision than do ophthalmologists, so why anyone thought it appropriate to 'test' the skills in these measures of an optometrist against an ophthalmologist is mind-boggling. This is delivering a blatant insult to the profession of optometry. This section adds nothing to the study and must be deleted.” and “As in the previous version, this section must be deleted. The justification, from the authors response to review, is that it was important to ensure consistency when the children were referred into the paediatric ophthalmologist. In this paper, there is no analysis of the outcome of referrals, and not even any mention of referring on any study subjects, so consistency between optometrist and paediatric ophthalmologist is entirely irrelevant for this study. Methods should reflect the study, and report only on the study. The paediatric ophthalmologist took no part whatsoever in the practical element of this study, which is designed to check consistency between volunteers and the optometrists. IF, in another paper, the authors want to assess the consistency between the optometrist and the paediatric ophthalmologist, then they can do so, although I hope they will word this section in less insulting terms.”

Thank you to Dr. Woodhouse for this valuable perspective on how we structured the Methods section. Upon reflection, we have agreed with her assessment and removed Part I from the study as it does not affect the validity of the outcome. Parts II and III have been renumbered accordingly and we have removed the ophthalmologist from the manuscript. No offense to optometrists was intended and having understood the reviewer’s concerns, we have removed that section.
6. ‘Training to correctly perform the following tests: distance and near visual acuity (VA), Ishihara color vision, and Randot stereoaucuity’ The tests for colour vision and stereopsis are precisely listed, so the reader either needs to know here, what visual acuity tests the volunteers were trained for, or restrict the list to distance and near acuity, colour vision and stereopsis.

We thank Dr. Woodhouse for this comment. We have added the specific tests for visual acuity in which the volunteers were trained. The new text reads “...training to correctly perform the following tests: distance visual acuity (VA) using Snellen crowded letters or LEA symbols (depending on child’s age); near VA using Rosenbaum chart or LEA symbols; Ishihara color vision; and Randot stereoaucuity.” (page 5, line 5-8)

7. In the Introduction, the authors use only one reference for vision screening recommendations, which is AAPOS. Colour vision and stereopsis are NOT part of those recommendations, so the authors need to justify why they have chosen those particular tests to be part of this study. And We come back to the question: why did this study measure colour vision and stereopsis when these tests are not relevant to this analysis? How do the different scoring systems used for the tests, particularly colour vision reflect the outcomes of the comparison? Could this contribute to the differences between optometrist and trainees on the different tests?

We agree with Dr. Woodhouse that further clarification is required as to why we included colour vision and stereopsis in this study, although they are not part of the AAPOS guidelines. To that end, we have added the following sentences: “While most vision screening programs do not include testing of colour vision, some have begun using stereopsis in their vision screening recommendations, as these tests can add useful information regarding visual function.” (page 10, line 9-10)

8. The term 'colour blind' is a misnomer, layman's language and has no place in a scientific report. The correct term is colour defect. Please change throughout.

We thank Dr. Woodhouse for this correction. We have made the suggested changes throughout and replaced with scientific/medical language.

9. I think we need 'suspected' here, since not all children with reduced stereo will have strabismus. (p. 7 line 42)
We thank Dr. Woodhouse for this comment and have added the word ‘suspected’ as per her suggestion. (Page 6 line 18)

10. Not all readers will know what the M&S Smart System is, so we need an explanation here. Was it a projection system, computer screen, series of test cards?

We agree with Dr. Woodhouse that adding this information will make our research more accessible to all readers. We have added a description of the M&S smart system as follows: “The M&S Smart System (M&S Technologies, Niles, IL), a computer-based visual acuity testing system where the Snellen chart is shown on a computer screen, was used for measuring VA.”(page 5, lines 21-22)

11. How was acuity recorded; it would appear to be whole line acuity; was this in LogMAR or Snellen? What is the recommended way of recording acuity; by letter or line?

We thank Dr. Woodhouse for her questions. In the text we address these question as follows: “Each child’s distance visual acuity was measured at a distance of 20 feet with Snellen crowded letters, or LEA symbols if the child could not read.” (page 6, lines 4-6) And “Visual Acuity was recorded as the lowest line on which the child correctly identified half or more of the optotypes…” (Page 6, line 2-3)

12. We are told that children read letters or LEA symbols. It is widely recorded that different tests tend to give different results, but nowhere in the results section do the authors consider whether the optometrist and volunteers used the same test for individual children.

We thank Dr. Woodhouse for this comment. We have clarified the area in the results section where we discuss the study procedure to better reflect that the optometrist and screeners always ensured that each individual child was given the same test by the screener and optometrist. The new text reads: “It was ensured that for any given child, the same test was used by both the optometrist and volunteer for distance visual acuity (Snellen or LEA) and near visual acuity (Rosenbaum or LEA) measurement.” (page 6 line 7-9)

13. What quantitative score was used for analysis of the Ishihara colour vision test?
We thank Dr. Woodhouse for her question. To clarify in the text we have added the following sentence: “Colour vision was scored separately for each eye as the number of plates the child identified correctly.” (page 6, lines 11-12)

14. The list of data is in different order to the description of the tests in sections above. To avoid irritating the reader, best to stick to the same order.

We thank Dr. Woodhouse for her comments. We have checked the order of description of the texts and ensured consistency throughout: no changes were made.

15. This is a very low consent rate and needs attention in the discussion.

We thank Dr. Woodhouse for this comment and have highlighted our existing comments about the consent rate by adding a ‘Limitations’ heading, which can be found on page 12, line 3)

16. Explain the missing participants in Figure 1

We thank Dr. Woodhouse for her question about missing participants. We have rechecked the math to ensure accuracy. The numbers in Figure 1 are correct with all study participants accounted for, therefore no changes were made.

17. I don't think the word 'please' is needed here

We agree with Dr. Woodhouse’s assessment and have removed the word ‘please’ from this portion of the manuscript.

18. Colour vision is not normally tested in each eye separately, unless there is suspicion of pathology, so I think we need some justification for its being conducted in this way.

We agree with Dr. Woodhouse that testing colour vision in each eye separately is not the most efficient way when screening children, whose attention spans are short and their potential colour vision defects are congenital. We have added a sentence to address this as part of our answer to the following comment. (see #18)
19. We are not told how colour vision results are quantified, but surely we expect the same score in each eye? I am, therefore somewhat surprised to see a difference in agreement between the two eyes in Table 2. I wonder if the authors could comment on this?

We agree with Dr. Woodhouse that a comment on the difference between agreement scores found in the colour vision section of table 2 would be judicious. Therefore, we have added the following to the text: “When measuring colour vision, the small differences in trainer/trainee agreement between left and right eyes likely comes down to the interest and energy level of the individual children engaging in these tests. In future it may be better to test colour vision binocularly.” (Page 12, line 16-19)

20. 75% is not high. Suggest ‘acceptable’ (p. 13 line 53)

We thank Dr. Woodhouse for her suggestion. We have changed the wording to ‘acceptable’.

21. The authors think that the sensitivity and specificity of the volunteers was high. In my understanding there is no agreed criterion for acceptance of sensitivity/specificity scores, but we do need some justification (or at the very least comparison) for the authors' conclusion. To my mind, 40 hours of training is a very great investment to end up with 75% accuracy. The authors state that there is no cost for the volunteers. In real life there would be of course; what about insurance? And if volunteers were to take on vision screening, who would take clinical responsibility for the exercise and how would safeguarding be ensured? These are not cost-free issues. What about the costs of an extra 151 children in every batch of 690 (that is, 22% or 1 in 5 false positives) entering the health care system unnecessarily?

We thank Dr. Woodhouse for her comments regarding the economic impacts of vision screening using trained volunteers. While in this study there were no costs for volunteers, apart from opportunity costs of participating in other activities (which is a cost associated with all volunteering), we have addressed how a more formalized program may need to consider other volunteer costs with the following: “In future, clinical insurance for volunteers or covering the cost of vulnerable sector screening could be included as cost considerations.” (page 9, line 20-21) Regarding the overall cost of screening, we believe it is a high-value process that can catch some vision problems early, but also reminds the public about the importance of vision screening and regular optometrist visits.