Reviewer's report

Title: Vision problems linked to reading difficulties in a cohort of European school children: prismatic correction offers the most effective treatment

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Reviewer: Brendan Barrett

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This study compares the effectiveness of HTS (computer therapy) and base-in prism spectacles for the treatment of convergence insufficiency relative to a control sample in whom no treatment was provided. The authors conclude that both treatment modes are effective but that base in prism spectacles are more effective than HTS.

The manuscript is well written and the results are clearly presented and, in my view, certainly publishable. The treatment of CI is topical. I have no major issues to raise but several comments which the authors may wish to consider:

(i) One of the main findings/conclusions is that base-in spectacles are more effective than HTS therapy for CI patients. Whereas all of the other metrics that improved over the four week period showed similar changes between the HTS and the prism specs groups, the results presented in Table 3 indicate that reading time for the base-in specs group changed significantly between the first and second visits whereas for the HTS group, the reading time did not change significantly. The numbers in Table 3 indicate that the HTS group improved in reading speed over the 4 weeks by around 12.5 seconds whereas the base-in group improved by an average of around 21 seconds. The standard deviations at the pre-treatment stage are almost identical for the two groups as are the SDs after 4 weeks of treatment. The superior benefit of the prisms is somewhat surprising because the results after 4 weeks in the base-in specs group were obtained without the prism spectacles being worn. Are prisms generally considered to represent a treatment for CI or do they simply provide a ‘crutch’ (or coping mechanism)? What mechanism do the authors believe is responsible for the improvement brought about by the prism specs?

(ii) Related to (i), the authors report statistically significant improvements in several of the measures they obtained. But statistical significance is not the same as clinical significance. Do they consider, for example, that an average improvement in amplitude of accommodation of 1 to 1.5D is significant when the average pre-treatment amplitude is already >11D? I would like to see a little more discussion on the clinical significance of these results.

(iii) In a similar vein, from a statistical standpoint it is useful to know what the average change is that is brought about by HTS or prisms, but I think clinicians reading this paper would want to get a feel for the results at the level of the individual. In other words, clinicians would (in my view) be interested in seeing a table of results showing the initial and 4-week results on each of the tests for
each individual participant. If this is too much to add to the paper, perhaps it could be added as online table with hyperlink from the paper?

(iv) What was the rationale for choosing 8BI as the prism power? This doesn’t seem to have been justified. The authors do mention that other studies have selected BI prism power for individual subjects based on their fusional reserve measures. Since the phoria (exophoria in this case) is normally not considered in absolute terms but relative to the fusional reserve that opposes it (base-out for exophoria), what was the rational for selecting a standard 8BI and for not measuring the opposing fusional reserves?

(v) The same individual took all the measures and this, as is pointed out, confers advantages in terms of consistency in measurement approach. I would like to know if this individual knew at the 1st visit, and in particular at the 2nd visit, to which group each individual had been assigned? Unless, the testing was carried out ‘blind’, isn’t there a danger that this could have implicitly have affected the outcome?

(vi) I wondered why so many (n=32) had refused treatment and thus formed the control group? Strictly speaking this can’t be considered as an RCT since participants were not randomly assigned to the groups. This point should be made explicitly. Why did the participants in the control group refuse treatment? because they had no symptoms or because they had tried and failed with a previous treatment? Had any received treatment before? Were participants randomly assigned to the HTS or prism-specs group? If not, were participants given a choice about treatment? Might this have influenced the findings? If not, why not? I think more detail may be needed here on the make-up and formation of the 3 groups.

(vii) Related to point (vi) above, would the authors agree that the results of the present study must be considered as preliminary, because in order to establish that there is no placebo effect from the base-in specs, it would be necessary to establish that base-in specs perform better than plano/no-prism specs?

Minor points:

(a) 1st sentence of the conclusion section of the abstract: “Reading difficulties with no apparent…. convergence insufficiency”. This is a contentious statement and I don’t think it is a conclusion from the present results set. Many powerful organisations believe (e.g. recent joint ophthalmology & orthoptics statement from the USA) do not believe that visual anomalies [aside from major refractive error] are a common cause of reading problems.

(b) I found the first sentence of the introduction somewhat curious: this is the ultimate chicken & egg isn’t it? Are children with reading difficulties at greater risk of developing visual anomalies or are these anomalies the cause of the reading problems. The way this sentence is currently worded suggests that visual anomalies are secondary to the reading difficulties: is this what the authors mean?

(c) The paragraph on AC/A appears to repeated (it appears in the “accommodation” section of the methods and again in the “accommodative convergence system of the eyes”
(d) Definition of CI in the methods section (subsection ‘subjects’) “…2. At least 6 prism dioptres of exophoria that was greater at near than at distance”. Do they mean exophoria at both near and distance but which was at least 6 prism dioptres more at near than at distance (usual definition) or more exophoric at near than at distance but at least 6 prism dioptres at near or distance? I suspect they mean the former (more usual) but the current wording is ambiguous.

Discussion, 1st paragraph, 3rd sentence: “With respect to children with suspected…. oversight of basic binocular visual problems”. This is a very strong/definitive statement: does it need a citation? Relates to point (a) above

Discussion, 8th paragraph: “ ….although patient compliance may pose a concern with this [HTS} from of treatment….” Doesn’t the HTS program have a facility for remote checking of how much therapy has been undertaken? For this reason, isn’t compliance with wearing specs for near work just as much [or even more] of a concern?

I found it a little surprising that all 51 subjects in the HTS and prism specs attended at the second visit, and that all 32 of the control group returned after 4 weeks. Was there no dropout whatsoever?

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I declare that I have no competing interests