Author's response to reviews

Title: Hyperopia: a meta-analysis of prevalence and a review of associated factors among school-aged children

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Author's response to reviews: see over
Author's response to reviews

Title: Hyperopia: a meta-analysis of prevalence and a review of associated factors among school-aged children (MS: 1740598651109263)

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Author's response to reviews: see over
Reviewer's report

Title: Hyperopia: a meta-analysis of prevalence and a review of associated factors among school-aged children

Version: 4 Date: 11 August 2014
Reviewer: Jenny M Ip

Reviewer's report:

General

Major essential revisions

1. discussion page 15. "Near activities increase the demand of the process." This statement, and the two following it in the next paragraph unfortunately over simplifies the issue of how emmetropisation is achieved, and ignores previous findings of a lack of association between time spent reading, with refraction (Ip JM, Saw SM, Rose KA et al Invest Ophthalmol Vis Sci. 2008 Jul;49(7):2903-10.).

We agree with the reviewer's arguments that there is a lack of empirical data to confirm the suppositions that some activities (reading distance and outdoor activities) may increase the chance of eyesight remaining hyperopic. The paragraph on pages 14-15 of the discussion has been modified.

It should be be clarified that the significant association cited is between parental reports of close reading distance (<30cm) and less hyperopic refraction (0.11D vs. 0.42D, p=0.0001).

This association was mentioned on page 12 of the results ("Outdoor activities and hyperopia in children").
The paragraph on page 15 of the discussion has been modified.

Additionally, the supporting citations (3, 57, 59) are either theoretical or cross sectional studies, and should be considered inadequate support for this controversial viewpoint.

The paragraph has been modified to specify what is considered to be empirical evidence and what is considered to be theoretical evidence, in recognition of the insufficiency of empirical evidence on this theme.

Minor essential revisions.

2. Background, line 3 "Thus, children may present symptoms related to asthenopia while reading.." The implication appears to be a reference to "children with hyperopia", so this should be stated.

Done: “with hyperopia” has been included.

3. Results. page 7, in the paragraph beginning "In most studies, the cut-off ..." please clarify if the studies refered to are included or excluded studies.

Done: “In most studies included…”

4. Results page 12, in the paragraph beginning "spending time engaged in outdoor activities was slightly associated with hyperopia..", please modify the paragraph appropriately, as the authors use "our" and "we", when the study was undertaken by another research group, and not the current authors. In the same paragraph, the authors should consider "reading distance" rather than "reading", as the parameter under study is distance between reader and reading material.

The paragraph has been changed accordingly

5. discussion page 13. " ..autorefraction is the best way of testing to diagnose ametropias.." the authors should consider modifying this statement to either "acceptable way" or else an alternative descriptor, as it appears contradictory when followed by the next sentence.
The statement has been modified to include “acceptable way” as suggested by the reviewer.

6. Figure 1 needs a title and legend

Figure 1 did have a title and did not need a legend. A title and legends have been added to Figure 2.

7. Please check for minor grammatical and spelling errors still remaining in the manuscript

Grammatical and spelling errors have been corrected by a native English speaker.

**Level of interest:** An article of importance in its field

**Quality of written English:** Needs some language corrections before being published

**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.
Reviewer's report

Title: Hyperopia: a meta-analysis of prevalence and a review of associated factors among school-aged children

Version: 4 Date: 19 August 2014

Reviewer: Brendan Barrett

Reviewer's report:

The authors have combined Tables 1 & 2, conducted a meta-analysis and included a new figure 2. The paper is improved but still has some major issues.

Required Change: Discussion of how myopia onset and prevalence is relevant to the hyperopia story

The authors use the example of tallness and shortness in physical stature to make the case that hyperopia prevalence data alone have value without reference to myopia prevalence in the same population. Specifically they say “As a parallel it can be stated that populations which on average are tall have lower prevalence of short individuals, nevertheless one of these events does not cause the other, they are complimentary and what needs to be examined are the causes”.

Although I recognise the point they are making I can’t agree! As the authors know well, as axial length (AL) increases with age, hyperopia diminishes; and as AL continues to increase, myopia develops. Thus, while hyperopia doesn’t cause myopia or myopia doesn’t cause hyperopia, both are caused by axial length anomalies (too big, myopia; too short, hyperopia), just like how limb length dictates height. Given that spherical refractive error hinges on axial length, and that emmetropization is complete by the age of 5 (the youngest children in this study), the variation with age in the prevalence of hyperopia (one of the main aspects of this paper) is only part of the story; myopia onset and progression is the other part because the axial length scale is continuous not dichotomous.

MAJOR COMPULSORY REVISION: Because emmetropization is over by the age of 5, the reduction in hyperopia prevalence is caused by increased axial length and, for many children (especially in Asia), the drift to myopia. However, myopia is not discussed at all. While the authors have stated (in their response to my comments) their reasons for not reporting myopia prevalence data here, they should at the very least include a paragraph in the discussion to acknowledge that that show the biggest reductions in the prevalence of
hyperopia, the reduction is prevalence of hyperopia in not due to emmetropization (it’s too late for that), and so it must be due to the same process that leads to the onset and development of myopia in children and teenagers. As well as acknowledging this point, this paragraph could speculate that populations with more myopia or with earlier onset myopia might be expected to be the populations or the earliest reduction in hyperopia or both. Indeed, the authors may actually wish to examine the evidence for this in the literature they examined, but I am not insisting on this [i.e. DISCRETIONARY REVISION]

The paragraph on page 13 has been modified in relation to the emmetropization process.

A paragraph has been included in the Conclusion (page 15) as per the reviewer’s suggestion.

Specific comments requiring consideration:

Abstract, method: PRISMA guidelines. [MINOR ESSENTIAL REVISION]

Done.

Abstract, method: “…through cycloplegic autorefraction or cycloplegic retinoscopy.” [i.e. add cycloplegic before retinoscopy, if it was the case that all retinoscopy studies included were also conducted under cyclop legia]. [MINOR ESSENTIAL REVSION]

Done. All retinoscopy studies were conducted under cycloplegia

Abstract, results: Figure 1 says 40 studies were included but here it says 41. Also (in next sentence) what is “summary effect”. Is this overall prevalence? [MINOR ESSENTIAL REVISIONS]

Done. 40 studies were included and this has been corrected in the Abstract.

Abstract, conclusion: I don’t understand how the conclusions in the abstract relate to the material presented in the paper. For example, while the studies considered in the review may have used different criteria to classify hyperopia, were there many/any that had an insufficient sample size? In short, I’m struggling to understand how the conclusions presented in the abstract relate to the main manuscript. The same applies to the conclusion in the main text. Related to my main point about myopia: while ethnicity, and outdoor activities appear to affect prevalence of hyperopia, as does the definition of hyperopia (hence he need for consistent definition and agreed means for measurement), a large part of the variation must also stem from the underlying prevalence and severity of myopia in each population that is studied. [MAJOR COMPULSORY REVISION]
The structure of the conclusion in the abstract has been improved in line with the conclusion in the main manuscript.

Increasing the sample size is a strategy intended to increase the precision of estimated prevalence, especially in the context of evaluating specific ages.

A paragraph regarding myopia has been included in the conclusion (page 15).

**Background:**

Although short, some of the background section seems to me to be irrelevant, and some important aspects of the hyperopia story are lacking or completely absent. Why give prominence to emmetropization when this is a paper about hyperopia in 5-18 year olds? How is a discussion of axial length and corneal curvature (their contribution to spherical equivalent refractive error) relevant here? I would have thought that more relevant topics for the ‘background’ and ‘discussion’ sections might be: how much hyperopia is a problem given that children have lots of accommodation and so can overcome it to see clearly? The issue with hyperopia is that we don’t really know how much of a problem it is because (i) we don’t know how much exists (this is one of the positive contributions of this paper) and (ii) even if we did know precisely how prevalent it is (at different severities), we still don’t have agreement about how it should be managed. As the authors point out in the conclusions, many think that low to moderate hyperopia can be left uncorrected, whereas others want to intervene to correct hyperopia even at modest levels. Isn’t this aspect of the hyperopia story deserving of greater attention? Isn’t his of interest to the reader in a paper about hyperopia? [DISCRETIONARY REVISION]

The paragraph about emmetropization (page 4) has been reduced.

The relevance of the anatomical components is that there are studies indicating modifications in the anatomical conformation of the eyes of children aged 12 to 14 (AL and corneal curvature) owing to environmental questions.

The relationship between hyperopia and accommodative and binocular function is emphasized in the first paragraph (page 4).

The final paragraph of the background (page 4) mentions that this article contributes to estimating the occurrence of the problem.

The review does not contribute to the definition of management, given that for management to be defined studies into the consequences of hyperopia would need to be reviewed and there are not sufficient empirical studies on this theme. For this reason this extremely relevant aspect is included in the discussion.
Methods:

Some of the terminology needs attention. For example, in the meta-analysis section the authors refer to (a) moderate hyperopia prevalence whereas I’m convinced they mean something different, specifically prevalence of moderate hyperopia ( (a) and (b) have completely different meanings despite the similar terminology!). This is more of an English language issue. [MINOR ESSENTIAL REVISION]

Done: prevalence of moderate hyperopia

Results:

In the ‘hyperopia prevalence by age’ section, the authors mention that while most studies used a criterion of +2.00D of above, many did not. Is it valid to include prevalence studies that compare studies with different definitions for hyperopia? Maybe this was taken care of in the meta analysis? Was it? Please elaborate on this and, if not, justify how it valid to compare prevalence when the cut-off for defining hyperopia differed from +2DS or above?

As explained in the meta-analysis item of the methods section, only studies with a cut-off point \( \geq +2.00 \) were used.

The authors still don’t seem to define what they mean by ‘outlier’. Why, specifically, was Fotouhi’s study excluded? OK, the prevalence estimates were different: but how different did estimates have to be in order to be excluded? [BOTH ARE MINOR ESSENTIAL REVISIONS]

The homogeneity assumption for the adequacy of the effect summary has been reported on page 6.

The p-value of the homogeneity test with and without Fotouhi’ study is described on page 7.

Discussion:

1st sentence mentions " …several studies on the prevalence of hyperopia in childhood….". Please add these citations. Also, precisely where do the authors specifically compare and discuss their meta-analysis results with the studies that showed a substantially higher or lower hyperopia prevalence, and explain (or try to) the likely reasons for these differences? Can it be added? If this doesn’t exist (and I couldn’t see it) please add it. [MINOR ESSENTIAL REVISIONS].

The first sentence talks about all the studies included in the meta-analysis. This is why we did not include a citation. In the meta-analysis, outliers were excluded owing to the homogeneity assumption. The aim is to produce an adequate
effect summary. The variability among the studies is discussed with the associated factors, particularly ethnicity.

Figures:

**Figure 2.** Given that many readers will not be familiar with forest plots the figure legend should provide instructions as to how these plots should be interpreted. For example, it is not obvious that “effect summary” in fact means “prevalence.” The number in brackets after the prevalence (at each age) presumably represent the 95% confidence intervals? This should be clearly explained; even if this appears in the main text, it should also appear in the legend for clarity and to aid the reader understand the plots. Also, ‘anos’ appears instead of ‘years’.

[MINOR ESSENTIAL REVSIONS]

Done: Legends have been included. Other corrections have been made.

General point:

There continue to be many typographical errors in the manuscript [e.g. in figure legends ‘metha’ analysis and ‘fostes’ plots; in the conclusion, ‘youger’]. Please ask a native English-speaker to fully proof read the manuscript. [MINOR ESSENTIAL REVISIONS]

Grammatical and spelling errors have been corrected by a native speaker