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LETTER TO THE EDITOR (BY INVITATION)

Detecting the effect of under-correcting myopia

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Dear Editor,

The Letter to the Editor "Refractive correction and myopia progression" [1] ("the Letter") makes some good points about the article "The progression of corrected myopia" [2] that the article had already addressed in part.

Medina's feedback model for emmetropization predicts that correction of myopes aggravates their condition, and that delaying correction will result in less progression rate and probably a reduced myopic final level. The model also predicts that under-correcting myopia would have a small effect in reducing the progression rate.

The Letter advises that there is controversy on the issue of whether under-correction of myopia will have any beneficial effect, citing four published reports [3–6] involving distance under-correction. Medina [2] cites those reports, and others, noting the conflict and suggesting experimental problems. The Letter overlooks several reports that show that under-correction for near vision with bifocals reduces myopia progression, e.g. [7] and those cited in [2].

In response to the Letter, the effect of distance under-correction would be difficult to detect experimentally due to the small effect and the difficult experiment. Reports [3–6, 8] discussed in the paragraphs below confirm the small and conflicting effect and exemplify the difficulty.

Chung and Mohidin [3] showed a small (0.23 D) but significant greater rate of progression in a group of 47 children under-corrected by about 0.75 D as compared to another group of 47 children fully corrected for a period of 2 years. They paired the data in an attempt to avoid the problem of intersubject variation. However, the myopia progression rate is very variable, even for paired subjects of the same age and initial refractive error.

Adler and Millodot [4] show no significant myopia progression difference between two groups of 23 fully corrected myopes and 25 myopes under-corrected by 0.50 D for a period of 18 months.

Vasudevan et al. [5] found a significant positive correlation between the degree of under-correction of refractive error and the rate of myopic progression. This result is contradicted by a later study [8]. The difference in myopia progression between the groups with full correction and under-corrected by 0.5 D is less than 0.25D. See its Figure 1 (as amended [9]).

Ong et al. [6] in a longitudinal study concluded that, over a period of at least 3 years, refractive shifts were not significantly different among a group of full-time wearers (n = 8) of spectacle correction and a group of non-wearers (n = 5), when the data were corrected for age effects. The non-wearers, however, developed less myopia than the fulltime lens wearers, and the difference was borderline significant when there was no "correction" for age effects. The age "correction" may be questionable given the large variation in progression rate and the reduced number of subjects. The natural variation in myopia progression is much larger than the effect of under-correction.

A recent study of two groups of under-corrected and fully corrected children [8] failed to show any difference in myopia progression. However, the regression analysis showed that

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myopia progression significantly decreased with increasing amount of under-correction. This result supports the feedback model prediction that a sufficient amount of under-correction will noticeably reduce myopia progression.

In the two studies [3, 5] showing greater myopia progression when under-corrected versus corrected, we notice that the difference in progression is below the 0.25-D generally accepted step in refractions and prescriptions, a quantization error. The effect observed is less than the quantization error.

All these studies used different groups of subjects. Rather than comparing the myopia progression in two groups, a better designed study could compare the myopia progression of the same subjects before and after correction (or under-correction). For example, newly diagnosed myopes could be left uncorrected for a period of time, and their rate of myopia progression before and after correction compared.

A study without group assignment showed that fully corrected eyes had a significantly faster myopia progression of 0.36 D/year than the uncorrected or under-corrected fellow eye [10].

In summary, the current literature is inconclusive and contradictory on the issue, but it tends to indicate that under-correction may be of limited benefit. The feedback model for emmetropization is consistent with most results. It predicts an increased constant progression for fully corrected myopia, and can provide a prediction of what progression to expect depending on the treatment, such as the amount of under-correction. Those predictions could then be compared to actual refractions. It would be desirable to design future experiments with current knowledge to demonstrate the effect of under-correction or no correction.

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