Correspondence

Unfixed reference, monocular occlusion, and developmental dyslexia—a critique

SIR, I would like to respond to Dr D V M Bishop's criticisms[1] of my hypothesis that disordered vergence control causes poor visual direction sense, and is therefore a potent cause of children's reading problems.[2,3] I provided Dr Bishop with the full data on which our paper published in the *Lancet*[2] was based in order to try to convince her that monocular occlusion can help many dyslexic children to improve their fine vergence control, following which their reading often improves. So I am naturally disappointed with her conclusions.

Dr Bishop makes three main points, namely: (1) there is no evidence of a specific link between unstable vergence control and reading disability, once age and intelligence have been accounted for; (2) there is no evidence that dyslexics with unstable vergence control make visual localisation errors of the kind expected from our hypothesis; (3) there is no evidence that monocular occlusion in children with unstable vergence control helps them to improve their reading. Hence she concludes that there is no evidence that poor vergence control is a cause of poor reading. I will deal with each of these assertions separately.

1. Is there a link between unstable vergence and poor reading?

Dr Bishop and colleagues were actually the first to publish in 1979[4] the results of a study of 147 unselected primary school children which showed clearly that children with unstable vergence control, as revealed by the Dunlop test, tended to be worse readers than those with good vergence control. However, she found that the children with poor binocular control tended to have lower intelligence than their peers, so she suggested that their lower intelligence was in fact the explanation for their poor reading, and that not understanding the test rather than poor binocular control explained their unstable Dunlop test responses. However, Bishop *et al.* assessed the children's intelligence using the full scale WISC, the verbal components of which are well known to penalise poor readers disproportionately. Hence the apparently lower intelligence of her subjects who gave unstable Dunlop test responses may well have been the result of their reading badly rather than the cause of it. Since that time several studies have been published, as Dr Bishop admits, which show conclusively that there is a strong association between unstable vergence control and poor reading[3,5] even when differences in chronological age, performance mental age, and reading experience have been accounted for. Thus, contrary to Dr Bishop's conclusion, there is in fact good evidence of a strong link between poor binocular control and poor reading.

2. Evidence that children with unstable vergence make 'visual' errors

In our 1985 study[2] we found that dyslexic children with unstable vergence tended to make more visual than auditory errors when attempting to read, whereas dyslexics with stable vergence tended to make more auditory than visual errors. We found that many dyslexics made both types of error, however, probably because vergence instability was only one of their problems. Those who made equal numbers of visual and phonemic errors were the children who also tended to make sequencing errors. (We did perform a sequencing test, contrary to Dr Bishop's assertion.[1] She also states that we had found no difference in the requirement for speech therapy between children with unstable and stable vergence control, whereas we state clearly that 40% more of the latter (auditory dyslexics) had been given speech therapy.)

Dr Bishop criticised the lack of a non-verbal spatial discrimination test in our 1985 paper,[2] but she does not mention our recent studies (to which I have drawn her attention) in which we have shown conclusively that children with poor vergence control are very significantly worse at dot localisation tasks than IQ, chronological age, or reading age matched controls.[6] Thus, again contrary to Dr Bishop's conclusion, there is in fact good evidence that children with unstable vergence control make the kinds of visual localisation errors which one would expect from my hypothesis.

3. Evidence that monocular occlusion results in improved reading

It should be noted that neither Dr Bishop nor anyone else has disputed our finding that monocular occlusion helps about half of children with initially unstable vergence to gain good control within six months.[2] The question is whether this ocularmotor development is followed by improved reading. Here it seems to me that Dr Bishop reverses her previous arguments. In 1979 she thought that children with unstable vergence were of lower intelligence and that the latter, rather than poor binocular control, was what explained their poorer reading. However, she is now claiming that the reading progress of children

with unstable vergence whose binocular control improved after monocular occlusion can be entirely explained by their having higher reading ability (ie, higher intelligence) to begin with.

To support this argument she has transformed our reading deficit measures to T scores. In our 1985 paper we chose to use (reading age minus chronological age) as our measure of reading deficit rather than reading T scores, because the latter have several drawbacks. First, calculation of a child's T score depends on the assumption that reading ability is normally distributed around the mean for a particular chronological age. But this is probably not true of the reading of dyslexic children.[7] Second, we felt that the T score is a very insensitive measure of reading ability. Children over the age of 9 are grouped in six-monthly bands which has the unfortunate effect of equating the scores of children of similar reading ability whose ages are six months apart. Moreover the T score range has a floor value of only −2 SDs from the mean, whereas the region of interest when considering dyslexics lies lower than this. Nevertheless, Dr Bishop transformed our measurement of reading deficit into T scores. So we do not find it surprising that using this blunt instrument she missed the real reading progress which some children make after developing stable vergence control.

In our 1985 paper[2] we confirmed the clear relationship which many people have shown to exist between IQ, initial reading age, and reading progress. The effect of Dr Bishop's choosing to analyse reading T score changes has been to highlight this strong relationship and to bury the improvement which those who achieved good vergence control experienced. Using our more sensitive reading deficit score we were able to show by means of matched pairs and multiple regression analyses that the reading improvement of children whose vergence control became stable was highly significant, and independently of their initial reading age or their performance IQ. Thus, contrary to Dr Bishop's assertion, there is strong evidence that monocular occlusion not only improves the binocular control of many dyslexic children but also helps them to learn to read.

In conclusion we have shown that Dr Bishop was probably mistaken in her 1979 conclusion that children with poor vergence control were of low intelligence and that this was the cause of both their unstable Dunlop test responses and their poor reading. The weight of more recent evidence shows that poor binocular control can lead to poor reading in children of both high and low intelligence, because such children are unable to localise small visual targets, such as letters, accurately. We have presented strong evidence that monocular occlusion can help many of these children to develop good vergence control, and that this is often followed by rapid reading improvement. We will shortly publish further results confirming that assisting children to develop good binocular control often helps them to learn to read.

But poor visuomotor control is not the only problem suffered by dyslexic children; many have phonemic segmentation difficulties in addition.[8] Hence identifying the visuomotor component of their reading problems will remain difficult, and arguments about its significance will continue. But I believe there is now little doubt that many children with reading problems do have binocular control abnormalities. These can be demonstrated objectively by means of eye movement recordings.[9] The onus continues to lie with us, of course, to prove that they are a cause of dyslexic children's problems, and that improving binocular control helps such subjects to improve their reading.

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References

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Note

Scanning laser ophthalmoscopy

The first International Symposium on Scanning Laser Ophthalmoscopy will be held on 7–8 July 1989 at the University Eye Hospital, Munich, West Germany. Details from J Nasemann, MD, Universitäts-Augenkilik, Mathildenstrasse 8, D 8000 München 2, West Germany.