



## Cochrane corner: home or office when treating convergence insufficiency

Fiona J. Rowe<sup>1</sup> · Sarah R. Hatt<sup>2</sup> · Sue Elliott<sup>3</sup>

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An update to the Cochrane Review on non-surgical interventions for convergence insufficiency by Scheiman et al. [1] has been recently published, providing a summary of current evidence for this frequently encountered clinical condition. This update builds on a previous version of the review which was first published by the lead author in 2011 [2]. Key changes include the addition of seven new randomised trials, an expanded author team and improved methodology related to the search process, reporting of outcome measures, assessment of risk of bias and reporting bias, measures of treatment effect, analysis and data synthesis and evaluation of confidence in the evidence (with use of the CINeMA framework and GRADE).

Treatment of convergence insufficiency is important when the condition leads to symptoms of headache, eye strain, double or jumbled vision and reading difficulty. The reported rate of convergence insufficiency varies from 2.25 to 17.6% [3–5]. Traditionally, treatment has been carried out at home after initial assessment and demonstration of the treatment regime in the clinic or office environment. The majority of treatment options are non-surgical and typically involve convergence training using low-tech near targets such as a pen/pencil or higher-tech computer training programmes. Base-in prism glasses are used less frequently [6–8]. Invasive treatment options such as extra-ocular muscle surgery or botulinum toxin injection are reserved for refractory cases [6, 9].

Whilst there is empirical evidence that non-surgical treatments for convergence insufficiency actually work,

there is limited evidence as to which approaches might be more effective. This review includes randomised trials that have evaluated both home- and office-based non-surgical treatments.

The authors identified a total of 12 randomised trials; 6 in children (aged 7–18 years) and 6 in adults (aged 15–40 years in 5 trials and 40+ years in 1 trial) with 1289 participants overall. The trials were conducted over 6 weeks to 6 months. While the review was open to including any non-surgical interventions for primary convergence insufficiency, five active interventions were evaluated across the 12 included trials: (1) office-based vergence/accommodative therapy with home reinforcement, (2) home-based pencil/target push-ups, (3) home-based computer vergence/accommodative therapy, (4) office-based vergence/accommodative therapy alone, (5) prism reading glasses. Participants assigned to control groups underwent placebo vergence/accommodative therapy, placebo reading glasses or other placebo intervention.

Since children and adults may respond differently to treatments for convergence insufficiency the authors separately evaluated trials conducted in children and adults. The six trials in children included 968 participants. Composite success rates (normal near point of convergence and positive fusional vergence with a priori improvement criteria) indicated that office-based treatment coupled with home-based reinforcement was better than placebo treatment and may be better than home-based treatment alone, whether using computer training or near target training. There was no difference using base-in prism reading glasses versus placebo treatment. The overall certainty of evidence was high for all comparisons involving office-based vergence and/or accommodative therapy with moderate or low certainty evidence for comparisons between the two home-based interventions. Four of six trials rated at low risk of bias.

The evidence for treatment effectiveness in adults was less clear since composite success rates could not be reported for the adult trials. The six trials in adults involved 321 participants and the results indicated that office-based

✉ Fiona J. Rowe  
rowef@liverpool.ac.uk

<sup>1</sup> Institute for Population Health, University of Liverpool, Liverpool, UK

<sup>2</sup> Ophthalmology Research, Mayo Clinic, Rochester, MN, USA

<sup>3</sup> Department of Orthoptics, Salisbury NHS Foundation Trust, Salisbury, UK

treatment was relatively more effective than placebo treatment for improving positive fusional vergence and reducing symptom reporting, but interestingly, not more effective for improving the near point of convergence. For almost all comparisons in these adult trials, the certainty of evidence was low with just one of six trials rated at low risk of bias.

Overall, there were no reported adverse effects for children or adults. Variable adherence rates were reported for home-based treatment whilst adherence rates were excellent for office-based treatment (as would be expected). Cost analysis data and quality of life data were not available for any of the included trials.

The overarching conclusion of this Cochrane Review relates to the setting in which treatment is performed rather than the treatment modality itself, i.e., office-based therapy is more effective than home-based therapy. Whilst this conclusion is extremely informative, it is important to note that it is likely to reflect the optimal adherence achieved under the direct guidance and supervision of a practitioner. In addition, it is crucial to consider such benefit in the context of the cost and convenience of a treatment. Office-based treatments include costs relating to the therapist's time (unless covered by health insurance or national healthcare provider), travel costs to the office, the inconvenience of taking time off school and work, each multiplied by numerous sessions. There is a cost difference across countries; some with publicly funded healthcare systems (e.g., UK) and others requiring health insurance (e.g., USA). Furthermore, for publicly funded healthcare systems, the capacity for those systems to offer time-intensive office-based treatment must be weighed against demand (e.g., patient load). Where treatment involves computerised programmes, the costs of access to computer or tablet devices along with the costs of the treatment programme must also be considered. These considerations are vital when aiming to ensure equality of care for our patients and cost effectiveness in addition to clinical effectiveness of treatments.

A number of implications for research are, justly, raised. These should inform future trials with robust methodologies. The authors have introduced primary outcomes to define treatment success which are based on composites of convergence near point, positive fusional vergence and/or symptoms. These warrant reporting in future trials. With regard to the treatment itself, it remains unclear which specific treatment procedures are better. Are particular combinations of push-up, jump and fusional vergence tasks more effective? In addition, in light of cost and equitable access to care, a determination should be made as to whether these treatments are as effective when delivered using low-tech, traditional target-based exercises, or if there is an advantage to delivery through a computerised programme.

Future research should also further distinguish between the effects of better adherence and the effects of the treatment approach itself when conducting home-based treatment. It is important to determine whether a different dose of treatment is needed in a home versus an office environment to achieve equivalent outcomes, and also if home-based treatment can be adapted in other ways for improved effectiveness.

Home versus office-based treatment considerations are timely given the current circumstances of the COVID-19 pandemic. At a time when office/clinic visits must be minimised, the role of home-based treatments have received greater attention along with the role of telemedicine.

**Author contributions** All authors contributed to the writing of this Comment.

### Compliance with ethical standards

**Conflict of interest** The authors declare that they have no competing interests. The authors are editors on the Cochrane Library Eyes and Vision group.

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