



Evidence Based
Healthcare Team

Brief Report

OPTOMETRIC VISION THERAPY IN REHABILITATION OF COGNITIVE DEFICIT SECONDARY TO TRAUMATIC BRAIN INJURY

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Important Note: This brief report summarises information on optometric vision therapy in rehabilitation of cognitive deficit arising from Traumatic Brain Injury (TBI). It has not been systematically developed according to a predefined methodology. It is not intended to replace clinical judgement, or be used as a clinical protocol. A reasonable attempt has been made to find and review papers relevant to the focus of this report. It does not claim to be exhaustive.

BRIEF REPORT ON OPTOMETRIC VISION THERAPY IN REHABILITATION OF COGNITIVE DEFICIT SECONDARY TO TRAUMATIC BRAIN INJURY

EXECUTIVE SUMMARY

This report was initially set as an evidence-based review with the aim to examine current scientific evidence on effectiveness of optometric vision therapy in treatment of cognitive problems arising from Traumatic Brain Injury (TBI).

However a thorough search of the multiple databases and secondary sources of references did not find any published studies in respect to efficacy of vision therapy in treatment of cognitive impairment.

Several studies have reported use of eye exercises for correction of reading disorders, dyslexia and visual dysfunctions (3, 5, 13, 15, 16, 19-23, 25, 27-30, 33). Developmental optometrists argue that improvements in visual function enable better learning and enhance cognition (1). If this argument was accepted, these studies could be regarded as a proxy for assessment of impact of this treatment modality on cognitive problems. For the purpose of this report the studies related to these proxy variables have been briefly outlined but not examined in-depth.

As no direct studies on efficacy of optometric vision therapy in treatment of cognitive impairment consequent to TBI have been identified, it is not possible to subject this matter to a scrutiny of an evidence-based review.

Overall impression of the studies perused for the purpose of this report is that they do not provide robust scientific evidence in support of effectiveness of visual therapy in rehabilitation of cognitive deficiencies secondary to TBI.

Background

Dr Paterson asked the EBH team to carry out an evidence-based review of research related to use of optometric vision therapy in treatment of cognitive problems consequent to TBI. ACC case-managers receive treatment requests from optometrists, and there is a need for assessing scientific evidence of efficacy of this treatment modality.

Cognitive impairment secondary to deficit in information processing is commonly associated with acquired brain injury. Visual processing is described as the cognitive interpretation of information from optic sources (11).

Behavioural optometrists argue that improvement in visual processing through optometric vision therapy has remedial effect on cognitive function.

Behavioural optometry is a term used in reference to optometric vision therapy. Originally this treatment modality was used in strabismus therapy and then developed through case analysis as an optometric treatment for patients with other

visual deficiencies. Two complementary lines of behavioural optometry have been described in the literature: traditional physiologically-based model focusing on vergence dysfunction, and behavioural approach emphasizing impact of environment and experience on visual function, the relationship of vision to other aspects of behaviour and the role of vision in gathering and processing of information (2, 9).

Rehabilitative optometric interventions comprise a number of treatment modalities, such as prescription of glasses, ophthalmic lenses and prisms, and optometric vision therapy (visual training) (31).

Vision therapy is part of behavioural optometry and it is defined as an optometric treatment method that is aimed at developing efficient visual skills and processing.

Optometric vision therapy, also known as eye exercises, visual training and orthoptics, is thought to improve visual function and performance through individualised eye training programme.

Optometric vision therapy is used for rehabilitation of visual problems related to the dynamic systems of vision. This includes dysfunction of eye movements, and the accommodative and binocular systems (strabismus).

Significant visual problems resulting in loss of acuity, binocular and accommodative dysfunctions and oculomotor deficits are a common consequence of TBI (24). Vision therapy is noted as one of the non-surgical rehabilitation services available to TBI patients (32). Use of behavioural optometry and vision therapy for cognitive rehabilitation is based on the notion that brain function can be improved through this treatment.

Search strategy

The sources used for this report include:

- Scopus
- PsycINFO
- EBSCO: Medline, CINAHL Plus with full text, Biomedical reference collection: Comprehensive, Psychology and Behavioural Science Collection, PsycARTICLES, CINAHL Select
- EBM reviews – Cochrane Central Register of Controlled Trials
- EBM reviews – Database of Abstracts of Reviews of Effects
- EBM reviews Full Text – Cochrane DSR, ACP Journal Club, and DARE
- All EBM reviews – Cochrane DSR, ACP Journal Club, DARE, and CCTR
- Proquest
- References to relevant research listed in the referenced articles
- A list of 62 references provided by Grant Dabb, Optometrist.
- References to the NORA website by the Australasian College of Behavioural Optometrists

Key words used for searching: traumatic brain injury (TBI), acquired brain injury (ABI), behavioural optometry, optometry, optometric vision therapy, optometric

therapy, vision therapy, vision training, orthoptics, eye training, eye exercise, oculomotor rehabilitation.

Selection criteria

Due to paucity of research, all the publications related to use of visual therapy in treatment of cognitive deficiencies secondary to TBI found during the search have been perused.

The studies and papers related to use of oculomotor rehabilitation for visual symptoms associated with brain injuries have been obtained but not included in this review.

Investigation

A thorough search of the multiple databases and secondary reference sources, such as well referenced publications (1, 4, 9), did not find any direct studies on effectiveness of optometric vision therapy in treatment of cognitive problems arising from TBI. In the absence of direct research, several papers related to use of eye exercises in management of learning disabilities and dyslexia have been examined.

In a discussion of perspectives of behavioural therapy Gitz states that behavioural optometrists observed dramatic increase in IQ scores following vision therapy, and proposes that improvement in vision would result in improved brain function (14). However this claim is not corroborated by available scientific evidence.

A number of publications referred to use of visual therapy in treatment of dyslexia and reading disorders arising from causes unrelated to TBI (3, 4, 6, 10, 13, 16, 19, 23, 25, 27, 28, 30). A couple of papers described a scientific justification for the therapeutic effects of this treatment modality (8, 9).

College of Optometrist in Vision Development (COVD) asserts that improvement in visual function enables better learning (1).

Several studies described positive effect of oculomotor rehabilitation on ocular motility as well as reading ability (3, 7, 13, 21).

A clinical review of the management of 323 consecutive patients with learning disabilities referred to binocular instability, low amplitude of accommodation and Meares-Irlen syndrome as the visual correlates of specific learning disabilities. The study reported some benefits for the patients with these disorders (13).

Of a particular interest is a study by Ciuffreda et al assessing reading-related oculomotor rehabilitation in patients with acquired brain injury (7). The study evaluated effect of an 8-week training programme on reading ability of 14 patients. The authors concluded that the participants demonstrated subjective and objective improvement in reading ability as a result of oculomotor learning and indirectly related attentional aspects. However the sample size in this study was small, and

the authors concluded that a larger clinical trial is needed to validate the study results.

A review of eleven studies published from 1940 to 2001 on use of vision therapy in improving reading skills in patients with reading disability indicated some value of this therapy (3). The review summarised that the vast majority of studies showed a weak but positive association between oculomotor vision therapy and reading skills. The paper concluded that improvement in reading rate and comprehension was equivalent to that of conventional reading therapy, but with most improvement when both therapies were used.

A multi-centre randomised clinical trial comparing vision therapy/orthoptics, pencil pushups and placebo vision therapy/orthoptics concluded that vision therapy/orthoptics produced significant improvements in treatment of convergence (28).

Conversely, other studies found no improvement from use of some specific types of optometric therapy (5, 15).

Likewise, several publications and systematic reviews found no scientific evidence to corroborate the use of optometric vision therapy in treatment of learning disabilities (18, 25, 26).

A systematic review by Rawstron et al evaluated the current scientific evidence related to the efficacy of eye exercises used in optometric vision therapy (26). The paper reviewed 43 publications pertaining to the subject. The publications asserted therapeutic value of eye exercises for a variety of ophthalmic conditions. The review refers to one controlled study on role of visual therapy in treatment of learning disabilities, and suggests that no scientific proof in support of this treatment modality has been published.

The review summed up that some evidence existed on efficacy of eye exercises in treatment of convergence insufficiency, developing stereoscopic skills and improving visual field remnants after brain injury. However no scientific evidence was published to validate use of eye exercise for treatment and rehabilitation of other conditions.

This view is supported by Halveston (18) in the analysis of place of visual training in ophthalmology. Referring to a literature review and personal experience the author concludes that visual exercises play a minor and decreasing role in eye therapy used by ophthalmologists. Halveston indicates that ophthalmologists' consensus is that except for near point convergence exercises, visual therapy lacks scientific evidence of effectiveness.

The impression that scientific evidence on effectiveness of optometric therapy in rehabilitation of cognitive deficits does not support its use is corroborated by the policies of the major insurance companies.

Cigna HealthCare coverage position documents states that this insurance company does not fund vision therapy as its efficacy in the management of visual disturbances and learning disabilities is not proven (17).

Likewise, Aetna insurance company in the clinical bulletin summarised that no effective visual treatment was known for dyslexia and learning disabilities⁵.

UniCare Clinical Guideline list amblyopia, acquired esotropia and convergence insufficiency as the medical conditions that warrant vision therapy. The guideline exclude learning disabilities and other visual symptoms from the list of medical conditions that require this treatment⁶.

A position paper published by the American Academy of Pediatrics alluded to the controversies of various therapeutic modalities used in treatment of complex pediatric developmental and neurological conditions (12). Visual training was discussed in the report as one of these modalities that relied on anecdotal evidence and was not supported by robust scientific studies. The report concluded that no scientific evidence existed in support of the use of eye exercises in treatment of children with learning disabilities.

This publication was vehemently criticised by Bowan in a well referenced rebuttal (4). Bowan refers to the significant body of studies on the role of visual therapy techniques in treatment of learning dysfunctions and dyslexia. The author concluded that this treatment modality had proven effectiveness in problems related to reading dysfunctions, such as accommodative disorders, amblyopia, convergence insufficiency and intermittent exotropia.

Overall impression of the perused papers is that research on visual therapy in rehabilitation of cognitive impairment arising from TBI is scarce and mostly limited to isolated case studies. A thorough search of the scientific databases detected only one case series study assessing impact of visual restitution training programmes on patients with optic nerve or brain injuries (21). No studies evaluating effectiveness of visual therapy in rehabilitation of patients with cognitive impairment secondary to TBI were found.

Conclusion

A thorough literature search of multiple databases and secondary sources of references did not find any studies related to efficacy of optometric vision therapy in rehabilitation of cognitive deficit secondary to TBI.

Therefore due to the absence of research in this area it is not possible to either verify or refute effectiveness of eye exercises in rehabilitation of cognitive deficiencies secondary to TBI.

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⁵ http://www.aetna.com/cpb/medical/data/1_99/0078.html

⁶ http://medpolicy.unicare.com/policies/guidelines/MED/vision_therapy.html

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