Peninsula Cerebra Research Unit
PenCRU Childhood Disability Research

What's the Evidence?

Helping children with a type of vision impairment called hemianopia learn to read

Key findings

- Hemianopia is a vision impairment in which there is loss of part of the field of vision. It affects ability to move around objects and reading. It can impact on learning, independence, and leisure activities.
- Several interventions and aids aim to help children with hemianopia including prisms, compensatory training, and vision restoration therapy.
- Most of the evidence for treatment to improve reading with hemianopia is based on adults with stroke.
- We were not able to find robust evidence for prisms or vision restoration therapy for improving reading.
- There is some evidence that compensatory training in reading skills can improve reading speed in adults.
- More research is needed to determine the effectiveness of these interventions and aids to help children with hemianopia with reading.

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What were we asked?

A parent asked us: What is the best way to help young children with hemianopia, especially right-sided, learn to read?

What did we do?

We structured the question using the PICO format: Are any interventions or aids effective to improve reading for children with hemianopia?

We searched the following evidence databases: NHS Evidence, the Cochrane Library, Trip, NICE (National Institute for Health and Care Excellence), and PubMed. We also looked at studies referred to in the papers we found. We brought the information together in this summary. The searches were last updated in December 2017.

Experts in visual impairment and members of our Family Faculty reviewed the accuracy and accessibility of the summary.

What did we find?

What is hemianopia?

Hemianopia is a type of cerebral vision impairment, which means that the impairment is caused by processing problems in the brain rather than any structural problem with the eyes. The vision loss is usually right or left-sided.

Vision is lost on the same side in both eyes; for example right-sided homonymous hemianopia means that vision is lost on the right side in both eyes. There are other types of hemianopia in which sight is lost in different parts of the field of vision. For example in the outer half of both the right and left side (bitemporal hemianopia) or in a quadrant of vision in both eyes (quadrantanopia).

The vision loss can be due to stroke, brain tumours, obstructed blood supply, bleeding in the brain, or a number of other causes.[1]

Hemianopia can affect a child's ability to read and how they move around objects. It can

impact on learning, independence, and leisure activities.

Children with right-sided hemianopia have difficulty reading left-to-right efficiently as they cannot see the next few letters or words as they move their eyes along the page. Children with left-sided hemianopia can have difficulty finding the next line of text or beginning of words.

Children with hemianopia from birth may be more likely to develop eye movements that help them to read than those who acquire hemianopia later.[2]

Children and adults with a hemianopia will often adopt a head posture to shift their remaining field of vision more to the middle, which can be helpful for them.

Interventions and Aids

There are several interventions and aids available to help children with hemianopia which can be used together.[3]

Prisms

The aim of prism treatment is to expand the field of vision by adding prisms to a pair of spectacles. A prism is a specially shaped lens, which sits on the lens of the glasses with the purpose of shifting the image being seen from the blind field of vision to the seeing field of vision. They can either be temporary press-on prisms or they can be permanently added to the lenses of a pair of glasses. They can be added to the lenses for one or both eyes.

Some users find prisms unpleasant or difficult to adapt to. Training can be provided to learn to use the prisms. NHS optical vouchers, which apply to prism lenses are available for those eligible.[4]

Compensatory training

Compensatory training involves learning eye and head scanning movements that can help patients to use their vision more efficiently. Training can be done with or without prisms.

Training varies and can include activities that improve visual attention skills, improve eye movements, or improve reading abilities.

Training strategies include:

- looking at rows of coloured lights
- searching for targets on a screen among other items using only the eyes
- turning the paper by 90 degrees so that the eyes can read down rather than along
- practicing looking at single words by moving eyes towards the blind side of longer and longer words
- focusing on the ends of words
- putting a green dot at the start of a line and a red dot at the end of a line
- covering the beginning of words or lines as you read
- covering all but one line of words, or one or two words at a time on a page
- putting a finger at the end of each line of reading
- printing reading in bigger font on the same size of paper
- reading words that scroll across a screen

Some compensatory training programmes can be done at home on a computer.

NHS professionals may offer compensatory training, but the specific methods will vary according to the professional and the age, needs, and abilities of the child.

Vision restoration therapy

Vision restoration therapy (VRT) aims to regain sight at the border between the area of sight and the area with lost sight. Patients focus on a point on a screen while lights are repeatedly shown in the border area. It is usually delivered as an intensive computer-based programme over a period of months. It is not currently available through the NHS.

What is the evidence for the treatment options?

Most of the evidence on the effectiveness of treatment options for reading with hemianopia is based on research on adults following stroke. There is no high quality evidence from studies with children.[5, 6]

Prisms

We were not able to find evidence for the effectiveness of prisms to improve reading.

Evidence for prisms in general is very limited. Current NICE guidance only refers to using prisms for adults with visual neglect after stroke.[7]

One randomised controlled trial of prisms for hemianopia has been conducted with adults.[8] It found that most patients wanted to keep the prism spectacles. Most patients who kept them reported improvement in mobility.

A second randomised controlled trial compared prisms with visual search training and standard care.[9] No significant improvements were found in visual field increases. Some of those using the prisms reported headaches and confusion of vision.

Reading speed was not measured in either of these trials.

Compensatory training

There is some positive evidence for compensatory training. We were able to find four rigorous studies looking at reading, but all were with adults rather than children.

One study found that training involving reading words that scroll across a screen improves speed of reading normal (non-scrolling) words.[10]

The second study compared two specific types of training: 1) reading longer and longer single words on a screen and 2) searching for targets on a screen.[11] They found that the word-reading training led to improvements in reading speed and accuracy. The searching training only lead to very small improvements in reading but improved searching skills.

The third study found that training in searching for targets on a screen did not lead to any improvements in reading.[12]

The fourth study tested a computer-based training programme with tasks in visual exploration and reading gradually longer words and then series of words. It found greater improvements in both searching and reading speed and accuracy with this programme, compared to a visual attention training programme.[13]

Vision restoration therapy (VRT)

We were not able to find any evidence from rigorous scientific studies to indicate the effectiveness of VRT.[14] Low quality studies indicated only a small increase in the field of vision (2-5%), and some increase in reading speed, but it is unclear whether these changes would have occurred without VRT.[15-18] VRT is also an expensive treatment option compared to compensatory training.

What do we think?

Some positive evidence for improving reading speed in adults has been found for:

- compensatory training involving reading words that scroll across a screen
- compensatory training involving reading longer and longer single words and strings of words on a screen

However, it is not clear whether these would be effective strategies for children, particularly those learning to read.

We found no evidence that visual search training improves reading skills.

More research is needed to determine whether prisms, VRT, and other training methods are effective for helping children with hemianopia learn to read.

Signposts to other information

Eye care health services

Eye care health services are provided by a number of different professionals:[19]

Regulated by General Optical Council/Association of British Dispensing Opticians:

- *Dispensing Opticians* advise, fit and supply glasses and contact lenses.
- *Optometrists* examine eyes for defects, offer advice and make referrals to specialists.

Regulated by General Medical Council/Royal College of Ophthalmologists:

- *Ophthalmologists* are medical doctors who examine the eyes, determine the cause of vision loss, give glasses and treat eye conditions with drops, medicines or surgery. Ophthalmologists can certify patients as being sight impaired, which anyone with hemianopia is eligible for.

Regulated by Health Professions Council/British & Irish Orthoptic Society:

- *Orthoptists* focus on eye movement/ability of eyes to work together.

Other resources

The Royal Society for the Blind has produced a leaflet on Hemianopia: http://www.rsb.org.au/sites/all/themes/rsb/pdf/Homonymous-Hemianopia-DL-Brochure-(web).pdf

The Royal Society for Blind Children has a Family Support Service: http://www.rsbc.org.uk/our-services/family-support-service/

Vision UK's Starting Point provides information for parents and carers: https://www.visionuk.org.uk/startingpoint/

Ulster University has a page with information on assessment and strategies to try at home and at school: https://www.ulster.ac.uk/research/institutes/biomedical-sciences/research/optometry-and-vision-science-research-group/vision-resources/resources-for-professionals/cerebral-visual-impairment-assessment

Several online compensatory training programmes have been developed:

https://www.dur.ac.uk/psychology/research/drex/

http://www.readright.ucl.ac.uk/

https://www.wescfoundation.ac.uk/what-we-do/research-and-development/eyelander-online/

We would like to hear your feedback on this summary – please email us at pencru@exeter.ac.uk if you have any comments or questions.

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Note: the views expressed here are those of the Peninsula Cerebra Research Unit (PenCRU) at the University of Exeter Medical School and do not represent the views of the Cerebra charity, or any other parties mentioned.

We strongly recommend seeking medical advice before undertaking any treatments/therapies not prescribed within the NHS.

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