EBPX CAT

Evidence Topic

Eye movement exercises

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Evidence Question

Are eye movement exercises effective in improving academic performance for students with learning disabilities?

Question Background

Eye movements can play an important part in a child's ability to read. Efficient reading requires the ability for accurate eye movements and ability to translate this information within the brain. A literature review by Kulp and Schmidt (1996) showed a relationship between oculomotor efficiency and reading skills. Many problems can go wrong with the eye that can disrupt eye movements and/or transmission of information to the brain. These problems can include reduced visual acuity, low vision, visual field deficits, binocular vision disorders (strabismus), amblyopia, accommodative disorder, ocular motility disorders, nystagmus, and visual perception disorders. Vision therapy can often be used as treatment for many of these eye problems. Vision therapy is prescribed and implemented by an optometrist and consists of a program tailored to fit the individual. Vision therapy usually includes lenses, prisms, filters, occlusion, modalities, eye equipment and other specific procedures. Occupational Therapists and Optometrists can work

together to implement the vision therapy program, this is most often seen in hospitals and school systems. The Occupational Therapist usually performs the parts of the vision therapy program that consists of activities to improve eye movements, scanning, or visual information procession skills (Fishman-Hellerstein & Fishman, 1999).

Parameters of the Search

Parameters:

The original EBPX question was related to ocular motility exercises in the improvement of academics. A search was first completed looking for studies on ocular motility exercises within the occupational therapy (OT) literature and then progressed to searching literature within vision specific professions. Through researching the literature no articles were found on ocular motility related to academics in the OT or vision literature. Within searching the vision literature studies were found comparing eye movement exercises and vision therapy. The question was then broadened to eye movement exercises according to the research findings. All articles included within the CAT are from vision related journals, no articles were found within the occupational therapy journals.

The initial search only incorporated research within the last ten years. Only two studies were found related to the research question. An additional search was completed expanding to the most recent research within 20 years. Two more articles were found and included. These articles expanded on the use of vision therapy for children with reading problems.

<u>Keywords:</u> convergence, convergence insufficiency, dyslexia, exercises, eye exercises, eye movements, impaired vision, learning disabilities, ocular motility, perception scan, pursuits movement, reading, saccades, saccadic accuracy, saccadic movement, scanning, sensory integration, sensory training, vergence, vision, visual perception, vision therapy, and vision training program

Databases searched: CINAHL PUBMED MEDLINE ERIC Google Scholar Cochrane Collaboration National Guideline Clearinghouse

Websites, Resources:

• www.aota.org

- www.dr-s.net
- www.optometrists.org
- www.covd.org
- www.visionandlearning.org
- www.simplybrainy.com
- www.pave-eye.com
- www.ocp.org
- www.nora.cc
- www.aoa.org
- www.guideline.gov
- www.childrensvision.com

Evidence Table

Contains appraisals of evidence reviewed.

Key to Level of Evidence

(Level of evidence may be adjusted downward by EBPX team if study has poor rigor.)

Level	1	2	3	4	5
Type of Evidence	Systematic Reviews and meta-analyses	Randomized Control Trials (RCT)	Quasi-experimental and Comparative studies	Correlation and Non- experimental studies	Descriptive studies & Expert Opinion articles

Citation	Type of Evidence	Description of Evidence/ Type	Level of Evidence	Description of Population	Description of Intervention	Outcome/ Findings
Citation Rawstron, J.A., Burley, C.D., & Elder, M.J. (2005). A systematic review of the applicability and efficacy of eye exercises. Journal of Pediatric Ophthalmology	Type of Evidence & Access Systematic Review: database searched included AMED, SCSR, CCTR, EMBASE, & MEDLINE	Description of Evidence/ Type of studyI43 studies were reviewed, 14 clinical trails, 18 review articles, 2 historical articles, 1 case report, 6 editorial/letters, and 2 position statements from professional colleges	Level of Evidence	Description of Population Through the review of articles eye exercises were used with children and adults with the following vision problems: • vergence disorders • amblyopia • myopia • accommod ation	Description of Intervention Research articles for each vision problem were reviewed. For learning disabilities and dyslexia 4 articles were reviewed. 1. Learning disabilities, dyslexia, and vision: a subject review, 1998, by the American Academy of Pediatrics revealed that no significant or scientific evidence exists proving that eye exercises improve academic learning disabilities. 2. Vision training revisited, 1985, by Keogh and Pelland gathered information from optometrisrist, psychologist, and scientific/professional literature.	Outcome/ Findings There were not enough controlled studies that clearly supported the use of eye exercises in treating the before mentioned vision problems
42(2), 82-88.				 (focusing) learning disabilities/ dyslexia steroacuity sports vision training residual function (after brain damage) motion sickness 	 enough controlled studies to say if eye exercises assist those with learning disabilities. 3. Optometric vision therapy, results of a demonstration project with a learning disable population by Seiderman is a RCT including 18 pairs of children. One member of the pair was in the control group and the other in the experimental group. The experimental group received vision therapy. The study was conducted for 2 years with improvements in reading assessment (not spelling) and visumotor and perception measures (not in divergence break or recovery at near/distance). 4. Efficacy of vision therapy as assessed by the COVD quality of life checklist, 2002, by Maples and Bither indicated an improvement in symptoms after vision therapy. This trail did not have uniform inclusion criteria, consistent treatment and application of checklist, and there were no controls. 	except in the area of convergence insufficiency (CI). There were 15 studies with over 2,000 participants on vision therapy for patients with CI. The success rates in these studies rated about 70%.

Citation	Type of	Description	Level of	Description of	Description of Intervention	Outcome/ Findings
	Evidenc	of	Evidence	Population		
	e &	Evidence/				
	Access	Type of				
	D.CT	study		45 1 11 1 0 40	N 11 1	T
Scheiman, M.,	RCT	12 week,		47 children ages 9-18	Pencil push-ups	Each child was
Mitchell, L., Cotter,		masked,	2	who had	each participant was instructed to place a sharpened	assessed at the
S., Cooper, J.,		placebo-		symptomatic	pencil at arms length between there eyes and move the	beginning & the end of
Kulp, M., Rouse,		controlled,		convergence	pencil forward. An index card was taped to the wall in	the 12 weeks with the
M., et al. (2005). A		multicenter,		insufficiency.	front of them. When the participant could no longer see	CI symptom survey
randomized clinical		randomized		Eligibility	the index card on the wall they were to blink there eyes	15-item. A score of
trail of treatments		control trail.		requirements;	and repeat. 3 sets of 20 were completed per day at	less than 16 was
for convergence		Participants		exophoria at near at	home, 5 days per week.	considered a
insufficiency in		were		lest 4 times greater		successful outcome
children. Arch		randomly		than at far, receded	Office based vision therapy/orthoptics	and patients were
Ophthalmology,		assigned to		near point of	60 minute office visit and home program 15 minutes per	considered "cured."
<i>123</i> (1), 14-24.		either:		convergence break,	day, 5 days a week. A specific procedure and order of	Patients who
		pencil push-		and insufficient	treatments was followed:	experienced decrease
A larger study (221		ups, office		positive fusional	Accommodative Procedures	in symptoms were
children) was		based		convergence at near.	 Loose-lends accommodative facility 	considered
conducted in 2008		therapy/orth		Eligibility testing	• Letter chart accommodative facility	"improved." The
by the same		optics, or a		included the 13 item	Binocular accommodative facility	office based treatment
research team. A		placebo		CI symptoms Survey	Convergence Procedures	8/15 achieved the
4th treatment was		office based		and a variety of	Barrel card	cured status while only
added combining		therapy/orth		vision tests including;	Brock string	1/12 in the placebo,
computer vision		optic.		best corrected visual	Divergence Procedures	and $0/11$ in the pencil
therapy with pencil				acuity	Vectograms	push-up group.
push-ups. The				(distance/near),	Computer orthoptics	
other 3 treatments				cycloplegic	• Aperture rule	The results indicated
mentioned in the				refraction,	• Eccentric circles free-space fusion cards	office based vision
2005 study were				sensorimotor, near	 Loose prism facility 	therapy is effective in
completed exactly				point of convergence,		improving the
the same. In the				positive/negative	Placebo office based vision therapy/orthoptics	symptoms and signs of
end the same				fusional vergence at	Was conducted in the same procedural way as the real	CI. Pencil push-ups
conclusion was				near, near	treatment using placebo accommodative and vergence	were proven to not be
reached with a 66%				stereoacuity,	methods as treatment. There was no expectation of	effective.
"cured" status for				accommodiative	affecting vergenence, accommodative, or saccadic	
those in the office				amplitude, and	function	
based vision group.				accommodiative		
				facility.		

Citation	Type of	Description	Level of	Description of	Description of Intervention	Outcome/ Findings
	Evidenc	01 Evidence/	Evidence	Population		
	Access	Type of				
		study				
Alinon D., Nemet P., Ishay A., & Karni, E. (1993). A randomized prospective		blind prospective study divided into 3 treatment groups	2	reading disabilities having 100% poor fusional convergence, 60% receded near point convergence, and several had	 Group one received orthoptic (the same as vision therapy) treatments including Tibbs Binocular trainer, physiologic diplopia instruction, framing and bar reading exercises, and loose prism convergence training. Group two received conventional reading 	strain) symptoms were eliminated in the orthoptic treatment group. Reading improved significantly in both the orthoptic
masked and matched comparative study of orthoptic treatment verses conventional reading tutoring treatment for				asthenopic (eye strain) symptoms 62 children completed the study	 tutoring Group three was the control and received no treatment Each child received 40 sessions for 20 minutes a day. 	and tutoring groups but not in the control group. The study concluded that orthoptic therapy is as effective as reading tutoring in improving reading for children with learning disabilities. Orthoptic
reading disabilities in 62 children. <i>Binocular</i> <i>Vision and Eye</i> <i>Muscle Surgery</i> <i>Quarterly, 8</i> , 91-106.						therapy is beneficial in eliminating eye strain.

Citation	Type of	Description	Level of	Description of	Description of Intervention	Outcome/ Findings
	Evidenc	of	Evidence	Population		
	е &	Evidence/				
	Access	Type of				
		study				
Getz, D.J.	RCT	Posttest only		120-2 nd grade	Background on study: A school district hired an	Significant results
(1980).		control	2	students from 4	optometrist to conduct a program to assist there students	were found for both
Learning		group design		different elementary	who were poor readers by implementing a vision	the reading measures
anhanaamant		with random		schools who were	training program. This study was conducted by the	(California and wild
		assignment		assessed as poor	school before implementing the vision program to prove	range). These tests
through visual		of subjects		readers. At the end	the program worked. The optometrist trained the special	indicated that the
training.		using a two-		of the study only 70	education teachers in each school to implement the	vision training
Academic		tailed t test		students, who had	vision training.	program improved
<i>Therapy</i> , <i>14</i> (4),		with a 0.05		completed at least		reading skills over the
457-66		level of		80% of the study,	Study consisted of 2 treatment groups: One half of the	control group with an
+57 00.		significance		were included in the	120-2 ^m graders were the control group receiving general	additional mean
		A		results.	special education services to assist with reading and the	growth of 2 months for
		A pre and		Ta slavion onitania	other half were treated with the vision training program.	the California test
		post		inclusion criteria	The vision thereasy are sensisted of 1.5 hours a	(reading) and a
		optometric		feiled the Dender	dev. five deve a week for 4 months. Vision training was	additional mean
		the shildren		Costalt Test or	approximately a week for 4 months. Vision training was	the wild range
		who		optometric screening	total of 40 hours of therapy. Therapy consisted of 52	(reading and word
		completed		and who scored in the	specific activities. The activities were outlined in a	(recognition)
		the study		bottom 25% on the	manual given to the special education teachers by an	The second secon
		was		1 st grade Cooperative	optometrist hired by the school Activities included	There was only I
		administered		Primary Test	general games (jig saw puzzle simon says) vision	month additional mean
		but was not		r minary rost.	specific (convergence, penlight versions, fixations.).	the vision training for
		part of the			motor, chalkboard, and balance.	the spelling section of
		experimental				the wild range which
		design			At the end of the 4 months the 70 students with 80%	was not significant
		8			program completion were assessed with the following	The study concluded
					post-test measures: California cooperative primary	that vision training
					(standardized reading test), Spelling section of the Wild	gives significant
					Range Achievement test, and the reading section of the	gives significant results for children
					Wild Range Achievement test.	with reading problems
						in the area of reading
						and word recognition
						but not in spelling.

EBPX Summary

There is not enough evidence to clearly state if eye exercises improve academic performance in school aged children.

The studies reviewed revealed that pencil push-ups is the most widely used eye exercise, The studies comparing eye exercise to vision therapy all used pencil push-ups as the eye exercise. Pencil push-ups are a convergence (reading) and divergence (distant focus) exercise holding a pencil in between the eyes and moving it backward and forward. Evidence indicated that pencil push-ups do not have significant effect in improving reading and/or reducing eye strain.

Vision therapy consists of combining a variety of vision instruments, eye exercises, and prism lenses within several therapy sessions most often in a clinic. Convergence insufficiency is the vision problem that the literature pointed to as having the most significant results when treated with vision therapy. When compared to reading tutoring, vision therapy had the same results in that they both showed improvement in reading skills however vision therapy completely eliminated eye strain as well as improved reading.

EBPX Strength and Impact Summary

There is NO EVIDENCE that eye exercises improve academic performance in school children. Based on individual response, methods without evidence are appropriate if methods backed by evidence have been ineffective for this person. Therapists are cautioned to carefully measure individual outcomes when selecting this intervention

References

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