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Orthoptics (Vergence/Accommodative Therapy), Visual Exercises or Training

Table of Contents
Coverage
Policy Guidelines
Description
Rationale
Coding
References
Policy History

Related Policies (if applicable)
None

Disclaimer

Carefully check state regulations and/or the member contract.
Each benefit plan, summary plan description or contract defines which services are covered, which services are excluded, and which services are subject to dollar caps or other limitations, conditions or exclusions. Members and their providers have the responsibility for consulting the member's benefit plan, summary plan description or contract to determine if there are any exclusions or other benefit limitations applicable to this service or supply. If there is a discrepancy between a Medical Policy and a member's benefit plan, summary plan description or contract, the benefit plan, summary plan description or contract will govern.

Coverage

Office-based vergence/accommodative therapy for up to 12 weeks **may be considered medically necessary** for individuals with symptomatic convergence insufficiency if, following a minimum of 12 weeks of home-based therapy (e.g., push-up exercises using an accommodative target; push-up exercises with additional base-out prisms; jump-to-near convergence exercises; stereogram convergence exercises; recession from a target; and maintaining convergence for 30-40 seconds), symptoms have failed to improve.

Convergence insufficiency and stereoacuity is documented by:

- Exodeviation at near at least 4 prism diopters greater than at far vision; AND
- Insufficient positive fusional vergence at near (positive fusional vergence <15 prism diopters blur or break) on positive fusional vergence testing using a prism bar; AND
- Near point of convergence break of >6 cm; AND
- Appreciation by the individual of at least 500 seconds of arc on stereoacuity testing.

Orthoptic eye exercises **are considered experimental, investigational, and/or unproven** for the treatment of learning disabilities.

Orthoptic eye exercises **are considered experimental, investigational, and/or unproven** for all other conditions, including but not limited to the following:

- Slow reading;
- Visual disorders other than convergence insufficiency (e.g., convergence excess).

Vision restoration therapy (VRT) **is considered experimental, investigational and/or unproven,** including but not limited to the treatment of visual field deficits following stroke or neurotrauma.

Policy Guidelines

None.

Description

Orthoptic Training

Orthoptic training refers to techniques designed to correct accommodative and convergence insufficiency or convergence dysfunction, which may include push-up exercises using an accommodative target of letters, numbers, or pictures; push-up exercises with additional base-out prisms; jump-to-near convergence exercises; stereogram convergence exercises; and/or recession from a target. (1) A related but distinct training technique is behavioral or perceptual vision therapy, in which eye movement and eye-hand coordination training techniques are used to improve learning efficiency by optimizing visual processing skills.

In addition to its use in the treatment of accommodative and convergence dysfunction, orthoptic training has been investigated for treating attention deficient disorders, dyslexia, dysphasia, and reading disorders.

Vision Restoration Therapy (VRT)

VRT is an in-home computer-based program designed to strengthen the visual information processing of residual neuronal structures that have survived following acute lesions of the nervous system resulting from neurotrauma, stroke, inflammation, or elective surgery for removal of brain tumors. In VRT, patients focus on a central point on a computer screen and respond each time they see light stimuli appear. The light stimuli are presented in the area most likely to recover visual function and will change as treatment progresses and vision is improved. By repeated activation through the course of the therapy, patients use the program to train and improve their impaired visual functions with the goal of regaining vision in the area of the visual field deficit. (2)

Regulatory Status
On April 22, 2003, NovaVision™ VRT (Boca Raton, FL.) was approved through the U.S. Food and Drug Administration (FDA) 510(k) process (K023623) for the diagnosis and improvement of visual functions in patients with impaired vision that may result from trauma, stroke, inflammation, surgical removal of brain tumors or brain surgery, and may also be used to improve visual function in patients with amblyopia. (3) FDA Product Code: HPT.

Rationale

This medical policy was created in 1998 and has been updated regularly with searches of the PubMed database. The most recent literature update was performed through July 31, 2024.

Medical policies assess the clinical evidence to determine whether the use of a technology improves the net health outcome. Broadly defined, health outcomes are length of life, quality of life (QOL), and ability to function-including benefits and harms. Every clinical condition has specific outcomes that are important to patients and to managing the course of that condition. Validated outcome measures are necessary to ascertain whether a condition improves or worsens; and whether the magnitude of that change is clinically significant. The net health outcome is a balance of benefits and harms.

To assess whether the evidence is sufficient to draw conclusions about the net health outcome of a technology, 2 domains are examined: the relevance and the quality and credibility. To be relevant, studies must represent one or more intended clinical uses of the technology in the intended population and compare an effective and appropriate alternative at a comparable intensity. For some conditions, the alternative will be supportive care or surveillance. The quality and credibility of the evidence depend on study design and conduct, minimizing bias and confounding that can generate incorrect findings. The randomized controlled trial (RCT) is preferred to assess efficacy; however, in some circumstances, nonrandomized studies may be adequate. RCTs are rarely large enough or long enough to capture less common adverse events and long-term effects. Other types of studies can be used for these purposes and to assess generalizability to broader clinical populations and settings of clinical practice. The following is a summary of key literature to date.

Orthoptic Training for Convergence Insufficiency
Clinical Context and Therapy Purpose
Convergence insufficiency is a binocular vision disorder associated with defects in the eyes' ability to turn inward toward each other (e.g., when looking at near objects). The diagnosis of convergence insufficiency is made when individuals have a remote near point of convergence or difficulty in sustaining convergence in conjunction with sensations of visual or ocular discomfort at near vision. Symptoms of this common condition may include eyestrain, headaches, blurred vision, diplopia, sleepiness, difficulty concentrating, movement of print, and loss of comprehension after short periods of reading or performing close activities. Prism

reading glasses, home therapy with pencil push-ups, and office-based vision therapy and orthoptics have been evaluated for the treatment of convergence insufficiency.

The purpose of orthoptic training in individuals who have convergence insufficiency is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The following PICO was used to select literature to inform this policy.

Populations
The relevant population of interest is individuals with convergence insufficiency.

Interventions
The treatment being considered is in-office orthoptic training. Orthoptic training refers to techniques designed to correct accommodative and convergence insufficiency (or convergence dysfunction).

Comparators
The comparator of interest is standard management of convergence insufficiency with at-home vision training exercises.

Outcomes
The general outcomes of interest are symptoms and functional outcomes.

Timing of intervention is approximately 12 weeks of in-office training, followed by 6 months of at-home training. Follow-up at 1 year or more is preferable.

Study Selection Criteria
Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs.
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
- Studies with duplicative or overlapping populations were excluded.

Systematic Reviews
At least 2 systematic reviews have addressed the role of orthoptic training for convergence insufficiency. A systematic review by Rawstron et al. (2005) assessing the applicability and efficacy of eye exercises found that small, controlled trials and a large number of cases supported their use in the treatment of convergence insufficiency. (4) Scheiman et al. (2020) conducted a systematic review and network meta-analysis of RCTs that evaluated nonsurgical treatments for convergence insufficiency. (5) Six trials in children (n=968) were analyzed. When treatment success was defined as a composite of normal clinical convergence parameters and a

prespecified magnitude of improvement, office-based vergence/accommodative (orthoptic) training with home reinforcement was more likely to lead to a successful outcome than home-based computer training (risk ratio, 1.96; 95% confidence interval [CI], 1.32 to 2.94) and home-based pencil/target push-up training (risk ratio, 2.86; 95% CI, 1.82 to 4.35). An analysis that defined treatment success as a composite of both improved convergence parameters and improved symptoms found that office-based training with home reinforcement was more effective than home-based computer training (risk ratio, 4.65; 95% CI, 1.23 to 17.54) or home-based pencil push-up training (risk ratio, 4.41; 95% CI, 1.26 to 15.38); however, these findings were based on low-certainty evidence. Six RCTs in adults were included, but none compared office-based and home-based orthoptic training. Three trials in adults compared office-based training to placebo; results were limited, and the authors concluded that the benefit of orthoptic training in adults was less clear overall than in children.

Randomized Controlled Trials

In 2008, the Convergence Insufficiency Treatment Trial (CITT) Study Group reported on an RCT of 221 children with symptomatic convergence insufficiency. (6) Symptoms were evaluated by the Convergency Insufficiency Symptom Survey (CISS), a 15-item survey with a final score ranging from 0 (least symptomatic) to 60 (most symptomatic). Scores of less than 16 were considered "asymptomatic," and a decrease of 10 or more points was considered "improved." On blinded evaluation after 12 weeks of treatment (99% completion rate), 73% of patients treated with office-based therapy were considered to be successful or improved on the composite outcome of CISS, near point convergency (NPC), and positive fusional vergency (PFV), as defined above, compared with 43%, 33%, and 35% of those treated with home pencil push-ups, home computer exercise, or placebo, respectively. At 1-year follow-up, 88% of the 32 children who were asymptomatic at the completion of the 12-week office-based treatment program remained successful or improved; 67% of the home-based pencil push-up group remained successful or improved. (7) A limitation of this RCT is that near consisted of multiple therapies, making it difficult to correlate outcomes with specific modalities.

Following the publication of the main results of the CITT trial, a number of re-analyses were performed. The effectiveness of these forms of vision therapy (pencil push-ups, home computer exercises, office-based vision therapy) in improving accommodative amplitude in 164 (74%) of the 221 children who had coexisting accommodative dysfunction with convergence insufficiency was reported by the CITT Study Group in 2011. (8) Of the 164 children with accommodative dysfunction, 63 (29%) had a decreased amplitude of accommodation, 43 (19%) had decreased accommodative facility (latency and speed of the accommodative response), and 58 (26%) had both. After 12 weeks of treatment, increases in amplitude of accommodation were significantly greater in the 3 active groups (range, 5.8-9.9 diopters) compared with office-based placebo therapy (2.2 diopters). The percentage of children who no longer showed decreased amplitude of accommodation was 91.4% for office-based therapy, 79.3% for home computer therapy, 74.1% for home pencil push-ups, and 35.7% for placebo treatment. Accommodative facility improved by 9.4 cycles per minute (cpm) for office-based therapy, 7.0 cpm for home computer-based therapy, 5.0 cpm for home pencil push-ups, and 5.5 cpm for office-based placebo therapy; only the office-based therapy showed significantly greater

improvement than office-based placebo therapy. One year after completion of therapy, recurrence of decreased accommodative amplitude was found in 5 (11%) of 44 children and in 4 (12.5%) of 32 children who did not undergo subsequent treatment.

The effect of successful treatment for convergence insufficiency on parents' perception of academic behavior in the 218 children who completed this trial was also reported by the CITT group (2012). (9) Participants were classified as successful (n=42), improved (n=60), or nonresponder (n=116) after 12 weeks of treatment. This study used the Academic Behavior Survey (ABS), a 6-item questionnaire (scoring range, 0-24 points) developed by the CITT Study Group to quantify parents' perceptions of the frequency of adverse behaviors exhibited by children when reading or performing schoolwork (5 questions) and overall parental concern about the child's academic performance (1 question). Mean ABS score at baseline was 12.85 points and improved by 4.0, 2.9, and 1.3 points in children classified as successful, improved, and nonresponder, respectively. Improvements in ABS scores correlated with reductions in symptom level (r=0.29), but not changes in measures of convergence. Although the ABS has not been validated outside of this study, the effect sizes in the successful and improved groups were 0.9 and 0.7, representing a clinically meaningful change.

In 2012, the CITT Study Group reported a post hoc analysis of this RCT on the effect of convergence insufficiency treatment on specific types of symptoms. (10) Outcomes were measures on the CISS, which has 2 subscales: a performance-related subscale consisting of 6 symptoms related to visual efficiency when reading or performing near work (e.g., loss of place with reading) and an eye-related subscale consisting of 9 symptoms specific to visual function or asthenopic-type complaints (e.g., eye pain). Those with a "treatment response" (improvement of at least 8 points) on the overall CISS score demonstrated improvements in both the performance-related subscale and the eye-related subscale (mean, 1.1 points). Further research is needed to determine whether the treatment-related improvement in performance-related symptoms seen with orthoptics training translates into improvements in reading performance and attention.

In 2019, results of the CITT-Attention & Reading Trial (CITT-ART) were published. (11) Children with convergence insufficiency were randomized to 16 weeks of weekly office-based vergence/accommodative therapy or office-based placebo therapy. Both groups performed home exercises 15 minutes per day, 5 days per week. The study outcomes for convergence ability and symptoms were the same as the outcomes in the CITT. After 16 weeks, mean CISS had decreased from baseline by -11.8 (95% CI, -13.4 to -10.3) and -10.4 (95% CI, -12.4 to -8.4) in the therapy and placebo groups, respectively, which was statistically similar between groups. There was no difference in the proportion of patients in each group that achieved normal or improved symptoms. Significantly more patients in the therapy group versus the placebo group met the criteria for normal or improved near point of convergence ($p<0.001$) and positive fusional vergence ($p<0.001$). Several composite outcomes for treatment success found significant improvements with therapy versus placebo. Interpretation of the symptom comparisons in this trial may be limited by the clinically relevant improvement in symptoms in the placebo group. Results for accommodation were published separately by Chen et al. (2021).

(12) Among the 288 children in the CITT-ART study with decreased accommodative amplitude or facility, normal amplitude (69% versus 32%; p<0.0001) and facility (85% versus 49%; p<0.0001) were achieved by significantly more patients in the therapy group compared to the placebo group, respectively. In a separate publication, results for improvement in reading comprehension were not significantly different between the therapy and placebo groups. (13) Reading comprehension subtest scores of the Wechsler Individual Achievement Test, Third Edition (WIAT-III) increased by 3.68 points in the therapy group and 3.8 points in the placebo group (difference -0.12; 95% CI, -1.89 to 1.66). All other reading outcome measures were also similar between groups.

Singh et al. (2021) published results of an RCT in 176 children and young adults (aged 9 to 30 years, mean 19 years) with symptomatic convergence insufficiency. (14) Patients were randomized to 6 weeks of office-based orthoptic therapy (3 times per week) or home-based pencil push-up exercises (15 minutes per day). At study end, there was no difference between groups in near point of convergence or CISS scores, but there was a significantly greater improvement in positive fusional vergence with office-based therapy compared to home-based exercises (p<0.001). Limitations of this study include lack of blinding, a wide range of patient ages, short duration compared to other studies, 20% to 30% loss to follow-up leading to a lack of power, and the study was conducted at a single center in India.

Alvarez et al. (2020) conducted the Convergence Insufficiency Neuro-Mechanism in Adult Population Study, a small RCT (N=50) that compared 6 weeks of twice weekly office-based vergence/accommodation therapy and office-based placebo therapy in young adults (aged 18 to 35 years) with symptomatic convergence insufficiency. (15) All patients performed home-based computer exercises 10 minutes per day, 3 days per week. Outcomes included change in near point of convergence, positive fusional vergence, and CISS scores. Both near point of convergence (p<0.01) and positive fusional vergence (p<0.001) were significantly improved with office-based therapy compared to placebo, but there was no difference between groups in symptom scores (2.3 points; 95% CI, -8.3 to 4.6; p=0.6).

Tables 1 and 2 summarize the key RCTs in patients with convergence insufficiency.

Table 1. Summary of Key RCT Characteristics

Study; Trial	Countries	Sites	Dates	Participants	Interventions	
					Active	**Comparator**
Convergence Insufficiency Treatment Trial Study Group (2008) (6)	U.S.	9	2005-2006	Children aged 9 to 17 years, exodeviation at or near at least 4 prism diopters greater than at distance, insufficient	Office-based vergence therapy with home reinforcement; weekly visits and 15 minutes/day, 5 days/week for	Home-based pencil push- up therapy; 15 minutes/day, 5 days/week for 12 weeks; n=54 Home-based computer

				positive fusional convergence, receded near point of convergence of ≥6 cm break, best corrected visual acuity of 20/25 in both eyes at distance and near, CISS score ≥16, not previously treated with pencil push-up or vergence orthoptic therapy	12 weeks; n=60.	vergence therapy with pencil push-ups; 20 minutes/day, 5 days/week for 12 weeks; n=53 Office-based placebo therapy with home reinforcement; weekly visits and 15 minutes/day, 5 days/week for 12 weeks; n=54
CITT-ART Investigator Group (2019); CITT-ART (11)	U.S.	9	2014-2017	Children aged 9 to 14 years with exodeviation at or near at least 4 prism diopters greater than at distance, insufficient positive fusional convergence, receded near point of convergence of ≥6 cm break, best corrected visual acuity of 20/25 in both eyes at	Office-based vergence therapy with home reinforcement; weekly visits and 15 minutes/day, 5 days/week for 16 weeks; n=206	Office-based placebo therapy with home reinforcement; weekly visits and 15 minutes/day, 5 days/week for 16 weeks; n=104

				distance and near, CISS score ≥16, not previously treated with office-based or home-based vergence therapy		

CISS: Convergence Insufficiency Symptom Survey; CITT-ART: Convergence Insufficiency Treatment Trial - Attention & Reading Trial; cm: centimeter; n: number; RCT: randomized controlled trial; U.S.: United States.

Table 2. Summary of Key RCT Results

Study	Change in Convergence Insufficiency Survey Symptom score[a] (mean, 95% CI)	Symptoms resolved or improved at end of study[b]	Convergence ability normal or improved at end of study[c]
CITT Study Group (2008) (6)	N=221	N=218	N=218
Office-based vergence therapy	-14.8 (-17.2 to -12.4)	72.9%	72.9-95.0%
Home-based pencil push-up therapy	-7.1 (-9.6 to -4.5)	47.1%	56.6-77.4%
Home-based computer vergence therapy with pencil push-ups	-6.0 (-8.6 to -3.4)	38.5%	59.6-77.0%
Office-based placebo therapy	-7.8 (-10.4 to -5.3)	42.6%	44.5-59.3%
Mean difference (95% CI); p-value	Office-based vergence therapy vs. home-based pencil push- ups: 7.9 (4.4 to 11.4); p<0.001 Office-based vergence therapy vs. home-based computer vergence	Office-based vergence therapy vs. home-based pencil push-ups: p=0.008 Office-based vergence therapy vs. home-based computer vergence therapy with pencil push-ups: p=0.006	Office-based vergence therapy vs. home-based pencil push-ups: p<0.05 Office-based vergence therapy vs. home-based computer vergence therapy with pencil push- ups:

	therapy with pencil push-ups: 8.4 (4.9 to 11.9); p<0.001		p<0.05
CITT-ART Investigator Group (2019); CITT-ART (11)	N=311	N=311	N=311
Office-based vergence therapy	-11.8	61.8%	92.4-95.5%
Office-based placebo therapy	-10.4	58.7%	50.0-67.3%
Mean difference (95% CI); p-value	1.5 (-3.8 to 0.8); p=0.21	p=NS	p<0.001

CI: confidence interval; CISS: Convergence Insufficiency Symptom Score; CITT: Convergence Insufficiency Treatment Trial; CITT-ART: Convergence Insufficiency Treatment Trial - Attention & Reading Trial; NS: not significant; RCT: Randomized controlled trial; vs: versus.

[a] Based on the Convergence Insufficiency Symptom Survey, a 15-item survey with scores ranging from 0 (least symptomatic) to 60 (most symptomatic). A score of <16 is considered asymptomatic, and a decrease of ≥10 points is considered improved.

[b] Asymptomatic (CISS Score <16) or improved (change in CISS Score ≥10 points).

[c] Based on near point convergency and positive fusional vergency. A "normal" near point convergency was defined as <6 cm, and an improved near point convergency was defined as an improvement (decrease) of >4 centimeters from baseline to follow-up. To be classified as having normal positive fusional vergency, a patient had to pass Sheard's criteria (i.e., positive fusional vergency blur, or if no blur, then a break value at least twice the near phoria magnitude) and have a positive fusional vergency blur/break of >15 prism diopters. Improvement in positive fusional vergency was defined as an increase of ≥10 prism diopters from baseline to follow-up.

Tables 3 and 4 display notable limitations identified in each study.

Table 3. Study Relevance Limitations

Study	Population[a]	Intervention[b]	Comparator[c]	Outcomes[d]	Duration of Follow-up[e]
Convergence Insufficiency Treatment Trial Study Group (2008) (6)				3 - harms briefly described in text	
CITT-ART Investigator Group (2019); CITT-ART (11)	3 - patients with learning or developmental disabilities		2 - placebo involved some eye exercises and may have had		

	were not excluded		a therapeutic effect		

CITT-ART: Convergence Insufficiency Treatment Trial - Attention & Reading Trial
The evidence limitations stated in this table are those notable in the current literature review; this is not a comprehensive gaps assessment.
[a] Population key: 1. Intended use population unclear; 2. Clinical context is unclear; 3. Study population is unclear; 4. Study population not representative of intended use.
[b] Intervention key: 1. Not clearly defined; 2. Version used unclear; 3. Delivery not similar intensity as comparator; 4. Not the intervention of interest.
[c] Comparator key: 1. Not clearly defined; 2. Not standard or optimal; 3. Delivery not similar intensity as intervention; 4. Not delivered effectively.
[d] Outcomes key: 1. Key health outcomes not addressed; 2. Physiologic measures, not validated surrogates; 3. No CONSORT reporting of harms; 4. Not establish and validated measurements; 5. Clinical significant difference not prespecified; 6. Clinical significant difference not supported.
[e] Follow-Up key: 1. Not sufficient duration for benefit; 2. Not sufficient duration for harms.

Table 4. Study Design and Conduct Limitations

Study	Allocation[a]	Blinding[b]	Selective Reporting[c]	Data Completeness[d]	Power[e]	Statistical[f]
Convergence Insufficiency Treatment Trial Study Group (2008) (6)		1 - office vs. home therapy				
CITT-ART Investigator Group (2019); CITT-ART (11)						

CITT-ART: Convergence Insufficiency Treatment Trial - Attention & Reading Trial
The evidence limitations stated in this table are those notable in the current literature review; this is not a comprehensive gaps assessment.
[a] Allocation key: 1. Participants not randomly allocated; 2. Allocation not concealed; 3. Allocation concealment unclear; 4. Inadequate control for selection bias.
[b] Blinding key: 1. Not blinded to treatment assignment; 2. Not blinded outcome assessment; 3. Outcome assessed by treating physician.
[c] Selective Reporting key: 1. Not registered; 2. Evidence of selective reporting; 3. Evidence of selective publication.
[d] Data Completeness key: 1. High loss to follow-up or missing data; 2. Inadequate handling of missing data; 3. High number of crossovers; 4. Inadequate handling of crossovers; 5. Inappropriate exclusions; 6. Not intent to treat analysis (per protocol for noninferiority trials).
[e] Power key: 1. Power calculations not reported; 2. Power not calculated for primary outcome; 3. Power not based on clinically important difference.
[f] Statistical key: 1. Analysis is not appropriate for outcome type: (a) continuous; (b) binary; (c) time to

event; 2. Analysis is not appropriate for multiple observations per patient; 3. Confidence intervals and/or p values not reported; 4. Comparative treatment effects not calculated.

Nonrandomized Comparative Studies

Shin et al. (2011) reported on a nonrandomized comparative study of office-based vision therapy. (16) Fifty-seven children with symptomatic convergence insufficiency or combined convergence insufficiency and accommodative insufficiency were divided into a treatment and a sham control group, matched by age and sex. Vision therapy was performed in the school clinic 2 times a week with instructions for home exercises to be performed for 15 to 25 minutes a day during the week. After 12 weeks of office-based vision therapy, the mean College of Optometrists in Vision Development QOL questionnaire score decreased from 27.07 to 10.40, and NPC improved from 8.67 to 3.20 in the children with convergence insufficiency. Mean PFV improved from 13.93 to 26.80. Sixty-seven percent of the children were considered to have been cured, and 82% were improved. There were no significant changes between baseline and 12-week follow-up for the control group. Of the 20 children in the treatment group who completed a 1-year follow-up, 3 (15%) showed recurrence.

Dusek et al. (2011) reported on a nonrandomized comparative study of 134 children with convergence insufficiency who had been referred to a tertiary care center in Austria for reading difficulties. (17), Thirty-two participants refused all treatment offered (control group); the remaining children were given base-in prism reading glasses (n=51) or computerized home vision therapy (n=51) based on preference. Parents were instructed to ensure that their child carried out the procedure correctly; compliance was verified weekly. All participants were examined for total reading time, reading error score, amplitude of accommodation, and binocular accommodative facility at baseline and after 4 weeks. Prismatic reading glasses were not worn during testing. Significant improvements were found in the prism glasses and computer exercise groups for total reading time, reading error score, amplitude of accommodation, binocular accommodative facility, and vergence facility. For example, reading speed improved by 21 seconds in the reading glasses group, by 12 seconds in the computer exercise group, and by 4 seconds in the control group. Mean amplitude of accommodation improved by 1.4 diopters in the reading glasses group, by 1.0 diopters in the computer exercise group, and by 0.3 diopters in the control group. The only significant improvement for the control group was vergence facility. Although this nonrandomized study had the potential for selection and performance bias, the results suggested that base-in prism reading glasses might be an effective treatment for CI and associated reading problems in children.

Lee et al. (2014) reported on results from a small nonrandomized, controlled trial of vision therapy in children with vergence insufficiency and symptomatic attention-deficit/hyperactivity disorder (ADHD). (18) Of 1,123 children (age range, 8-13 years) who were screened for ADHD, 81 were identified as having symptomatic ADHD; of those, 16 were identified as having accommodative dysfunction on binocular function testing. Eight subjects received vision therapy, and the remainder acted as a control group; eligibility criteria for vision therapy included: high exophoria at near vision (>6 prism diopters), exophoria at near vision at least 4 prism diopters greater than at distant vision, a receded near point of convergence break (>6

cm), or insufficient PFV at near vision, failing Sheard's criterion (PFV less than twice the near phorias), or a minimum PFV of 15 prism diopters or less base-out blur or break. Vision therapy included progressive home- and office-based convergence and accommodative exercises over 12 weeks. At the 12-week follow-up, intervention group subjects demonstrated improvements in NPC (11.50 to 4.38 cm; p<0.05), breakpoint of near PFV (11.88 to 32.38 cm; p<0.01), recovery point of near PFV (6.38 to 19.75 cm; p<0.01), and near exophoria (12.00 to 7.81 cm; p<0.05). ADHD symptoms, as measured by the parent-reported Korea-ADHD Rating Scale, improved from 23.25 at baseline to 17.13 (p<0.05) after vision therapy. Only within-group comparisons were reported. Control group subjects did not demonstrate improvements in vision metrics or Korea-ADHD Rating Scale scores.

In a small randomized comparative study, Momeni-Moghaddam et al. (2015) compared the effectiveness of pencil push-up therapy with office-based vision therapy in 60 individuals with convergence insufficiency (mean age, 21.3 years). (19) Subjects received either pencil push-up therapy or office-based therapy without home intervention and underwent reevaluation at 4 and 8 weeks after the start of treatment. With a single exception, the 2 groups did not differ significantly regarding the NPC, phoria, and PFV. After 4 and 8 weeks of follow-up, PFV was significantly more improved in the pencil push-up therapy group (p=0.001). Study authors suggested that pencil push-up therapy and office-based vision therapy were largely comparable for treatment of convergence insufficiency (CI).

Noncomparative Studies

Borsting et al. (2016) published results of a single-arm multicenter study, the CITT–Reading Study. (20) Investigators evaluated parent-reported behavioral and emotional problems at baseline among children with symptomatic convergence insufficiency and after 16 weeks of office-based vergence accommodative therapy. The intervention was consistent with that administered in the CITT trial. Parent-reported ADHD symptoms were assessed with the Conners 3 ADHD Index (Conners 3AI) and behavioral and emotional symptoms with the 120-item Child Behavior Checklist. Of the 53 children enrolled, 48 consented to office-based therapy and 44 completed therapy and provided posttreatment data. After completion of therapy, there were significant within-subject improvements in CISS scores and in Conners 3 ADHD Index scores (d=0.58, significantly different from zero). Subjects also demonstrated statistically significant improvements in the Child Behavior Checklist competency-related subscale related to school performance but not to social- or activities-related performance. On Child Behavior Checklist's symptom-related subscales, there were statistically significant improvements in the anxious/depressed, somatic complaints, and internalizing problems subscales. This study provided some evidence that ADHD-like and emotional and behavior problems may improve among children with symptomatic CI after office-based vision therapies. However, the study's small size and lack of a control group preclude making definitive conclusions about the efficacy of this treatment.

Section Summary: Orthoptic Training for Convergence Insufficiency

At least 2 systematic reviews support the efficacy of orthoptic training for convergence insufficiency, especially in children. The most direct evidence on office-based orthoptic training

comes from a 2008 RCT that demonstrated that office-based vision training improves symptoms of convergence insufficiency in a greater percentage of patients than a home-based vision exercise program. Subgroup analyses of this RCT demonstrated improvements in accommodative vision, parental perception of academic behavior, and specific convergence insufficiency related symptoms. However, in this trial, as in others, the home-based regimen did not include the full range of home-based therapies, which may have biased results in favor of orthoptic training. Another RCT published in 2019 did not find a difference in symptoms of convergence insufficiency between office-based orthoptic training plus home exercises and office-based placebo therapy plus home exercises, possibly due to notable improvements in symptoms in the placebo group.

Orthoptic Training for Learning Disabilities

Clinical Context and Therapy Purpose

Some learning disabilities, particularly those in which reading is impaired, have been associated with deficits in eye movements and/or visual tracking. For example, many dyslexic individuals may have an unstable binocular vision and report that letters appear to move around, causing visual confusion.

The purpose of orthoptic training in individuals who have learning disabilities is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The following PICO was used to select literature to inform this policy.

Populations

The relevant population of interest is individuals with learning disabilities, including attention deficit disorders, dyslexia, dysphasia, and reading disorders. Diagnosis of learning disabilities should be conducted by a qualified, licensed professional. Attention deficit disorder can be diagnosed by professionals qualified and licensed to do so, as well as by psychiatrists and physicians, although only medical doctors can prescribe medication.

Interventions

The treatment being considered is office-based orthoptic training for learning disabilities.

Comparators

The comparator of interest is standard management of learning disabilities. The practices currently being used to treat learning disabilities vary depending on the type of disability, but they could include receiving special services at school such as individualized education programs and accommodations.

Outcomes

The general outcome of interest is functional outcomes.

The limited available literature showed that approximately 12 sessions over 5 weeks are needed to assess results. Longer-term follow-up was not indicated. (21)

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs.
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
- Studies with duplicative or overlapping populations were excluded.

Systematic Review

A 2005 systematic review evaluating the applicability and efficacy of eye exercises found no clear scientific evidence to support the use of eye exercises for other disorders (e.g., learning disabilities, dyslexia), except convergence insufficiency. (4)

Randomized Controlled Trials

Two studies focused on the use of tinted lenses and eye patching as a technique to steady binocular vision for dyslexia. Stein et al. (2000) reported on results of a randomized trial in which 143 dyslexic children were instructed to wear yellow-tinted glasses with or without the left lens occluded. (22) Children were instructed to wear these glasses when reading or writing. Significantly more children given occluded glasses gained stable binocular vision in the first 3 months (59%) compared with children given unoccluded glasses (36%). Christenson et al. (2001), however, found no difference in reading ability of children with dyslexia and abnormal binocular vision tested with and without occluded, blue-tinted lenses. (23)

Nonrandomized Comparative Studies

Ramsay et al. (2014) reported results from a non-RCT on a computerized vergence training program in 13- to 14-year-old patients with dyslexia. (21) Twelve subjects with dyslexia were treated with the computerized vergence training program, receiving an average of 11.75 sessions over 5 weeks; 12 control students included were not treated. All subjects underwent vision testing and were not diagnosed with CI. The computerized training program involved the generation of a computerized stereogram, which appears in 3 dimensions with convergent vision. For the intervention groups, reading speed improved from 87.83 to 95.58 words read per minute from baseline to follow-up ($p<0.006$); reading speed was unchanged from baseline to follow up for the control group (85.00 words per minute at baseline to 89.37 words per minute at follow-up; $p<0.123$). Mean improvement in reading speed from baseline to follow-up did not differ significantly between groups ($p<0.123$).

Several studies have reported that poor reading in children with dyslexia or attention deficits may be related to impairments in accommodation or convergence, suggesting the need for an ophthalmologic and orthoptic evaluation. (24-26)

Section Summary: Orthoptic Training for Learning Disabilities

Peer-reviewed studies have not directly demonstrated improvements in reading or learning outcomes with orthoptic training. At least 2 earlier studies that addressed other types of vision therapies reported mixed improvements in reading.

Vision Restoration Therapy (VRT)

In 2006, McFadzean (27) reviewed the controversial findings for NovaVision's VRT since it has been claimed that NovaVision's computerized therapy results in expansion of the visual field in optic nerve and occipital lesions, but the outcome has been challenged on the grounds of unsatisfactory perimetric control of central fixation and disputed mechanisms. The author stated that in clinical practice NovaVision's therapy should not currently gain acceptance in view of unacceptable perimetric standards and equivocal results. Possible effects on a relative scotoma at the edge of a lesion have not been adequately explored. In the interim, research should also be focused on compensatory eye movement strategies.

In 2007, Mueller and colleagues (28) performed an observational analysis of visual fields of 302 patients before and after treatment with computer based VRT for a period of 6 months at 8 clinical centers in Europe. The visual field defects were due to ischemia, hemorrhage, head trauma, tumor removal or anterior ischemic optic neuropathy. The primary outcome measure was a visual field assessment with super-threshold perimetry. Additionally, conventional near threshold perimetry, eye movements and subjective reports of daily life activities were assessed in a subset of the patients. VRT improved the patients' ability to detect super-threshold stimuli in the previously deficient area of the visual field by 17.2% and these detection gains were not significantly correlated with eye movements. Notable improvements were seen in 70.9% of the patients. Efficacy was independent of lesion age and etiology, but patients with larger areas of residual vision at baseline and patients >65 years of age benefited most. Conventional perimetry validated visual field enlargements and patient testimonials confirmed the improvement in everyday visual function. The study concluded that VRT improves visual function in a large clinical sample of patients with visual field defects involving the central nervous system (CNS), which confirms former experimental studies although the lack of a control group limits the validity of the results of this study.

In a retrospective study, Romano and colleagues (2008) examined the effect of a visual rehabilitation intervention on visual field defects in a U.S. cohort. (29) This study evaluated individuals with homonymous visual field defects from retrochiasmatic lesions treated with 6 modules of VRT. Supra-threshold visual field testing of the central 43 x 32 was obtained at baseline and following each module. The main outcome measures were the change in stimuli detection and the shift in the position of the border of the blind field. The impact of age, time from injury and type of visual field defect were analyzed. Among 161 patients, the mean absolute improvement in stimuli detection was 12.8%. The average border shift was 4.87. Improvements of greater than or equal to 3% were noted in 76 % of patients. Absolute change in stimulus detection of greater than or equal to 3% at mid-therapy was associated with a greater final improvement. Age, time from lesion and type of visual field defect did not influence the degree of field expansion. The authors concluded that VRT improves stimulus detection and results in a shift of the position of the border of the blind field as measured on

suprathreshold visual field testing. These results support prior reports and support VRT as a useful rehabilitative intervention for a proportion of patients with visual field defects from retrochiasmatic lesions. However, the findings of this study were limited by lack of randomization, control group and long-term follow-up.

In 2011, Pollock et al. (30) sought to determine the effects of interventions for people with visual field defects after stroke by searching the Cochrane and MEDLINE database, EMBASE, CINAHL, AMED, and PsycINFO, reference lists, trials registers, journals and conference proceedings and expert opinion for randomized trials. Thirteen studies (344 randomized participants, 285 of whom were participants with stroke) met the inclusion criteria. However, only 6 of these studies compared the effect of an intervention with a placebo, control or no treatment group and were included in comparisons within this review. The authors noted there is insufficient evidence to reach generalized conclusions about the benefits of VRT or prisms (substitutive intervention) for patients with visual field defects after stroke.

In a prospective, double-blind, randomized, placebo-controlled clinical trial completed in 2014, Sabel and Gudlin (31) determined if behavioral activation of areas of residual vision using daily 1-hour VRT for glaucoma for 3 months improved detection accuracy compared with placebo. The study participants included a sample of patients with glaucoma (mean age, 61.7 years) with stable visual fields and well-controlled intraocular pressure. Study interventions included computer based VRT for glaucoma (n=15) or visual discrimination placebo training in the intact visual field (n=15). After randomization, 4 patients withdrew from the trial because of mild headaches (n=2) or lack of time (n=2). The primary endpoint was change in detection accuracy in high-resolution perimetry. VRT for glaucoma led to significant detection accuracy gains in high-resolution perimetry, which were not found with white-on-white or blue-on-yellow perimetry. Furthermore, the pre-post differences after VRT for glaucoma were greater compared with placebo in all perimetry tests, and these results were independent of eye movements. VRT for glaucoma (but not placebo) also led to faster reaction time. Vision-related QOL was unaffected, but the health-related QOL mental health domain increased in both groups. The authors concluded that visual field defects caused by glaucoma can be improved by repetitively activating residual vision through training the visual field borders and areas of residual vision, thereby increasing their detection sensitivity. According to the authors, this trial revealed evidence that visual field loss is in part reversible by behavioral, computer-based, online controlled vision training, comprising a new rehabilitation treatment option in glaucoma. These findings require confirmation in a larger study with long-term follow-up.

In 2016, Hunt et al. (32) conducted a systematic review of evidence regarding the use of oculomotor-based vision assessment to identify and monitor recovery from mild traumatic brain injury (mTBI). Their objectives were to 1) identify changes in oculomotor-based vision following mTBI; 2) distinguish methods of assessment; 3) appraise the level and quality of evidence; and, if warranted, 4) determine clinical recommendations for assessment. A systematic review of literature included if study populations were clearly identified as having mTBI and used an assessment of oculomotor-based vision. Articles with pooled data (e.g., mTBI and stroke), addressing afferent visual function (e.g., visual field deficits) or using single case

designs, were excluded. Twenty articles met inclusion criteria. Exploratory findings suggest that measurements of saccades, smooth pursuit, and vergence are useful in detecting changes associated with mTBI. Assessment methods included eye tracker protocols, optometric assessment, and the King-Devick test. The authors noted that the strength of evidence is not yet sufficient to warrant clinical recommendations. Research using rigorous methods is required to develop reliable, valid, and clinically useful assessment protocols.

UpToDate

In 2024, UpToDate reviewed available evidence related to nonarteritic ischemic optic neuropathy. (33) UpToDate stated that a new modality called VRT has been advocated for patients with low vision. A randomized, double-blind pilot trial to evaluate the effects of VRT on the visual function in 10 non-arteritic anterior ischemic optic neuropathy (NAION) patients found a nonsignificant trend toward benefit of visual function. However, VRT remains controversial and unproven and there is very little evidence to support the use of VRT as part of low vision interventions due to optic neuropathies.

Section Summary: Vision Restoration Therapy (VRT)

Although there are studies assessing the clinical value of VRT, there is insufficient evidence of efficacy for this treatment. The available published studies are small sample sizes with short term follow-up. Additional long-term data with larger sample sizes are needed to determine the impact on health outcomes.

Summary of Evidence

For individuals who have convergence insufficiency who receive office-based orthoptic training, the evidence includes systematic reviews, several randomized controlled trials (RCTs), and nonrandomized comparative studies. Relevant outcomes are symptoms and functional outcomes. The most direct evidence on office-based orthoptic training comes from a 2008 RCT that demonstrated office-based vision or orthoptic training improves symptoms of convergence insufficiency in a greater percentage of patients than a home-based vision exercise program consisting of pencil push-ups or home computer vision exercises. Subgroup analyses of this RCT demonstrated improvements in accommodative vision, parental perception of academic behavior, and specific convergence insufficiency related symptoms. However, in this trial, as in others, the home-based regimen did not include the full range of home-based therapies, which may have biased results in favor of orthoptic training. Another RCT published in 2019 did not find a difference in symptoms of convergence insufficiency between office-based orthoptic training plus home exercises and office-based placebo therapy plus home exercises, possibly due to notable improvements in symptoms in the placebo group. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have learning disabilities who receive office-based orthoptic training, the evidence includes nonrandomized comparative and noncomparative studies. Relevant outcomes are functional outcomes. Studies have not directly demonstrated improvements in reading or learning outcomes with orthoptic training. At least 2 earlier studies that addressed other types of vision therapies reported mixed improvements in reading. The evidence is

insufficient to determine that the effects of the technology results in an improvement in the net health outcome.

For all individuals, vision restoration is considered experimental, investigational and/or unproven, including but not limited to the treatment of visual field deficits following stroke or neurotrauma. The evidence is insufficient to determine the efficacy of this treatment. The available published studies are limited by small sample sizes with short term follow-up. Additional long-term data with larger sample sizes are needed to determine the overall impact on health outcomes.

Clinical Input from Physician Specialty Societies and Academic Medical Centers
Clinical input supports the use of office-based orthoptic training when home-based therapy has failed. Therefore, orthoptic training may be considered medically necessary in patients with convergence insufficiency whose symptoms have failed to improve with a home-based treatment trial of at least 12 weeks. Home-based therapy should include pushup exercises using an accommodative target, push-up exercises with additional base-out prisms, jump-to-near convergence exercises, stereogram convergence exercises, recession from a target, and maintaining convergence for 30 to 40 seconds.

Practice Guidelines and Position Statements
American Academy of Pediatrics et al.
In 2009 (reaffirmed in 2014), the American Academy of Pediatrics, American Academy of Ophthalmology (AAO), American Association for Pediatric Ophthalmology and Strabismus, and the American Association of Certified Orthoptists issued a joint policy statement on pediatric learning disabilities, dyslexia, and vision. (34) For vision therapy, the statement concluded: "Currently, there is inadequate scientific evidence to support the view that subtle eye or visual problems cause learning disabilities. Furthermore, the evidence does not support the concept that vision therapy or tinted lenses or filters are effective, directly or indirectly, in the treatment of learning disabilities. Thus, the claim that vision therapy improves visual efficiency cannot be substantiated. Diagnostic and treatment approaches that lack scientific evidence of efficacy are not endorsed or recommended."

In 2011, these same 4 associations also published a joint technical report on learning disabilities, dyslexia, and vision. (1) This report concluded: "There is inadequate scientific evidence to support the view that subtle eye or visual problems cause or increase the severity of learning disabilities…. Scientific evidence does not support the claims that visual training, muscle exercises, ocular pursuit-and-tracking exercises, behavioral/perceptual vision therapy, 'training' glasses, prisms, and colored lenses and filters are effective direct or indirect treatments for learning disabilities."

American Academy of Ophthalmology (AAO)
The AAO's amblyopia preferred practice pattern (35) considers vision therapy (also called orthoptics or eye exercises) as an "alternative therapy" which includes computer programs, prisms, filters, metronomes, vergence activities, accommodation activities, antisuppression

activities, and eye-hand coordination exercises. These techniques are often conducted in an office setting with a therapist, supplemented with home exercises. These treatments have also been promoted for the treatment of amblyopia as an adjunct to patching. However, there is insufficient evidence to recommend vision therapy techniques.

Ongoing and Unpublished Clinical Trials

Some currently ongoing and unpublished trials that might influence this policy are listed in Table 5.

Table 5. Summary of Key Trials

NCT Number	Trial Name	Planned Enrollment	Completion Date
Ongoing			
NCT03908112	Interventions for Convergence Insufficiency in Concussed Children (ICONICC)	264	March 2025

NCT: national clinical trial.

Coding

Procedure codes on Medical Policy documents are included **only** as a general reference tool for each policy. **They may not be all-inclusive.**

The presence or absence of procedure, service, supply, or device codes in a Medical Policy document has no relevance for determination of benefit coverage for members or reimbursement for providers. **Only the written coverage position in a Medical Policy should be used for such determinations.**

Benefit coverage determinations based on written Medical Policy coverage positions must include review of the member's benefit contract or Summary Plan Description (SPD) for defined coverage vs. non-coverage, benefit exclusions, and benefit limitations such as dollar or duration caps.

CPT Codes	92065, 92066, 92499
HCPCS Codes	V2799

*Current Procedural Terminology (CPT®) ©2023 American Medical Association: Chicago, IL.

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Centers for Medicare and Medicaid Services (CMS)

The information contained in this section is for informational purposes only. HCSC makes no representation as to the accuracy of this information. It is not to be used for claims adjudication for HCSC Plans.

The Centers for Medicare and Medicaid Services (CMS) does not have a national Medicare coverage position. Coverage may be subject to local carrier discretion.

A national coverage position for Medicare may have been developed since this medical policy document was written. See Medicare's National Coverage at <https://www.cms.hhs.gov>.

Policy History/Revision

Date	Description of Change
09/15/2024	Document updated with literature review. Coverage unchanged. No new references added; others updated.
08/15/2023	Reviewed. No changes.
12/01/2022	Document updated with literature review. The following change was made to Coverage: Not medically necessary policy statement on orthoptic eye exercises for the treatment of learning disabilities changed to experimental, investigational, and/or unproven per current standards, intent unchanged. No new references added.
09/01/2021	Document updated with literature review. Coverage unchanged. Added references 5, 11-15, 29, 34, 35; some updated, others removed.
08/15/2020	Reviewed. No changes.
07/01/2019	Document updated with literature review. Coverage unchanged. Added reference 3.
01/15/2019	Reviewed. No changes.
05/15/2018	Document updated with literature review. The following change(s) were made to Coverage: added experimental, investigational and/or unproven coverage for vision restoration therapy.
07/15/2016	Document updated with literature review. Coverage unchanged.
07/15/2015	Document updated with literature review. Coverage unchanged.
07/15/2014	Reviewed. No changes.
11/01/2013	Document updated with literature review. Coverage unchanged.
10/01/2011	Document updated with literature review. Coverage changed to: “Office-based vergence/accommodative therapy for up to12 weeks may be considered medically necessary for patients with symptomatic convergence insufficiency if, following 12-weeks of home-based therapy (e.g., push-up exercises using an accommodative target; push-up exercises with additional base out prisms; jump to near convergence exercises; stereogram convergence exercises; recession from a target; and maintaining convergence for 30-40 seconds), symptoms have failed to improve.”

	Convergence insufficiency and stereoacuity is documented by: 1) Exodeviation at near at least four prism diopters greater than at far; AND 2) Insufficient positive fusional vergence at near (PFV < 15 prism diopters blur or break) on PFV testing using a prism bar; AND 3) Near point of convergence (NPC) break of > 6 cm; AND 4) Appreciation by the patient of at least 500 seconds of arc on stereoacuity testing. Policy name changed to "Orthoptics (Vergence/Accommodative therapy), Visual Exercises or Training."
02/15/2009	Document updated with literature review. Coverage changed to: Orthoptic training, visual exercises, ocular neuromuscular re-education and all other interventions to address oculomotor dysfunction are considered experimental, investigational and unproven.
11/01/2008	Revised/updated entire document. Coverage changed to: Orthoptic training, visual exercises, ocular neuromuscular re-education and all other interventions to address oculomotor dysfunction are considered experimental, investigational and unproven for the treatment of learning disabilities.
09/15/2006	Revised/updated entire document. Coverage changed to: Orthoptic training, visual exercises and neuromuscular re-education are considered experimental, investigational and unproven for the treatment of learning disabilities, oculomotor disorders or any other indication.
08/15/2003	Revised/updated entire document. Coverage states: Orthoptic training and visual exercises or training are considered experimental or investigational for the treatment of learning disabilities, oculomotor disorders or any other indication
09/01/1998	New Medical Document