

Question 23 evidence tables

**Question 23: What is the effectiveness of interventions aimed at improving function in people with visual field defects?**

*NB Any discrepancies between reviewers in evidence quality and comment were discussed at the corresponding evidence review meeting*

AV = audio-visual, EEG = electroencephalography, VIS = vision in stroke, MOS-SF-36 = Medical Outcomes Study, SSQoL = Stroke Specific Quality of Life scale, USER-P = Utrecht Scale for Evaluation of Rehab Participation, CDDI = Coarse direction discrimination and Integration, FDD = Fine direction discrimination, SR = systematic review, MA = meta-analysis, RCT = randomised controlled trial, IPDMA = individual patient data meta-analysis, MDT = multidisciplinary team, PICO = patient/population, intervention, comparison and outcomes, OR = odds ratio, CI = confidence interval, QoL = quality of life, ADL = activities of daily living, OR = odds ratio, RR = relative risk, aOR = adjusted odds ratio, cOR = crude odds ratio, CI = confidence interval, RoB = risk of bias, I2 = heterogeneity statistic.

Ref ID	Source	Setting, design and subjects	Intervention	Outcomes	Results	Evidence quality (SIGN checklist score) and comment
778	K. Alwashmi et al (2022). Audio-visual stimulation for visual compensatory functions in stroke survivors with visual field defect: a systematic review. Neurological Sciences. 43: 4.	Systematic review on effectiveness of interventions that use Audio-Visual (AV) multisensory training as rehab for post stroke visual field defects. 16 studies included. (14 articles (188 participants) and two literature reviews).	AV training of hemianopia -tasks measuring the training effects by comparing visual stimulation training to audio-visual training -localization abilities in hemianopia -AV integration.	Visual v AV ADL Visual scanning Reading.	Systematic AV training may improve the processing of visual information.  Nevertheless, the underlying mechanisms supporting the reported positive effects are not currently understood.	+ Acceptable study.
778	K. Alwashmi et al (2022). Audio-visual stimulation for visual compensatory functions in stroke survivors with visual field defect: a systematic review. Neurological Sciences.	Systematic review with a narrative synthesis including a wide range of study methodologies from reviews, RCT to observational studies. Individuals with homonymous hemianopia with or without visual inattention – adults and children discussed separately.	Multisensory integration, focusing especially on audio-visual training.	Activities of daily living Visual scanning tests Reading EEG.	16 studies included in the review. 2 RCTs Risk of bias assessment undertaken.  Training duration variation 2 weeks – 2 months  Improvement in ocular exploration, visual scanning	+ Excluded studies not listed. Unclear if animal studies included in review. Study characteristics included for 14/16 studies.

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	43: 4.				behaviour, reading performance and quality of life reporting after AVT.  AVT compensatory not restorative.  The optimal training paradigm has not been established yet.	
779	M. R. Cavanaugh et al (2021). Efficacy of Visual Retraining in the Hemianopic Field after Stroke: Results of a Randomized Clinical Trial. Ophthalmology. 128: 7. 2299-2321.	Industry sponsored multicentre RCT. Hemianopia of at least 90-day duration. Pretraining assessment and post training assessment at 28 +/- 2 weeks	Motion (direction) discrimination training within the blind field or sighted field. 300 discriminations one daily for 30 mins over 5 days per week for 6 months. Target of 120 training days.	Visual field perimetry by Humphrey 24-2 programme; Change in mean deviation. Deficit size. Area of improvement. Area of worsening. OCT change in thickness of GCIPL and RNFL. Microperimetry average sensitivity change. VFQ25 questionnaire.	48 patients; 25 with deficit field training (group 1) and 23 with sighted field training (group 2). Group 1 had 99.4 +/-43.3 treatment days. Group 2 had 114.8 +/-48.5 treatment days.	RCT
780	L. B. Dehn et al (2020). Cognitive training in an everyday-like virtual reality enhances visual-spatial memory capacities in stroke survivors with visual field defects. Topics in Stroke Rehabilitation. 27: 6. 1091-1101.	20 stroke patients with hemi or quadrantopia and 20 healthy controls accomplished a real-life-like shopping task in a virtual reality supermarket during a 14 day rehabilitation programme. Study set in Germany.	Training programme required participants to learn a shopping list and to buy the respective products in a VR supermarket environment. In the supermarket task, participants were asked to enter the VR supermarket and to buy as many products of this shopping list as possible.	Neuropsychological and clinical assessments before and after the training programme.	Both patients and controls showed improved performances in visual scanning, mental rotation, visuoconstruction and cognitive flexibility. Patient group demonstrated improved visual memory retrieval and reduced memory complaints.	+  Study did not focus on visual field recovery but on the positive effects of VR training on cognitive functioning.

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781	J. A. Elshout et al (2018). Improvement in activities of daily living after visual training in patients with homonymous visual field defects using Goal Attainment Scaling. Restorative Neurology and Neuroscience. 36: 1. 199-207.	Nested study. Adults (18-75 years) with post-stroke homonymous hemianopia >10 months. Other visual pathology was excluded	Visual discrimination training at home using custom made training unit.  Pre-defined region of visual field – one round in defect and one in intact area.  1 hour per day, 5 day per week for 8 weeks (>40 hours)	Visual field defect – Humphrey (blinded) and Goldman (unblinded) Activities of Daily Living (GAS).  Quality of Life: 36-item short-form Medical Outcomes Study (MOS-SF-36), Stroke-Specific Quality of Life scale (SSQoL) Utrecht Scale for Evaluation of Rehabilitation-Participation (USER-P).	40 recruited – drop out of 5 during first training. Full data set for 20 participants.  Improvement in Humphrey and Goldmann visual field – 0.79dB and 5.8mm respectively. Quality of life and ADL scores improved after intervention. No correlation between increased VF and QoL improvement.	-  Small sample size Data pooled
781	J. A. Elshout et al (2018). Improvement in activities of daily living after visual training in patients with homonymous visual field defects using Goal Attainment Scaling. Restorative Neurology and Neuroscience. 36: 1. 199-207.	Setting - Netherlands Design - randomized controlled crossover design  Subjects - 35 stroke patients with homonymous visual field defect due to post chiasmatic stroke, time since lesion at least 10 months.  Patients with other visual anomalies and visual neglect excluded.	Visual training - patients performed a visual discrimination task at many different locations within the targeted part of the visual field.  Each patient trained successively two predefined regions of the visual field at home during two rounds of training. At least one of these regions was located in the visual field defect.	Visual field - 30-2 program of the Humphrey Field Analyzer and Goldman perimetry.  Three QoL questionnaires: the 36-item short-form Medical Outcomes Study (MOS-SF-36), the Stroke Specific Quality of Life scale (SSQoL) and the Utrecht Scale for Evaluation of Rehab Participation (USER-P).  Goal Attainment Scaling (GAS) scores.	Visual training improved the visual field for both Goldman (ECSG = 5.82 ± 0.94 mm; p < 0.039; n = 29), but showed no significant relation with either type of field improvement (p > 0.359).  Approx 75% of patients improved on their (personalized) GAS score.	-  Need to consider only 35 included and large variation in training types with data pooled due to small numbers.
782	K. L. Hanna et al (2017). The treatment methods for post-	Systematic review of the literature (systematic reviews, RCTs, cohort studies, observational studies, and	Systematic search strategies, detailed protocol developed prior to the review.	49 articles were included in this review paper and the quality of evidence was assessed for each.	9 articles (3,613) participants and 529 health care professionals were included). 4 Cochrane reviews	++  Limited evidence for all interventions. Strong

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	stroke visual impairment: A systematic review. Brain and Behavior. 7: 5.	retrospective reviews) reporting on the available treatment of visual impairment post stroke. Article selection - two authors independently.  Types of participants: adult with visual impairment as a direct cause of stroke. Studies which included mixed population were included if over 50% of participants had a diagnosis of stroke .	Two reviewers independently reviewed the quality of the studies. Adapted version PRISMA. STROBE. All domains covered in these checklists to reduce bias in the reported articles.		Interventions appraised included those for visual field loss, ocular motility deficits, reduced central vision, visual perceptual deficits. -35 studies (2,233 participants) on interventions for visual field loss (restitutive, compensatory and limited meta analyses were possible only completed for compensatory treatment. . -9 reported on interventions for versional inattention/neglect. 23 trials identified. Lack of high quality evidence.  -7 of the studies (1,029 participants) intervention for ocular motility=Pharmacology interventions, Prisms, observational studies report positive benefits of prisms -6 studies (1,085) on intervention for reduction of central vision. -2 reported on interventions for visual perceptual defects. Very few treatments no clear evidence base.	requirement for further high quality evidence to determine the effectiveness of interventions. Small number of patients. Limited long term follow up.
783	K. L. Hanna; F. J. Rowe (2017). Clinical versus Evidence-based Rehabilitation Options for Post-stroke Visual Impairment.	Systematic review of the literature (RCT's, cohort studies, observational studies and retrospective reviews) reporting on the available treatment options compared against the	Comparison of the visual interventions reportedly used in a large, visually impaired stroke cohort (the VIS study) against the treatment options	44 articles were included in the systematic review.	Interventions in the VIS study consisted of verbal or written advice, refractions, prisms, typoscopes, occlusion and low vision aid.	+ Current recommendations from the literature are for compensatory search strategies to treat post-stroke visual field loss either paper or

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	Neuro-Ophthalmology. 41: 6.	visual treatments used in the Vision In Stroke (VIS) study. Subjects included adult participants with visual impairment as a direct result of stroke.	identified in a comprehensive synthesis of the published literature.  The VIS study had a total of 915 stroke survivors from 20 recruiting sites in the UK with 92% had a confirmed visual impairment.		In the systematic review literature treatment for visual field loss included visual search training, Peli prisms, and restitution therapy. Treatment options for visual neglect included hemifield eye patching and scanning treatment. Treatment options for ocular motility disorders included prisms, occlusion and pharmacological methods. Treatment for reduced central vision included spectral filters, refractive correction, reading aids and advice.	web-based training. Peli prisms may also be of benefit.  Reduced central vision may benefit from refraction, low vision aids, typoscopes and verbal advice including recommendations of lighting.  Prisms and occlusion are beneficial for diplopia. Also advice on head postures and convergence exercises.
784	C. Howard; F. J. Rowe (2018). Adaptation to poststroke visual field loss: A systematic review. Brain and behavior. 8 :8.	Systematic review with a narrative synthesis including a wide range of study methodologies from systematic reviews, RCT to observational studies.  Adults with post-stroke homonymous hemianopia.	Visual scanning Prisms.	None specific mentioned.	30 studies included relevant to+ interventions to aid adaptation.  Majority of studies investigated compensatory techniques using eye movements and scanning to the affected side. Subjective improvements in ADL and QoL reported a number of studies.  Substitutive options did not report improvements in QoL in a real vs sham crossover, and more adverse events report.  Substantial evidence that individuals with post-stroke field loss can be supported to compensate and adapt with a range of interventions.	

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785	K. P. Y. Liu et al (2019). A Systematic Review and Meta-Analysis of Rehabilitative Interventions for Unilateral Spatial Neglect and Hemianopia Poststroke From 2006 Through 2016. Archives of Physical Medicine and Rehabilitation. 100: 5.	Systematic review including RCTs only.  Limited meta-analysis.  Adults (>16 years) with post-stroke hemianopia and/or unilateral spatial neglect.	Rehabilitations strategies in hemianopia studies included: Computer based reading and exploration tasks, audio-visual stimulation training, scanning training, flicker training, prismatic glasses.  Drug treatments and brain stimulation excluded.	Functional performance of ADLs Visual search or exploration tasks Reading tasks  25 different measures used across studies.	5 RCTs included in review - 5 in relation to hemianopia (focus on these for rest of results here). Meta analysis included 2 studies of visual search.  Number of therapy sessions ranged from 15-60 and frequency of 5-10 times per week. Total number of hours ranged from 7.5-36 hours over 3-6 months.  Activity based, demonstrated significant results for improving visual outcomes in meta-analysis, but not significant effect on ADLs.  All studies of visual search reported positive effects. Yields greater benefits in individuals with hemianopia than neglect.  No conclusions drawn for restitution therapy or nonactivity based therapy.	+
785	K. P. Y. Liu et al (2019). A Systematic Review and Meta-Analysis of Rehabilitative Interventions for	A Systematic Review and Meta-Analysis of Rehabilitative Interventions for Unilateral Spatial Neglect and Hemianopia Poststroke 2006-2016 only	Activity based and non-activity based  Activity based training includes visual	Visual field Reading ADL	5 studies identified for hemianopia, involving 206 stroke participants.	+

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	Unilateral Spatial Neglect and Hemianopia Poststroke From 2006 Through 2016. Archives of Physical Medicine and Rehabilitation. 100: 5.	Limited to English publications. Included RCTs with a score of 6 or more in the Physiotherapy Evidence Database Scale that examined the effects of activity-based and nonactivity-based rehabilitation interventions for people with USN or hemianopia.	exploration and scanning training. Non activity based included peripheral prism glasses.		Encouraging results were found in relation to activity-based interventions for visual scanning training and compensatory training for hemianopia.	
786	L. Mena-Garcia et al (2021). Multitasking compensatory saccadic training program for hemianopia patients: A new approach with 3-dimensional real-world objects. Translational Vision Science and Technology. 10: 2.	Setting: Home based with clinic visits. Design: Quasi-experimental, pre-test/post-test design (non-blinded & non-randomised). Subjects: Intervention Group (IG) (n = 20) and a no-training group (NTG) (n = 20) matched for age, hemianopia type, and brain injury duration. Criteria: 18+, 3/12+ post stroke, No cognitive impairment, visual hemi-neglect, sufficient hearing & UL function to participate.	3D-MCSTP (3-D non-computerized multitasking compensatory saccadic training program) -min 10 mins daily read-aloud exercises. -8 diff types of daily multitasking exercises (using board game items) with progressive challenge (increasing number of reach to grasp tasks, increasing horizontal visual reach and increasing distracting stimuli) Participants kept a log / diary of tasks & times Clinic visits checked the logs and progressed exercises. Non-Training Group:	IG Ax @ 0,6 & 12/52 NTG Ax @ 0 & 12/52 Visual ability / function: -Computerized visual-processing speed Ax System -Monocular 30-2 perimetry - The IReST Test63 read aloud performance (10 para of 10-pt font) - The Benton Visual Retention Test (shape reproduction) QoL SF-36 Functional Independence -National eye institute visual function questionnaire-25 -Goldberg Scale -Functional independence measure -Pfeffer test	Visual-Processing Speed IG: improved speed @ 12/52 in 57.34% (P < 0.0001) NTG improved by 2.46% (P= 0.5015) IG: improved 26.67% (P < 0.0001) in no of correct reproductions; NTG: worsening of -2.08% (P = 0.6461) QoL & FI IG: large change effects in 75% of evaluated dimensions, esp periph vision. Significant differences between groups in 92% of all dimensions studied (P < 0.05) Efficiency (enhancement over shortest time) Only sig improvements in processing speed and reading performance @ 6/52 (only IG group Ax @ 6/52)	- Unacceptable. Risk of bias too high. No discussion re: allocation / attempts at randomisation Included aneurysm and tumour No blinding Non representative sample (age & impairment) Significant difference in visual acuity between groups @ baseline – not mentioned.

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			Information and advice to optionally read a book and continue with ocular motility exercises			
787	M. J. Metzler et al (2021). Clinical provision of compensatory visual training after neurological injury: example of a multisite outpatient program. Disability and rehabilitation. 43: 1.	Outpatient rehabilitation programme in community setting.  Occupational therapy assessment and treatment.  Quality improvement initiative study.	Formal OT assessment with Canadian Occupational performance Measure, Useful field of view task, Dynavision performance assessment battery, Visual field assessment, Ocular motility assessment, Visual acuity test, Visual perception, Reading, Trail making A and B tasks. Treatment = 2-3 times per week for 4-6 weeks. Goal directed and aim for improved scanning within the affected field of vision. Treatment with Dynavision D2, eye search, attention-processing training, Brain HQ, Luminosity, Warren exercises, scan course and functional tasks. Retrospective study. Approx 14 treatment sessions.	Initial and post treatment subjective and objective outcome measurements include client COPM ratings for return to driving, useful field of view, Dynavision performance assessment battery.	49 patients. 60% (n=29) had treatment for visual field loss. 40% (n=20) had treatment for visual perception impairment. Mainly stroke survivors. Improved performance across all cases. Descriptive figures given only. Confidence intervals did not overlap for Dynavision simple task score and reaction times, difficult tasks score and endurance task score on UFOV task.	Cohort study



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789	A. Sahraie et al (2020). Efficacy and predictors of recovery of function after eye movement training in 296 hemianopic patients. Cortex. 125. 118-125.	296 patients with a hemianopia underwent NeuroEyeCoach training (web deliverable). Study set in the USA. 103 with left visual field loss, 101 with right visual field loss and 92 visual field loss both sides.	Intervention was performed with NEC and accessed online by patients. NEC contains 12 levels with 4 levels at each of op-out, complex, and conjunction search categories, hence the task difficulty is systematically increased as therapy progresses. Half the participants completed the intervention in approx. 3 weeks with nearly ¾ of patients completing in 6 weeks.	Performance on two objective tasks– visual search times and errors and one subjective self reported disability measure of performance was assessed before and after therapy.	294 cases were analysed as two patient’s datasets were partially corrupted.  87% improved in search time, 80% had less errors and 66% had improved disability scores.  Older patients showed larger improvements.	+  Compensatory training inevitably involves practicing target/distractor detection across the visual field, it remains a possibility that any improvements is due to a practice effect and does not reflect a functional change in oculomotor behaviour.  Sample of patients reported had little or no cognitive impairments or other stroke related disability that would impair task performance.
790	E. L. Saionz et al (2020). Functional preservation and enhanced capacity for visual restoration in subacute occipital stroke. Brain. 143: 6.	Setting: Home Design: Non-blinded, pseudo randomised observational cohort.  (10 sub-acute alternately assigned to CDDI or non, then the next 3 to CDDI).  Subjects: 18 subacute & 14 chronic Incl – Adult Primary motor cortex damage confirmed on imaging with contralesional homonymous visual field defect Reliable visual fields & stable accurate gaze fixation	Intervention: CDDI (10 subacute & 14 chronic) - Coarse Direction Discrimination and Integration. Home based visual training on own computer. 300 trials per location, min 5/7. Data emailed to lab and training modified accordingly.  (2 locations identified through mapping of blind field border, based on point at which FDD fine direction	Coarse direction discrimination and Integration (CDDI).  Fine direction discrimination (FDD).  Contrast sensitivity functions for orientation and direction discrimination.	Preserved direction discrimination, direction integration abilities & luminance contrast sensitivity (strongest for direction discrimination) in the blind fields of a significant proportion of subacute participants. Lots of broad narrative claims	-  Unacceptable with potential bias.  Non-representative sample (age and impairments).  Small sample size (no discussion of recruitment or drop out).  Non-blind & pseudo randomised.  Changing study goals based on unexpected finding of preserved visual abilities –

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		Excl – ocular disease, neuro or cog impairment that prevents training & hemi-spatial neglect.	discrimination becomes equal to chance)  Untrained (n=5subacute) Other (n=5 subacute): described and reported elsewhere.			therefore aims & study design unclear.
791	R. Szalados et al (2021). The clinical effectiveness of Eye-Search therapy for patients with hemianopia, neglect or hemianopia and neglect. Neuropsychological rehabilitation. 31: 6. 1857-1872.	Retrospective review of patients on eye search server over 2012-2019.  Self-enrolled patients.	Eye search visual scanning training. 1200 trials.	Visual search task. ADL scale. Visual field test. Visual neglect test.	426 patients. Onset to time of training was median of 85 days. Time to T1 was median of 5 days. Time to T3 was median of 20 days. 212 with left hemianopia. 156 with right hemianopia. 9 with left neglect. 7 with right neglect. 37 combined left hemianopia/neglect. 5 with combined right hemianopia/neglect. Improvement for patients with right or left hemianopia and combined hemianopia/neglect. No change for neglect only patients. Some aspects of ADL improved; finding things – for left/right hemianopia and combined hemianopia/neglect. No change for neglect only patients.	Cohort study.

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					Slight improvement in visual field extent but likely due to spontaneous recovery given the early time period after stroke.	
788	A. Pollock et al (2019). Interventions for visual field defects in people with stroke. Cochrane Database of Systematic Reviews. 5.	Systematic review including RCTs and cross over trials only. Qualitative synthesis and meta-analysis. Adults (>18 years) with post-stroke visual field loss.	Compensatory, restitutive and substitutive interventions.	Primary – functional ability in ADLs  Secondary - functional ability in extended ADLs, reading, visual field, balance, falls, depression/anxiety, QoL, visual scanning, adverse events	20 studies included in qualitative synthesis and 8 in meta-analysis.  Low quality evidence that compensatory strategies may improve QoL.  Insufficient evidence for restitution therapy or substitutive interventions (prisms). Prisms had a high number of adverse events.	++