

Advancing Concussion Recovery: A Scoping Review Of Visual Rehabilitation Interventions

BACKGROUND

- **Concussions/mild traumatic brain injury (mTBI)** can produce persistent visual, vestibular, and oculomotor dysfunction, including abnormalities in saccades, fixation, convergence, accommodation, vestibulo-ocular reflex function, and visual-motion processing (Cade & Turnbull, 2022; Cifu et al., 2015).
- Emerging rehabilitation approaches include visual desensitization, vestibular rehabilitation, oculomotor exercises, and multimodal interventions (Kontos et al., 2021; Murray et al., 2021; Storey et al., 2018).
- Rehabilitation approaches vary by intervention type, outcome measure, population, and reported effectiveness.
- Considerable variability in treatment protocols and outcome measures limits direct comparison of effectiveness (Lee et al., 2020; Stuart et al., 2020).

PURPOSE

- Primary Aim:**
To synthesize current evidence on visual and oculomotor rehabilitation interventions used following concussion or mild traumatic brain injury.
- Secondary Aim:**
To characterize intervention approaches, visual outcome measures, and reported effects on post-concussion visual and visuo-vestibular dysfunction.

METHODS

- **Design:** Scoping review of peer-reviewed literature examining visual rehabilitation after a concussion/ mTBI
- **Database:** PubMed
- **Search:** ((concussion[Title/Abstract] OR mTBI [Title/Abstract]) AND intervention[Title/Abstract]) AND (vision [Title/Abstract] OR visual[Title/Abstract] OR eye movement[Title/Abstract]) NOT review[Title/Abstract]
- **Screening:** The search identified 103 records, which were screened using predefined eligibility criteria for relevance to concussion/mTBI, rehabilitation, intervention, and visual/oculomotor outcomes.
- **Included Studies:** 17 studies met final eligibility criteria and were included in the scoping review.

ELIGIBILITY

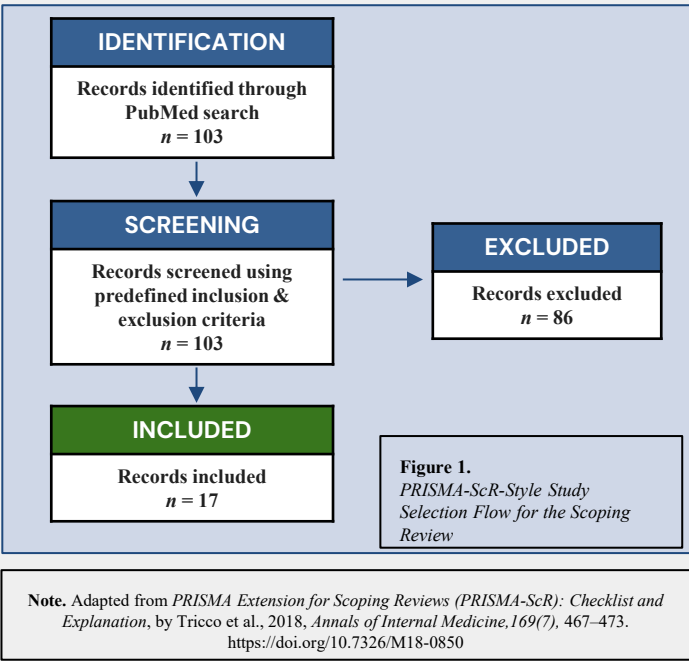
- Included**
- Concussion/mTBI relevance
 - Rehabilitation or therapeutic intervention
 - Visual, oculomotor, vestibulo-ocular, or visuovestibular outcomes
 - Relevant to post-concussion visual rehabilitation strategies
- Excluded**
- No relevance to concussion/mTBI
 - No applicable rehabilitation intervention
 - No relevant visual/oculomotor outcomes
 - Review articles

CLINICAL IMPLICATIONS

Visual rehabilitation after concussion/mTBI shows the greatest promise when treatment is targeted to specific oculomotor, vestibular, or visual-processing deficits rather than applied as a one-size-fits-all approach (Kontos et al., 2018; Lee et al., 2026).

REFERENCES

Full Reference list available via QR Code



KEY FINDINGS

- Reported improvements included:**
- 1. Oculomotor Function**
Saccadic performance | Fixation/gaze stability | Convergence
 - 1. Visuovestibular Function**
Vestibulo-ocular reflex | Visual motion sensitivity
 - 1. Functional Vision**
Accommodation | Reading | Visual processing
 - 1. Functional Recovery**
Balance/postural stability | Reduced symptom burden
- Overall pattern:** Targeted rehabilitation demonstrated improvement across several visual and visuovestibular domains, however, treatment responses varied across interventions and outcome measures.

RESULTS

- The PubMed search identified **103 records**, with **17 studies** that met final eligibility criteria & were included in the scoping review.
- Included interventions represented **vestibular/ visuovestibular rehabilitation, vision/ oculomotor training, multimodal rehabilitation, and adjunctive visual approaches.**
- Improvements were reported across **saccadic outcomes, balance, gaze stability, vestibulo-ocular reflex function, convergence, accommodation, visual processing, and post-concussion symptoms.**

LIMITATIONS/EVIDENCE GAPS

- Substantial heterogeneity exist in study populations, interventions, treatment duration, & visual outcome measures.
- Evidence ranged from controlled trials to small pilot, case-series, & case-based studies, limiting direct comparisons.
- Sample sizes varied considerably across the studies.
- This review was limited to PubMed
- Larger controlled trials using standardized visual & oculomotor outcomes are needed.

CONCLUSIONS

- Targeted visual, oculomotor, vestibular, and visuovestibular rehabilitation demonstrated promising improvements in selected post-concussion visual and functional outcomes.
- Improvements were consistently reported in oculomotor performance, vestibulo-ocular function, convergence, visual processing, balance, and symptom burden.
- Substantial heterogeneity across interventions and outcome measures prevents identification of a single optimal rehabilitation strategy.
- Future studies should prioritize standardized outcome measures, larger controlled trials, and deficit-specific individualized rehabilitation.