

INPLASY

Sport-specific transfer to normal-vision performance after stroboscopic visual training in athletes: a protocol for a framework-informed systematic review and restricted meta-analysis

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ADMINISTRATIVE INFORMATION

Support - No dedicated external funding has been secured for this review at the time of registration.

Review Stage at time of this submission - Preliminary searches.

Conflicts of interest - The authors declare no financial conflicts of interest related to stroboscopic visual training devices, stroboscopic eyewear, sports vision training products, or commercial training platforms. Any relevant relationships identified before manuscript submission will be disclosed and managed according to journal policy.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 26 May 2026 and was last updated on 26 May 2026.

INTRODUCTION

Review question / Objective This systematic review aims to determine whether multi-session stroboscopic visual training improves normal-vision post-training Level 2 sport-specific performance proxy outcomes in athlete or sport-trained samples, relative to explicit concurrent between-group comparators. The review will also map the broader SVT evidence base across transfer level, measurement type, post-test vision condition, time scale, comparator structure, and representativeness.

Rationale Existing SVT reviews have often synthesised mixed outcomes, test conditions, and time scales. This can combine evidence addressing acute perturbation response, domain-generic visual or cognitive outcomes, strobe-condition performance, retention, sport-specific

proxy performance, and formal competitive performance. This review is needed because the practically important transfer question is narrower: whether multi-session SVT transfers to sport-specific performance under normal vision in athlete or sport-trained samples. The review will first audit the evidence structure using a transfer-by-measurement evidence map, then conduct a restricted primary meta-analysis in a prespecified comparable subset.

Condition being studied The topic is sport-related perceptual-motor function and sport-specific performance transfer after stroboscopic visual training in athlete or sport-trained populations. SVT is a training intervention performed under intermittent visual perturbation, usually using stroboscopic eyewear or shutter-type devices, with the aim of improving subsequent perceptual,

visuomotor, or sport-specific performance under normal visual conditions.

METHODS

Search strategy The final database-specific strategies will be adapted for each database and reported in a PRISMA-S supplement. Searches will not use outcome, design, athlete-only, normal-vision-only, L2-only, comparator-only, or multi-session-only filters.

English Route A: (stroboscop* OR "stroboscopic visual training" OR "stroboscopic vision training" OR "stroboscopic training" OR "strobe glasses" OR "stroboscopic eyewear" OR "shutter glasses" OR "intermittent vision" OR "visual perturbation") AND (sport* OR athlete* OR athletic* OR player* OR "team sport*" OR "combat sport*" OR soccer OR football OR basketball OR volleyball OR badminton OR baseball OR hockey OR tennis OR handball OR boxing OR "martial art*" OR "sport performance" OR "sports performance").

English Route B: "stroboscopic visual training" OR "stroboscopic vision training" OR "stroboscopic training" OR "strobe glasses" OR "stroboscopic eyewear" OR "shutter glasses" OR "intermittent vision".

Chinese Route A: (频闪视觉训练 OR 频闪训练 OR 频闪眼镜 OR 视觉频闪 OR 间歇视觉 OR 间歇性视觉 OR 视觉遮挡) AND (运动 OR 运动员 OR 体育 OR 竞技 OR 训练 OR 球类 OR 足球 OR 篮球 OR 排球 OR 羽毛球 OR 网球 OR 手球 OR 棒球 OR 冰球 OR 拳击 OR 武术 OR 格斗).

Participant or population The review will focus on human athlete or sport-trained participants, including elite/professional, national-level, collegiate, youth competitive, competitive club, and trained sport participants. Recreationally active or non-athlete samples may be identified during broad searching and documented as adjacent evidence, but they will not define the main-text athlete evidence map or the primary meta-analysis.

Intervention The intervention is stroboscopic visual training, defined as training conducted under intermittent clear/opaque visual perturbation using stroboscopic eyewear, shutter-type devices, or equivalent strobe-like visual occlusion. For Dataset A, interventions must be multi-session and last at least one week. Acute single-session exposures will not enter the primary meta-analysis but may be mapped or synthesised separately.

Comparator For Dataset A, studies must include an explicit concurrent between-group comparator,

such as no-training control, usual training, standard sport training, sham/active visual training, or alternative active training. Historical controls, single-arm pre-post baselines, and unresolved within-subject contrasts will not qualify for the primary meta-analysis. Comparator type and match level will be coded.

Study designs to be included For the evidence map, empirical SVT intervention or exposure studies in sport-related contexts will be considered, including randomised trials, non-randomised comparative studies, crossover studies, single-arm pre-post studies, and acute exposure studies. For the primary meta-analysis, eligible studies must use between-group comparative designs with an explicit concurrent comparator.

Eligibility criteria Evidence-map inclusion: human sport-related SVT studies using SVT or strobe-like visual perturbation as training or exposure, with at least one visual, perceptual, cognitive, visuomotor, sport-specific, or performance-related outcome. Dataset A requires athlete or sport-trained participants, multi-session SVT of at least one week, normal-vision post-training testing, Level 2 sport-specific performance proxy outcomes, explicit concurrent between-group comparator, and between-group design. Dataset A excludes acute-only exposure, strobe-condition post-test only, retention-only outcomes, domain-generic/mechanistic/near-transfer or Level 3 outcomes, no explicit comparator, single-arm designs, non-athlete samples, and unresolved within-subject contrasts.

Information sources MEDLINE via PubMed; Embase; Scopus; Web of Science Core Collection; SPORTDiscus; PsycINFO; Cochrane CENTRAL if accessible; CNKI; Wanfang; ClinicalTrials.gov; WHO ICTRP if accessible; backward and forward citation chasing; harvesting of recent SVT reviews and relevant reference lists.

Main outcome(s) Primary outcome: normal-vision post-training Level 2 sport-specific performance proxy outcomes in athlete or sport-trained samples. Level 2 sport-specific proxies are domain-specific tasks related to sport performance but not official competition analytics, such as sport-specific reactive agility, decision-response tasks, target accuracy, catching/interceptive tasks, sport-specific reaction tasks, or skill execution proxies.

Additional outcome(s) Additional outcomes include domain-generic visual/cognitive outcomes,

mechanistic outcomes, near-transfer outcomes, acute exposure outcomes, retention outcomes, strobe-condition post-test outcomes, Level 3 competitive performance or match analytics, intervention parameters, comparator characteristics, adherence, adverse events, and reporting completeness. These will not define the primary transfer estimate.

Data management Records will be exported in RIS/BibTeX/CSV formats and deduplicated with reference management software plus manual audit. Screening decisions, full-text exclusions, extraction tables, outcome inventory, effect-size ledger, and risk-of-bias evidence will be stored in Excel/CSV/TSV files. Master tables will include TRIAL, ARM, PROTOCOL, OUTCOME, and RISK-OF-BIAS evidence tables. Disagreements will be resolved by discussion or senior adjudication.

Quality assessment / Risk of bias analysis Randomised trials will be assessed using RoB 2. Non-randomised comparative studies included in comparative synthesis will be assessed using ROBINS-I. Certainty of evidence for primary outcomes will be evaluated using GRADE / Summary of Findings where feasible. Studies retained only for evidence mapping or non-comparative descriptive modules may not receive formal RoB 2 or ROBINS-I judgements; their design limitations will be described separately.

Strategy of data synthesis The review will first construct a trial-level evidence map across transfer level, measurement type, post-test vision condition, time scale, comparator structure, and representativeness. The primary meta-analysis will use Dataset A only: athlete/sport-trained samples, multi-session SVT lasting at least one week, normal-vision post-training testing, Level 2 sport-specific proxy outcomes, explicit concurrent between-group comparators, and between-group designs. A random-effects model will be used when pooling is appropriate. The headline model will use one primary independent effect per trial.

Subgroup analysis Prespecified subgroup or stratified analyses may include Level 2 task subtype, comparator match level, sport/task class, competitive level or age group, randomised versus non-randomised comparative design, risk-of-bias strata, training task class, and variance-source type. Subgroups will be interpreted cautiously if study counts are small.

Sensitivity analysis Prespecified sensitivity analyses may include randomised-only subset, exclusion of high risk-of-bias studies, exclusion of

passive or unmatched comparators, alternative outcome selection rules, post-test versus change-score effect-size source, alternative variance-source assumptions, leave-one-out or influence diagnostics, and supportive multilevel or robust-variance analyses if dependent effects are explored.

Language restriction No language restriction at search stage.

Country(ies) involved China; Australia.

Other relevant information This review has been invited as a full manuscript for the Sports Medicine themed issue The Development of Expertise and Expert Performance in Sport. The invitation does not imply acceptance. The protocol is registered to define the review question, evidence-map framework, and primary meta-analysis eligibility before formal screening, extraction, and synthesis. This protocol is also registered or will be registered on OSF and PROSPERO for time-stamped preservation and complementary registry records.

Keywords stroboscopic visual training; athletes; sport-specific transfer; normal vision; evidence map; meta-analysis; sports vision.

Dissemination plans The review is planned for submission to Sports Medicine as an invited full manuscript for the themed issue The Development of Expertise and Expert Performance in Sport. Protocol deviations, if any, will be reported transparently.

Contributions of each author

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