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INPLASY

Transfer Effects of Visual Training on Performance in Soccer Players: A Systematic Review of Training–Testing Task Overlap and Outcome Levels

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INPLASY registration number: INPLASY2026110002

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 1 November 2026 and was last updated on 1 November 2026.

INTRODUCTION

Review question / Objective To determine, at outcome level, whether visual function training or explicit visual-motor training in association football (soccer) players improves performance, and at which transfer level any benefit is supported.
PICOS:
P: soccer players of any age, sex, and competitive level, including goalkeepers; futsal players as a supplementary layer.
I: visual function training or explicit visual-motor training, including stroboscopic/light restriction, spatial occlusion, eye-movement/quiet-eye, peripheral-vision, multiple-object tracking, video/VR perceptual-cognitive, feedback/biofeedback, and colour-cue or multi-component programmes.
C: same-duration conventional training, sham/placebo intervention, alternative training, or no additional training.
O: outcomes coded into a five-level transfer hierarchy — T0 trained task, T1 untrained general visual/visuomotor/fitness test, T2 soccer-specific test, T3 small-sided game or structured match simulation, T4 official match performance.
S: randomised and non-randomised controlled trials with multiple training sessions; single-group pre-post studies were coded as a supplementary layer and cannot support attribution. Cross-sectional studies, reviews, opinion pieces and theoretical papers were not eligible for the effect set and were used only as background or for methodological comparison.
Secondary objectives: to examine whether training-to-test task correspondence, comparator

quality, and retention testing explain the pattern of transfer.

Rationale Visual training is widely marketed to football players, yet the evidence base is heterogeneous in test task, comparator, and outcome level. Previous reviews have largely summarised at study level, which cannot distinguish improvement on the trained task from improvement in match performance. This review therefore re-poses the question as one of transfer level and codes each outcome separately, so that gains can be located where they actually occur. Two estimation objects are separated: the incremental benefit of adding a visual manipulation or feedback component to identical baseline training, and the total benefit of a multi-component package versus conventional training.

Condition being studied Association football performance and the visual/perceptual-cognitive functions proposed to support it. Football requires rapid identification of dynamic targets, use of peripheral information, and action selection under time pressure. Visual function (e.g., dynamic visual acuity, peripheral detection, accommodation, eye movement control) and visual-motor coordination are hypothesised to support these demands, but the degree to which training them transfers to match performance is uncertain.

METHODS

Search strategy PubMed was searched on 16 October 2026 using four strategies without date limits: (Q1) soccer/football terms combined with visual terms; (Q2) the same plus training terms; (Q3) perceptual-cognitive/video/scanning/VR terms; (Q4) stroboscopic and occlusion terms. The full Boolean strings are provided in the supplementary materials. The four strategies returned 2,090 records; after de-duplication by PMID, 1,755 unique records remained; 80 records already present in the existing corpus were removed, leaving 1,675 records for title/abstract screening. Screening excluded 1,584 records as unrelated to football vision training; 91 records (22 rated A, 69 rated B) proceeded to full-text or abstract assessment; after assessment 79 records were excluded with coded reasons and 2 were confirmed as already included, yielding 10 included records from the database search.

An earlier, preliminary PubMed search was run on 9 October 2026 restricted to 2016-2026 (four strategies; 262 records; 212 after de-duplication; 34 records initially included) and was used to build the initial corpus; it was superseded by the unrestricted search of 16 October 2026.

Backward citation chasing from 27 seed papers identified 1,528 references (1,151 after de-duplication; 1,046 screened) and forward citation chasing identified 796 citing works (787 after cleaning; 680 screened); these yielded 37 initially included records (14 core, 23 supplementary) and 62 pending records.

The included studies of two prior systematic reviews were also checked: the 34 included studies of Bergmann et al. (2021) yielded no additional eligible study, and the 7 included studies of Paludo et al. (2026) yielded 1 additional record.

An existing corpus of previously collected records was also used (187 PDFs; 169 unique files after byte-level de-duplication; 163 records after identity merging).

The database search contributed 10 included records and citation checking 1, giving 11 records added to the existing 163, for a final corpus of 174 records; 99 of these were read in full and 88 were coded at outcome level.

Scopus was used only to spot-check the search strategy (records not systematically screened). Web of Science Core Collection and SPORTDiscus were not searched; this limitation is stated explicitly in the review.

Participant or population Association football (soccer) players of any age, sex and competitive level, including goalkeepers; futsal players included as a supplementary layer. Studies of other sports and of referees were used for background only.

Intervention Visual function training or explicit visual-motor training, classified into four families: (C1) visual input restriction training (stroboscopic/light-environment restriction and spatial occlusion); (C2) visual function training (eye-movement/quiet-eye and peripheral-vision training); (C3) perceptual-cognitive training (multiple-object tracking, video/360/VR decision training, and VR/AR training without a decision component); (C4) integrated multi-component training (augmented feedback/biofeedback, multi-component devices, and colour-cue or composite programmes). Within these families eleven sub-classes (S01-S11) are used for descriptive breakdowns: C1=S01+S02, C2=S03+S04, C3=S09+S10+S11, C4=S06+S07+S08. Reviews, systematic reviews and theoretical framework papers are coded

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separately as category R and are reported at literature level rather than as outcome-level records.

Comparator Same-duration conventional soccer training, sham/placebo intervention (e.g., non-stroboscopic clear lenses), alternative training methods, or no additional training. Single-group pre-post designs were coded but cannot support attribution.

Study designs to be included Randomised controlled trials and non-randomised controlled trials with multiple training sessions; single-group pre-post studies were coded as a supplementary layer and cannot support attribution. Cross-sectional studies, reviews, opinion pieces and theoretical papers were not eligible for the effect set and were used only as background or for methodological comparison.

Eligibility criteria Peer-reviewed empirical studies reporting a quantified outcome; intervention must involve an explicit visual stimulus or visual-function target with a visually guided response. Excluded: training without any visual component; balance or mental imagery training without visual stimuli; acute studies that tested performance only during the visual manipulation without a post-training test; studies without an identifiable soccer-specific population; conference abstracts without retrievable data.

Information sources PubMed (four search strategies; full Boolean strings in the supplementary materials); an existing corpus of previously collected records (187 PDFs → 169 unique files after byte-level de-duplication → 163 records after identity merging); backward and forward citation tracking from 27 seed papers identified during screening; and checking of the included studies of two prior systematic reviews (Bergmann et al., 2021; Paludo et al., 2026). Scopus was used only to spot-check the search strategy and its records were not systematically screened. Grey literature, trial registries, hand-searching of journals and conference proceedings, and contact with authors were not systematically searched; Web of Science Core Collection, SPORTDiscus and CNKI were not searched.

Main outcome(s) Primary outcome: transfer of training effects, coded at five outcome levels — T0 trained task; T1 untrained general visual/visuomotor/fitness test; T2 soccer-specific test; T3 small-sided game or structured match simulation; T4 official match performance. Each outcome is coded independently for transfer level and for evidence status (five decision categories plus two pre-decision categories: unmeasured transfer and excluded from the effect set). The unit of analysis is the individual outcome, not the study; no composite score is used and no single level is privileged.

Additional outcome(s) Task correspondence between training and test (four dimensions: stimulus information, trained function, effector/action, contextual constraints), retention interval, training dose (total training minutes vs visual-exposure minutes), and study design/reporting quality. Task correspondence is coded at the level of 158 study × outcome-level instances; three instances lacked sufficient information and were recorded as 'information insufficient'. Instances from review-level records are included in this count and are flagged as such.

Data management Records and extractions are held in a structured spreadsheet with one row per outcome; each of the 479 rows records the outcome, transfer level, comparator type, effect statistic, evidence status, page/table locator, DOI, and — where available — the verbatim source fragment. A coding manual (version 4.0, dated 31 October 2026) defines all categories and boundary rules, including the five transfer levels (T0-T4), the five decision statuses plus two pre-decision statuses (unmeasured transfer; excluded from the effect set), the intervention classification (C1-C4 with sub-classes S01-S04 and S06-S11, and a separate R category for reviews and theoretical frameworks), and the T4 exclusion rules. Of the 174 records in the corpus, 99 were read in full and 88 were coded at outcome level, yielding 479 coded outcome records (477 within the effect set, 454 with a decision status, and 446 measured outcomes after excluding unmeasured transfer and non-objective T4 records). Duplicate reports of the same study are linked under a single study identifier while the unit of analysis remains the individual outcome. The outcome-level dataset and the coding manual are provided as supplementary materials; the dataset will be deposited in a public repository with a DOI.

Quality assessment / Risk of bias analysis Formal risk-of-bias assessment has not yet been completed and is declared as pending. The planned approach is: RoB 2 for randomised trials; ROBINS-I for non-randomised controlled studies; and, for single-group pre-post studies, a separate appraisal covering absence of a control condition, regression to the mean, maturation, familiarisation and repeated-testing effects, measurement properties, and handling of missing data. GRADE

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will be applied to the main transfer-level comparisons (T0–T4) once risk-of-bias judgements are complete; no composite quality score will be computed or used to weight studies. In the present version, design and reporting features are extracted for every study (randomisation, allocation concealment, blinding, retention testing, pre-registration) and are used, together with the availability of a between-group comparison and the provenance of the data (first-hand vs review-reported), to assign the evidence status of each outcome. Evidence status is therefore rule-based and does not depend on any aggregate quality score.

Strategy of data synthesis Synthesis is primarily structured narrative following SWiM, organised by transfer level within each intervention family. Quantitative pooling is performed only where at least two independent studies share design, estimation object, population, intervention and outcome construct. A single directly poolable soccer-specific estimate was available from a published three-level meta-analysis and is reported as such rather than re-estimated.

Subgroup analysis Planned subgroups: intervention family (C1–C4); transfer level (T0–T4); design type (randomised vs non-randomised vs single-group); competitive level; and retention-test availability. Subgroup analyses are descriptive because of small numbers.

Sensitivity analysis Sensitivity analyses and alternative coding scenarios. (a) Interventions whose primary manipulation is multiple-object tracking were reclassified from the visual-input-restriction family (C1) to the perceptual-cognitive family (C3). (b) Excluding the four outcomes of the supplementary layer (a chronic ankle instability subgroup and a trial with a statistically flawed report) from the measured set, which would reduce it from 446 to 442. (c) Including, at outcome level, the 51 records derived from reviews and framework papers, which raises the measured set from 395 to 446. (d) Retaining the eight non-objective T4 records (career progression, school enrolment, season attendance/injury days, review-level judgements, overall evidence judgements, theoretical predictions, opinion-article conclusions, and subjective interview reports) as measured outcomes rather than recoding them as unmeasured transfer, which raises the measured set from 446 to 454. (e) For the pooled estimate, design-stratified sensitivity analysis: randomised trials (k = 26; g = 0.48, 95% CI 0.11–0.84) versus crossover designs (k = 4; g = −0.01, 95% CI −0.77 to 0.74), showing that the near-null pooled soccer estimate (k = 6; g = 0.10, 95% CI −0.56 to 0.76) is sensitive to designcomposition.

Language restriction No language restriction was planned. The evidence set is English-dominant; systematic searching of non-English databases was not performed.

Country(ies) involved China.

Keywords soccer; football; visual training; visual-motor training; sports vision; stroboscopic training; perceptual-cognitive training; transfer of training; systematic review; sports performance.

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