Supplementary

Supplementary Material 1- Corrected manuscript-based PRISMA 2020 checklist

PRISMA 2020 CHECKLIST

Multimodal interventions for upper limb recovery after cervical spinal cord injury: A systematic review and quantitative synthesis

Important: This checklist reports what is documented in the submitted manuscript. Where a PRISMA element was not reported, the checklist states that explicitly rather than inferring that the method was performed.

Section	Item #	Topic	PRISMA 2020 checklist item	Location / what is reported
TITLE	1	Title	Identify the report as a systematic review.	Title page — "Multimodal Interventions for Upper Limb Recovery After Cervical Spinal Cord Injury: A Systematic Review and Quantitative Synthesis."
ABSTRACT	2	Abstract	See the PRISMA 2020 for Abstracts checklist.	Abstract — Structured as background, methods, results and conclusions. A separate PRISMA-for-Abstracts audit is not included here.
INTRODUCTION	3	Rationale	Describe the rationale for the review in the context of existing knowledge.	Section 1 — Rationale addresses limitations of conventional rehabilitation, growth of multimodal therapies (2016–2026), and remaining methodological gaps.
INTRODUCTION	4	Objectives	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Section 1, final paragraph — States the main aim: quantitative synthesis of data from 38 studies centred on five validated upper-limb outcome measures.
METHODS	5	Eligibility criteria	Specify the inclusion and exclusion criteria and how studies were grouped for the syntheses.	Section 2.3 and Table 1 — Inclusion/exclusion criteria are detailed. Section 2.6 describes thematic grouping for synthesis.
METHODS	6	Information sources	Specify all databases, registers, websites, organisations, reference lists and other sources searched/consulted, and the date each source was last searched/consulted.	Section 2.2 — PubMed, Embase, Scopus, Web of Science and Cochrane Library are identified. The manuscript reports a final search on 10 June 2026; database-specific last-search dates are not separately reported.
METHODS	7	Search strategy	Present the full search strategies for all databases/registers/websites, including filters and limits.	Section 2.2 — The core Boolean search concepts are reported in the manuscript. Complete database-specific search strings, filters and limits for all databases are not provided.
METHODS	8	Selection process	Specify study-selection methods, number of reviewers, independence and automation tools, if applicable.	Section 2.4 — Two independent reviewers screened titles/abstracts and full texts; discrepancies were resolved by consensus. No automation tool is reported.
METHODS	9	Data collection process	Specify data-collection methods, number of reviewers, independence, investigator contact and automation, if applicable.	Section 2.5 — Standardised extraction form; two independent reviewers; discrepancies resolved by consensus. No investigator-contact or automation procedure is reported.
METHODS	10a	Data items	List and define all outcomes for which data were sought and specify whether all compatible results/time points/analyses were sought.	Sections 2.5, 2.8 and Results 3.3 — Core outcomes include GRASSP, ARAT, grip/pinch strength, UEMS and SCIM. All available pre–post numerical changes were extracted; qualitative-only reports were excluded from quantitative tables. The manuscript does not explicitly state that every compatible time point/analysis was sought.

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METHODS	10b	Data items	List and define other variables sought and describe assumptions made about missing or unclear information.	Section 2.5 — Author/year, study design, population, sample size, devices/equipment, intervention details, key numerical outcomes, follow-up, limitations, IRB/consent/adverse events. No explicit assumptions or procedure for missing/unclear information are reported.
METHODS	11	Study risk of bias assessment	Specify tools, domains, number of reviewers, independence and automation, if applicable.	Section 2.7 and Table 2 — Qualitative assessment using domains adapted from Cochrane RoB 2 and ROBINS-I; two reviewers independently assessed studies and resolved disagreements by consensus. The reported summary is primarily stratified by intervention category.
METHODS	12	Effect measures	Specify for each outcome the effect measure(s) used in synthesis/presentation.	Section 2.8 — Absolute and percentage pre–post changes; unweighted means, medians and SDs. No RR/OR measures were used because formal meta-analysis was not performed. Outcome-specific effect-measure definitions are not fully prespecified.
METHODS	13a	Synthesis methods	Describe processes used to decide which studies were eligible for each synthesis.	Sections 2.6 and 2.8 — Studies were classified a priori into thematic groups; quantitative synthesis was limited to studies with sufficient numerical pre–post data for the five core outcomes.
METHODS	13b	Synthesis methods	Describe methods required to prepare data for presentation/synthesis, including missing summary statistics or conversions.	Section 2.8 — Studies with only qualitative descriptions or percentage changes without baselines were excluded from quantitative tables. Means and medians were reported to reduce the influence of outliers. Specific conversion rules are not detailed.
METHODS	13c	Synthesis methods	Describe methods used to tabulate or visually display individual-study and synthesis results.	Results — Tables 3–11 provide intervention- and outcome-specific tabulation; Figures 1–19 provide classification, flow, pathway, evidence-landscape and decision-framework displays.
METHODS	13d	Synthesis methods	Describe synthesis methods and rationale; if meta-analysis was performed, describe models, heterogeneity methods and software.	Sections 2.1 and 2.8 — Formal meta-analysis was not performed because of clinical/methodological heterogeneity. Descriptive quantitative synthesis used unweighted means/medians/SDs. No meta-analysis software/model was used.
METHODS	13e	Synthesis methods	Describe methods used to explore possible causes of heterogeneity among study results.	No formal investigation of causes of heterogeneity was performed because no meta-analysis was conducted. Heterogeneity was addressed narratively by intervention category and study characteristics, with medians emphasised over means.
METHODS	13f	Synthesis methods	Describe sensitivity analyses conducted to assess robustness of synthesised results.	Section 2.8 / Table 6 note — Excluding the two largest outliers (+1,136% and +1,035% force gains) reduced mean grip percentage change to approximately +45%, while the median remained stable.
METHODS	14	Reporting bias assessment	Describe methods used to assess risk of bias due to missing results in a synthesis.	Not formally assessed — Selective reporting is acknowledged within overall risk-of-bias discussion/Table 2, but no dedicated missing-results/reporting-bias method is reported.
METHODS	15	Certainty assessment	Describe methods used to assess certainty/confidence in the body of evidence for each outcome.	Not performed — No formal GRADE or equivalent certainty assessment is reported.
RESULTS	16a	Study selection	Report search and selection results from records identified to studies included, ideally with a flow diagram.	Section 2.4 and Figure 2 — 1,330 records identified → 320 duplicates removed → 1,010 screened → 290 full texts assessed → 38 studies included.

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RESULTS	16b	Study selection	Cite studies that might appear to meet inclusion criteria but were excluded, and explain why.	Section 2.4 — Aggregate exclusion reasons are reported (wrong population, no quantitative UL outcomes, irrelevant intervention, publication type/date, animal/epidemiology, other), but individual potentially eligible excluded studies are not listed/cited.
RESULTS	17	Study characteristics	Cite each included study and present its characteristics.	Sections 3.1–3.2 and Tables 3–5 — Included studies are cited and characterised by design, population, intervention category, devices and key outcomes.
RESULTS	18	Risk of bias in studies	Present assessments of risk of bias for each included study.	Section 2.7 and Table 2 — Risk of bias is summarised by intervention category with key domains/justifications. An explicit study-by-study risk-of-bias display for all 38 studies is not provided.
RESULTS	19	Results of individual studies	For all outcomes, present per-study summary statistics and effect estimates with precision where appropriate.	Tables 7–11 — Study-level baseline, post/follow-up and change values are presented for grip/pinch, ARAT, GRASSP, SCIM and UEMS. Precision estimates such as CIs were not consistently available/reported and were not synthesised.
RESULTS	20a	Results of syntheses	For each synthesis, summarise characteristics and risk of bias among contributing studies.	Section 3.3 and cross-category insights in Section 3.4; Table 2 — Contributing-study characteristics and risk-of-bias information are summarised.
RESULTS	20b	Results of syntheses	Present results of all statistical syntheses conducted; if meta-analysis was done, present estimates, precision and heterogeneity measures.	Table 6 — Descriptive synthesis reports number of extractable changes, mean, median and SD for the five core outcomes. No meta-analytic summary estimate was calculated.
RESULTS	20c	Results of syntheses	Present results of investigations of possible causes of heterogeneity.	No formal heterogeneity investigation was conducted. Narrative stratification by intervention type and study characteristics is provided.
RESULTS	20d	Results of syntheses	Present results of all sensitivity analyses conducted.	Table 6 note — Removal of two extreme outliers reduced the mean grip percentage change; the median remained stable.
RESULTS	21	Reporting biases	Present assessments of risk of bias due to missing results for each synthesis assessed.	Not formally assessed or presented — No dedicated assessment of missing results/reporting bias is reported for the syntheses.
RESULTS	22	Certainty of evidence	Present certainty/confidence assessments for the body of evidence for each outcome.	Not performed — No formal certainty ratings are presented.
DISCUSSION	23a	Discussion	Provide a general interpretation of results in context of other evidence.	Section 4 — Interprets approximately 75% improvement rate, larger effects with stimulation/hybrid approaches, and comparison with natural-recovery limitations.
DISCUSSION	23b	Discussion	Discuss limitations of the evidence included in the review.	Section 4 — Discusses high/critical RoB, small samples, lack of controls, short follow-up, heterogeneity and limited long-term evidence.
DISCUSSION	23c	Discussion	Discuss limitations of the review processes used.	Section 4 — Acknowledges absence of formal meta-analysis/certainty assessment, descriptive synthesis and potential language bias (English-only inclusion).
DISCUSSION	23d	Discussion	Discuss implications for practice, policy and future research.	Sections 4 and 5 — Calls for larger multicentre RCTs, standardised outcomes, longer follow-up, hybrid protocols, early MEP stratification and user-centred design.

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OTHER INFORMATION	24a	Registration and protocol	Provide registration information, including register name/number, or state that the review was not registered.	The review was not prospectively registered. No registration number is available.
OTHER INFORMATION	24b	Registration and protocol	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	No protocol was prepared and no protocol is publicly accessible.
OTHER INFORMATION	24c	Registration and protocol	Describe and explain amendments to information provided at registration or in the protocol.	No protocol was prepared; therefore, no protocol amendments were made.
OTHER INFORMATION	25	Support	Describe financial/non-financial support and the role of funders/sponsors.	No external funding was received for this review, and no funder or sponsor had a role in the design, conduct, analysis, interpretation, or reporting of the review.
OTHER INFORMATION	26	Competing interests	Declare competing interests of review authors.	Conflict of Interest statement — Authors declare that they have no conflicts of interest related to this work.
OTHER INFORMATION	27	Availability of data, code and other materials	Report which data-collection forms, extracted data, analysis data, analytic code and other materials are publicly available and where.	The data collection form, extracted dataset, analysis dataset, analytic code, and other review materials are not publicly available. Study-level outcome data are reported in the manuscript tables.