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Effects of Isokinetic Muscle Strengthening on Gait speed and Functional mobility after Stroke: A Systematic Review and Meta-analysis with Subgroup Analyses

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ADMINISTRATIVE INFORMATION**Support** - No support.**Review Stage at time of this submission** - Completed but not published.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202690001

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

INTRODUCTION

Review question / Objective This systematic review and meta-analysis aimed to evaluate the effects of isokinetic strength training (IST) on walking speed and functional mobility in individuals with stroke.

Rationale Stroke is a leading cause of long-term disability, frequently resulting in persistent impairments in motor control, muscle strength, balance, and coordination. These impairments can limit walking ability and functional mobility, thereby reducing independence, community participation, and quality of life. Resistance training is therefore an important component of stroke rehabilitation for improving muscle strength and functional performance. Resistance training includes isometric, isotonic, and isokinetic exercise. IST provides accommodating resistance throughout the range of motion, allowing resistance to adapt to force-generating capacity at different joint angles. It also enables precise control of training

parameters, reproducible exercise prescription, and real-time feedback and performance monitoring, making it a potentially useful approach for stroke rehabilitation]. Although resistance training has been extensively investigated after stroke, evidence specifically regarding IST remains limited. Therefore, this systematic review and meta-analysis evaluated the effects of IST on walking speed and functional mobility after stroke and further explored the influence of training characteristics and dosage using subgroup and meta-regression analyses.

Condition being studied This meta-analysis will be conducted using the PICO framework as follows: Population (P): diagnosis of stroke; Intervention (I): IST; Comparison (C): the control group who did not undergo IST; Outcomes (O): gait speed performance, functional mobility.

METHODS**Participant or population** Stroke.

Intervention IST.

Comparator Other conventional physical therapy.

Study designs to be included Controlled clinical trials.

Eligibility criteria The inclusion criteria will be as follows: (1) employed a controlled clinical trial design; (2) included adults diagnosed with stroke; (3) incorporated IST, either alone or in combination with other rehabilitation interventions; and (4) included a comparison group that did not receive IST.

Information sources The literature search will use terms related to IST and stroke (“isokinetic” OR “isokinetic exercise” OR “isokinetic training” OR “isokinetic strength training” OR “isokinetic muscle strengthening”) AND (“stroke” OR “cerebrovascular accident” OR “cerebral infarction” OR “brain infarction”). Search terms were combined using appropriate Boolean operators, with database-specific syntax and indexing terms applied as required.

Main outcome(s) Gait speed was the primary outcome and was assessed using the 10-meter walk test (10MWT) or GAITRite system, which demonstrate acceptable concurrent validity in individuals with stroke.

Additional outcome(s) Functional mobility was assessed using the Timed Up and Go (TUG) test, which has excellent intra- and inter-rater reliability.

Data management Data were independently collected by two reviewers using a standardized extraction procedure. Extracted information covered study and participant characteristics, sample size, study design, intervention characteristics, outcome measures, and follow-up duration. Any discrepancies were resolved through discussion, and study authors were contacted when additional or missing information was required. For studies with multiple assessment time points, only data collected immediately after the intervention were included in the meta-analysis.

Quality assessment / Risk of bias analysis Study quality was assessed using the Physiotherapy Evidence Database (PEDro) Scale (0–10), with higher scores indicating better methodological quality. The certainty of evidence for each outcome was evaluated using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach and classified as

high, moderate, low, or very low based on risk of bias, inconsistency, indirectness, imprecision, and publication bias.

Strategy of data synthesis Statistical analyses were performed using Comprehensive Meta-Analysis (version 4; Biostat, USA). A random-effects model was applied to account for potential clinical heterogeneity among studies. Treatment effects were expressed as Hedges’ g , with values of 0.2, 0.5, and 0.8 representing small, moderate, and large effects, respectively. Between-study heterogeneity was assessed using Cochran’s Q and I^2 statistics, with I^2 values of 25%, 50%, and 75% representing low, moderate, and high heterogeneity, respectively. Statistical significance was defined as a two-sided $p < 0.05$.

Subgroup analysis Subgroup analyses were conducted according to training regimen (IST alone vs. IST combined with other rehabilitation interventions), training velocity (single vs. multiple velocities), and targeted region (single vs. multiple regions), assuming a common between-study variance (τ^2) across subgroups. Meta-regression analyses examined the potential effects of treatment duration, training frequency, right-to-left hemiplegia ratio, and contraction mode on treatment effects.

Sensitivity analysis Sensitivity analyses will be conducted using a leave-one-out approach to assess the robustness of the pooled effect estimates.

Language restriction No language limit.

Country(ies) involved Taiwan.

Keywords Isokinetic Training, Stroke Rehabilitation, Exercise Therapy, Walking Speed.

Contributions of each author

Author 1 - Long-Huei Lin - Conceptualization; Methodology; Formal analysis; Data curation; Writing – Original Draft; Visualization.

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