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RESEARCH **Open Access**

Robotic Glove Therapy in Stroke Rehabilitation: A Scoping Review of Current Evidence and Research Trends

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Abstract

Stroke remains a leading cause of long-term disability worldwide, with persistent upper limb and hand impairments substantially restricting functional independence and quality of life. Robotic glove therapy has emerged as an innovative wearable rehabilitation technology designed to deliver high-intensity, repetitive, and task-specific hand training to stimulate neuroplastic recovery. Despite growing clinical interest, the breadth of current evidence and its translational implications remain insufficiently synthesized. This scoping review aimed to systematically map existing research on robotic glove therapy in stroke rehabilitation, identify methodological gaps, and analyze technological and clinical outcome trends. The review followed the PRISMA-ScR framework. A comprehensive search of PubMed, ScienceDirect, ProQuest, Google Scholar, and national index databases identified 110 records published between 2016 and 2026. After duplicate removal and eligibility screening, eight studies were included in the final synthesis, comprising randomized controlled trials, pilot trials, double-blind studies, and case reports conducted in Europe, Asia, and North America. The findings indicate that robotic glove interventions—including soft robotic gloves, EMG-driven systems, passive mobilization devices, and hand exoskeleton gloves consistently improved upper limb motor outcomes, hand dexterity, grip strength, spasticity, pain, and activities of daily living. Technologies incorporating intention-driven or EMG-triggered control demonstrated superior functional gains, underscoring the importance of active patient engagement in motor relearning. Importantly, robotic glove therapy demonstrates practical feasibility due to its wearable design, adaptability to various impairment levels, and potential for semi-supervised or home-based deployment. By increasing training intensity without proportionally increasing therapist workload, this innovation offers a scalable rehabilitation solution, particularly relevant for healthcare systems facing workforce limitations and growing stroke prevalence. While methodological heterogeneity and limited sample sizes constrain definitive conclusions, current evidence supports robotic glove therapy as a clinically promising and operationally feasible adjunct to conventional stroke rehabilitation, warranting larger standardized trials and contextual implementation studies in emerging healthcare settings.

Keywords: Stroke, Stroke Rehabilitation, Hand Rehabilitation, Neuroplasticity, Robotic Glove.

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1. INTRODUCTION

Stroke remains one of the leading causes of mortality and long-term disability worldwide, posing a substantial public health and socioeconomic burden (Tang et al., 2024). According to the latest update from the World Stroke Organization, approximately 12.2 million new stroke cases occur globally each year, with more than 101 million people living with the consequences of stroke (World Stroke Organization, 2023). Stroke accounts for nearly 6.5–7 million deaths annually, making it the second leading cause of death worldwide. In addition, stroke is a major contributor to disability, responsible for over 143 million disability-adjusted life years (DALYs) lost globally (Anwer et al, 2022; Feigin et al, 2022). Importantly, more than 50% of stroke survivors experience persistent upper limb motor impairment, and approximately 30–40% remain functionally dependent in activities of daily living (ADLs) months to years after the event (Chen, 2025). The global burden of stroke continues to increase, particularly in low- and middle-income countries (LMICs), where nearly 86% of stroke-related deaths and disability occur (Wang et al, 2023). Recent epidemiological analyses published in The Lancet Neurology indicate that population aging, hypertension, diabetes, obesity, and sedentary lifestyles are major contributors to the rising incidence and prevalence of stroke worldwide (GBD 2021 Stroke Collaborators, 2023).

In Indonesia, stroke represents a critical and escalating health problem. Based on the most recent data from Kementerian Kesehatan Republik Indonesia and the 2018–2023 national health reports, stroke remains the leading cause of death in Indonesia, accounting for approximately 21% of all mortality from non-communicable diseases. The national prevalence of stroke diagnosed by health professionals increased from 7‰ to 10.9‰, with more recent provincial health profiles indicating a continued upward trend in absolute case numbers due to demographic aging and improved case detection (Ministry of Health of The Republic of Indonesia, 2013; Ministry of Health of The Republic of Indonesia, 2018). Indonesia also faces a significant post-stroke disability burden, with many survivors experiencing long-term motor deficits, particularly in the upper limb and hand, which substantially limit independence and productivity (Ko et al, 2023). Limited access to intensive neurorehabilitation services, unequal distribution of rehabilitation professionals, and infrastructure constraints further exacerbate functional outcomes in many regions (Abdelraouf et al, 2025).

Motor dysfunction remains one of the most disabling sequelae of stroke (Lim et al, 2023). Upper limb impairment affects approximately 50–70% of stroke survivors, and recovery of fine hand function is often incomplete despite conventional rehabilitation (Shin et al, 2022; Wang et al, 2023). Distal motor deficits, including impaired finger extension, reduced grip strength, spasticity, and poor dexterity significantly compromise independence in ADLs and quality of life. Although conventional approaches such as task-oriented training, mirror therapy, constraint-induced movement therapy, and occupational therapy have demonstrated benefits, outcomes are frequently limited by insufficient training intensity, therapist availability, and plateau effects in chronic stages of recovery (Ko et al, 2023; Abdelraouf et al, 2025). Given the rising global and national stroke burden, there is an urgent need for scalable, high-intensity, and technology-assisted rehabilitation strategies that can enhance neuroplastic recovery while optimizing healthcare resources. Robotic glove therapy has emerged as a promising modality within neurorehabilitation, designed to deliver repetitive, task-specific, and assistive hand training aligned with principles of experience-dependent neuroplasticity (Shin et al, 2022). By enabling intensive and controlled finger movement practice, robotic gloves may address persistent distal motor impairment and potentially reduce long-term disability among stroke survivors.

2. RESEARCH METHOD

This study employed a scoping review methodology to comprehensively map the existing evidence on robotic glove therapy in stroke rehabilitation. A scoping review approach was selected due to the heterogeneity of study designs, intervention characteristics, and outcome measures, as well as the rapidly evolving nature of wearable robotic technologies. The review was conducted in accordance with the PRISMA Extension for Scoping Reviews (PRISMA-ScR) guidelines and followed the five-stage framework proposed by Arksey and O'Malley (2005): (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, and (5) collating, summarizing, and reporting the results as shown in Fig. 1

A comprehensive literature search was conducted in the following electronic databases: PubMed, ScienceDirect, ProQuest, Google Scholar, and National Index Databases (Garba Rujukan Digital Indonesia). Database names are presented consistently according to their official titles. The primary search was performed between 1 January 2026 and 15 January 2026. All searches were limited to peer-reviewed articles published between January 2016 and January 2026. In PubMed, both Medical Subject Headings (MeSH) and free-text terms were used to enhance sensitivity and specificity. The MeSH terms included: "Stroke"[MeSH]; "Rehabilitation"[MeSH]; "Robotics"[MeSH]; "Upper Extremity"[MeSH]. These were combined with relevant keywords using Boolean operators. The core Boolean search string applied (with database-specific syntax adjustments) was: ("robotic glove" OR "soft robotic glove" OR "robotic hand" OR "robot-assisted glove" OR "hand exoskeleton" OR "robot-assisted hand rehabilitation") AND ("stroke" OR "post-stroke" OR "cerebrovascular accident") AND ("rehabilitation" OR "therapy" OR "motor recovery" OR "upper limb recovery" OR "hand function") NOT ("animal study" OR "protocol" OR "conference abstract"). Field restrictions were applied where appropriate (title/abstract/keywords). For Google Scholar, advanced filters were used to restrict publication year and language.

To minimize publication bias and enhance comprehensiveness, a supplementary manual search was conducted by: Screening reference lists of all included studies, Reviewing relevant systematic reviews on robotic rehabilitation, Performing citation tracking of key articles. National Index Databases was included as a supplementary regional database to identify potentially relevant studies from Indonesia or Southeast Asia.

No explicit open-access restriction was applied during the initial search process. However, full-text availability was required for eligibility assessment. This may introduce availability bias, as studies inaccessible through institutional subscriptions could not be evaluated. This limitation is acknowledged and discussed in the manuscript.

All identified records were exported to Mendeley reference management software for duplicate removal. The screening process was conducted in two stages: Title and abstract screening, Full-text eligibility assessment. Screening was performed independently by two reviewers. Each reviewer assessed eligibility according to predefined inclusion and exclusion criteria. In cases of disagreement, discrepancies were resolved through discussion and consensus. If consensus could not be reached, a third senior reviewer was consulted for final decision-making. The selection process is illustrated using a PRISMA-ScR flow diagram (Figure 1), which details the number of records identified, screened, excluded (with reasons), and included in the final synthesis.

All searches were limited to peer-reviewed English-language articles published between January 2016 and January 2026. This structured Boolean approach ensured that retrieved articles simultaneously addressed robotic glove interventions AND stroke populations AND rehabilitation outcomes, thereby minimizing irrelevant retrievals while maintaining search sensitivity. The initial search yielded 110 records. After removal of 14 duplicates, 96 articles remained for title and abstract screening. Following screening, 62 full-text articles were assessed for eligibility. Of these, 54 articles were excluded based on predefined criteria, resulting in 8 studies included in the final synthesis, as illustrated in Figure 1.

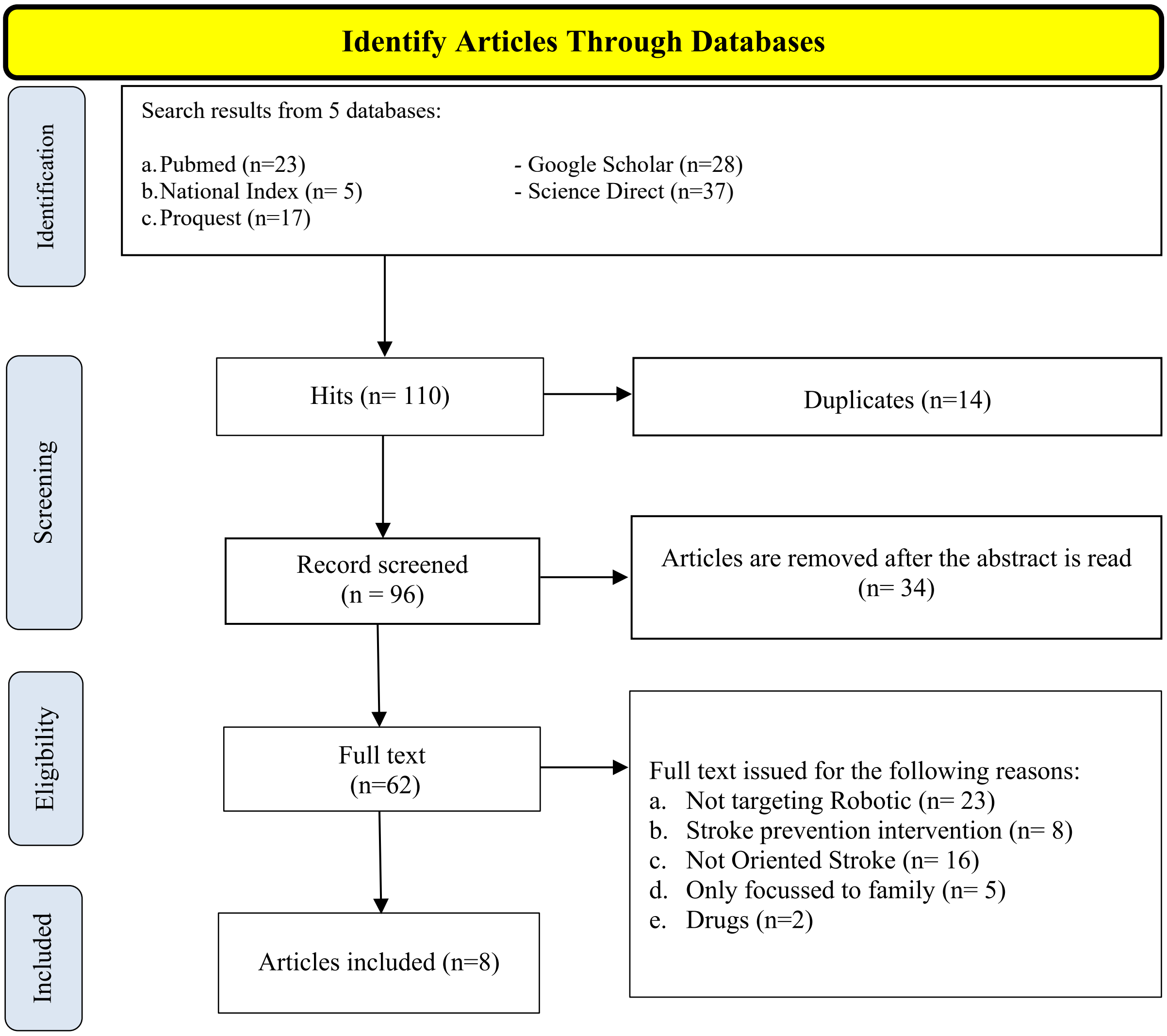

Figure 1. PRISMA flow diagram for the scoping review.

3. RESULTS AND DISCUSSION

The final database search was conducted on 15 January 2026, identifying a total of 110 records. After screening and eligibility assessment, eight studies met all inclusion criteria and were included in the final synthesis. The study selection process, as illustrated in the PRISMA flow diagram (Fig. 1), is also summarized in Table 1.

Table 1. Analysis for 8 articles

Author	Aim	Research Design	Intervention	Finding
(Shi et al, 2021)	Evaluate efficacy of EMG-driven soft robotic hand in chronic stroke	RCT, n=16 (China)	20 sessions (1 hour) of EMG-driven soft robotic hand training (flexion–extension).	Significant improvement in FMA-UE, ARAT, BBT, grip strength; effective particularly in mild/no spasticity.
(Ranzani et al, 2020)	Compare robot-assisted	RCT, n=33 (Switzerland)	15–45 min/session for 4	Non-inferior motor recovery

	neurocognitive therapy vs conventional therapy		weeks using ReHapticKnob device integrated into standard rehab	(FMA-UE) compared to conventional therapy; feasible for reduced supervision and home use.
(Villafañe et al, 2018)	Assess short-term robot-assisted mobilization in hand paralysis	RCT, n=32 (Italy)	30 min robotic passive mobilization (Gloreha), 3×/week for 3 weeks + standard therapy	Comparable improvement to conventional therapy in reducing pain and spasticity; improved functional scores.
(Borboni et al, 2017)	Examine effect of robotic mobilization on edema and pain	Double-blind trial, n=30 (USA)	Passive mobilization with Gloreha, twice daily for 2 weeks	Significant reduction in wrist edema and pain (greater in partial paralysis group).
(Yurkewich et al, 2020)	Evaluate HERO Grip Glove usability and ADL support	Case study, n=11 (Canada)	Wearable extension orthosis supporting finger extension during functional tasks	Improved finger extension, grip strength, and ADL performance; enhanced independence
(Franceschini et al, 2020)	Compare robot-assisted vs traditional therapy in subacute stroke	RCT, n=48 (Italy)	Robot-assisted upper-limb training vs traditional therapy; follow-up at 6 months.	Greater motor improvement (FM-UL) in robotic group; gains maintained at follow-up.
(Carpinella et al, 2020)	Assess robot therapy on kinematics and arm function	Pilot RCT, n=40 (Italy)	Robot-assisted training vs physiotherapy; pre–post kinematic analysis.	Comparable FM-UE improvement; superior shoulder–elbow coordination and reduced

				trunk compensation.
(Cisnal et al, 2022)	Assess emotional response to RobHand platform	Case study, n=5 (Spain)	30 sessions using RobHand exoskeleton with virtual environment.	Increased patient engagement, perceived control, and positive emotional response.

Importantly, the observed variability in outcomes does not appear to be determined solely by device type, but rather by the interaction between robotic assistance characteristics, task specificity, and the degree of active patient engagement. Studies incorporating EMG-driven or intention-based control mechanisms demonstrated more consistent functional gains, supporting motor learning frameworks that emphasize volitional effort as a driver of neuroplastic adaptation.

However, it is important to acknowledge that none of the included studies were conducted in Indonesia. The eight eligible studies originated from Europe, North America, and Asia (primarily China), indicating that the current evidence base is geographically concentrated in technologically advanced rehabilitation settings. This limits the direct generalizability of findings to the Indonesian healthcare context, where infrastructure availability, therapist-to-patient ratios, funding mechanisms, and access to advanced rehabilitation robotics may differ substantially. The absence of Indonesian-based clinical trials highlights a significant research gap and underscores the need for locally conducted studies to evaluate feasibility, cost-effectiveness, and cultural adaptation of robotic glove–based interventions within Indonesia's rehabilitation system.

The analysis of the characteristics of included studies provides critical insight into the maturity, scope, and translational readiness of robotic glove–based rehabilitation research. Understanding study design, sample size, stroke stage, intervention intensity, and outcome measures is essential to determine the strength of evidence, identify methodological gaps, and evaluate how these technologies may address the growing burden of stroke-related disability. The eight included studies, published between 2017 and 2022, were conducted in Europe (Italy, Spain, Switzerland), North America (United States, Canada), and Asia (China). Study designs consisted of randomized controlled trials (n = 4), pilot RCTs (n = 1), a double-blind clinical trial (n = 1), and case or feasibility studies (n = 2). Sample sizes ranged from 5 to 48 participants, indicating that most studies were small-scale and exploratory. Stroke stages varied, including acute, subacute, and chronic phases, with the majority focusing on individuals with moderate to severe upper limb impairment, particularly limited finger extension and impaired hand function (Shi et al, 2021; Ranzaniet al, 2020; Villafañe et al, 2018; Borboni et al, 2017; Yurkewich et al, 2020; Franceschini et al, 2020).

Figure 2. A robotic glove used for stroke rehabilitation.

The predominance of randomized and controlled designs indicates an emerging but still developing evidence base. While the presence of RCTs strengthens internal validity, the relatively small sample sizes limit statistical power and generalizability. Given that stroke remains one of the leading causes of long-term disability globally and in Indonesia, robust multicenter trials are necessary to determine whether robotic glove therapy can meaningfully reduce population-level disability burden.

The inclusion of both subacute and chronic stroke populations is clinically significant. Early-stage (subacute) rehabilitation is associated with heightened neuroplastic potential, whereas chronic-stage interventions address persistent disability. The fact that robotic glove interventions demonstrated benefits across stages suggests potential applicability both for early motor recovery and for long-term disability management two critical dimensions in addressing stroke-related functional dependence.

Intervention intensity and duration were relatively short (2–4 weeks in most studies), yet measurable improvements were observed in motor function, dexterity, and ADLs. This suggests that robotic glove systems may enhance training efficiency by increasing repetition and task specificity within limited rehabilitation time. In healthcare systems facing workforce shortages such as Indonesia, where rehabilitation services are unevenly distributed technologies that amplify training intensity without proportionally increasing therapist workload may contribute to reducing unmet rehabilitation needs. Outcome measures consistently included validated motor scales such as FMA-UE, ARAT, grip strength, and ADL indices. The focus on distal hand function is particularly relevant, as hand impairment remains one of the most disabling and persistent sequelae of stroke. Recovery of fine motor skills directly influences independence in self-care, productivity, and social participation. Therefore, studying these characteristics helps determine whether robotic glove therapy addresses clinically meaningful endpoints rather than merely laboratory-based kinematic improvements.

From a public health perspective, linking these study characteristics to the broader stroke problem clarifies their practical relevance. Stroke imposes not only mortality risk but also long-term disability, caregiver burden, and economic costs. Technologies that demonstrate improvements in functional independence especially in hand use have the potential to reduce dependency, shorten rehabilitation duration, and improve reintegration into daily life. However, a critical gap remains: none of the included studies were conducted in Indonesia or similar low-to middle-income healthcare contexts. This geographic concentration limits direct applicability. Evaluating study characteristics therefore also highlights the need for context-specific trials assessing feasibility, cost-effectiveness, infrastructure compatibility, and therapist training requirements within Indonesian rehabilitation settings. In summary, analyzing the characteristics of included studies is not merely descriptive; it provides essential evidence regarding methodological rigor, clinical applicability, and translational potential. The findings suggest that robotic glove therapy may contribute to addressing persistent post-stroke hand disability through intensive, task-specific, and potentially scalable rehabilitation strategies. Nevertheless, larger trials and context-adapted implementation studies are required to determine whether these benefits can meaningfully reduce the growing stroke-related disability burden, particularly in emerging healthcare systems.

Intervention Characteristics

Intervention protocols demonstrated notable heterogeneity in duration, frequency, and intensity. Training periods ranged from 2 to 4 weeks, with session durations between 15 and 60 minutes, delivered 3–5 times per week. In most studies, robotic glove therapy was administered as an adjunct to conventional physiotherapy and occupational therapy, whereas a smaller number evaluated semi-independent or home-based applications (Ranzani et al, 2020; Villafañe et al, 2018). Importantly, although family involvement was not systematically measured across the included studies, its potential role is clinically relevant—particularly in home-based or minimally supervised settings. Stroke survivors with moderate to severe hand impairment often require assistance for device setup, monitoring, and adherence to prescribed training schedules. In such contexts, caregiver or family support may influence treatment compliance, safety, and long-term engagement with robotic rehabilitation devices (Yurkewich et al, 2020). However, none of the included studies explicitly evaluated caregiver training protocols, caregiver burden, or the impact of family support on functional outcomes. This represents a significant gap in the current evidence base, especially for implementation in healthcare systems where family-centered care is integral to rehabilitation practice. Future studies should incorporate structured assessment of caregiver involvement, feasibility of home supervision, and psychosocial dynamics influencing sustained device utilization.

Clinical and Functional Outcomes

Across the included studies, robotic glove therapy was associated with improvements in upper limb motor function, particularly in hand and finger performance. Commonly reported outcome measures included the Fugl-Meyer Assessment for Upper Extremity (FMA-UE), Action Research Arm Test (ARAT), grip strength, Box and Block Test (BBT), and activities of daily living (ADL) scales. EMG-driven soft robotic hand training demonstrated significant improvements in FMA-UE, ARAT, and grip strength among individuals with chronic stroke and mild to moderate spasticity (Shi et al, 2021). Passive robotic mobilization using the Gloreha device resulted in reductions in pain, spasticity, and wrist edema, particularly in patients with partial hand paralysis (Borboni et al, 2017;Villafañe et al, 2018). Comparative trials indicated that robotic glove–assisted therapy achieved motor recovery outcomes comparable to, or in some cases exceeding, conventional therapy, especially in subacute stroke populations (Ranzani et al, 2020; Franceschini et al, 2020). Improvements were not limited to clinical scores but extended to movement quality, including enhanced shoulder–elbow coordination and reduced compensatory trunk movements (Carpinella et al, 2020).

Psychosocial and User Experience Outcomes

Beyond physical outcomes, several studies evaluated usability, acceptance, and emotional responses to robotic glove therapy. Case studies involving the HERO Grip Glove and RobHand platform reported increased patient independence in ADLs, enhanced motivation to use the affected limb, and positive emotional engagement during therapy sessions (Yurkewich et al, 2020; Cisnal et al, 2022). Familiarity with the robotic systems over time was associated with increased perceived control and comfort, supporting their feasibility for longer-term use.

Overall, the findings reveal a growing trend toward personalized, technology-assisted hand rehabilitation, emphasizing soft robotics, neurocognitive integration, and patient-centered design. However, notable gaps persist, including small sample sizes, short intervention durations, and limited long-term follow-up. Additionally, variability in outcome measures and intervention protocols limits cross-study comparability, underscoring the need for standardized frameworks and larger multicenter trials.

DISCUSSION

This scoping review advances existing literature by specifically isolating glove-based robotic interventions, thereby offering a focused synthesis that distinguishes distal hand rehabilitation from broader upper-limb robotics.The present scoping review synthesizes contemporary evidence on robotic glove therapy in stroke rehabilitation, revealing consistent indications that soft robotic gloves (SRGs) provide measurable benefits in hand function and motor recovery relative to conventional rehabilitation modalities (Louie et al, 2016). Across multiple controlled trials and comparative studies, SRGs improved key outcomes such as the Fugl-Meyer Assessment for Upper Extremity (FMA-UE), distal Fugl-Meyer scores, Box and Block Test (BBT), and Action Research Arm Test (ARAT), particularly when rehabilitation sessions exceeded 30 minutes and when stroke latency was prolonged (>6 months) (Iqbal et al, 2015). These findings align with broader meta-analytic evidence supporting the efficacy of SRGs for upper limb motor recovery in stroke survivors.

Interpretation of Findings

The improvements reported across included studies were observed following relatively short intervention periods, generally ranging from 2 to 4 weeks, with session durations between 15 and 60 minutes, delivered three to five times per week. In most randomized controlled trials, statistically significant improvements in motor outcomes such as FMA-UE, ARAT, and grip strength were detected immediately after completion of the intervention period (post-test evaluation at 2–4 weeks) (Ko et al, 2023; Shin et al, 2022). For example, studies using EMG-driven soft robotic gloves reported measurable gains in hand motor function after approximately 20 supervised sessions over four weeks. Similarly, passive robotic mobilization devices demonstrated reductions in pain and spasticity within 2–3 weeks of use. One study that included a longer follow-up period (6 months) indicated that motor improvements achieved during the intervention phase were partially maintained over time, suggesting potential durability of gains (Wachirayongyot et al, 2022). However, it is important to clarify that robotic gloves do not “cure” stroke-related motor impairment. Rather, they facilitate incremental functional recovery through repetitive, task-oriented training. The magnitude and sustainability of recovery appear to depend on stroke chronicity, baseline impairment severity, intervention intensity, and integration with conventional therapy (Abdelraouf et al, 2025). Most studies included small sample sizes and short intervention durations, limiting firm conclusions regarding optimal treatment length or long-term recovery trajectories (Wang et al, 2023). Overall, current evidence suggests that clinically measurable improvements may begin to emerge within 2–4 weeks of structured robotic glove therapy, but long-term recovery beyond this period remains insufficiently studied (Heo et al, 2012).

Comparison and Possible Explanations for Outcomes

The results corroborate prior systematic reviews that indicated positive effects of SRGs on manual dexterity and functional performance, albeit with persistent gaps in evidence strength due to small sample sizes and methodological variability (Mehrholz et al, 2018; Ko et al, 2023). Unlike older reviews that pooled various robotic devices (exoskeletons, end-effectors) and often diluted specific glove effects, this scoping review focuses narrowly on SRGs, enabling a more precise understanding of glove-mediated rehabilitation outcomes. Notably, larger meta-analyses have reported small positive effects of robotic rehabilitation on upper limb capacity but variable impacts on activities of daily living (ADLs), emphasizing that glove design and task specificity may moderate efficacy (Smith et al, 2025). Several mechanisms may explain the observed benefits of SRGs. First, enhanced sensorimotor feedback and repeated movement practice facilitate activity-dependent cortical reorganization, a central principle of post-stroke neuroplasticity (Shin et al, 2022). Second, SRGs may reduce spasticity and improve coordination through assistive torque generation, which enables patients to engage in tasks beyond their voluntary capability (Wachirayongyot et al, 2022). Third, the integration of biofeedback and EMG-triggered actuation in some SRGs fosters active patient engagement, a factor linked to superior motor learning outcomes (Ko et al., 2023).

Theoretical and Practical Implications

From a theoretical standpoint, robotic glove therapy aligns with principles of experience-dependent neuroplasticity, emphasizing repetition, task specificity, intensity, and active engagement (Polygerinos et al, 2016). By facilitating assisted finger movement and providing structured task-oriented training, robotic gloves operationalize motor learning frameworks that support cortical reorganization after stroke (Zhang et al, 2021). However, it is important to acknowledge that none of the included studies were conducted in Indonesia. The existing evidence originates primarily from Europe, North America, and parts of Asia with advanced rehabilitation infrastructure. Therefore, direct translation of these findings into Indonesian clinical practice requires careful consideration of contextual factors.

In Indonesia, several structural challenges may influence feasibility, including limited availability of rehabilitation robotics, unequal distribution of physiotherapists and occupational therapists, cost constraints within the national health insurance system (BPJS), and disparities between urban and rural healthcare facilities. Robotic gloves are currently not standard equipment in most Indonesian rehabilitation centers, and their procurement cost may limit widespread adoption. Nevertheless, potential pathways for implementation exist. First, robotic gloves could be introduced in tertiary referral hospitals or academic medical centers as pilot programs. Second, integration into outpatient neurorehabilitation units may reduce therapist workload by enabling semi-assisted repetitive training. Third, locally developed or lower-cost soft robotic systems could improve affordability and accessibility. Finally, collaboration between biomedical engineers, rehabilitation specialists, and policymakers is essential to evaluate cost-effectiveness and scalability within Indonesia's health financing framework. Thus, while robotic glove therapy is not yet widely implemented in Indonesia, it is theoretically applicable and may become feasible through phased adoption, local adaptation, and structured evaluation studies. Future research conducted within Indonesian rehabilitation settings is critically needed to assess clinical effectiveness, economic viability, and patient acceptance in real-world practice.

This scoping review's strengths include a focused synthesis on glove-specific robotic interventions, rigorous PRISMA-ScR methodology, and inclusion of recent trials with long-term follow-up data. However, limitations remain. Many studies were limited by small sample sizes, variable intervention protocols, and short follow-up durations. Additionally, heterogeneity in outcome measures impedes direct comparison across trials. Thus, while SRGs show promise, large, multicenter randomized controlled trials (RCTs) with standardized protocols are needed to strengthen causal inferences and enable definitive practice guidelines. Despite promising trends, the current evidence base remains constrained by small sample sizes, short intervention durations, and heterogeneous outcome measures, precluding definitive conclusions regarding dose–response relationships.

4. CONCLUSION

This scoping review synthesized current evidence on robotic glove therapy for stroke rehabilitation, identified methodological limitations, and assessed technological advancements and patterns of clinical outcomes. The results indicate that robotic glove therapy enhances distal hand function during short-term interventions of 2 to 4 weeks; however, all included studies were conducted in technologically advanced countries outside Indonesia, which restricts direct applicability. While adoption in Indonesia may be limited by cost, infrastructure, and reimbursement challenges, gradual implementation in tertiary and academic centers appears feasible. Future research should prioritize evaluating the feasibility, clinical effectiveness, cost-effectiveness, and long-term sustainability of robotic glove therapy in Indonesian rehabilitation contexts.

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