Systematic Review

Effect of Dual-Task Training on Falls and Fall-Related Outcomes After Stroke: A Systematic Review of Randomized Controlled Trials

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ABSTRACT

Background: Stroke survivors fall often, and many of these falls occur when walking competes with another attentional demand. Dual-task training rehearses precisely this situation, yet its value for fall prevention remains uncertain. This review synthesized the evidence on whether dual-task training reduces falls and improves fall-related outcomes after stroke.

Methods: Five databases (PubMed/MEDLINE, Cochrane CENTRAL, Scopus, Web of Science, PEDro) were searched up to September 2026 and supplemented by trial registers and citation tracking. Eligible studies were randomized trials in adult stroke survivors in which dual-task practice was tested against single-task practice, usual rehabilitation or any other control, with falls, fall-related self-efficacy or a laboratory fall-risk measure as an outcome. Screening, data extraction and RoB 2 appraisal were each performed independently by two reviewers. Findings were synthesized narratively, and the certainty of evidence was rated using GRADE.

Results: Of 1,100 records, six trials (269 participants) were included. Two trials recorded falls. In chronic stroke, 12.0% of the dual-task group fell over six months versus 37.0% of an upper-limb control group, although a matched single-task group fell at a similar rate (15.4%). In subacute stroke, higher-intensity trunk training with dual tasks reduced the proportion of fallers by 19.1% at six months compared with moderate-intensity trunk training alone. Of five trials assessing balance confidence or fall efficacy, the two smallest favored dual-task training, while the remaining three showed no between-group difference. Risk of bias raised some concerns in four trials and was high in two. Certainty was low for falls and injurious falls, and very low for other outcomes.

Conclusion: Dual-task training may lower the number of people who fall after stroke. However, this finding rests on only two trials, and neither demonstrates that the added task confers greater protection than balance practice alone. Its effect on balance confidence remains very uncertain.

Keywords: *Accidental Falls; Cognition; Exercise; Postural Balance; Stroke*

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INTRODUCTION

Stroke remains a major global cause of mortality and long-term disability, and as survival improves, the population living with its sequelae continues to grow[1]. Following discharge home, falls are among the most common complications experienced by survivors: about half fall at least once in the first year, and falls are several times more frequent than in people without stroke[2]. The consequences extend well beyond the fall itself. The risk of hip fracture more than doubles after stroke[3], and fear of falling, which is common in survivors, is itself associated with further falls in both the acute and chronic phases[4].

Among community-dwelling older adults, exercise is the best-supported intervention for fall prevention[5], yet the evidence in stroke is less settled. A recent meta-analysis of 18 randomized trials found that exercise reduced the number of falls after stroke by about 39%, but its effect on the proportion of people who fall was smaller and less certain[6]. One possible explanation lies in how training is conventionally delivered. Standard programs rehearse balance and gait in quiet, single-task settings, whereas real-life falls typically occur when attention is divided, for example while talking, carrying a drink or crossing a crowded street.

Walking under divided attention is difficult after stroke. Adding a cognitive or manual task slows gait by about 0.1 m/s, a clinically meaningful reduction, and often worsens performance on

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the second task as well, a phenomenon termed cognitive-motor interference[7]. Among older adults, poorer dual-task performance is associated with recurrent falling[8]. Dual-task training addresses this problem directly: patients practice standing or walking while simultaneously performing a cognitive or additional motor task, with the aim of increasing gait automaticity and improving attentional allocation[9]. A previous systematic review reported improvements in walking speed and balance after stroke with this approach[10]; however, its pooled outcomes were performance measures such as gait speed and Berg Balance Scale scores, and actual falls or fear of falling were rarely addressed.

Improved performance on a clinical walking test does not guarantee fewer falls at home. Trials of dual-task training after stroke differ in the secondary task used, the comparator, the training dose and the length of follow-up, and only a few have recorded falls; others have relied on fall efficacy, balance confidence or laboratory balance tests as surrogate measures. To the authors' knowledge, no systematic review has examined dual-task training after stroke with falls as the primary outcome, analyzed real-world falls separately from surrogate measures and graded the certainty of evidence for each.

This review therefore examined whether, in adults with stroke, dual-task training reduces falls and improves fall-related outcomes compared with single-task training, usual rehabilitation or another control. The specific objectives were to (i) summarize its effect on falls and injurious falls, (ii) summarize its effect on fall-related self-efficacy and laboratory measures of fall risk, and (iii) identify the methodological weaknesses that limit the existing trials.

METHODOLOGY

Protocol and Reporting

The review was conducted from January to September 2026 and is reported in accordance with the PRISMA 2020 guidelines[11] and the Cochrane Handbook for Systematic Reviews of Interventions[12]. The review question, eligibility criteria, risk-of-bias method and synthesis plan were all specified before the search began. No protocol was registered with PROSPERO or any other registry. As the review used only published data, ethical approval was not required.

Review Question and Eligibility Criteria

The review question was structured using PICOS (Population, Intervention, Comparator, Outcomes, Study design): *among adult stroke survivors, does practicing dual tasks prevent falls and improve fall-related outcomes relative to single-task practice, usual rehabilitation or any other control?* Table 1 presents the inclusion and exclusion criteria.

Table 1. Eligibility criteria (PICOS)

Element	Inclusion	Exclusion
Population	Adults (≥ 18 years) with ischemic or hemorrhagic stroke at any stage of recovery, in any setting	Mixed neurological samples without separate data for stroke; transient ischemic attack only
Intervention	Dual-task training: posture, balance or gait practice performed simultaneously with a cognitive task (cognitive-motor) or an additional motor task (motor-motor); exergaming and virtual-reality programs qualified if they contained a clear dual-task component[9]. Dual-task practice could be delivered alone or added to an exercise program, provided the comparator received an exercise program of the same type. Any dose, setting or supervision	Dual-task practice combined with a different type of therapy that the comparator did not receive; perturbation-based training without a secondary task
Comparator	Single-task training of the same motor content, conventional rehabilitation, other active training (e.g., upper-limb exercise), usual care or no intervention	-
Outcomes	Primary: falls recorded prospectively over at least 3 months (fallers, fall rate or injurious falls), defined according to the ProFaNE consensus[13]. Secondary: balance confidence or fall-related self-efficacy (for example, ABC scale[14], Falls Efficacy Scale[15] or FES-I); laboratory fall-risk measures (e.g., responses to slip or trip perturbations)	Trials that measured gait or balance performance alone (such as gait speed, Berg Balance Scale or Timed Up and Go) and none of the outcomes above
Study design	Randomized controlled trials, including pilot and cluster trials and the first period of crossover trials	Quasi-randomized, non-randomized, observational and single-group studies; reviews, protocols, conference abstracts and theses
Other	English-language full texts published at any time up to the search date.	Multiple publications of one trial (only the most complete report was retained)

Information Sources and Search Strategy

Five bibliographic databases were searched from inception to September 2026: PubMed/MEDLINE, CENTRAL (Cochrane Central Register of Controlled Trials), Scopus, the Web of Science Core Collection and PEDro (Physiotherapy Evidence Database). Registered studies were identified through ClinicalTrials.gov and the WHO ICTRP, and the 200 most relevant Google Scholar results were screened to capture studies not indexed in the databases. The reference lists of the included trials and of a previous review on dual-task training in stroke were hand-searched[10], and Google Scholar was used to identify subsequent articles citing each included trial.

The search combined four concepts: stroke, dual-task training, falls and related outcomes, and randomized design. Within each concept, MeSH headings and free-text terms were combined with OR, and the concepts were then combined with AND. Table 2 presents the PubMed strategy, which was adapted for the other databases. Balance confidence and fall efficacy terms were deliberately included in the falls concept so that trials reporting these outcomes would be captured even when the term ‘falls’ did not appear in the title or abstract.

Table 2. PubMed/MEDLINE search strategy

Block	Search terms
#1 Stroke	"Stroke"[MeSH] OR "Stroke Rehabilitation"[MeSH] OR stroke*[tiab] OR "cerebrovascular accident"[tiab] OR hemipare*[tiab] OR hemipleg*[tiab]
#2 Dual-task training	"dual task*"[tiab] OR "dual-task*"[tiab] OR "cognitive-motor"[tiab] OR "cognitive motor"[tiab] OR "motor-cognitive"[tiab] OR multitask*[tiab] OR "multi-task*"[tiab] OR "secondary task"[tiab] OR exergam*[tiab]
#3 Falls and fall-related outcomes	"Accidental Falls"[MeSH] OR fall*[tiab] OR "fear of falling"[tiab] OR "fall efficacy"[tiab] OR "falls efficacy"[tiab] OR "balance confidence"[tiab]
#4 Randomized design	"Randomized Controlled Trial"[pt] OR "Controlled Clinical Trial"[pt] OR randomized[tiab] OR randomised[tiab] OR randomly[tiab] OR trial[ti]
#5 Combined	#1 AND #2 AND #3 AND #4

Study Selection

After the records were pooled and duplicates removed, HA and ZF independently screened each title and abstract against the criteria in Table 1, then assessed every potentially eligible article in full text and recorded the reasons for exclusion. Disagreements were resolved through discussion, with KH acting as arbiter when consensus could not be reached. Figure 1 illustrates the flow of records using the PRISMA 2020 template[11].

Data Extraction

HA and ZF independently extracted data using a purpose-built Microsoft Excel form, which was piloted on two included studies and refined before full use. Discrepancies were resolved by rechecking the original article and through discussion. The following data were collected:

- **Trial identifiers:** lead author, publication year, journal, country, setting, registration status and funding source.
- **Participants:** number randomized and analyzed per arm, age, sex, stroke type, time since stroke, cognitive inclusion threshold and walking ability.
- **Intervention and comparator:** whether the dual task was cognitive-motor or motor-motor, the primary and added tasks, mode of delivery, length and frequency of sessions, total program length and what the control group received.
- **Outcomes:** fall definition and ascertainment method, duration of fall monitoring, number of fallers, falls and injurious falls per arm; fall-related self-efficacy instrument and scores; laboratory fall-risk measures.
- **Results:** between-group estimates with confidence intervals or p-values, the analysis population and the authors' conclusions.

For trials with multiple control arms, priority was given to the arm receiving the same motor practice without a second task, as this contrast best isolates the dual-task component. Items absent from the article were coded as not reported.

Risk-of-Bias Assessment

Each fall-related result was appraised with RoB 2, the updated Cochrane tool for randomized trials[16], taking the effect of assignment to the intervention as the estimand. HA and ZF independently assessed each trial across the five RoB 2 domains: the randomization process, deviations from intended

interventions, missing outcome data, measurement of the outcome and selection of the reported result. Domains were graded as low risk, some concerns or high risk. An overall high-risk rating was assigned if any domain was rated high risk, or if concerns in multiple domains together substantially lowered confidence in the result[16]. Because participants were aware of their allocation and self-reported falls, balance confidence and fall efficacy, the outcome measurement domain was not rated better than "some concerns" for these outcomes.

Data Synthesis

Falls were to be pooled (as a risk ratio or rate ratio[17]) and fall-related self-efficacy (as a standardized mean difference) if at least two trials reported comparable data. However, pooling was not feasible. The two trials recording falls differed in stroke phase, control condition and follow-up, and one reported internally inconsistent summary figures; the self-efficacy trials used different scales, and several provided no between-group estimate. The findings were therefore summarized narratively, outcome by outcome (falls, fall-related self-efficacy, laboratory fall-risk measures), in keeping with the SWiM (Synthesis Without Meta-analysis) reporting guideline[18], using the between-group estimates reported by each trial.

Certainty of Evidence

The certainty of each body of evidence was graded using GRADE (Grading of Recommendations Assessment, Development and Evaluation)[19]. Randomized evidence began as high certainty and was downgraded where there were problems with risk of bias, inconsistency, indirectness, imprecision or publication bias. As fewer than ten trials contributed to each outcome, formal testing for publication bias was not possible.

RESULTS

Study Selection

Database searching yielded 842 records, trial registers 96, and Google Scholar with citation tracking a further 162. After removal of 214 duplicates, 886 titles and abstracts were screened and 742 were excluded. Of the 144 articles assessed in full text, 138 were excluded, most commonly because they assessed gait or balance performance without any fall-related outcome. Six trials were included (Figure 1)[20–25].

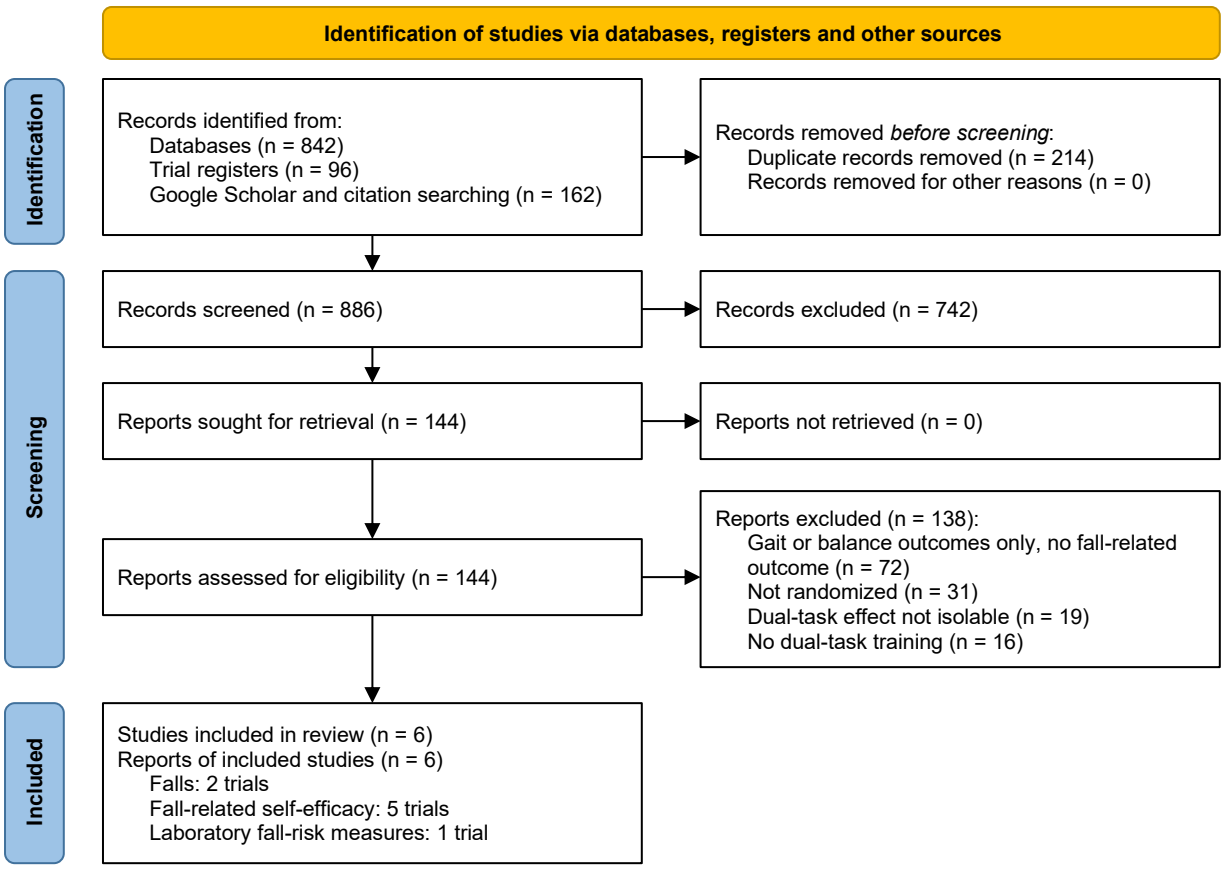


Figure 1. PRISMA 2020 flow diagram of study selection

Characteristics of the Included Trials

The included trials were published between 2016 and 2021 and together randomized 269 participants (Table 3). Two trials were conducted in South Korea and one each in Hong Kong, Israel, the United States and Pakistan. All trials enrolled ambulatory participants; five involved chronic stroke and one subacute stroke, and three applied a minimum cognitive score for inclusion. Five trials combined walking or balance with a cognitive task, and one combined it with a second motor task. Only Baek et al.[24] and Fishbein et al.[22] compared dual-task training against single-task training identical in every other respect; Pang et al.[21] included a matched single-task arm alongside an upper-limb control, and in Ahmed et al.[25] the dual-task arm also trained at a higher intensity and in more movement planes than the comparator.

Table 3. Main features of the included trials (n = 6)

Study (year)	Country	Participants	Dual-task intervention	Comparator(s)	Dose	Fall-related outcomes; follow-up
Kim et al. (2016)[20]	South Korea	20 enrolled, 14 analyzed (7 vs 7); chronic hemiparetic stroke (~37 months); MMSE-K > 24	Ball-kicking walking task with cognitive tasks (e.g., counting backwards), progressed in three stages	Treadmill gait training at comfortable speed	30 min, 3×/week, 4 weeks, plus 1 h routine PT	ABC scale; post-training
Pang et al. (2018)[21]	Hong Kong	84 (28 per arm); chronic stroke (mean 75 months); age ≥ 50 y; MoCA ≥ 21; Mini-BESTest ≤ 25	Balance and mobility exercises performed while doing cognitive tasks	(a) The same balance and mobility exercises without a cognitive task, plus cognitive training while seated; (b) upper-limb exercise	60 min, 3×/week, 8 weeks	Falls and injurious falls by blinded monthly telephone interview for 6 months; ABC scale
Fishbein et al. (2019)[22]	Israel	22 (11 vs 11), no dropouts; chronic stroke (≥ 1 year); age 40–80 y	Virtual-reality upper-limb games during treadmill walking (motor-motor)	Treadmill walking alone at 60–70% heart-rate reserve	20 min treadmill walking per session, 2×/week, 4 weeks	ABC scale; post-training and 4-week follow-up
Kannan et al. (2019)[23]	USA	25 randomized (13 vs 12); chronic hemiparetic stroke; ambulatory	Wii Fit exergames played while solving cognitive tasks (cognitive-motor; 20 sessions)	Progressive conventional balance training (90-min sessions)	6 weeks	Reactive balance to a slip and volitional balance (limits of stability), both under dual-task conditions; ABC scale; post-training
Baek et al. (2021)[24]	South Korea	34 (17 vs 17), 31 analyzed; chronic stroke	Treadmill walking combined with a simultaneous cognitive task	Identical treadmill and cognitive practice delivered one after the other	60 min, 2×/week, 6 weeks	Falls Efficacy Scale (Korean, 13 items); post-training
Ahmed et al. (2021)[25]	Pakistan	84 (42 vs 42), 74 analyzed; subacute stroke (3–12 months); MMSE ≥ 24	Higher-intensity multiplanar trunk training with dual-task practice, plus routine physiotherapy	Moderate-intensity, mainly sagittal trunk training without dual tasks, plus routine physiotherapy	5×/week, 12 weeks	Falls and injurious falls at 6 and 12 months

ABC, Activities-specific Balance Confidence scale; MMSE(-K), (Korean) Mini-Mental State Examination; MoCA, Montreal Cognitive Assessment; PT, physiotherapy.

Risk of Bias in the Included Trials

None of the trials was rated at low overall risk of bias (Table 4). Four had some concerns[21,22,24,25] and two were at high risk[20,23], mainly because substantial attrition was handled with completers-only analyses and, in Kannan et al., the number of participants analyzed varied across outcomes. Outcome measurement raised concerns in all trials because participants who were aware of their allocation self-reported their falls and balance confidence. Pang et al.[21] mitigated this risk by using blinded assessors to collect fall reports. In Ahmed et al.[25], some summary statistics for falls were internally inconsistent, and the trial, like Baek et al.[24], was registered retrospectively, after recruitment had begun.

Table 4. RoB 2 judgements for each included trial

Study	D1	D2	D3	D4	D5	Overall
Kim et al., 2016[20]	?	?	✗	?	?	✗
Pang et al., 2018[21]	✓	✓	✓	?	✓	?
Fishbein et al., 2019[22]	✓	✓	✓	?	✓	?
Kannan et al., 2019[23]	?	?	✗	?	?	✗
Baek et al., 2021[24]	✓	✓	✓	?	?	?
Ahmed et al., 2021[25]	✓	?	✓	?	?	?

✓, low risk; ?, some concerns; ✗, high risk. D1, randomization; D2, deviations from intended intervention; D3, missing data; D4, outcome measurement; D5, selective reporting

Outcome 1: Falls

Two trials recorded falls. In Pang et al.[21], 12.0% of the dual-task group fell during the six months after training, compared with 37.0% of the upper-limb control group, an absolute reduction of 25.0% (95% CI 3.1% to 46.9%; p = 0.037). No participant in the dual-task group had an injurious fall, compared with 22.2% of controls (absolute reduction 22.2%, 95% CI 4.0% to 38.4%; p = 0.023). The proportion of fallers was also lower in the single-task arm (15.4%) than in the control arm, and the authors did not directly compare falls between the two training arms. However, only the dual-task arm reduced the dual-task cost of walking.

In Ahmed et al.[25], 3 of 42 participants who received trunk training with dual tasks fell within six months, compared with 11 of 42 who received trunk training without dual tasks, an absolute reduction of 19.1% (95% CI 3.2% to 35.1%). All five injurious falls at six months occurred in the comparison group. The difference persisted at twelve months, with 6 versus 17 fall episodes and an absolute reduction in fall risk of 28.1% (95% CI 8.1% to 48.0%). These results are subject to two caveats: the dual-task arm also trained at a higher intensity, so the effect cannot be attributed to the dual-task element alone, and several of the reported effect estimates and numbers needed to treat are internally inconsistent.

Outcome 2: fall-related self-efficacy

Five trials with 185 participants measured balance confidence or fall efficacy, and only the two smallest reported a benefit. Three trials found no between-group difference. Pang et al.[21] reported no group-by-time interaction for the ABC scale, Baek et al.[24] reported Falls Efficacy Scale scores that did not differ significantly (between-group difference 10.50 points, 95% CI −7.93 to 28.94; p = 0.253), and in Kannan et al.[23] ABC scores rose by similar amounts in both groups (by 7.1 and 7.8 points) without a between-group test. In Kim et al.[20], ABC scores rose by 5.7 points with dual-task training and 2.9 points with treadmill training (between-group p = 0.006), but only 14 participants were analyzed and the dual-task group had higher baseline confidence. In Fishbein et al.[22], balance confidence improved with dual-task training but declined with treadmill walking alone (group-by-time interaction p = 0.001).

Outcome 3: Laboratory Fall-Risk Measures

Kannan et al.[23] tested balance under dual-task conditions in the laboratory. When participants were exposed to an unexpected slip, center-of-mass stability improved in both groups without a between-group difference, but only the exergaming group became more accurate on the concurrent cognitive task. Volitional balance, measured as limits-of-stability

movement velocity, improved only with exergaming (group-by-time interaction p = 0.001). Laboratory falls were not reported.

Certainty of evidence

Table 5 shows the GRADE ratings: low for falls and injurious falls, and very low for fall-related self-efficacy and the laboratory measures.

Table 5. GRADE evidence profile

Outcome	Trials (participants)	Risk of bias	Inconsistency	Indirectness	Imprecision	Certainty	Summary of findings
Falls (6–12 months)	2 (168)	Not serious: some concerns only	Not serious: both favor dual-task training	Serious (−1): one comparator was upper-limb exercise and the other differed in intensity; ambulatory participants with adequate cognition	Serious (−1): few events; wide CIs	⊕⊕◯◯ Low	May lower the proportion of fallers (absolute reductions 19.1% and 25.0%)
Injurious falls (6 months)	2 (168)	Not serious	Not serious	Serious (−1): as above	Serious (−1): very few events	⊕⊕◯◯ Low	May lower injurious falls
Fall-related self-efficacy (ABC, FES)	5 (185)	Serious (−1): self-reported by unblinded participants; two trials at high risk	Serious (−1): three trials null, two small trials positive	Not serious	Serious (−1): small samples; wide CIs	⊕◯◯◯ Very low	Very uncertain effect on balance confidence and fall efficacy
Laboratory fall-risk measures	1 (25)	Very serious (−2): high risk of bias	Not assessable (single trial)	Serious (−1): surrogate measures, not falls	Serious (−1): one small trial	⊕◯◯◯ Very low	Very uncertain effect on reactive and volitional balance

Randomized evidence started at high certainty and was downgraded one level for each serious concern. Publication bias could not be tested (fewer than ten trials per outcome). ⊕⊕◯◯, low; ⊕◯◯◯, very low. ABC, Activities-specific Balance Confidence; CI, confidence interval; FES, Falls Efficacy Scale.

DISCUSSION

Summary Of Main Findings

Six trials met the eligibility criteria, and only two of them recorded falls. Both found that fewer people fell after dual-task training: absolute reductions in the proportion of fallers were 25.0% over six months in chronic stroke[21] and 19.1% over six months in subacute stroke[25]. However, neither design isolates the contribution of the dual-task component, and confidence in these estimates is low. Of the five trials measuring balance confidence or fall efficacy, only the two smallest found an improvement, and the single laboratory study found little between-group difference in the response to a slip[23].

Does the Dual Task Matter?

This is the central question, and the available trials cannot answer it. In Pang et al.[21], falls were much less frequent in both training arms than in the upper-limb control arm (12.0% and 15.4% vs 37.0%), and the two training groups were not compared directly for falls. Much of the benefit may therefore derive from balance and mobility practice in general, consistent with broader evidence that balance and functional exercise prevents falls in older adults[5]. In Ahmed et al.[25], dual-task practice was added to trunk training that was also more intensive and multiplanar than the comparator's, so the two effects cannot be separated.

A specific effect of dual-task practice nonetheless remains plausible. Falls after stroke often happen during everyday activities that divide attention, and adding a second task slows walking by a clinically meaningful amount after stroke[7]. Only the dual-task arm in Pang et al. reduced the cost that a secondary task imposed on walking, a change that would be expected to precede fewer falls in daily life. Whether that change prevents falls beyond what single-task balance training achieves remains untested. A recent meta-analysis found that exercise reduces the number of falls after stroke, and its exploratory analyses suggested that programs with a cognitive component, such as dual-task training, may be among the most effective[6]; a direct comparison with matched single-task training is therefore all the more necessary.

Fall-Related Self-Efficacy

Fewer falls did not translate into greater confidence. The largest trial found no change in balance confidence despite a reduction in falls[21], and Baek et al.[24] and Kannan et al.[23] also found no between-group difference. The two positive results came from trials with 14 and 22 participants, one at high risk of bias[20,22]. Fear of falling after stroke is only modestly associated with actual falls[4], and the ABC scale may offer limited scope for improvement in individuals who already walk in the community. Balance confidence and fall efficacy are also different constructs[14,15], so programs intended to reduce fear of falling are likely to need to target it directly.

Applicability

All six trials recruited ambulatory participants, and most excluded individuals with cognitive impairment. However, survivors with poorer balance, mobility and lower-limb motor function are among those most likely to fall[2]. Ahmed et al. is the only trial from a low- or middle-income country and the only one in the subacute phase, and its dose of five sessions a week for twelve weeks may be difficult to deliver in routine clinical services.

Implications For Practice and Research

In clinical practice, clinicians may reasonably incorporate dual-task balance and mobility work in rehabilitation for ambulatory stroke survivors with adequate cognition, with a possible benefit for falls. On current evidence, it should complement rather than replace established balance and strength training, and there is not yet a basis for recommending it to prevent falls in individuals with cognitive impairment or restricted mobility.

Future trials should include a single-task comparator matched for content and dose and should adopt falls as the primary endpoint. Falls should be recorded prospectively, for example with monthly calendars as recommended by the ProFaNE consensus[13], for at least six to twelve months, analyzed with methods suited to count data[17], and the sample size should be calculated for falls rather than gait speed. Trials should also recruit people in the subacute phase and with mild cognitive impairment, report fall-related self-efficacy in full with a single validated instrument such as the FES-I, and be registered before recruitment begins. Trials from South Asia, where the stroke burden is rising[1], are especially needed.

Strengths and Limitations

To the authors' knowledge, no previous systematic review of dual-task training in stroke has adopted falls as its primary outcome or analyzed real-world falls apart from self-efficacy and laboratory measures. The search covered five databases, two trial registers and citation sources, and the falls concept included balance confidence and fall efficacy so that relevant trials would not be missed. Extracted data were verified against each full report, every trial was appraised with RoB 2, and each outcome received a GRADE rating.

Several limitations apply. In the absence of a registered protocol, undeclared changes to the methods cannot be entirely excluded, although the eligibility criteria and outcomes were specified in advance. Only two trials recorded falls, and neither isolated the dual-task element. Differences in comparators, follow-up and reporting prevented meta-analysis. Restricting inclusion to English-language reports may have led to the omission of eligible trials, and the small number of studies prevented formal testing for publication bias. Finally, the included trials mostly enrolled ambulatory people with chronic stroke and adequate cognition, which limits applicability to the survivors at highest risk of falling.

CONCLUSION

Low-certainty evidence from two randomized trials suggests that dual-task training may reduce falls and injurious falls after stroke in ambulatory individuals with adequate cognition. Neither trial demonstrates that the dual-task element provides protection beyond that of balance training without a secondary task, and effects on balance confidence and fall efficacy are very uncertain. Trials that compare dual-task with matched single-task training, count falls prospectively and include people with

cognitive impairment are needed before dual-task training can be recommended specifically for fall prevention after stroke.

Author Contributions
HA: Conception and design, literature search, data extraction, and manuscript writing
KH: Supervision, critical review, and final approval
SFF: Conception and design, and critical review
ZF: Study selection, data extraction, and risk-of-bias assessment
M: Data extraction and final approval

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