THE EFFECT OF INTERVENTIONS ON BALANCE SELF-EFFICACY IN THE STROKE POPULATION: A SYSTEMATIC REVIEW

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INTRODUCTION

Stroke, or cerebral vascular accident (CVA), is reported to be the leading cause of long-term disability worldwide (1). Impairments in balance and mobility are common after stroke and stroke survivors are estimated to suffer more than twice as many falls as age and gender-matched counterparts (2). In addition to falls, research has shown that balance and mobility impairments are associated with decreased self-efficacy (3). Self-efficacy is defined as "an individual's judgment of his or her ability to organize and execute given types of performances" (4). Impaired balance self-efficacy has been reported in community dwelling post-stroke patients (5) and has been shown to be an independent predictor of satisfaction with community reintegration in older adults with chronic stroke (6).

In order to prevent a perpetuating cycle of falls, decreased self-efficacy, avoidance behavior, deconditioning and functional decline (7), it is important for both therapists and researchers to understand how balance self-efficacy can be improved in the stroke population. There is currently little understanding of how to best improve balance self-efficacy in stroke patients; therefore, our objective is to determine the effect of various interventions on balance self-efficacy in the stroke population, and to determine which types of interventions are most effective.

METHODS

Study Selection Criteria

- Inclusion Criteria:
  - (i) English language; (ii) Prior to October 2011; (iii) Studies that compared intervention with a control (ie. Randomized Control Trials); (iv) Trials with individuals with stroke, aged 18 or above, of any type, at any stage or severity along the post-stroke continuum, in any setting; (v) Trials reporting an outcome measure (primary or secondary) related to balance self-efficacy
- Exclusion Criteria:
  - (i) Case studies, case series, and pre-test/post-test studies; (ii) Studies published in doctoral dissertations or conference proceedings; (iii) Studies that included participants with significant comorbidities affecting balance and mobility

Search Strategy

- Databases:
  - MEDLINE (1948 - present), CINAHL (1982 – present), EMBASE (1980 – present) and PsycINFO (1987 – present)
- Search terms:
  - Population (P) - stroke* or CVA* or cerebrovascular stroke* or apoplexy or cerebrovascular accident* or cerebral stroke*
  - Intervention (I) - any
  - Outcome (O) - fear of falling or balance self-efficacy or balance self efficacy or balance confidence

Data extraction

Information extracted: (i) study type, (ii) participant details, (iii) details of interventions received by experimental and control groups, (iv) outcome measure used, (v) results, (vi) time of follow-up, and (vii) any limitations or significant concerns with the study.

Qualitative Assessment

All studies, including non-RCTs, were appraised using the PEDro (Physical Therapy Evidence Database) scale (8).

Data analysis

Overall effect size for multiple studies was calculated using RevMan 5.0 (http://ims.cochrane.org/revman/download). Forest plots were generated using RevMan 5.0 to illustrate the overall effect of interventions on balance self-efficacy and funnel plots were used to determine whether publication bias was present.

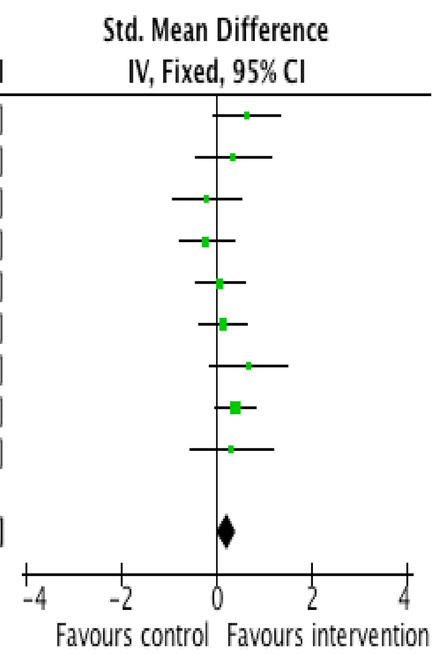
RESULTS

10 studies met our inclusion/exclusion criteria, nine of which had interventions involving physical activity

Meta-analysis of 9 studies with interventions involving physical activity

	Experimental			Control				Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% CI
Holmgren 2010	4.6	4.9	15	1.5	4.7	19	8.5%	0.63 [-0.06, 1.33]
Huijbregts 2008	14.7	17.5	16	8	21.7	10	6.5%	0.34 [-0.46, 1.13]
Lord 2008	7.9	18.9	14	11.9	18.5	16	7.9%	-0.21 [-0.93, 0.51]
Marigold 2005	5.9	18.6	22	10.3	21.2	26	12.6%	-0.22 [-0.79, 0.35]
Mudge 2009	0.5	2	31	0.39	1.7	27	15.4%	0.06 [-0.46, 0.57]
Pang & Eng 2008	2.9	19.6	30	0.4	18	30	16.0%	0.13 [-0.38, 0.64]
Park 2011	17.4	17.4	13	2.55	24.9	12	6.2%	0.67 [-0.14, 1.48]
Salbach 2005	8.2	18.6	41	0.6	19.7	42	21.7%	0.39 [-0.04, 0.83]
Yang 2008	8.86	12.4	11	4.37	15.1	9	5.2%	0.31 [-0.57, 1.20]
Total (95% CI)			**193**			**191**	**100.0%**	**0.21 [0.00, 0.41]**

Heterogeneity: $Chi^2 = 7.37$, df = 8 (P = 0.50); $I^2 = 0\%$
Test for overall effect: Z = 1.99 (P = 0.05)



When the nine trials (n = 384 subjects) were combined using a fixed effects model, a small but non-significant effect was found (SMD 0.21, 95% CI (0.00–0.41), $P = 0.05$), though it trended towards significance. Heterogeneity was low and non-significant ($I^2 = 0\%$, $P = 0.50$). A funnel plot produced for the nine studies did not show a publication bias in either direction.

As no significant results were found in the meta-analysis, studies were also evaluated for general trends. Of the 10 studies included in our review, four demonstrated a small positive effect (9,10,11,12), two demonstrated a medium positive effect (13,14), one demonstrated a large positive effect (15), and two demonstrated a small negative effect (16,17) on balance self-efficacy. Only four studies found statistically significant changes in balance self-efficacy post-intervention (11,13,14,15).

DISCUSSION

One possible reason why the results of our meta-analysis were small and not significant is that balance self-efficacy was not used as a primary outcome measure in any of the studies. As well, most of the studies involved small sample sizes; therefore, the studies may not have been sufficiently powered to detect changes in balance self-efficacy. None of the studies had a pure control group; all control groups received either an attention control such as education or low dose physical activity and may also have experienced improved balance self-efficacy as a result. There was also a large degree of variation amongst the interventions; therefore, grouping them together as "physical activity" interventions for the meta-analysis may not have been appropriate.

Of the nine physical activity studies, seven used the original ABC scale as the self-efficacy outcome measure with resulting changes of 2.9 to 17.4 in ABC (9,10,11,14,16,17,18). Five studies had changes greater than the published SEM (9,11,14,16,17) while two did not (10,18).

The one study not included in the meta-analysis (15) used an intervention of locomotor imagery training and demonstrated a large and significant effect on balance self-efficacy. The psychological component of the intervention may be one reason why there was such a large improvement, however, methodological flaws may have biased the results, as the study was not randomized and the assessors were not blinded to the intervention group and the control group.

The results of our meta-analysis found that exercise interventions had a small, non-significant effect on balance self-efficacy in older adults. This indicates that interventions focused on improving physical capacity in the stroke population may not be enough, and that psychological aspects such as balance self-efficacy need to be addressed to promote optimal recovery, activity and participation.

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