



THE UNIVERSITY *of* EDINBURGH

Edinburgh Research Explorer

Physical Fitness Training for Patients With Stroke

Citation for published version:

Saunders, D, Sanderson, M, Hayes, S, Kilrane, M, Greig, CA, Brazzelli, M & Mead, G 2016, 'Physical Fitness Training for Patients With Stroke', *Stroke*, vol. 47, pp. e219-e220. <https://doi.org/10.1161/STROKEAHA.116.013640>

Digital Object Identifier (DOI):

[10.1161/STROKEAHA.116.013640](https://doi.org/10.1161/STROKEAHA.116.013640)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Peer reviewed version

Published In:

Stroke

Publisher Rights Statement:

Author's final peer-reviewed manuscript as accepted for publication.

General rights

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.



PHYSICAL FITNESS TRAINING FOR STROKE PATIENTS

David H Saunders¹ BSc, MPhil, PhD

Mark Sanderson² BSc, MSc, PhD

Sara Hayes³ BSc, PG.Dip. (Stats), PhD

Maeve Kilrane⁴ BSc, MBChB

Carolyn A Greig⁵ BSc, MSc, PhD

Miriam Brazzelli⁶ BSc, PhD

Gillian E Mead⁷ MB, BChir, FRCP, MD, MA

1 University of Edinburgh; Institute for Sport, Physical Education and Health Sciences (SPEHS), Moray House School of Education, Edinburgh, Midlothian, UK

2 University of the West of Scotland, Institute of Clinical Exercise and Health Science, Hamilton, UK

3 University of Limerick, Department of Clinical Therapies, Faculty of Education and Health Science, Health Research Institute (HRI), Limerick, Ireland

4 Institute of Sport Exercise and Health, University College London

5 University of Birmingham; School of Sport, Exercise and Rehabilitation Sciences, MRC-Arthritis Research UK Centre for Musculoskeletal Ageing Research, Birmingham, UK

6 University of Aberdeen; Health Services Research Unit, Aberdeen, UK

7 University of Edinburgh, Centre for Clinical Brain Sciences, Edinburgh, UK

Contact address:

David H Saunders, The Moray House School of Education, Institute for Sport, Physical Education and Health Sciences (SPEHS), University of Edinburgh, St Leonards Land, Holyrood Road, Edinburgh, Midlothian, EH8 8AQ, UK.

Dave.Saunders@ed.ac.uk.

Cardiorespiratory and musculoskeletal fitness are low after stroke. Interventions to improve physical fitness after stroke could have a range of physical, cognitive and psychosocial benefits.

OBJECTIVES: The primary aims of this updated review (1) were to determine whether physical fitness training after stroke reduces death, dependence, and disability. The secondary aims were to assess the effects of training on adverse events, risk factors, physical fitness, mobility, physical function, quality of life, mood, and cognitive function. Cognition outcomes have become an important post-stroke intervention target and are therefore added to this review update.

METHODS

SEARCH METHODS: We searched the Cochrane Stroke Group Trials Register (last searched February 2015), the Cochrane Central Register of Controlled Trials (CENTRAL 2015, Issue 1: searched February 2015), MEDLINE (1966 to February 2015), EMBASE (1980 to February 2015), CINAHL (1982 to February 2015), SPORTDiscus (1949 to February 2015), and five additional databases (February 2015). We also searched ongoing trials registers, hand-searched relevant journals and conference proceedings, screened reference lists, and contacted experts.

SELECTION CRITERIA:

Randomised trials comparing either cardiorespiratory training or resistance training, or both (mixed training), with usual care, no intervention, or a non-exercise intervention in stroke survivors.

DATA COLLECTION & ANALYSIS:

Two review authors independently selected trials, assessed quality and risk of bias, and extracted data. We analysed data using random-effects meta-analyses. Diverse outcome measures limited the intended analyses.

RESULTS:

We included 58 trials, involving 2797 participants, which comprised cardiorespiratory interventions (28 trials, 1408 participants), resistance interventions (13 trials, 432 participants), and mixed training interventions (17 trials, 957 participants). There were few deaths with no between-group differences at end of intervention (n=13) or end of follow-up (additional n=9). No dependence data were reported. Global indices of disability showed moderate improvement after cardiorespiratory training (standardised mean difference (SMD 0.52, 95% confidence interval, 0.19-0.84; $P=0.002$) and a small improvement after mixed training (SMD 0.26, 95% confidence interval, 0.04-0.49; $P=0.02$); benefits at follow-up were unclear.

Significant increases in the speed and tolerance of walking were observed after cardiorespiratory and mixed training which involved walking (Table 1); some benefits persisted after the interventions finished. Balance scores improved slightly after mixed training (SMD 0.27, 95% confidence interval, 0.07-0.47; $P=0.008$). The variability, quality of the included trials, and lack of data prevent conclusions about other outcomes and limit the generalisability of the observed results.

REVIEWER CONCLUSIONS:

Cardiorespiratory training and, to a lesser extent, mixed training reduce disability during or after usual stroke care; perhaps mediated by improved mobility and balance. There is sufficient evidence to incorporate cardiorespiratory and mixed training, involving walking,

within post-stroke rehabilitation programmes to improve the speed and tolerance of walking; improvement in balance may also occur. There is insufficient evidence to support the use of resistance training. The effects of training on death and dependence after stroke are unclear but these outcomes are rarely observed in physical fitness training trials. Cognitive function is under-investigated despite being an important outcome for people with stroke. Further well-designed randomised trials are needed to determine the optimal exercise prescription and identify long-term benefits.

Keywords; Stroke, physical exercise, systematic review, physical fitness, disability

Word count not including title = **503**

Disclosures

DH Saunders and CA Greig were co-authors of one included study (Mead 2007).

GE Mead has received research funding for exercise after stroke. She has received honoraria from Later Life Training to develop an educational course of exercise after stroke for exercise professionals. She has also received honoraria and expenses to present work on exercise after stroke at conferences. She has led a trial of exercise after stroke that is included in the review (Mead 2007).

S Hayes, M Kilrane, M Sanderson and Brazzelli have no declarations of interest.

Funding Sources

None

Acknowledgement

This paper is based on a Cochrane Review published in The Cochrane Library 2016, Issue 10 (see www.thecochranelibrary.com for information). Cochrane Reviews are regularly

updated as new evidence emerges and in response to feedback, and The Cochrane Library should be consulted for the most recent version of the review.

Reference

1.) Saunders DH, Sanderson M, Hayes S, Kilrane M, Greig CA, Brazzelli M, Mead GE.

Physical fitness training for stroke patients. Cochrane Database of Systematic Reviews

2016, Issue 3. Art. No.: CD003316. DOI: 10.1002/14651858.CD003316.pub6.

<http://dx.doi.org/10.1002/14651858.CD003316>

Table 1. Random-effects meta analyses of cardiorespiratory training, resistance training, and mixed training interventions on walking performance outcomes at the end of intervention and at the end of follow-up

Fitness Training Intervention	Walking outcome	End of intervention			End of follow-up		
		N(n)	Mean difference (95% CI)	Sig. level	N(n)	Mean difference (95% CI)	Sig. level
Cardiorespiratory Training	MWS	14 (631)	6.71 m/min (2.73, 10.69)	P<0.0006	5 (312)	6.71 m/min (2.40, 11.02)	P=0.002
	PWS	10 (505)	4.28 m/min (1.71, 6.84)	P=0.001	3 (176)	1.67 m/min (-3.27, 6.62)	NS
	6-MWT	15 (826)	30.29 metres (16.19, 44.39)	P<0.0001	5 (283)	38.29 metres (7.19, 69.39)	P=0.02
Resistance Training	MWS	4 (104)	1.92 m/min (-3.50, 7.35)	NS	1 (24)	-19.8 m/min (-95.77, 56.17)	NS
	PWS	3 (80)	2.34 m/min (-6.77, 11.45)	NS	-	-	-
	6-MWT	2 (66)	3.78 metres (-68.56, 76.11)	NS	1 (24)	11.0 m/min (-105.95, 127.95)	NS
Mixed Training	MWS	-	-	-	-	-	-
	PWS	9 (639)	4.54 m/min (0.95, 8.14)	P=0.01	4 (443)	1.60 m/min (-5.62, 8.82)	NS
	6-MWT	7 (561)	41.60 metres (25.25, 57.95)	P<0.00001	3 (365)	51.62 metres (25.20, 78.03)	P=0.0001

CI: confidence interval, m: metres, min: minutes, MWS: maximum walking speed, N: trial number, n: participant number NS: non-significant, PWS: preferred walking speed, 6-MWT: six minute walking test, -: no data