# The BASES Expert Statement on Fitness, Physical Activity and Exercise after Stroke

Produced on behalf of the British Association of Sport and Exercise Sciences by Dr David Saunders, Prof Frederike van Wijck, Bex Townley, Prof Dawn A Skelton, Dr Claire Fitzsimons and Prof Gillian Mead.

## Introduction

### *Stroke*

Stroke is a major global health problem with around 152,000 cases each year in the UK alone. More people now survive a stroke with long-term disabilities; stroke is one of the largest causes of disability adjusted life years. Currently there are around 1.2 million stroke survivors in the UK, over one third of whom are dependent on other people (Stroke Association, 2016).

Stroke is a sudden, life-changing event, often with diverse long-term consequences for those who survive (Stroke Association, 2016). These commonly include impaired movement, resulting in reduced strength, coordination and balance. Other functions may also be affected, including vision and hearing, thinking and problem solving, goal-setting and action planning, sexual function, mood, swallowing, communication and continence. In other words, stroke can affect not just movement but how one thinks, feels, acts and communicates. Many stroke survivors continue to have unmet needs, especially around mobility (McKevitt *et al.,* 2011).

This statement summarises the rationale for exercise after stroke and explains how current evidence for exercise interventions is being implemented in the UK.

## Background and evidence

### *Low activity and fitness*

Stroke survivors show cardiorespiratory and musculoskeletal fitness impairments compared with normative values from age- and gender-matched healthy people (Saunders & Greig, 2013):

- Cardiorespiratory fitness: $\dot{V}O_2$ peak is half (50-60%) of normative values whilst the $\dot{V}O_2$ cost of walking (economy) can be double.
- Muscle explosive power output is 40-60% of normative values.
- Muscle strength impairment is observed but varies in extent and nature.

Direct neurological effects of stroke explain the commonly-held assumption that a 'unilateral disabling weakness' (paresis) is a defining feature of stroke. Despite more pronounced musculoskeletal impairments on the affected side, bilateral impairment in limb strength and power are commonly observed, suggesting physical inactivity (as well as a sedentary lifestyle), before and/or after stroke, could have a role.

Low levels of physical activity are common after stroke. Objective monitoring of stroke survivors showed >80% of time was spent sedentary, with this pattern of behaviour changing very little in the first year after stroke and was independent of functional ability (Tieges *et al.,* 2015).

Low post-stroke fitness could arise from the accumulation of low pre-stroke activity and fitness, direct neurological effects of stroke and the effect of post-stroke physical inactivity (Saunders & Greig, 2013).

### *Rationale for activity and exercise*

Low post-stroke fitness could limit physical activities, including activities of daily living, by making them difficult, excessively fatiguing or even impossible to perform. Observational studies of stroke survivors support this, demonstrating that impaired cardiorespiratory fitness predicts slower walking, while impaired muscle strength and power predict slower walking and reduced capacity to climb stairs or rise from a chair (Saunders & Greig, 2013). Consequently, there is a plausible rationale to improve fitness after stroke using physical activity/exercise and/or the reduction of sedentary behaviours. Improved fitness could benefit post-stroke function and participation.

Participation in physical activity/exercise may be beneficial even in the absence of substantial fitness improvements due to effects on cognition, arm function, balance and gait, confidence, secondary prevention and fatigue (Saunders *et al.,* 2014). These are common post-stroke problems viewed as important issues by stroke survivors.

## Current evidence

A recent systematic review of fitness training after stroke is the best summary of current evidence (Saunders *et al.*, 2016). The review included 58 randomised controlled trials (RCTs) with $n=2,797$ participants, to examine the effects of cardiorespiratory (28 trials, $n=1,408$), resistance (13 trials, $n=432$), and 'mixed' (cardiorespiratory plus resistance) training interventions (17 trials, $n=957$) on important health outcomes in stroke patients.

All interventions were progressive in nature and were presented at different stages of usual care (35 RCTs, 9 were <1 month post-stroke) and after discharge (23 RCTs).

There was evidence of fitness improvements. For example, meta-analysis of 9 RCTs ($n=425$ participants) showed that cardiorespiratory training improved peak $\dot{V}O_2$ by ~20% (mean difference 2.86 ml/kg/min, 95%CI 1.76 to 3.96; $P=0.0001$). Improved $\dot{V}O_2$ peak may not only confer functional advantages but could also have a plausible role in secondary prevention because this variable is predictive of stroke. Mixed exercise and resistance training showed the potential to improve strength but variations in the mode and method of strength measurement made pooling these data more difficult.

**"There was consistent evidence that mobility (walking speed and tolerance) improves after cardiorespiratory or mixed exercise training in which walking was an exercise mode."**

There was consistent evidence that mobility (walking speed and tolerance) improved after cardiorespiratory or mixed exercise training in which walking was an exercise mode. In contrast, resistance training alone, in the absence of walking, did not lead to improved mobility.

The effect of exercise training on other health-related outcomes, including mortality, secondary prevention, quality of life, mood, cognitive function and vascular risk factors were unclear, as the evidence is still incomplete and inconsistent. Currently, most studies are restricted to ambulatory and 'high functioning' patients. We are currently synthesising evidence for the effects of exercise and fitness training in non-ambulatory stroke survivors (e.g. Lloyd *et al.,* in press).

Qualitative evidence indicates that stroke survivors show improved social and physical confidence from participating in group exercise (Saunders *et al.,* 2014). Group exercise fosters psychosocial benefits, including improved self-efficacy, from watching others progress.

Evidence supporting exercise after stroke is growing but uncertainties remain about the optimum dose and types of exercise at different stages after stroke. However, there is sufficient information available to support/endorse implementation of safe and effective exercise prescription for stroke survivors.

**UK implementation**

The Department of Health's National Stroke Strategy (2007) identified a role for exercise in stroke prevention and rehabilitation. Since this publication, numerous UK policies and guidelines have emerged that use the evidence-base for exercise after stroke (see www.exerciseafterstroke.org.uk). Therefore, allied health professionals and specialist fitness professionals have a mandate for the promotion and implementation of 'exercise after stroke'.

With guidelines stating the need for continued support for ongoing rehabilitation from a range of community-based services, including specialist-led exercise classes, service implementation in NHS/local council settings is growing.

The *Best-practice Guidance for the Development of Exercise after Stroke Services in Community Settings* (2011; www.exerciseafterstroke.org.uk) recommends exercise professionals receive training to design, deliver and evaluate exercise programmes for stroke survivors. Accordingly *Skills Active* have a National Vocational Standard (D516: *Design, agree and adapt a physical activity programme with adults after Stroke*) at Level 4 on the Register for Exercise Professionals. A specific Level 4 course (*Exercise and Fitness Training after Stroke Instructor*) delivered across the UK has now trained >300 instructors qualified to deliver exercise classes for stroke survivors in the community.

Typically prescribed exercise classes include 1-3 sessions per week with the evidence-based components of cardiorespiratory training (circuit format) and resistance training (delivered as a group). Exercise is progressive, aimed at promoting improvements in functional movement patterns and physical fitness. Exercises are performed bilaterally through individually-tailored adaptations for stroke impairments, promoting safe movement ranges informed by assessment and referral information/outcomes. The programmes last 8-12 weeks and aim to enable self-management and maintenance after the supervised sessions finish.

**Conclusions**

- Exercise science has shown key fitness parameters, linked to activities of daily living, are impaired after stroke. These observations underpin the design of exercise interventions intended to improve post-stroke fitness, function and independence.

- Evidence of the effectiveness of exercise interventions, generated by clinical trials and systematic reviews, has influenced clinical guidelines worldwide and provides a mandate for implementation of exercise training post-stroke.

- Research evidence underpins training programmes for specialist community-based exercise instructors, in order that they can provide stroke survivors with much-needed opportunities to improve their fitness, health and quality of life.

- Exercise scientists play a crucial, distinctive role in the translational process from basic science to service delivery. ■


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References:

**Department of Health. (2007).** National Stroke Strategy. London: Department of Health.

**Exercise after stroke website** – Policies and Information Available: www.exerciseafterstroke.org.uk

**Lloyd, M. et *al.* (in press).** Systematic Review: Physical activity interventions for non-ambulatory stroke survivors. Clinical Rehabilitation.

**McKevitt C. et *al.* (2011).** Self-reported long-term needs after stroke. Stroke, 42(5), 1398-1403.

**Saunders, D.H. & Greig, C.A. (2013).** Fitness and function after stroke. In Mead & van Wijck (Ed.), Exercise after stroke: evidence based practice (pp. 77-91). Churchill Livingstone Elsevier.

**Saunders, D.H., Greig, C.A. & Mead, G.E. (2014).** Physical Activity and Exercise After Stroke - Review of Multiple Meaningful Benefits. Stroke, 45(12), 3742-3747.

**Saunders D.H. et *al.* (2016).** Physical fitness training for stroke patients. Cochrane Database of Systematic Reviews, Issue 3. Art. No.: CD003316. DOI: 10.1002/14651858.CD003316.pub6.

**Stroke Association. (2016).** State of the Nation Stroke Statistics. Available: www.stroke.org.uk

**Tieges, Z. et *al.* (2015).** Sedentary behavior in the first year after stroke: a longitudinal cohort study with objective measures. Archives of Physical Medicine and Rehabilitation, 96(1), 15-23.


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