Physical fitness is important for the performance of everyday activities. Although muscle strength and cardiorespiratory fitness are impaired in stroke patients, it is not known whether improving fitness by physical fitness training reduces disability after stroke.

**Objectives**

The objective of this study was to perform a systematic review to establish whether strength and/or cardiorespiratory fitness training reduces death, dependence, and disability after stroke. Secondary aims were to evaluate the effects of fitness training on physical fitness, mobility, physical function, health and quality of life, mood, and the incidence of adverse events.

**Methods**

**Search Strategy**

We searched the Cochrane Stroke Group Trials Register (last searched June 2003). In addition, the following electronic databases were searched: Cochrane Central Register of Controlled Trials (Cochrane Library, Issue 4, 2002), MEDLINE (1966 to December 2002), EMBASE (1980 to December 2002), CINAHL (1982 to December 2002), SPORTDiscus (1949 to December 2002), Science Citation Index Expanded (1981 to December 2002), Web of Science Proceedings (1982 to December 2002), PEDro (December 2002), REHABDATA (1956 to December 2002), and Index to UK Theses (1970 to December 2002). We hand-searched relevant journals and conference proceedings and screened reference lists. To identify unpublished and ongoing trials, we searched trial directories and contacted experts in the field.

**Selection Criteria**

Randomized controlled trials were included when an intervention represented a clear attempt to improve muscle strength and/or cardiorespiratory fitness, and whose control groups comprised either usual care or a non-exercise intervention.

**Data Collection and Analysis**

Data from eligible studies were independently extracted by 2 reviewers. The primary outcome measures were death, disability, and dependence. Standardized mean differences (SMD) and weighted mean differences (WMD) of variables were calculated using fixed and random effects models, but lack of common outcome measures limited the analysis.

**Results**

Twelve trials comprising 289 participants met the inclusion criteria. Only 3 trials commenced soon (<1 month) after stroke, and only 2 examined the effect of strength training. No trials reported death and dependence data. Two small trials reporting disability showed no evidence of benefit (SMD, −0.06; 95% CI, −0.76 to 0.65). There were few secondary outcome measures common to the included trials. Significant improvements were observed only in Functional Ambulation Category scores (WMD, 0.60; 95% CI, 0.14 to 1.06) and maximal walking speed (SMD, 0.42 m/s; 95% CI, 0.04 to 0.79) after cardiorespiratory walking training. Like ambulation outcomes, the incidence of other physical benefits was associated with interventions using modes of physical activity closely related to the outcome task.

**Reviewer Conclusions**

There are inadequate data to either encourage or discourage physical fitness training after stroke. Beyond improvements in some measures of ambulation, little is known about the benefits of fitness training in stroke patients or the optimal regimen for improving fitness. Any training-induced functional benefits appear to be associated with specific or “task-related” training.

Fitness training after stroke is an under-researched area. Further trials are needed to determine the efficacy and feasibility of fitness training, particularly soon after stroke. The optimal training regimen for improving fitness remains unknown; therefore, smaller more specific studies are also required. These should explore the effect of “dose” and type of training, particularly strength training.

Note: The full text of this review is available in The Cochrane Library (for subscribers: www.update-software.com/Cochrane).

Physical Fitness Training for Stroke Patients
David H. Saunders, Carolyn A. Greig, Archie Young and Gillian E. Mead

Stroke. 2004;35:2235; originally published online July 15, 2004;
doi: 10.1161/01.STR.0000137413.94706.ba
Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2004 American Heart Association, Inc. All rights reserved.
Print ISSN: 0039-2499. Online ISSN: 1524-4628

The online version of this article, along with updated information and services, is located on the
World Wide Web at:
http://stroke.ahajournals.org/content/35/9/2235

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Stroke can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Stroke is online at:
http://stroke.ahajournals.org//subscriptions/