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Physical activity before and after stroke

Gudrun Boysen*

Department of Neurology, Bispebjerg hospital, University of Copenhagen, Denamark

Abstract

The beneficial effect of physical activity on the risk of cardiovascular disease has been established since the 1980s. Stroke risk was found to be 17-20% lower in persons with moderate physical activity as compared to inactive persons. Further, physical activity has been associated with milder strokes in several studies. In stroke survivors able to walk, physical activity generally is low. Trials aiming at improving physical activity in the chronic phase after stroke have shown that it is difficult to maintain even a moderate level of activity. It is until now unknown, if physical activity could result in reduced risk of recurrent stroke and death. Several trials are ongoing with the aim of improving physical activity long-term after stroke.

Physical activity before and after stroke

Physical activity is a general term which can be measured by many different scales. For the purpose of this review walking activity is the main measure, which can be specified in distance per time unit, steps per day, or simply by hours per day. Physical activity can also be expressed as energy expenditure during cardiorespiratory fitness training. The beneficial effect of physical activity on the risk of cardiovascular disease is well established since the 1980's [1]. Lack of physical inactivity was shown to increase the risk of stroke in women [2]. The preventive effect of physical activity on the incidence of stroke was established by two meta-analyses in 2003 [3] and 2004 [4], in which stroke risk was reduced by about 20 – 25% in individuals with moderately intense physical activity compared with inactivity. Since then several large-scale observational studies have assessed the association between physical activity and risk of stroke. In Finland, Hu et al. [5], found that a high level of leisure time physical activity reduced the risk not only of ischemic stroke, but also the risk of hemorrhagic stroke and subarachnoid hemorrhage. In Sweden, aerobic fitness was assessed in young males at conscription and the number of strokes during a mean follow-up period of 33 years was recorded. Low aerobic fitness was a strong risk factor for stroke [6]. In Californian Teachers study [7], individuals who met American Heart Association recommendations for moderate physical activity had reduced risk of stroke. In South Korea physical activity was assessed in a nation-wide sample cohort, 2017 [8]. After 3.6 years of follow-up, risk of stroke in the group with moderate to vigorous physical activity at leisure time had a 16% reduced risk of stroke compared with those with no physical activity. These studies have confirmed the beneficial effect of physical activity in prevention of stroke. The effect size seems to be less in the studies from 2017 than in earlier studies – about a 17% risk reduction in the physically active groups. The PURE study [9] from 2017 included participants from 17 countries, many of them low-income countries. The study showed that total mortality as well as risk of cardiovascular disease was significantly reduced in individuals with high physical activity compared to moderate physical activity, and that moderate physical activity was associated with lower risk than low physical activity. This large study thus could demonstrate a graded effect which supports the assumption that physical activity has a causal effect in the prevention of cardiovascular disease. Still, the possibility remains that persons who engage in physical activity are generally healthier than those who do not.

In 2007 [10] a sample of stroke patients were interviewed about their physical activity in the week preceding the first stroke resulting in the finding that physical activity was significantly lower than in healthy age matched controls. Higher physical activity was associated with better functional outcome 2 years after stroke [11]. In Taiwan, in a much larger study in 2017 [12] it was confirmed that high physical activity defined as dedicated leisure-time physical activity for at least 30 min/day for 3 days/week in the 6 months preceding stroke was associated with milder stroke, better outcome, and lower mortality than in inactive groups. Recently a Swedish study [13] confirmed that light to moderate physical activity in the years predating the stroke was associated with milder stroke. It may thus be concluded that physical activity not only reduces the risk of stroke, it also eventually leads to a milder stroke.

It is well established that physical exercise is an inherent part of stroke rehabilitation in the post-acute phase [14], and this phase will not be dealt with further in this review, which will focus on physical activity in the long term after stroke.

Unfortunately, a high degree of inactivity is prevailing in ambulatory stroke survivors. In a systematic review it was found that number of steps per day was less than half of that of age-matched normative values [15]. Time spent sitting was found to be 2 hours longer for stroke survivors than for age matched controls [16].

It is a reasonable assumption that risk of recurrent stroke and death might be reduced by exercise after stroke. This has, however, never been shown. In the ExStroke trial, 2009 [17] it was attempted to increase the level of physical activity in ambulatory stroke survivors by counselling and prompting every 3 months for two years. This was not successful. After two years the level of activity in the intervention group and the

Correspondence to: Gudrun Boysen, Department of Neurology, Bispebjerg hospital, University of Copenhagen, Tel +45 51511797; E-mail: g.boysen@dadlnet.dk

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control group was at the same low level as that at baseline. The number of recurrent strokes and deaths was the same in the two groups. A higher level of physical activity was associated with a lower number of falls. Thus, fear of falling should not be a reason for refraining from activity. Several other smaller studies reached the conclusion that improvement of physical activity was not maintained after training or counselling had stopped. A systematic review [18] of the literature on intervention to promote long-term physical activity after stroke included 11 studies with 1704 participants. A meta-analysis could not be done due to inhomogeneity of the studies. Therefore, the conclusion was rather vague that some studies found a long-term effect of tailored supervised exercise, others did not. Another systematic review [19] from 2018 came to similar results, that studies were too heterogeneous to perform a meta-analysis. A study from Australia [20] showed that at 5 years after stroke, exercise was maintained in 18% only. Lately, the LAST study, 2018 [21] from Norway also came to a negative result after 18 months of individualized coaching on physical activity. The hope, however, has not been given up. At present several ongoing studies aim to improve long-term physical activity. A community-based retrain program where stroke survivors are trained twice weekly in group classes with up to eight clients appears promising [22]. Many factors may explain why stroke patients refrain from training, in particular fatigue, cognitive impairment, and depression need further attention [23]. The good news, however, is that physical activity is associated with some improvement in cognitive performance [24].

On the background of these studies my proposal is to deliver training in groups of 8-10 persons in a community-based therapist-led post stroke program in order for the participants to inspire and stimulate each other. Even though a recent systematic review of studies [25] on group exercises found disappointing results after 6 months, this approach needs further investigation in sufficiently large groups. Only if physical activity can be improved in the long term, will it be known whether it can reduce recurrent stroke and death.

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