EVIDENCE FOR BODY-WEIGHT-SUPPORTED TREADMILL TRAINING (BWSTT) AFTER STROKE

By Jørgen Jørgensen, Physiotherapist at Center for Rehabilitation of Brain Injury, Copenhagen

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Consequences of stroke

Consequences of stroke can be limitation or loss of movement, mobility, and functional ability. Low levels of physical activity are common soon after stroke and in community-dwelling stroke patients. Cardiorespiratory fitness ranges from 26 % to 87 % of the value expected in age and gender-matched healthy people. Muscle strength and muscle power are also impaired with bilateral deficits, which suggest the influence of physical inactivity. Limitation or loss of functional abilities after stroke (e.g. walking, stair climbing, chair rising) are associated with low cardiorespiratory fitness levels, muscle strength, and muscle power.

Recommendations and research

In a Cochrane review from 2016 the conclusion was, that cardiorespiratory training and mixed training (strength and cardiovascular training), during or after usual stroke care is effective in increasing walking speed and walking capacity in stroke survivors. It is likely that improvements in fitness, mobility, and physical function outcomes are associated with 'task related' training[1]. The most relevant task related training activity is often walking, since improving walking is one of the main goals of rehabilitation. There is increasing evidence, that high-intensive, repetitive, task-related training results in better gait rehabilitation[2] and is recommended in international guidelines for adult stroke rehabilitation, latest from the American guidelines from 2016[3].

Intensive training with body-weight-support and progression of the speed

Cardiovascular training in a relevant task (functional cardiovascular training), has an effect on the cardiovascular system and at the same time on the skill required to do the task. Body weight supported treadmill training (BWSTT) is a potentially intensive, repetitive, task-specific gait training intervention and an obvious intervention for functional cardiovascular training. A prerequisite for an effect is an adequate dose of training, a walking speed above the habitual and a continuously progression of the speed.

An example of this approach is a study by Pohl and Merholz, that compared the effects of structured speed-dependent treadmill training (STT) with limited progressive treadmill training (LTT) and conventional gait training (CGT)[4]. They found that STT resulted in far better walking abilities (speed, stride length and cadence) than LTT and CGT.

Dose-equivalent BWSTT

Another example is a study by Mackay-Lyons where they compared the effectiveness of BWSTT to dose-equivalent usual care (UC) in improving cardiovascular fitness and walking early after stroke. They found that BWSTT elicits greater improvements in cardiovascular fitness and walking endurance than UC in the subacute post stroke period and the gains were largely sustained for 1 year[5].

The many different interacting symptoms after stroke, calls for interventions with several elements, in order to give the best possible effect. In research, this provides a problem, because it is not possible to determine which element is most important and isolate the crucial elements from the whole package. Consequently, research is usually investigating one single element and not on a combination, and thereby not reflecting rehabilitation in a clinical setting.

Intervention with different elements

In a study from the Center for Rehabilitation of Brain Injury (CRBI) in Denmark, the effects of the gait rehabilitation program for people with chronic stroke were investigated[6]. The intervention consisted of bodyweight supported progressive functional cardiovascular training on treadmill and stairmaster, strength training, outdoor and indoor walking. The dosage was high 7,5 hours a week for 12 weeks, with the highest possible intensity. Even though the average chronicity was 24 months, a substantial effect was found on gait parameters (table 1). The effect can partly be explained by dose and intensity, but also because the intervention contained several elements.

Conclusion

The effectiveness of gait rehabilitation is dependent on many parameters. Most importantly the intervention has to be individualized, high-intensive, repetitive and task-related. BWSTT is an intervention with evidence for effect, especially when prioritizing progression of speed and functional cardiovascular training. BWSTT is one relevant element in gait rehabilitation, and should be combined with other relevant elements, e.g. strength training and walking in different contexts.

Tabel 1
Improvement in walking capacity during the 6 Minute Walk Test

	Cardiovascular training	Mixed training	Rehabilitation at CRBI
6 Minute Walk Test (MD)	30,9 meters	41,6 meters	130 meters
	Cochrane review[1]		Research report[6]

The table shows the improvement in walking capacity after three different interventions.

Litterature

1. Saunders DH, Sanderson M, Hayes S, Kilrane M, Greig CA, Brazzelli M, et al. Physical fitness training for stroke patients. Cochrane Database of Systematic Reviews. 2016(3).

2. Mehrholz J, Pohl M, Elsner B. Treadmill training and body weight support for walking after stroke. Cochrane Database of Systematic Reviews. 2014(1).

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4. Pohl M, Mehrholz J, Ritschel C, Rückriem S. Speed-Dependent Treadmill Training in Ambulatory Hemiparetic Stroke Patients. A Randomized Controlled Trial. 2002;33(2):553-8.

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6. Jorgensen JR, Bech-Pedersen DT, Zeeman P, Sorensen J, Andersen LL, Schonberger M. Effect of intensive outpatient physical training on gait performance and cardiovascular health in people with hemiparesis after stroke. Phys Ther. 2010;90(4):527-37.

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Winncare - Tårnborgvej 12C - 4220 Korsør
Tlf. : +45 7027 3720 - Mail: info@winncare.dk

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