Doctoral dissertation
Author: Ulla-Britt Flansbjer
Title: Strength training after stroke: Effects on muscle function, gait performance and perceived participation
Key words:
Date of issue: 2006-12-15
Public defence of dissertation: Malmö 2006-12-15
Language: English
ISSN , ISBN

Abstract

The overall aim of this thesis was to evaluate the effects of strength training on muscle function, gait performance and perceived participation in subjects with chronic mild to moderate post-stroke hemiparesis.

A main impairment after stroke is reduced muscle strength. This post-stroke weakness is a major contributor to mobility limitations, which can prevent the resumption of activities of daily living and have an adverse effect on perceived participation: persons’ lives experiences of involvement in their life situation. Improving muscle function is important in stroke rehabilitation, but strengthening exercises have been controversial due to the hypothesized risk of increasing muscle tone.

To be able to evaluate changes following strength training, we need equipment and methods that provide reliable measurements of muscle strength and gait performance and also an increased knowledge about the relationships between muscle strength, gait performance and perceived participation in chronic post-stroke subjects. In the first two studies the reliability of different tests, assessing isokinetic knee muscle strength and gait performance, was evaluated. In the third study the relationships between isokinetic knee muscle strength, gait performance and perceived participation were analysed. The 50 subjects participating in these studies (mean age 58 ±6.4 years, 6-46 months post-stroke) were able to walk independently, and could understand both verbal and written information. The results showed that all measurements for isokinetic knee muscle strength and gait performance were reliable and for each measurement, limits were set to detect real improvements following an intervention. The relationship between knee muscle strength in the paretic knee muscles and gait performance was significant, and gait performance was in turn related to perceived participation. This indicates that improvements in knee muscle strength could have a potential effect on gait performance and perceived participation. To evaluate changes following an intervention, both isokinetic knee muscle strength measurements and gait performance tests are reliable and sensitive enough to detect real (clinical) improvements.
In the fourth study the effects of progressive resistance training (PRT) on knee muscle function, gait performance and perceived participation were evaluated. Twenty-four subjects (mean age 61 ±4.9 years) participated in this single-blinded randomised controlled study (ratio 2:1 training/control). All subjects were more than 6 months post stroke, could understand both verbal and written information, had muscle weakness greater than 15% in the paretic knee muscles (mean isokinetic peak torque at 60°/s) and were able to walk independently. The intervention consisted of PRT for the knee extensor and flexor muscles twice weekly, for ten weeks, at a load about 80% of maximum strength (6-8 reps, in 2 sets). Measurements of knee muscle strength, muscle tone, gait performance and perceived participation were performed before and after the intervention. The results showed that ten weeks of PRT significantly improved knee muscle strength, without any increase in muscle tone. Gait performance improved, with slow walkers at baseline having the best gains. Improvements in gait performance were, furthermore, related to improvements in perceived participation. For the control group there were some improvements in gait performance, but low or no increase in knee muscle strength and perceived participation.

In conclusion, PRT improves knee muscles strength and gait performance, without any negative effects on muscle tone and improvements in gait performance, in turn, positively affects perceived participation. Thus, PRT is an effective form of training in chronic stroke patients that can be used both as physiotherapy treatment for those with residual hemiparesis and as fitness training for those with a minor disability.