

Online Journal Club – Article Review

Background/Overview	
Article Citation	Sharp, Shelley A and Brouwer, Brenda J. "Isokinetic strength training of the hemiparetic knee: effects on function and spasticity." <i>Arch Phys Med Rehabil</i> 78 (1997): 1231-1236.
Study Objective/Purpose (hypothesis)	The authors examined whether isokinetic training can improve the strength of the hemiparetic knee musculature, functional mobility, and physical activity and to evaluate its effect on spasticity in long-term stroke survivors.
Methods	
Study Design	Prospective, nonrandomized, self-controlled (compared hamstring and quadriceps strength of affected and unaffected lower extremities) trial.
Target Population	A volunteer sample of 15 community-dwelling stroke (the left side was affected in 8 subjects) survivors of at least 6 months; All subjects were independently ambulatory for a minimum distance of 12 meters with or without an assistive device (8 subjects used canes for walking, one used a rollator walker, and 6 did not use any assistive devices); subjects had not participated in any formal exercise or therapy program within the previous 4 weeks and were not restricted in using an isokinetic device by contracture; subjects had physician consent to participate
Interventions (if applicable):	A 6-week (3 days/week, 40 minutes/day) program consisting of warm-up (5-minutes on stationary bike at low resistance and four 15-second stretches for the quadriceps and hamstrings of the affected leg), reciprocal knee extension and flexion isokinetic strengthening (reciprocal knee extension and flexion on the Orthotron isokinetic machine that controls velocity of concentric muscle action in a sitting position for 3 sets of 6-8 repetitions of maximal effort at speeds of 30, 60, and 120°/sec), and cool-down for the paretic limb (stretches again)

Outcome Measures	Peak isokinetic hamstring and quadriceps torque, quadriceps spasticity (measured using the pendulum test), gait velocity, Timed Up and Go, timed stair climb, and the Human Activity Profile (HAP) were all recorded at baseline, after training, and 4 weeks after training cessation ("follow-up")
Results	
Summary of Primary and Secondary Outcomes: note results that were statistically significant	<p>Paretic muscle strength improved after training (ie both affected hamstrings and quadriceps showed significant gains immediately following training at all velocities and gains remained evident at follow-up but were no longer significant except the quadriceps torque which remained significant at 30°/sec). Tone remained consistent.</p> <p>Gait velocity increased after training by 5.3% from baseline and at follow-up by 6.8% from baseline. Changes in stair climbing and Timed Up and Go were not significant, although subjects perceived gains in their physical abilities by 25% after training and by 36% follow-up on the HAP.</p>
Authors' Conclusions	
Authors' Conclusion	Gains in strength and gait velocity without concomitant increases in muscle tone are possible after a short-term strengthening program for stroke survivors. The psychological benefit associated with physical activity is significant.
Reviewer's Discussion and Conclusion	
Study Strengths	<ul style="list-style-type: none"> - The study addresses the stroke population with knee extensor spasticity - The intervention protocol design was based on functional activities such as stair climbing, TUG, and 12-meter walk for gait velocity which are applicable to every day life/function.
Study Limitations and Potential for Bias	<ul style="list-style-type: none"> - Small sample size - Sample only included those 6 months post stroke - Sample only included those that had not been exercising regularly - Focus is on ambulatory patients – may not be applicable to patients of a lower functional level - Subjects served as their own controls (ie affected vs unaffected hamstrings and quadriceps)

<p>Applicability:</p> <ul style="list-style-type: none"> • Types of patients (dx) that results apply to • Types of settings or patient acuity that the results apply to • Can interventions be reproduced? Can results be applied to other pt populations? 	<p>This study focuses on patients post stroke with knee extensor spasticity. Therefore, although a similar treatment can be used in subjects post-stroke without knee extensor spasticity, results may vary. Also, all patients included in the study were able to ambulate at least 12 meters (nearly 40 feet) which may signify that patients at a lower level of mobility may not be able to perform the treatment used in this study. Thus, the population most applicable would be community-dwelling individuals. The strengthening intervention, including warm-up and cool-down can be reproduced given that the necessary equipment is readily available (ie the Orthotron isokinetic machine that control the velocity of concentric muscle action)</p>
<p>How will study results impact PT management of this patient population?; List suggestions for how to implement changes in your clinic/department to integrate study findings into patient care</p>	<p>The study's results indicate that patients with spasticity can still benefit from a strengthening program but such exercises must continue to be performed to maintain strength gains. In addition, functional gains may not necessarily be seen simply because strength gains as achieved. However, the subject may report increased perceived gains in their physical abilities. Therefore, overall, strengthening should be used as part of a rehabilitative program post-stroke in combination with various treatments to realize the full functional potential a patient can achieve.</p>