Spasticity interventions for MS

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| **Author** **(Year), Title,** **Study Design** | **Study Purpose**  | **Participants** | **Procedures** | **Results (P>0.05)** | **Author's Conclusion** | **Notes** |
| Motl RW et al. (2006)Effect of acute leg cycling on the soleus H-reflex and modified Ashworth scale scores in individuals with multiple sclerosis.Quasi-experimental | To examine the effect of a bout of unloaded leg cycling on the soleus H-reflex and modified Ashworth scale (MAS) in 6 individuals with MS. | n=6 subjects with MS, currently taking oral baclofen (antispasmodic). EDSS 0.5-4.5. MAS 1-3. | The study took place over 3 sessions.Session 1: rode cycle ergometer 5 minutesSession 2&3: Either rode cycle ergometer for 20 minutes or sat for 20 minutes to serve as control.Soleus H-reflex and MAS collected before and 10, 30, and 60 minutes after intervention. | H-reflex reduced after cycling at 10-min, 30-min, and 60-min.H-reflex reduced after control condition at 30-min.MAS decreased at 10-min and 30-min after cycling.MAS increased at 60-min after control condition. | A single bout of unloaded cycling resulted in reductions in soleus H-reflex and MAS in individuals with MS taking anti-spasmodic drugs. This provides support for including exercise along with anti-spasmodic drugs in spasticity management. | Previous research by Motl reported a 25% reduction in H-reflex after cycling in both healthy controls and individuals with MS not taking anti-spasmodic drugs. |
| Sosnoff J, et al. (2009)Effect of a 4-week period of unloaded leg cycling exercise on spasticity in multiple sclerosisQuasi-experimental | To examine the effect of a 4-week period of unloaded leg cycling on spasticity in individuals with MS. | n=22 subjects with MS. 12 subjects recevied the exercise intervention. EDSS mean 3.5, age mean 45.6 years10 controls. EDSS 3.0. Age 46.0 yrs | Unloaded leg cycling for 30 minutes per session, 3 times per week, over a 4-week period.Measures: H-reflex of soleus, MAS of ankle PFs, MSSS-88. Assessed pre-intervention, post-intervention, post 1-week, and post 4-week. | Spasticity (MAS): no significant effectH-reflex: no significant effectSubjective report via MSSS-88: Significant reduction in score at post-intervention and follow ups. Greatest change in walking and pain and discomfort subscales. | Chronic, unloaded leg cycling is associated with improvements in spasticity from the participant's perspective, but neither improves nor worsens spasticity from electrophysiological and clinical perspectives. | Two individuals in each group were taking antispasmodic medications. |
| Szecsi J, et al. (2009)Functional electrical stimulation-assisted cycling of patients with multiple sclerosis: Biomechanical and functional outcome - A pilot study.Quasi-experimental | To determine whether functional electrical stimulation-supported ergometric training of patients with multiple sclerosis has a prosthetic or therapeutic effec on biomechanical outcomes. | n=12 subjects with MS. Subjects have limited standing or walking capability due to weakness and are not taking anti-spasmodic medications.All subjects received conventional PT prior to and during the study. 10 were in inpatient rehab during the study. | Subjects participated in 6 functional electrical stimulation (FES) supported cycling sessions on a stationary ergometer over 2 weeks.12-18 min of total cycling. 6 min of FES-supported cycling.Measures: 10-MWT, MAS, MMT of knee extensor and flexors. | Spasticity (MAS): significant reduction in the short-term for pre/post training. No significant reduction in the long term for first/last training. MAS mean decreased from 1.19 to 0.56.Walking capability: No significant changeMuscle strength: No significant change8 subjects completed the study. | Patients with MS are able to improve cycling power and smoothness by pedalling with stimulation.Severly affected patients benefit more from FES-cycling therapy than do slightly affected patients. Further research is needed to clarify whether a therapeutic gain can be achieved. | Subjective reports of increased independence with ADLs, gait improvements, and increased sensation in the feet following FES intervention.Study limitations include small sample size, short training period, no control group, no randomization. |
| Giovanelli M, et al. (2007)Early physiotherapy after injection of a botulinum toxin increases the beneficial effects on spasticity in patients with multiple sclerosisRCT | To determine whether additional physiotherapy increases botulinum toxin type A (botox) effects in reducing spasticity in patients with MS. | n=38 with SPMS and focal spasticity. EDSS mean 5.9.MAS mean 3.6  | All patients received botox in either the UE or LE. The treatment group also received PT for 15 consecutive days following botox injections. 40 min PT session included passive or active exercise and stretching.Assessment at baseline, 2, 4, and 12 weeks. MAS and VAS of satisfaction in the degree of relief from spasticity in injected muscles. | Significant reduction in spasticity (MAS) in both groups from baseline to all follow-up assessments. Significantly greater improvement in PT group compared to botox only group at 4 and 12 weeks post-injection. | PT in combination with botulinum toxin A can improve overall response to botulinum toxin. | Stretching after botulinum toxin A injection may improve efficacy by diffusing the botox within the muscle.Botox injections must be repeated every 3-6 months. |
| Baker K et al. (2007)Therapeutic standing for people with MSRCT | To assess the feasibility and efficacy of a daily standing programme in the community for subjects with multiple sclerosis.  | n=6 with secondary progressive MS. Mean age 45.6. EDSS mean 7.0 | Daily standing for 30 minutes for 3 weeks using Oswestry standing frames.Measures taken at week 0, 3, and : Ashworth scale of hip flexion, hip abduction, knee flexion, ankle dorsiflexion; frequency of spasms, passive ROM of hip, knee, and ankle. | Improved hip ext and ankle DF PROM.Improved spasticity in ankle dorsiflexion and knee flexion and decreased spasm frequncy. (Not statistically significant) | Using a stander at home is feasible, more research needs to be done to determine how beneficial it might be. | Two subjects unable to tolerate 30 min of standing until weeks 2. A-0nother until week 3. |

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3. Szecsi J, Schlick C, Schiller M, et al. Functional electrical stimulation-assisted cycling of patients with multiple sclerosis: Biomechanical and functional outcome - A pilot study. J Rehabil Med 2009; 41; 674-680.
4. Giovannelli M, Borriello G, Castri P, Prosperini L, Pozzilli C. Early physiotherapy after injection of botulinum toxin increases the beneficial effects on spasticity in patients with multiple sclerosis. Clin Rehabil. 2007; 21(4): 331-7.
5. Baker K, Cassidy E, Rone-Adams S. Therapeutic Standing for People with MS. International Journal of Therapy and Rehabilitation. 2007; 14(3): 104-109.