Corticomotor Excitability During a Noxious Stimulus and Following Exercise in Women with Fibromyalgia

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(472) Does rehabilitation dose predict functional recovery after total knee replacement?

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Total knee replacement (TKR) is a cost-effective treatment, with benefits of improved pain, function and quality of life. Considerable rehabilitation is needed to maximize recovery speed post-TKR, yet how rehabilitation dose influences functional recovery is not well-understood. The aim of this study was to determine whether exercise dose or general activity predict functional improvement 6 weeks following TKR. On postoperative day 2 (POD2) and at 6 weeks, 151 participants (61.3±9.6y) completed 4 knee function tasks (extension, extensor lag, flexion, walking speed), and rated their pain on a 21-point numeric scale. They also completed home record logs for 6 weeks, including daily minutes of (1)exercise dose (physical therapy, home exercises), and (2)other activity (housework, gardening), and pain with each task. Prescribed exercise was significantly higher in weeks 1 and 2 (45.7±19.2), and 3 and 4 (45.8±21.9) compared to 5 and 6 (38.9±20.8) (Wilcoxon test, p<0.001). Function improved significantly for all tasks from POD2 to 6 weeks (p's <0.001). Walking speed improvement was positively associated with prescribed rehabilitation dose during weeks 3 and 4 (multiple regression; b = 4.48, p < 0.01). Exercise dose was not associated with function change for the other tasks. A POD2 walking speed by sex interaction was observed for walking speed (b = -0.82, p = 0.01): males with lower POD2 speeds had greater improvements than males with higher POD2 speeds. Pain at 6 weeks was associated with less improvement for all tasks, and age was associated with poorer walking speed and flexion change (p's > 0.01). These results suggest exercise dose translates to better functional improvement, and people with higher pain and who are older have poorer functional recovery. Our study is the first to examine whether physical rehabilitation dose affects functional recovery after TKR and shows that dose is important for improvement in function. Funding: NINR R01 NR009844.

(473) Corticomotor excitability during a noxious stimulus and following exercise in women with fibromyalgia

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In young healthy adults, application of a noxious stimulus increases corticomotor excitability (motor evoked potentials, MEP) to the contralateral limb. Immediately following a sustained isometric contraction, the pain-induced increase in corticomotor excitability decreases in parallel with a decrease in pain reports. The purpose of this study was to assess corticomotor excitability during a noxious stimulus before and after isometric exercise in women with fibromyalgia (53.7±9.9 years) who participated in three research sessions: one familiarization and two randomized experimental. The experimental sessions involved measurement of pain perception and motor evoked potentials (MEPS) of the biceps brachii before and after 1) 30 minutes of quiet rest or 2) a fatiguing submaximal isometric contraction with the elbow flexor muscles. Corticomotor excitability was quantified as the amplitude of the MEP evoked at rest in the elbow flexor muscles in response to transcranial magnetic stimulation. Pain perception, measured as pain threshold and pain ratings, was assessed with a custom-made pressure pain device placed on the contralateral index finger for two minutes. Pain ratings were recorded every 20 s. MEPs using a 0-10 numerical rating scale. In contrast to healthy subjects, women with fibromyalgia did not experience a pain-induced increase in corticomotor excitability (p=0.05). Furthermore, following the submaximal isometric contraction, there was no change in pain reports or MEP amplitude compared with the quiet rest session (p=0.05). Thus, corticomotor excitability during a noxious stimulus and following exercise is very different for women with fibromyalgia compared with healthy adults. Supported by a grant from the Arthritis Foundation.

(474) Wearable long-duration ultrasound treatment of chronic trapezius myalgia

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Recent research suggests that Traditional ultrasound therapy (TUS) is most clinically effective on pain treatment when administered daily. However, owing to the patient costs and inconvenience of regular TUS, it is not considered a self-management approach to pain therapy. The purpose of this study was to evaluate if a novel wearable low intensity therapeutic ultrasound (LITUS) device could reduce patient’s pain, be easily self-applied at home, and if daily LITUS had an overall therapeutic benefit to treating chronic trapezius myalgia. The wearable LITUS device is about the size of an iPod® and provides 5 to 6 hours of 2.75 MHz ultrasound therapy at 90mW/cm² on a single charge. The wide-beam device treats a softball size volume and is attached to the body with ultrasound gel and tegaderm® bandage. The LITUS device was evaluated in a double-blinded placebo-controlled study under Cayuga Medical Center Institutional Review Board approval. The patient population consisted of 30 subjects, 40-60 years of age, with starting daily-pain ratings of <7 on the visual analog scale (VAS), and medically diagnosed with chronic trapezius myalgia. Each subject logged a daily 1 hour treatment session for 10-12 consecutive days, the onset of trapezius pain, and recorded VAS and SF-36 on their user diary. On average subjects reported a 2x VAS pain reduction over placebo. Placebo users had a 6.54% pain reduction, female and male active users had a 11.76% and 15.02% pain reduction, respectively. For the GROC, the average improvement over placebo was 2x. Placebo users had a 12.75% improvement, female and male active users had a 28.68% and 47.98% improvement, respectively. In almost all treatment sessions, the wearable LITUS device provided improved pain reduction over placebo, and no adverse events were reported during or after the study.