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

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## G03 Rehabilitation Medicine

### (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±9.6yrs) 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 (46.8±21.9) compared to 5 and 6 (38.9±20.8)(Wilcoxon test, p's < .001). Function improved significantly for all tasks from POD2 to 6 weeks (p's < .001). Walking speed improvement was positively associated with prescribed rehabilitation dose during weeks 3 and 4 (multiple regression; b = 4.48, p < .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 = .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 changes(p's > .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. Fifteen women with fibromyalgia (53.7±9.9 years) 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 seconds 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-pain 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 at the onset of trapezius spasm, and recorded VAS and GROC scores in 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 3x. 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.

### (475) High intensity TENS reduces pain during dressing changes on open wounds: a proof of concept study

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Dressing changes on open wounds cause moderate to severe pain in 50-80% of patients, which interferes with wound care. Effective interventions without significant side effects are lacking to control this procedure-evoked wound pain. The effect of high intensity transcutaneous electrical nerve stimulation (HI-TENS) for reducing procedure-evoked wound pain during dressing changes on open wounds was examined using a pre-post pilot study of 24 subjects. Inpatients reporting a pain intensity ≥ 4 on a 0-10 NRS during a screening dressing change of both acute and chronic open wounds were enrolled. Subjects' were primarily female (62.5%) and had a mean age of 49.3 ± 13.9 years. HI-TENS was applied 20 minutes prior to the intervention dressing change using four electrodes placed the top and bottom of both sides of the wound dressing at points of least resistance. Subjects controlled increases in amplitude to promote acceptance of sensation resulting in a mean amplitude of 48.6 ± 10.6 mA. Four of the 24 subjects received preventive or procedural analgesia during the HI-TENS dressing change beyond what they received during their screening dressing change so were eliminated from the analyses. The mean reduction in pain intensity with HI-TENS for the remaining 20 subjects was 2.3, going from an average pain intensity of 7.05 ± 1.97 without HI-TENS to 4.7 ± 2.55 with HI-TENS. This effect is similar in magnitude to that demonstrated with pharmacologic strategies for this purpose and HI-TENS far fewer side effects than opioids, such as sedation and nociceptor sensitization. Therefore, HI-TENS represents a preventive intervention for procedure-evoked wound pain that deserves further study in a large randomized clinical trial. If HI-TENS is shown to be effective, the positive impact would be improved wound outcomes because reduced procedure-evoked pain will lead to more thorough wound care, decreased infection, and better wound healing.