The Effects of Cryotherapy on Electrically Evoked Muscle Force  
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Context: Neuromuscular electrical stimulation (NMES) is commonly included in the management of musculoskeletal injury. When the therapeutic goal is to delay muscle atrophy or to preserve or enhance muscle strength, the strongest electrically evoked contraction is typically desired. This is usually limited by cutaneous nociceptor stimulation and tolerance to the electrical current. Thus, it is common practice to combine cryotherapy with NMES to achieve a stronger contraction through cold-induced analgesia and an increased pain threshold. However, the efficacy of this practice has not been fully investigated. **Objective:** To determine if the combination of cryotherapy and NMES will elicit stronger contractions than NMES alone and if precooling will provide and even greater effect. **Design:** A randomized cross over design. **Setting:** Athletic training research laboratory. **Participants:** Twelve healthy males and females (age=19.8±.8 years, height=169.5±7.4 cm, mass=59.5±21.7 kg) who were not suffering from any injury or condition that would affect upper extremity strength or ROM or any of the contraindications to cryotherapy or NMES. **Interventions:** Subjects were assessed under three randomly ordered conditions; 20-min of NMES alone (ES), 20-min of cryotherapy and NMES combined (C20) and 20-min of cryotherapy alone immediately followed by 20-min of cryotherapy and NMES combined (C40). A typical Russian protocol (Solaris 709, Dynatronics, Salt Lake City, Utah) applied to the non-dominant biceps brachii with a monopolar electrode arrangement was used for all treatment conditions. Cryotherapy consisted of a standard ice pack with 500-mg of crushed ice placed directly over the active electrode and held in place with plastic wrap. **Main Outcome Measures:** Current amplitude was recorded at 4-, 8-, 12-, 16- and 20-min during the NMES treatment. Peak electrically evoked elbow flexion force was assessed at the same time points using a wireless microFET2™ digital handheld dynamometer (Hoggan Scientific, Salt Lake City, UT). Skin surface temperature was also assessed at the same time points and prior to treatment using an Iso-Thermex thermometer (Isothermex, Columbus, OH) and SST-1 skin surface probe. **Results:** At each time point, both the C20 and C40 conditions resulted in cooler temperatures than the ES condition and the C40 condition resulted in cooler temperatures than the C20 condition ($F_{10,110}=128.52, p=.001$). The current amplitude progressively increased during each treatment condition ($F_{8,88}=13.98, p=.001$). Additionally, the current amplitude during the C40 condition was significantly greater at each time point as compared to both the ES and C20 conditions. However, cryotherapy had no effect on muscle force ($F_{8,88}=5.96, p=.779$), as no differences were observed between treatment conditions. **Conclusions:** While precooling resulted in colder surface temperatures and greater tolerable current amplitude, this did not result in a stronger electrically evoked contraction. Thus, the combination of NMES and cryotherapy is not superior to NMES alone when considering strength of contraction. **Word Count:** 448