

Title: (20 words)

An exploration of targeted cryotherapy protocols, using the Swellaway Knee Unit, on healthy male subjects

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Biography (150 Words)

Olivia has worked within academic research, testing the efficacy and effectiveness of clinical and sports equipment as part of the Allied Health Research unit at the University of Central Lancashire (UCLan). Olivia has contributed to valuable clinical research and development with a range of products and testing equipment, answering important clinical questions. Her current role as a Knowledge Transfer Partnership Associate, involves working as part of a collaboration with a commercial company (Swellaway) and two universities (Manchester Metropolitan University and UCLan). Olivia is currently studying for a PhD at Manchester Metropolitan University, investigating the development of clinical protocols using a controllable cooling, heating and compression device (Swellaway). Olivia has a particular interest in sport and exercise decision making, both personally and academically, and currently plays semi-professional football in the FA Women's National Premier League.

Ethical Review

Ethical approval was gained from the STEMH Ethics committee of the University of Central Lancashire (STEMH 953) (Part A) and Manchester Metropolitan University (EthOS 7880) (Part B).

Preferred Presentation Type

Rapid 5

How does your work fit with the conference theme you have chosen?

Exercise and Decision Making

With the introduction of 'optimal loading' into the POLICE guidelines to encourage early activity, interventions enabling this, whilst achieving other elements within POLICE, could be beneficial. Targeted compressive-cryotherapy could achieve the desired cooling whilst minimising commonly reported inhibition of proprioception and strength, which previously may have discouraged early activity post-intervention.

Abstract Type

Research report

Abstract (500 words)

Purpose:

With the development of the guidelines for acute injury management evolving from PRICE (Protection, Rest, Ice, Compression and Elevation) to POLICE (Protection, Optimal Loading, Ice, Compression, Elevation), the ability to facilitate optimal loading is key to promote early recovery with early activity. A 20-minute ice application has been reported to inhibit muscle strength and joint position sense. Therefore, the purpose of this study was to explore if targeted cryotherapy, over a smaller surface area using the Swellaway Knee Unit, could achieve the desired skin surface temperatures (T_{sk}), whilst minimising potential reductions in muscle strength or joint position sense post-intervention; hence facilitating early optimal loading.

Methods:

As the Swellaway Knee Unit can control temperature and pressure parameters, three compressive-cryotherapy protocol interventions within the therapeutic range were explored: 1) 10°C & *medium compression* (50mmHg), 2) 15°C & *medium compression* 3) 10°C & *low compression* (32mmHg). Each protocol required a separate visit, in a randomised crossover design. To minimise any interference between outcome measures, data collection was split into two parts (A & B). Part A investigated the effects on T_{sk} , tissue oxygenation, thermal sensation/comfort, on a convenience sample of 13 healthy male participants (21.5 ± 3.0 yrs). Part B explored the effects on muscle strength, pressure pain threshold and joint position sense, on a convenience sample of 13 healthy male participants (25.3 ± 3.4 yrs). Both parts used all three interventions and recorded all outcome measures pre, post and 20 minutes post-intervention.

Results:

Protocols set with a target temperature of 10°C achieved T_{sk} within the therapeutic range. Whereas, protocols set at 15°C , did not achieve T_{sk} within the therapeutic range. No significant differences ($P>0.05$) were found in T_{sk} between low and medium compression used in protocols 1 and 3. Most participants described the compressive-cryotherapy interventions a thermally 'comfortable' (80%) and 'slightly cool' (50%). No significant differences ($P>0.05$) were found in pressure pain threshold or tissue oxygenation between timepoints or interventions. No significant differences ($P>0.05$) were found in maximum knee flexion, following all interventions. All protocol interventions decreased concentric quadriceps muscle strength post-intervention by approximately 3-7%. Previous literature has presented concentric quadriceps muscle strength deficits of 18% following ice interventions.

Conclusion:

The targeted cooling approach, using the Swellaway Knee Unit, can achieve the desired cooling and appears to reduce the magnitude of inhibition to muscle strength and joint position sense reported following cryotherapy interventions. Protocols set at 10°C achieved T_{sk} within the therapeutic range may be considered effective cryotherapy interventions. However, protocols set at 15°C did not achieve T_{sk} within the therapeutic range so may be considered ineffective in achieving physiological responses to cooling. Future work should explore the effectiveness of the targeted cryotherapy approach on a population with soft tissue injuries.

Impact:

Clinicians should consider utilising targeted compressive-cryotherapy to fulfil the 'IC' in 'POLICE', whilst minimising the reported adverse effects following cryotherapy, which may have previously discouraged early optimal loading 'OL' post-intervention.

Keywords:

Cryotherapy, Compression, Optimal Loading

Funding acknowledgments:

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