College of Health Solutions
Arizona State University

Exploring the Efficacy of HydroMassage and CryoLounge+ Treatments on Consecutive Days of Resistance Training

FINAL REPORT

Provided by Associate Professor Jason Siegler
Arizona State University

Integrative Human Performance Laboratory
6161 E Mayo Blvd, Phoenix, AZ 85054
Jason.siegler@asu.edu | chs.asu.edu

College of Health Solutions
Arizona State University

Executive Summary

The premise of this project was to explore the influence of WellnessSpace Brands® HydroMassage® and the CryoLounge+ on subjective and functional recovery parameters after a targeted resistance training session. METHODS: A total of fifteen participants were recruited to perform a comprehensive resistance-training workout consisting of a series of lower-body (posterior chain) exercises on three separate occasions, with each session separated by one week. Participants were randomized to receive all three recovery interventions (HydroMassage®, CryoLounge+, and Control (no treatment)) across the three weeks in varying orders (counter-balanced repeated measures, cross-over design). After descriptive measurements (i.e., age, height, weight) and familiarization with the protocol, participants completed a one-day familiarization session prior to the 3 "training" weeks inclusive of 4 sets of 8 repetitions of the trap-bar deadlift (TBD) and the Romanian deadlift (RDL), respectively. Mean velocity was measured during the TBD, along with ratings of perceived exertion (RPE) during the RDL to ensure consistency in effort and accuracy in intensity prescription (70% 1RM for TBD and 7/10 RPE for RDL) for the experimental sessions. Upon arriving to the lab for the experimental sessions, participants were asked to self-rate muscle soreness and levels of muscle fatigue prior to starting the workout, immediately after completing the training session, and after receiving the recovery treatment (i.e., HydroMassage®, CryoLounge+, or Control). Functional measures of muscle force (i.e., isometric mid-thigh pull (IMTP)) were also obtained prior to the training session and again immediately post. 24 hours later, participants returned and completed the same self-rated and functional measurements to assess the effects of the treatment the following day. RESULTS: The resistance-training session induced a significant level of muscle fatigue as determined by declines in the IMTP pre- to post-workout ($p < 0.05$). Participants' perception of muscle fatigue was reduced after the workout when participants received both the CryoLounge+ (4%) and HydroMassage (13%) treatments when compared to Control. Additionally, muscle soreness was reduced after the workout when participants received the CryoLounge+ treatment (6%) when compared to Control. Finally, although there was no treatment effect on the functional measures of IMTP, participants perceived muscle soreness to be reduced by 32% (CryoLounge+) and 48% (HydroMassage) when compared to the no treatment control. Overall, both CryoLounge+ and HydroMassage treatments post workout resulted in improved participant's perceptions of muscle fatigue and soreness, with lower levels of muscle soreness persisting 24 hours post-workout.

Integrative Human Performance Laboratory
6161 E Mayo Blvd, Phoenix, AZ 85054
Jason.siegler@asu.edu | chs.asu.edu

College of Health Solutions
Arizona State University

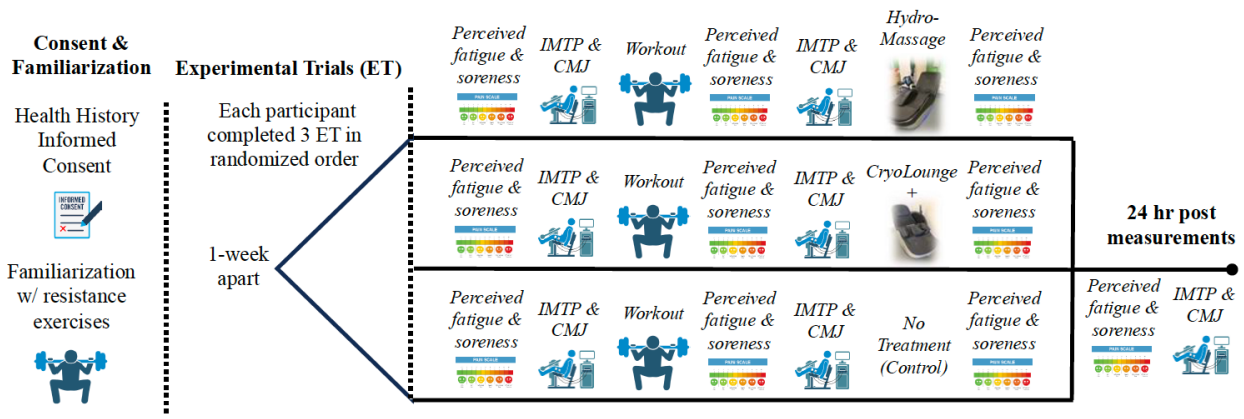
Introduction & Background

The premise of this project was to explore the influence of WellnessSpace Brands® HydroMassage® and the CryoLounge+ on subjective and objective recovery parameters after a targeted resistance training session. Both massage and cold-water-exposure have been proposed to decrease muscle soreness following a bout of exercise [1,3,4,5]. However, a large proportion of the research that exists on this topic is specific to perceived soreness for the days after the initial exercise bout, and not immediately post workout [1,3,4,5]. Currently, a variety of commercially available recovery modalities exist (massage and cold), for example: traditional massage, massage rollers, cold-water-immersion, and cold application (i.e., ice pack) [3,4,5,6]. These modalities are often costly, require the assistance of another person, and/or are time intensive to set up (i.e., filling a cold plunge tub or scheduling a massage). This warrants the further exploration of recovery modalities utilizing WellnessSpace Brands® products such as HydroMassage® and CryoLounge+ to examine the effectiveness of the massage and cold treatments on perceptive and functional measures of recovery immediately post-workout and the following day prior to another workout.

Methods

This study recruited fifteen healthy male and female participants (age range 30 ± 7 yrs, height 68 ± 3 inches, weight 160 ± 26 lbs) who had experience with resistance training for at least six months. Additionally, all of the participants had experience with the movements prescribed during their participation in the study protocol. The study required participants to perform a comprehensive resistance-training workout consisting of a series of lower-body (posterior chain) exercises on three separate occasions, with each session separated by one week. Participants were randomized to receive all three recovery interventions (HydroMassage®, CryoLounge+, and Control (no treatment)) across the three weeks in varying orders (counter-balanced repeated measures, cross-over design).

A study design schematic is provided as **Figure 1**.



Familiarization: Prior to participating in the experimental sessions, participants completed extensive familiarization with the protocol, inclusive of 4 sets of 8 repetitions of the trap-bar deadlift (TBD) and the Romanian deadlift (RDL), respectively. Mean velocity of the bar was measured during the TBD, along with ratings of perceived exertion (0 – 10 scale with 0 being no-effort and 10 being exhaustive effort; RPE) during the RDL to ensure consistency in effort and accuracy in intensity prescription (70% 1-repetition maximum (1-RM) for TBD and 7 out of 10 RPE for RDL) for the experimental sessions. Once completed, participants were randomized into the recovery treatment sequence (however had no prior knowledge of which treatment they would receive after completing the experimental day's work out). Participants were also asked to repeat their diet for 12-hours leading up to each of the three experimental visits, and to consume a minimum of 500 mL of water 2 – 3 hours prior to arrival.

Experimental Sessions: Upon arriving to the lab for the experimental sessions, participants were asked to self-rate muscle soreness and levels of muscle fatigue in the back of the legs and lower back on a scale of 1 – 10, with 1 representing no soreness and 10 extremely sore (or fatigued). Upon completion of the ratings scales, participants performed a standardized warm-up designed to prepare them for a posterior chain exercise stimulus. As the warm-up was completed, functional measurements of muscle strength and explosive power (isometric mid-thigh pull (IMTP) and

countermovement jump (CMJ), respectively) were performed prior to the work out on force plates with a sampling frequency of 1000 Hz (VALD ForceDecks LITE and ForceDecks IMTP Rack, Brisbane, AUS)).

The intervention (i.e., work out) was designed specifically to target posterior chain (back of the body) exercises in order to fatigue regions of the body directly in contact with the recovery modalities. The selected exercises were trap-bar deadlift (TBD), and Romanian deadlift (RDL), both of which were completed for 4 sets of 8 repetitions. The TBD and the RDL were performed at 70% of 1-RM, respectively. In order to standardize effort, the TBD repetition speed was monitored using a linear position transducer (GymAware RS, Canberra, AUS) that tracked mean velocity of the bar throughout the movement. For the RDL exercise, participants were instructed to work at a speed consistent with a 7 out of 10 effort on the RPE scale (hard). Once the work out was completed, participants again rated their perception of muscle soreness and fatigue prior to completing a post-training functional measurement sequence (i.e., IMTP and CMJ) to determine the effectiveness of the work out in inducing muscle fatigue.

Immediately after completing the post-work out assessments, participants received either the HydroMassage®, CryoLounge+, or Control (no treatment but sitting in a recliner) recovery treatments depending on the randomization sequence. Each treatment was administered for 15 minutes. The HydroMassage® was set to a speed of 3 and a pressure of 8, while the CryoLounge+ was set to the coldest temperature with lower body segments the focus of the cold treatment. After the completion of the recovery session, participants were asked to rate their perception of muscle fatigue and soreness before leaving the laboratory. would then complete the subjective questionnaire one more time before leaving the laboratory. Twenty-four (24) hours after the work out, the participants returned to the laboratory to complete the same self-rating scales and after a standardized warm-up, the IMTP and CMJ to measure recovery 24-hours post training. For the following two experimental sessions (1-week apart), the same methods were administered as described above with the exception of the recovery treatment post work out.

Statistical Analysis: All statistical analyses were completed using IBM SPSS Statistics version 28 (SPSS Inc., Chicago, USA). Descriptive data are presented as mean ± standard deviation (SD). Differences between pre- and post-work out, and pre-work out and 24 hours post-workout, for subjective ratings of muscle fatigue and soreness, along with functional measures of strength (IMTP) and explosive power (CMJ), were analyzed using linear mixed model two-way ANOVA for repeated measures. When significant interaction effects were detected, pairwise comparisons were made using the Bonferroni procedure. Mean differences and standard error between days, as well as 95% confidence intervals (CI) were calculated when significant differences were observed. Two-tailed statistical significance was accepted at $p < 0.05$.

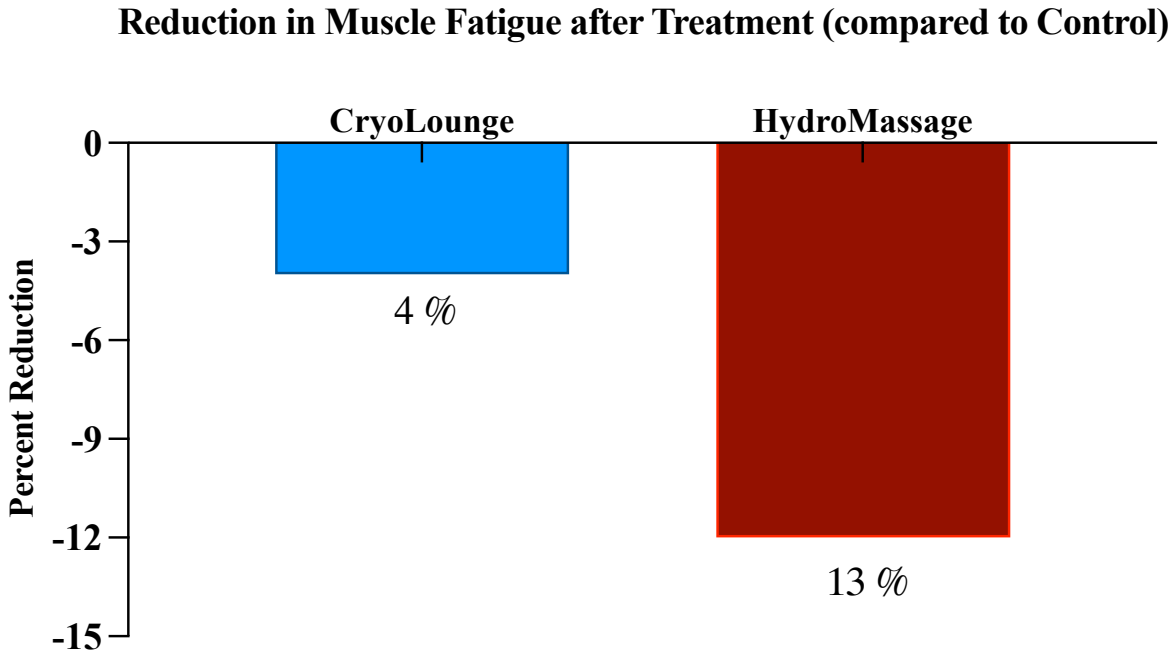
Results

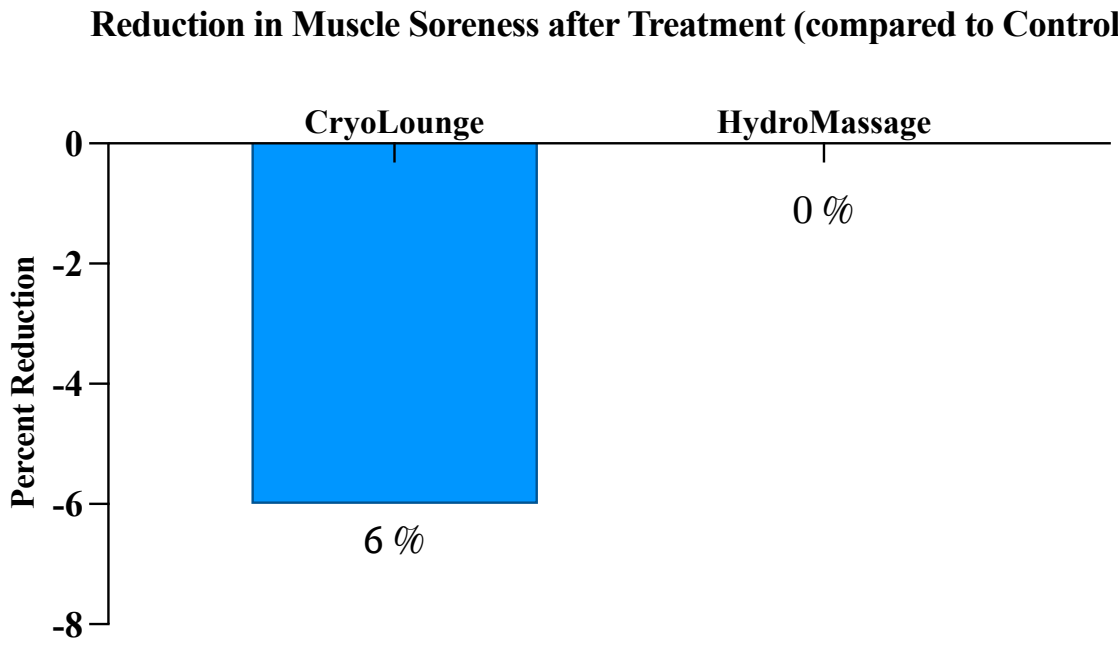
NOTE: Given the small sample size of this preliminary study, and the variability associated with subjective ratings, statistical outcomes must not be misinterpreted. Even with the repeated measures, cross-over design in the current study, a significantly larger sample size covering a much broader range of ages, training experience, etc. would provide greater insight as to the repeatability of the findings. As such, both statistical outcomes and percent change scores have been reported in this section.

Self-Ratings of Perceived Muscle Fatigue & Muscle Soreness

Statistical trends were evident across the three recovery modalities after treatment upon completing the workout ($p = 0.1$), however more importantly participants perceived their muscle fatigue to be reduced after when receiving either the CryoLounge+ (4%) and HydroMassage (13%) treatments when compared to No Treatment (Control) (Figure 2). Moreover, receiving CryoLounge+ treatment after the workout provided ~ 6% reduction in soreness when compared to both HydroMassage and No Treatment (Control) (Figure 2). These trends were similar when changes between the start of the workout to the end of treatment were assessed (Table 1). Similarly, although not statistically different, both CryoLounge+ and HydroMassage treatments reduced muscle soreness by 32 and 48%, respectively, when compared to No Treatment (Control) (Figure 3).

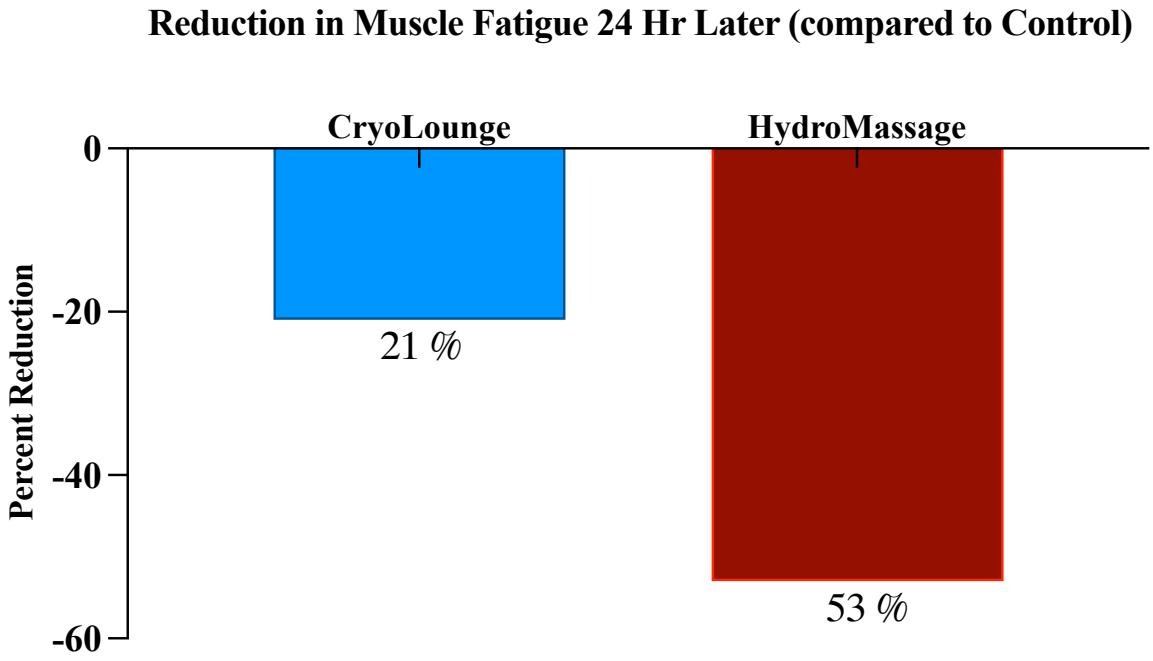
Figure 2: The change in perceived muscle fatigue and muscle soreness from immediately post workout to after completing the recovery treatments ~ 15 minutes later.

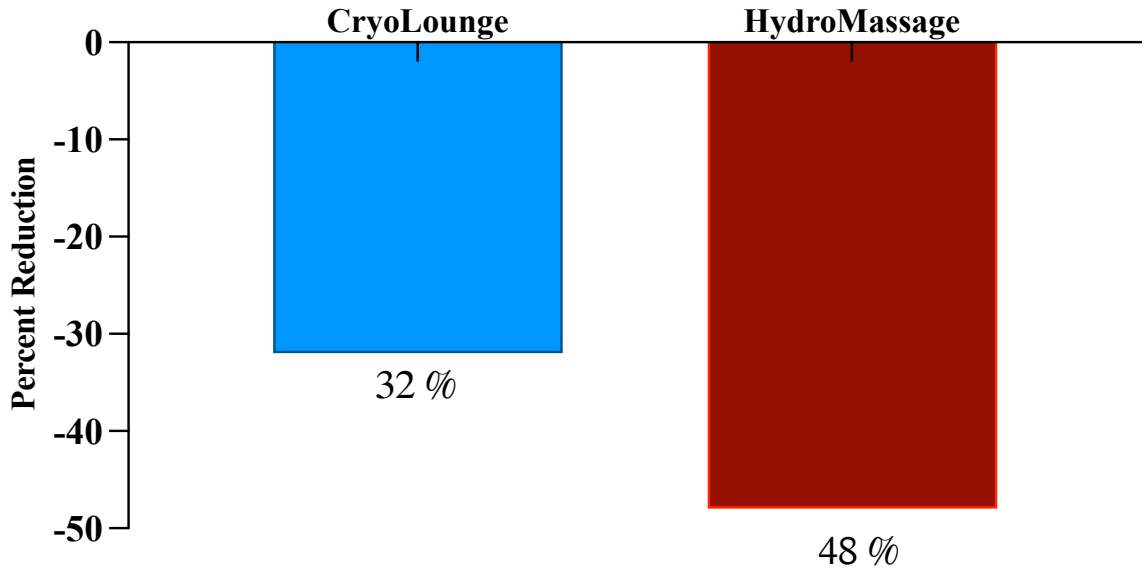




Integrative Human Performance Laboratory
6161 E Mayo Blvd, Phoenix, AZ 85054
Jason.siegler@asu.edu | chs.asu.edu

Figure 3: The change in perceived muscle fatigue and muscle soreness 24 hours after the workout.





Integrative Human Performance Laboratory
6161 E Mayo Blvd, Phoenix, AZ 85054
Jason.siegler@asu.edu | chs.asu.edu

Table 1: Presented in the top half of the table are percent change scores for perceived muscle fatigue from immediately post-workout to how they felt after receiving the recovery treatment. In the bottom half of the table are percent change scores from pre-workout day 1 to 24 hours after completing the workout.

Post-workout to after receiving treatment	HydroMassage®	CryoLounge+	Control
Fatigue (% Change)	31% less fatigued than when the workout finished	22% less fatigued than when the workout finished	18% less fatigued than when the workout finished

Pre-workout to 24 hours after workout	HydroMassage®	CryoLounge+	Control
Fatigue (% Change)	No change from pre-workout day 1	32% more fatigued when compared to pre-workout day 1	53% more fatigued when compared to pre-workout day 1
Soreness (% Change)	25% more sore than pre-workout day 1	42% more sore than pre-workout day 1	74% more sore than pre-workout day 1

Strength and Explosive Power Measures

The isometric mid-thigh pull (IMTP; strength) declined equally from the start to the end of the workout prior to recovery treatments across all experimental trials (IMTP: mean decline of 250 ± 119 Newtons (N), $p < 0.05$), suggesting the participants were significantly fatigued from the lower-body exercises. The workout did not appear to cause any residual fatigue 24 hours later as IMTP ($p > 0.56$) and CMJ ($p > 0.37$) were not different from pre-workout values. Thus, although the participants perceived less soreness and fatigue after the CryoLounge+ and HydroMassage treatments the day before, they were still functionally compromised across all three experimental sessions.

Volume-Load

With these preliminary data, there does not appear to be any dose-response relationship (e.g., the amount of weight an individual lifted (volume-load, 4 sets x 8 reps x weight) and their average fatigue and soreness levels).

Summary

When comparing the HydroMassage®, CryoLounge+, and the No Treatment Control, both the HydroMassage® and CryoLounge+ appear to be more favorable recovery treatments for individuals' perception of muscle fatigue and soreness. This preliminary data suggests these modalities have the potential to benefit individuals working out on successive days. More research is warranted to explore these recovery modalities under different exercise conditions, as well as different end-users (e.g., elderly).

References

1. Aidar, F. J., Santos, W. Y. H. d., Machado, S. d. C., Nunes-Silva, A., Vieira, É. L. M., Valenzuela Pérez, D. I., Aedo-Muñoz, E., Brito, C. J., & Nikolaidis, P. T. (2025). Enhancing Post-Training Muscle Recovery and Strength in Paralympic Powerlifting Athletes with Cold-Water Immersion, a Cross-Sectional Study. *International Journal of Environmental Research and Public Health*, *22*(1), 122. https://doi.org/10.3390/ijerph22010122

2. Cheatham, S. W., Kolber, M. J., Cain, M., & Lee, M. (2015). The Effects Of Self-Myofascial Release Using A Foam Roll Or Roller Massager on Joint Range Of Motion, Muscle Recovery, And Performance: A Systematic Review. *International journal of sports physical therapy*, *10*(6), 827–838.

3. Jay, K., Sundstrup, E., Sondergaard, S. D., Behm, D., Brandt, M., Saervoll, C. A., Jakobsen, M. D., & Andersen, L. L. (2014). Specific And Cross Over Effects Of Massage

For Muscle Soreness: Randomized Controlled Trial. *International Journal of Sports Physical Therapy*, *9*(1), 82–91.

4. Machado, A. F., Ferreira, P. H., Micheletti, J. K., de Almeida, A. C., Lemes, Í. R., Vanderlei, F. M., Netto Junior, J., & Pastre, C. M. (2016). Can Water Temperature and Immersion Time Influence the Effect of Cold Water Immersion on Muscle Soreness? A Systematic Review and Meta-Analysis. *Sports Medicine (Auckland)*, *46*(4), 503–514. https://doi.org/10.1007/s40279-015-0431-7

5. Poppendieck, W., Wegmann, M., Ferrauti, A., Kellmann, M., Pfeiffer, M., & Meyer, T. (2016). Massage and Performance Recovery: A Meta-Analytical Review. *Sports Medicine (Auckland)*, *46*(2), 183–204. https://doi.org/10.1007/s40279-015-0420-x

6. Tseng, Ching-Yu1; Lee, Jo-Ping2; Tsai, Yung-Shen2; Lee, Shin-Da3; Kao, Chung-Lan4; Liu, Te-Chih2; Lai, Cheng- Hsiu2; Harris, M. Brennan5; Kuo, Chia-Hua1,3. Topical Cooling (Icing) Delays Recovery From Eccentric Exercise–Induced Muscle Damage. (2013). Journal of Strength and Conditioning Research 27(5):p 1354-1361, May 2013. *DOI:* 10.1519/JSC.0b013e318267a22c