



Letter to the Editor

Letter to the Editor re ‘Volume of water added to crushed ice affects the efficacy of cryotherapy: a randomised, single-blind, crossover trial’

In the article *Volume of water added to crushed ice affects the efficacy of cryotherapy: a randomised, single-blind, crossover trial* the authors discuss the importance of adding water to crushed ice bags in order to optimise the thermodynamic properties of water and deliver a clinically relevant reduction in skin temperature to the treated area [1]. The authors concluded that adding 500 ml of water to a bag of crushed ice, compared with 50 ml of added water or no added water, decreased its effectiveness for reducing skin surface temperature. The authors assumed that skin surface temperature is an adequate predictor of intramuscular temperature. However, skin temperature is a poor predictor of intramuscular temperature [2,3]. Reductions in skin and intramuscular temperature are not strongly correlated [4] because the patterns of tissue cooling differ [5]. The magnitude of change in muscle temperature is inversely correlated with subcutaneous adiposity [6,7]. The authors did not measure skinfold thickness, nor did they mention this as a limitation of their study. If the participants in the treatment group receiving 500 ml of water + crushed ice had significantly greater skinfolds than those participants in the other two treatment groups, it is expected that their results were a cause of the participant’s skinfold thickness and not of the volume of water added to the ice bag.

Subcutaneous adiposity has a low thermal conductivity, creating an insulating effect [2]. Thus, the magnitude of reduction in intramuscular temperature will be less as skinfold thickness increases [8]. To reduce muscle temperature by a standard amount in a heterogeneous group, Otte *et al.* [7] demonstrated that an individual with a 31–40 mm skinfold thickness would have to apply ice for almost six times longer than an individual with a 0–10 mm skin-fold. Similarly, an individual with a 0–10 mm skinfold thickness will achieve the same degree of intramuscular cooling as an individual with a 31–40 mm skinfold thickness, but the

cooling duration will take 10 vs 60 minutes, respectively [9].

Thus, it is imperative that athletes and clinicians take subcutaneous tissue thickness into account when aiming to achieve a specific degree of intramuscular cooling [9]. Especially since adverse effects can occur from exposure to low temperatures for excessive durations or from low temperatures induced very quickly especially those that rapidly reduce skin temperature before muscle and core temperatures can catch up [10]. Clinicians and athletes alike should be mindful when administering ice bags with a ‘one-size-fits-all’ approach. Instead, individualising cryotherapeutic treatments based on anthropometrics will result in more favourable outcomes and save the patient, athlete, and clinician time and from potential ice-related injury.

Ethical approval: None required.

Conflict of interest: None declared.

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DOI of original article: <https://doi.org/10.1016/j.physio.2019.12.005>.

<https://doi.org/10.1016/j.physio.2020.02.007>

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