The Influence of Hydration on Strength

Summary of Findings

• Scientific Definition: The term strength is defined as the maximal force that a muscle or muscle group can generate at a specified velocity.¹

• Multiple reviews of the literature found that performance decrements were evident in relation to decreased strength with increased state of dehydration. These results, however, were variable as to magnitude of changes in strength with increasing state of dehydration.²⁻⁴

• It is difficult to interpret the results of the effects of hydration on strength due to both exacerbating (caloric restriction, increased muscle temperature, and fatigue) and masking (endurance training, test type, and menstrual status) factors within the methodological protocols which make it challenging to isolate the effects of dehydration on strength alone.⁵

• Of the six studies⁶⁻¹¹ to accurately assess the effects of dehydration on muscular strength, it is suggested that dehydration at a level of 3-4% body mass loss reduces muscle strength by an estimate of 2%.⁵

• Body mass losses of 3-4% can occur in exercise lasting 60-90 minutes, especially if an athlete begins practice dehydrated or there are additional external factors affecting sweat rate (environmental temperature, protective equipment/clothing, etc.).

These two graphs show the force production during 15 repeated brief maximal voluntary isometric contractions of the knee extensors of the non-dominant leg in both euhydrated and dehydrated subjects. The MVICs were performed prior to an exercise heat stress walk (PRE), immediately following the walk (POST-PM) and the following morning (POST-AM). Results show that there is a significant decrease in strength following the exercise heat stress walk and a near significant decrease in strength the following morning, which isolates the effect of dehydration on strength.¹²

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**Practical Applications**

- Prior to competition, practice, or conditioning sessions, ensure proper hydration to maximize strength during activity.
- Proper hydration during activity will assist in preventing any additive effects of dehydration on strength losses.
- Athletes participating in sports such as football, ice hockey, wrestling, and rugby should maintain adequate hydration to attenuate strength losses during activity.

**Looking Ahead**

- Further research investigating the effects of dehydration on strength in isolation from exercise or caloric restriction is needed to gain a better understanding of the magnitude on how dehydration affects strength during physical activity.
- Further investigations to determine if greater strength gains in athletes are obtained during strength and conditioning sessions if they are properly hydrated versus if they are dehydrated.

**References**