The Influence of Hydration on
Heart Rate

Summary of Findings

- **Scientific Definitions:** Hypohydration is the steady-state condition of decreased total body water. Dehydration is the process of losing body water (e.g., during exercise).
- Body mass losses as small as 2% have been shown to result in an increase in cardiovascular strain and subsequently decrease performance during exercise.\(^1\)\(^-\)\(^6\) Exercise in the heat further exacerbates cardiovascular strain, thus causing further decrements in performance.\(^7\)
- Results have shown that for every 1% decrease in body mass during exercise in the heat there is an increase in heart rate of 3.29 beats/min. This equates to an increase in heart rate of 10 beats/min if an athlete is 3% dehydrated.\(^8\)
- Exercise at a fixed and variable intensity has shown an increase in heart rate of 3.55 and 1.39 beats/min respectively during exercise in the heat.\(^8\)
- In order to maximize performance athletes should: 1) ensure proper hydration before exercise, 2) have knowledge of individual fluid needs (influenced by intensity of exercise, environmental conditions, body size, etc.) since each athlete’s fluid needs are different from one another and 3) Drink according to thirst sensation to minimize body mass losses of >2% since thirst is a good indicator of hydration status.\(^10\)

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<th>Change in HR per every additional 1% Change in BML (bpm/ΔBML)</th>
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Practical Applications

- Athletes should maintain an appropriate level of hydration prior to the start of an endurance event and aim to minimize fluid losses during the event to attenuate any performance decrements.
- Ensuring proper hydration during exercise in the heat is of utmost importance as the added heat stress amplifies the cardiovascular strain and resulting performance decrements found with dehydration.
- Although there is a small difference in heart rate for every 1% decrease in body mass loss during variable (real-world competition situations) intensity exercise, overall performance in these situations is adversely affected. Someone who is exercising at a certain intensity will be exercising with a higher heart rate if they are dehydrated.
- During competition, an athlete who is hydrated is able to compete at a higher intensity with a lower heart rate, which improves overall performance.
- In competing in sports, which expose athletes to heat stress, it is important that athletes undergo a period of heat acclimatization in addition to maintaining an appropriate level of hydration. Heat acclimatization is a series of cardiovascular and other physiological adaptations that improves heat tolerance and improves the ability of athletes performing in the heat.

Looking Ahead

- Further research is needed examining the effects of dehydration on heart rate during real-world situations. Conclusions that have been made looking at the effects of dehydration on heart rate lack ecological and external validity as these studies occur in the laboratory setting under fixed exercise intensity, which is unrealistic when applying to competition.
- A synthesis of heart rate changes due to dehydration under varying environmental conditions is needed in order to identify the added effect of temperature on changes in heart rate with increasing levels of dehydration.

References