SESSION 5

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Fluid intake between and during exercise bouts: a consideration for perception of sweat loss

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Much effort has been made to determine the optimal approach for athletes to rehydrate during and between training bouts and competition. Previous position stands by influential organizations in the sports medicine field included more blanket style recommendations. However, the key tenet in developing and implementing more currently promoted strategies is to base fluid consumption on volume of sweat loss. This more individualized approach is meant to deter extreme hypo- or hyperhydration which can be due to the large variability in both sweat losses and thirst sensation between athletes. Our laboratory has recently conducted multiple investigations concerning during and between training bout fluid intake and perception of sweat losses for both endurance and intermittent sprint sport athletes with several interesting trends emerging.

The first is that the message of individualized sweat loss strategies based on change in body mass before and after training is not recognized or incorporated by the majority of recreational or lower level athletes, and that the majority of athletes simply drink to thirst or based on an abstract version of what they perceive to be adequate.

Our second discovery was that athletes do not accurately estimate their sweat losses. In separate cool and hot environments, runners were found to repeatedly underestimate their sweat losses by ~50% when filling race aid station style paper cups with water to represent their perceived sweat losses. A similar trend was observed in collegiate basketball players during prolonged (150 min) in-season practices when players were asked to fill their practice and game sport bottles with water to estimate their sweat losses. Underestimation does not appear to be biased between genders.

The third trend that developed in our investigations was that athletes who reported weighing themselves before and after training sessions were surprisingly no better estimators than counterparts who did not. Athletes often reported not recognizing that change in body mass is due primarily to water loss or failed to consider variables that distort sweat loss calculation including; weighing in sweat saturated clothing, not considering fluid intake during training, and lack of recognition of sweat evaporation.

Increased efforts through popular media need to be used as avenues to further promote the proper procedures of developing individualized hydration strategies. Recommendations to keep a personalized sweat loss journal would also allow for increased accuracy in determining during and between bout fluid needs while limiting the need for frequent change in body mass assessments.

Key words: hydration, urine specific gravity, sweat perception, recreational athletes.

Hydration and human physiological function during rest and exercise

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Body water deficit or dehydration can pose a major challenge to the regulation of human physiological function and exercise capacity, particularly during prolonged and intense exercise in hot environments. The impact of dehydration upon physiological function is exemplified during whole-body exercise by significant overtime reductions in cardiac output and blood flow to locomotor muscle, skin and brain in conjunction with parallel internal body hyperthermia and, in some conditions, compromised muscle metabolism and aerobic capacity. Cardiovascular strain is closely associated with concurrent dehydration-mediated reductions in blood volume and hyperthermia and can be fully or partially restored by (1) ingesting fluids during exercise, (2) exercising in cold environments or in the supine position, (3) working at intensities that require a small fraction of human cardiovascular capacity and (4) when physiological function is assessed under resting and small muscle mass exercise conditions.

A salient feature of dehydration-induced cardiovascular strain is the decline in stroke volume, which is apparent even under resting and small muscle mass exercise conditions. However, the impact of dehydration upon physiological function depends on the magnitude of the metabolic and cardiovascular demand. For instance, cardiac output, limb blood flow and muscle metabolism are stable or increase during small muscle mass exercise or resting conditions, but are significantly impaired during whole-body moderate to intense exercise. In either exercise modality, however, a fall in left ventricular filling and ejection fraction, rather than impaired left ventricular function, appears to explain the stroke volume decline. During prolonged and maximal exercise, dehydration is also associated with an accelerated drop in perfusion and oxygen supply to the human brain. Yet, the consequences of diminished oxygen supply on aerobic metabolism are greater in the exercising muscles than the human brain because of the much smaller functional oxygen extraction reserve across any exercise intensity in contracting muscles compared to the brain.

This presentation will discuss recent advances in our knowledge and understanding of the physiological consequences of dehydration and fluid replacement on human physiological function at rest and during exercise. Emphasis will be placed on the evidence that dehydration indeed influences physiological function and the potential underlying mechanisms.

Key words: physiological strain, fatigue, hyperthermia, dehydration, blood flow.