Grant Information Summary:

Influence of Creatine Use on Exercise Heat Tolerance While Dehydrated

Practical Significance:

Creatine supplementation does not alter exercise heat tolerance while dehydrated. The finding contradicts anecdotal accounts that implicate creatine use for physiological problems associated with exercise in the heat.

Background

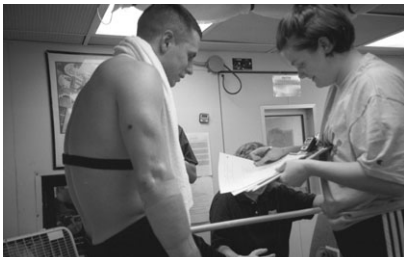
The purpose of this study was to assess if creatine use among athletes alters physiological function, the risk of exertional heat illness, and/or performance during intense exercise in the heat while dehydrated. Research on how creatine influences the thermoregulatory responses to exercise in the heat is preliminary. Also, research regarding the combination of creatine use, intense exercise, high ambient temperature, and severe dehydration is nonexistent. These four variables commonly are combined during many outdoor sporting events. Preliminary evidence has shown via descriptive data that the risk of exertional heat illnesses is not increased with creatine use, but these studies have not closely examined physiological perturbations, have not elicited significant dehydration, and/or have typically not provided an extreme heat stress. The ACSM specifically stated in a recent document (March, 2000) that high-dose creatine supplementation "should be avoided during period of increased thermal stress", yet no scientific evidence was presented to support the recommendation, and in reality, no studies to date have been published to support this recommendation.

Objective

Assess if creatine supplementation altered exercise heat tolerance while dehydrated. This is a critical question given the recent anecdotal accounts implying increased incidences of exertional heat illness and compromised hydration status when supplementing with creatine.

Design and Setting

Subjects were supplemented with 21.6 g.day-1 of creatine monohydrate (CM) or placebo (P) for 10 days (double-blind, randomized, cross-over design with washout between trials of 48 ± 10 days). On day 7, subjects performed 2 hours of sub-maximal exercise; alternating 30 min of walking (6.6 ± .32 km.h-1, 37.0 ± 5.8% VO2max) with 30 min of cycling (at a similar relative intensity) resulting in a ~2% decrease in body weight. Following a 1-hour snack/break period, an 80 min heat tolerance test (HTT) was performed which included 12 repetitions of an alternating 3 min walk (6.6 ± .32 km.h-1, 37 ± 5.8 % VO2max) and 1 min run (19 ± .64 km.h-1, 114.9 ± 5.3 % VO2max). After every 3 repetitions four min of walking followed by four min of standing occurred. Exercise and snack/break occurred in the heat (33 ^{O}C, 41% humidity). After the HTT subjects stood for 1 hr in room temperature, HTT measures were taken immediately before, every 20 min during, and every 20 min for 1 hour following.



Subjects

Twelve males (age = 22 ± 1 y, height = 71 ± 1 cm, mass = 78.8 ± 1.2 kg, body fat = 9.1 ± .7 %, VO2max = 50.9 ± 1 ml.kg.min-1) volunteered for participation.

Measurements

Morning body weight, rectal temperatures, skin temperature, sweat rate, % dehydration, thermal sensation, thirst, heart rate, BP, RER, VO2, VCO2, VE, plasma osmolality, plasma lactate, plasma Na, plasma K, and % D plasma volume

Results

A significant ($p < .05$) time x trial interaction indicated increased morning body weights through day 7 for CM as compared to P. Rectal temperature (CM = 39.37 ± .36 ^{O}C, P = 39.29 ± .36 ^{O}C post-HTT), skin temperature, sweat rate, % dehydration (CM = -4.4 ± .6 %, P = -4.1 ± .5 % 60 min post-HTT), thermal sensation, thirst, heart rate, BP, RER, VO_2, VCO_2, VE, plasma osmolality, plasma lactate, plasma Na, plasma K, and % D plasma volume revealed no differences ($p > .05$) between CM and P immediately before, during and for 60 min following the HTT.

Conclusions

Creatine supplementation did not alter exercise heat tolerance while dehydrated.

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Supplement to the *Journal of Athletic Training*. April-June 2003, 38 (2); S32.

National Athletic Trainers' Association Position Statement: Exertional Heat Illnesses. *Journal of Athletic Training* 2002; 37 (3): 329-343.

Inter-Association Task Force on Exertional Heat Illnesses Consensus Statement. *NATA News*; June 2003: 24-29

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