Creatine Monohydrate

Effects of creatine on mental fatigue and cerebral hemoglobin oxygenation

Airi Watanabe[a], Nobumasa Kato[a] and Tadafumi Kato[a, b]

[a] Department of Neuropsychiatry, Faculty of Medicine, University of Tokyo, 7-3-1 Hongo, Bunkyo, Tokyo 113-8655, Japan
[b] Laboratory for Molecular Dynamics of Mental Disorders, Brain Science Institute, RIKEN, 2-1 Hirosawa, Wako-shi, Saitama 351-0198, Japan

Neuroscience Research, Volume 42, Issue 4, April 2002, Pages 279-285

Abstract

While the role of creatine in preventing muscle (peripheral) fatigue for high performance athletes is well understood, its biochemical role in prevention of mental (central) fatigue is not. Creatine is abundant in muscles and the brain and after phosphorylation used as an energy source for adenosine triphosphate synthesis. Using double-blind placebo-controlled paradigm, we demonstrated that dietary supplement of creatine (8 g/day for 5 days) reduces mental fatigue when subjects repeatedly perform a simple mathematical calculation. After taking the creatine supplement, task-evoked increase of cerebral oxygenated hemoglobin in the brains of subjects measured by near infrared spectroscopy was significantly reduced, which is compatible with increased oxygen utilization in the brain.

Oral creatine supplementation enhances upper extremity work capacity in persons with cervical-level spinal cord injury

Patrick L. Jacobs PhD, Edward T. Mahoney MA, Kelly A. Cohn RN, MS, Laurey F. Sheradsky PTA and Barth A. Green MD

From the Department of Neurological Surgery, University of Miami School of Medicine, Miami, FL.

Archives of Physical Medicine and Rehabilitation, Volume 83, Issue 1, January 2002, Pages 19-23

Abstract

Jacobs PL, Mahoney ET, Cohn KA, Sheradsky LF, Green BA. Oral **creatine** supplementation enhances upper extremity work capacity in persons with cervical-level spinal cord injury. Arch Phys Med Rehabil 2002;83:19-23. **Objective:** To examine the effects of short-term **creatine monohydrate** supplementation on the upper extremity work capacity of persons with cervical-level spinal cord injury (SCI). **Design:** Randomized, double-blind, placebo-controlled, crossover design study. Consists of 2 treatment phases lasting for 7 days, separated by a 21-day washout period. **Setting:** University research laboratory trial. **Participants:** Sixteen men with complete cervical-level SCI (C5-7). **Intervention:** Subjects were randomly assigned to 1 of 2 groups and received either 20g/d of **creatine monohydrate** supplement powder or placebo maltodextrin powder for the first treatment phase; the treatment was reversed in the second phase. Incremental peak arm ergometry tests, using 2-minute work stages and 1-minute recovery periods, were performed immediately before and after each treatment phase (total of 4 assessments). The initial stage was performed unloaded, with power output progressively increased 10 watts/stage until subjects had achieved volitional exhaustion. **Main Outcome Measures:** Peak power output, time to fatigue, heart rate, and metabolic measurements, including oxygen uptake ([Vdot]O_2), minute ventilation, tidal volume (VT), and respiration frequency. **Results:** Significantly greater values of VO_2, VCO_2, and V_T at peak effort after **creatine** supplementation (*P* [lt] .001). **Conclusions:** **Creatine** supplementation enhances the exercise capacity in persons with complete cervical-level SCI and may promote greater exercise training benefits. *[copy] 2002 by the American Congress of Rehabilitation Medicine and the American Academy of Physical Medicine and Rehabilitation*

Comparison of creatine ingestion and resistance training on energy expenditure and limb blood flow*

Paul J. Arciero, Norman S. Hannibal, III , Bradley C. Nindl, Christopher L. Gentile, Jason Hamed and Matthew D. Vukovich

From the Exercise Science Department, Skidmore College, Saratoga Springs, NY; Military Performance Division, United States Army Research Institute of Environmental Medicine, Natick, MA; and the Department of Health, Physical Education, and Recreation, South Dakota State University, Brookings, SD.

Metabolism, Volume 50, Issue 12, December 2001, Pages 1429-1434

Abstract

This study determined the effects of 28 days of oral creatine ingestion (days 1 to 5 = 20g/d; [5 g 4 times daily]: days 6 to 28 = 10 g/d; [5 g twice daily]) alone and with resistance training (5 hours/week) on resting metabolic rate (RMR), body composition, muscular strength (1RM), and limb blood flow (LBF). Using a double-blind, placebo-controlled design, 30 healthy male volunteers (21 [plusmn] 3 years; 18 to 30 years) were randomly assigned to 1 of 3 groups; pure creatine monohydrate alone (Cr; N = 10), creatine plus resistance training (Cr-RT; N = 10), or placebo plus resistance training (P-RT; N = 10). Body composition (DEXA, Lunar DPX-IQ), body mass, bench, and leg press 1RM (isotonic), RMR (indirect calorimetry; ventilated hood), and forearm and calf LBF (venous occlusive plethysmography) were obtained on all 30 subjects on 3 occasions beginning at approximately 6:00 AM following an overnight fast and 24 hours removed from the last training session; baseline (day 0), and 7 days and 29 days following the interventions. No differences existed among groups at baseline for any of the variables measured. Following the 28-day interventions, body mass (Cr, 73.9 [plusmn] 11.5 *v* 75.6 [plusmn] 12.5 kg; Cr-RT, 78.8 [plusmn] 6.7 *v* 80.8 [plusmn] 6.8 kg; *P* [lt] .01) and total body water (Cr, 40.4 [plusmn] 6.8 *v* 42.6 [plusmn] 7.2 L, 5.5%; Cr-RT, 40.6 [plusmn] 2.4 *v* 42.3 [plusmn] 2.2 L, 4.3%; *P* [lt] .01) increased significantly in Cr and Cr-RT, but remained unchanged in P-RT, whereas, fat-free mass (FFM) increased significantly in Cr-RT (63 [plusmn] 2.8 *v* 64.7 [plusmn] 3.6 kg; *P* [lt] .01) and showed a tendency to increase in Cr (58.1 [plusmn] 8.1 *v* 59 [plusmn] 8.8 kg; *P* = .07). Following the 28-day period, all groups significantly increased (*P* [lt] .01) bench (Cr, 77.3 [plusmn] 4 *v* 83.2 [plusmn] 3.6 kg; Cr-RT, 76.8 [plusmn] 4.5 *v* 90.5 [plusmn] 4.5 kg; P-RT, 76.0 [plusmn] 3.4 *v* 85.5 [plusmn] 3.2 kg), and leg press (Cr, 205.5 [plusmn] 14.5 *v* 238.6 [plusmn] 13.2 kg; Cr-RT, 167.7 [plusmn] 13.2 *v* 238.6 [plusmn] 17.3 kg; P-RT, 200.5 [plusmn] 9.5 *v* 255 [plusmn] 13.2 kg) 1RM muscular strength. However, Cr-RT improved significantly more (*P* [lt] .05) on the leg press 1RM than Cr and P-RT and the bench press 1RM than Cr (*P* [lt] .01). Calf (30%) and forearm (38%) LBF increased significantly (*P* [lt] .05) in the Cr-RT, but remained unchanged in the Cr and P-RT groups following the supplementation period. RMR expressed on an absolute basis was increased in the Cr (1,860.1 [plusmn] 164.9 *v* 1,907 [plusmn] 173.4 kcal/d, 2.5%; *P* [lt] .05) and Cr-RT (1,971.4 [plusmn] 171.8 *v* 2,085.7 [plusmn] 183.6 kcal/d, 5%; *P* [lt] .05), but remained unchanged from baseline in P-RT. Total cholesterol decreased significantly in Cr-RT ([minus]9.9%; 172 [plusmn] 27 *v* 155 [plusmn] 26 mg/dL; *P* [lt] .01) compared with Cr (174 [plusmn] 46 *v* 178 [plusmn] 43 mg/dL) and P-RT (162 [plusmn] 32 *v* 161 [plusmn] 36 mg/dL) following the 28-day intervention. These findings suggest that the addition of creatine supplementation to resistance training significantly increases total and fat-free body mass, muscular strength, peripheral blood flow, and resting energy expenditure and improves blood cholesterol.

*Supported by a grant from Experimental and Applied Sciences, Golden, CO, to P.J.A.

The effect of creatine monohydrate loading on maximal intermittent exercise and sport-specific strength in well trained power-lifters

F. Rossouw MA(HMS)[a], P. E. Krüger PhD[b] and J. Rossouw DSc[c]

[a] Department of Sport Sciences, Technikon Pretoria, University of Pretoria, South Africa
[b] Department of Biokinetics, Sport and Leisure Sciences, University of Pretoria, South Africa
[c] Department of Sport Sciences, Technikon Pretoria, University of Pretoria, South Africa

Nutrition Research, Volume 20, Issue 4, April 2000, Pages 505-514

Abstract

The effect of **creatine** loading on the performance of sedentary and recreationally active individuals has been well documented, but research on well trained individuals is still lacking. In this double-blind study the effect of **creatine monohydrate** loading (9g/day) on maximal intermittent isokinetic exercise and sport-specific strength in 13 well trained power-lifters was ascertained. Both before and after supplementation the **creatine** (n=8) and placebo (n=5) groups performed three sets of maximal unilateral knee extensions on an isokinetic dynamometer interspaced with 60s rest periods. This was followed up the next day by a maximal deadlift strength feat performed in a gymnasium. Values for peak torque, average power, total work and work output during the first five sample repetitions in the **creatine** group increased significantly and in a relatively constant fashion in all subjects (correlation coefficients ranged between 0.84 and 0.92) after five supplementation days. There was also a significant (p = 0.010) increase in the deadlift lifting volume after six days of **creatine** supplementation. Findings from this study suggest that nine grams of **creatine monohydrate** per day for five and six days respectively, improves maximal intermittent isokinetic power output and sport-specific strength in well trained power-lifters.

Effects of 8 weeks of creatine supplementation on exercise performance and fat-free weight in football players during training

Jeffrey Stout PhD, Joan Eckerson PhD, David Noonan MS, Geri Moore MA and Diane Cullen PhD.

[a] Exercise Science Dept., Creighton University, Omaha, NE, USA
[b] the Osteoporosis Research Center, Creighton University, Omaha, NE, USA
[c] the University Of Nebraska-Omaha, Omaha, NE., USA

Nutrition Research, Volume 19, Issue 2, February 1999, Pages 217-225

Abstract

The purpose of this study was to examine the changes in bench press strength (BPS), vertical jump (VJ), 100 yd dash time, and fat-free weight (FFW) in football players following 8 weeks of supplementation with a carbohydrate placebo (CHO), **creatine monohydrate** (CM), or CM plus CHO. Using a double blind random design, 24 college football players were placed into one of three treatment conditions: CHO) 35g CHO; CM) 5.25g CM plus 1g CHO; or CM+CHO) 5.25g CM and 33g CHO. All treatments were similar in taste and were ingested four times per day for five consecutive days and twice daily thereafter. All subjects weight trained for 1 h and participated in 30 min of speed drills four times per week for 8 weeks. The CM+CHO group experienced significant ($p<0.05$) improvement in BPS, VJ, 100 yd dash time and FFW when compared to the CHO group. However, delta scores for the CM group were not significantly different from the CHO group. These data suggest that CHO taken with CM during training may be superior to training alone for enhancing exercise performance and FFW.

Author Keywords: ERGOGENIC AIDS; SPEED; BODY COMPOSITION; MUSCLE HYPERTROPHY

Creatine Supplementation Enhances Muscular Performance During High-Intensity Resistance Exercise

JEFF S. VOLEK MS, RD, WILLIAM J. KRAEMER PhD, JILL A. BUSH MS, MARK BOETES, THOMAS INCLEDON, KRISTINE L. CLARK PhD, RD and JAMES M. LYNCH MD

Journal of the American Dietetic Association, Volume 97, Issue 7, July 1997, Pages 765-770

Abstract

Objective This study was undertaken to investigate the influence of oral supplementation with **creatine monohydrate** on muscular performance during repeated sets of high-intensity resistance exercise.

Results Lifting performance was not altered for either exercise protocol after ingestion of the placebos. **Creatine** supplementation resulted in a significant improvement in peak power output during all 5 sets of jump squats and a significant improvement in repetitions during all 5 sets of bench presses. After **creatine** supplementation, postexercise lactate concentrations were significantly higher after the bench press but not the jump squat. A significant increase in body mass of 1.4 kg (range= 0.0 to 2.7 kg) was observed after **creatine** ingestion.

Conclusion One week of **creatine** supplementation (25 g/day) enhances muscular performance during repeated sets of bench press and jump squat exercise.