

0853**L-Glutamine Supplementation: Effects on Recovery from Exercise**Tavis Piattoly, Michael A. Welsch. *Louisiana State University, Baton Rouge, LA.*
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Clinical evidence supports the use for exogenous glutamine in the maintenance of muscle mass and immune system function in critically ill patients. Relatively little research has examined the potential benefits of glutamine for athletes engaged in heavy exercise training, despite a possible link between overtraining and glutamine. **PURPOSE:** To examine the influence of Glutamine on time to exhaustion and power before and after a prolonged bout of exercise. **METHODS:** Twelve men (Age: 19 to 30y) involved in cycle training programs were asked to participate in the study. All participants performed a Symptom-Limited Graded Exercise Test (SL-GXT) using the Astrand Cycle protocol. On a subsequent visit participants performed two Wingate tests on a cycle ergometer to assess Peak Power, Mean Power, and Fatigue Index. The tests were separated by an exhaustive bout of exercise at 70% of $\dot{V}O_{2R}$. Twenty-four hours later another Wingate test was performed. Immediately after performing the last Wingate test, subjects were randomized to: 1. Glutamine plus carbohydrate drink (0.3 grams/kg of body weight/ for 6 days) or 2) Placebo (Carbohydrate drink). After 6 days the Wingate and exhaustive bout of exercise were repeated in each individual. **RESULTS:** There were no group differences in $\dot{V}O_{2peak}$ (Glu: 44.53±8.75; Pla: 43.83±5.26 ml/kg/min), PP (Glu: 717.71±118.90; Pla: 593.66±117.08), TR (Glu: 38.50±2.26; Pla: 35.50±5.65) and time to exhaustion (Glu: 46.33±10.80; Pla: 41.90±3.82 ml/kg/min) before supplementation. Both groups showed a significant drop in PP (-27%, p=0.001), and TR (-22%, p=0.001) after the exhaustive exercise bout. Incomplete recovery was noted at 24h PP (-17%, p=0.03 vs. baseline), and TR (-13%, p=0.09 vs baseline). Following supplementation TE improved by 3.16±0.75min in the Glu group compared to no change in the Pla (p=0.001). Lastly, the Glu group had similar PP prior to each exhaustive bout of exercise, the PP in the Pla group was still significantly lower after 6 days. **CONCLUSION:** Participants in the Glu group increased time to exhaustion following 6 days of supplementation, and appeared to recover from exhaustive exercise earlier than the Pla group.

0854**Post-Marathon Recovery Enhanced By A Dietary Supplement**Shawn M. Talbott, FACSM. *University of Utah, Salt Lake City, UT.*
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Dietary supplements are routinely used by athletes in their quest for improved athletic performance. Recently, the concept of enhancing recovery following intense exercise has become more popular within the athletic community. Dietary supplementation with protein bars and carbohydrate beverages has been used effectively to promote immediate post-exercise recovery, but longer-term recovery strategies (days to weeks) have been used less frequently. **PURPOSE:** The current study was conducted to evaluate the effect of a post-exercise recovery supplement containing branched-chain amino acids (BCAAs), glutamine, and beta-sitosterol, on measures of fatigue, mood, cold/flu symptoms, and muscle/joint pain during the critical 2 weeks following a marathon. **METHODS:** Twenty-five subjects (7 women and 18 men) were randomly assigned to receive the supplement (S, n=14) or a matching placebo (P, n=11) in a double-blind fashion. Subjects consumed 8 capsules per day for 14 days immediately following completion of the Park City Marathon (average elevation 6650 ft). The standardized Profile of Mood States (POMS) questionnaire was used to evaluate Tension, Depression, Anger, Vigor, Fatigue, Confusion and Global Mood State during the 2-week period following the marathon. A standard health log was used to assess daily occurrence and severity of cold/flu symptoms, gastrointestinal complaints and degree of muscle/joint pain. Data were analyzed using two-tailed Student's t-tests with significance set at p < 0.05. **RESULTS:** S had significantly lower scores for Tension (-31%, p=0.039), Fatigue (-52%, p=0.009) and Confusion (-24%, p=0.020) and higher scores for Vigor (+38%, p=0.005) and Global Mood (+16%, p=0.015) compared to P. There were no differences between groups on measures of Depression or Anger. On measures of cold/flu symptoms, 20% of subjects in P reported symptoms, while none were reported in S. Reports of muscle/joint pain were reduced by 51% in S compared to P (p=0.007) and subjects in S were able to resume normal training an average of 5 days earlier than subjects in P (p=0.033). **CONCLUSIONS:** Adequate recovery is important for competitive athletes, not only for the obvious benefits of being able to train and compete at a higher level, but also for the less obvious benefits of protecting the athlete from overtraining, illness and injury. Overall, these results strongly suggest that targeted dietary supplementation may be effective in enhancing recovery following intense exercise.

0855**Addition of a Fenugreek Extract to Glucose Feedings Increases Post Exercise Glycogen Resynthesis**Dustin R. Shivka, Brent C. Ruby, FACSM, Steven E. Gaskill, FACSM, Stephanie G. Harger. *The University of Montana, Missoula, MT.*
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The resynthesis of muscle glycogen post exercise is critical to endurance performance during subsequent exercise bouts. Previous research generally supports the concept that supplemental protein and/or select amino acids may accelerate rates of glycogen resynthesis beyond carbohydrate alone. **PURPOSE:** The purpose of this study was to determine the effects of ingesting a commercial supplement containing 4-hydroxyisoleucine (4 OH-Ile), isolated from fenugreek seeds, with a glucose beverage (GLU+4 OH-Ile) on rates of post-exercise muscle glycogen resynthesis in trained

male cyclists. **METHODS:** Following an overnight fast (12 hr), subjects completed a 90-minute glycogen depletion interval ride after which a muscle biopsy was obtained from the vastus lateralis (0hr). During one trial, subjects received a 1.8 g kg BW⁻¹ oral dose of dextrose (GLU) immediately post biopsy and again 2 hours later. During another trial, subjects received the same dose of dextrose with 2.0 mg kg⁻¹ 4-OH-Ile (GLU+4 OH-Ile) at the same feeding schedule. A second muscle biopsy was obtained from the same leg 4 hours after the initial feeding (4hr). Blood samples for insulin and glucose were obtained throughout the recovery period. Trials were completed double blind in a randomized, counterbalanced order. Statistical significance was set at p<0.05. **RESULTS:** Post exercise (0hr) muscle glycogen concentration was similar for both trials. Overall, there was a significant increase in glucose and insulin concentrations from 0hr throughout the majority of the 4-hour recovery period. However, there were no significant differences in glucose or insulin concentration between the two trials at any time point. Although muscle glycogen concentration significantly increased from immediately post exercise (0hr) to 4hr of recovery for both trials, the average rate of muscle glycogen resynthesis was 63% greater during the GLU+4 OH-Ile trial (10.6±3.3 vs. 6.5±2.6 g kg wet wt.⁻¹hr⁻¹ for the GLU+4 OH-Ile and GLU trials, respectively). **CONCLUSION:** These data demonstrate that ingestion of the commercial 4-hydroxyisoleucine supplement along with an oral dose of dextrose stimulates skeletal muscle glucose uptake and muscle glycogen resynthesis by way of an insulin-independent mechanism. Funded by Technical Sourcing International, Inc.

**C-35 – Free Communication / Poster
Respiratory and Acid-Base****0856****Cardiopulmonary Requirements During Eccentric than Concentric Resistance Training When Performed at the Same Intensity**Alberto F. Vallejo, E. Todd Schroeder, Steve A. Hawkins, Fred R. Sattler. *University of Southern California, Los Angeles, CA.*
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It is known that eccentric contractions demonstrate lower electromyographic activation than concentric contractions at the same absolute workload. However, the energy cost of performing eccentric versus concentric contractions during a bout of resistance training (RT) have not been quantified. Lower cardiopulmonary requirements associated with eccentric RT may have implications for rehabilitation in populations with extreme weakness and/or poor muscular endurance. **PURPOSE:** To determine the cardiopulmonary requirements of eccentric versus concentric contractions during a bout of resistance training in young men and women. **METHODS:** Seven (2 men; 5 women) volunteers, 21-30 years of age participated in the study. The subjects performed leg extension and leg flexion exercises on a KinCom dynamometer at 60°s and bi-lateral full squat exercises in a modified smith rack (adapted for eccentric or concentric only exercises). The protocol consisted of 3 sets of 10 repetitions at 65% of the concentric 1-repetition maximum strength for each exercise with 30 second (leg ext/flex) and 2 minute (squats) rest periods between sets. Cardiopulmonary parameters including $\dot{V}O_2$, $\dot{V}CO_2$, and heart rate were measured 5 min. before, during, and 5 min. post exercise using a metabolic cart. **RESULTS:** Eccentric RT resulted in $\dot{V}O_2$, $\dot{V}CO_2$, and heart rate measures that were significantly lower than during concentric RT. The table below shows a portion of the metabolic and cardiopulmonary data collected during the squat exercise. *Significantly different from Concentric RT, P<0.004 **CONCLUSION:** Our data suggests that a bout of eccentric resistance training can be performed with lower cardiopulmonary requirements compared to a bout of concentric resistance training at the same intensity.

	$\dot{V}O_2$ (ml/min)	$\dot{V}O_2$ (ml/kg/min)	$\dot{V}CO_2$ (ml/min)	Heart Rate
Eccentric RT	756±157*	10.0±1.3*	714±161*	98±8*
Concentric RT	1319±305	17.3±2.2	1257±415	128±20

0857**Exercise Recruits Dormant Intrapulmonary Arteriovenous Shunts in Healthy Subjects**Hans C. Haverkamp, Jerome A. Dempsey, FACSM, John S. Hokanson, David F. Pegelow, Jamie Beebe, Marlowe W. Eldridge. *University of Wisconsin-Madison, Madison, WI.* (Sponsor: Jerome Dempsey, FACSM)
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There is morphologic evidence for arteriovenous intrapulmonary shunts that bypass the pulmonary capillaries in healthy humans. We postulated that these vessels are dormant at rest, but are then recruited during exercise as cardiac output and pulmonary vascular pressures rise. **PURPOSE:** To determine whether whole-body endurance exercise results in the recruitment of direct intrapulmonary arteriovenous connections in healthy humans. **METHODS:** 13 healthy males (31 yr; 178 cm; 73 kg) and 10 healthy females (27 yr; 165 cm; 59 kg) with normal lung function and a range of fitness levels (mean $\dot{V}O_{2max}$ = 126% predicted; range = 78-200% predicted) completed a maximal progressive exercise test on a bicycle ergometer. Agitated saline contrast echocardiography (4-chamber apical view) was used to test for the presence of intrapulmonary shunting at rest and during each exercise level. This technique entails infusion of saline microbubbles (diameter = 30-90 microns) into a peripheral vein. The contrast microbubbles are highly echogenic and are readily visualized as they enter the right heart. If there is no intracardiac or intrapulmonary shunting the microbubbles are filtered completely by the pulmonary microcirculation. A delayed appearance (>3