Nutrient timing for strength athletes: Mechanisms & adaptations

Information Session

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What is nutrient timing

Nutritional supplementation strategy to promote the anabolic response

- **Window of opportunity associated with each exercise bout**
  - Nutrient supply critical to net skeletal muscle protein balance and subsequent muscle growth and strength expression?

To maximise recovery, ingest small amounts of PRO and AA **pre**, **during** and **post**-training


- **Lean body mass, 1-RM strength and muscle growth greater ingestion pre and post resistance exercise**

- **Liquid CHO+EAA ingestion during resistance training maximises hypertrophy compared to CHO or EAA**

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Nutrient timing: Phases

1. Pre-workout (PW)
   - 30min prior to training
   - Muscle priming

2. Intra-workout (IW)
   - During the exercise bout
   - Muscle delivery

3. Immediate Post-workout (IP)
   - 0-15min
   - Muscle replenishment

Nutrient timing: Goals

1. ↑ nutrient delivery to muscles
2. ↑ muscle glycogen stores
3. ↑ protein synthesis
4. ↑ muscular recovery
5. ↓ immune system suppression (cortisol)
6. ↓ muscle damage (CK; cortisol; 3-MHIS)
7. ↓ catabolic processes

What about the research:
Nutrient timing research has gained popularity........


What about the research:
Nutrient timing research has gained popularity........


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What about the research:
Nutrient timing research has gained popularity.......


"Timing of the energy intake and the ratio of certain ingested macronutrients are likely attributes which allow for enhanced recovery and tissue repair following high-volume resistance exercise, augmented muscle protein synthesis, and improved mood states when compared with unplanned or traditional strategies of nutrient intake."

What about the research:
Nutrient timing research has gained popularity........


However,

No research has examined complete nutrient timing

Nutrient timing: pre-exercise, during exercise, post-exercise
Purpose of study

This research will examine the science behind nutrient timing;

- **Four (4) combined studies over ~16 weeks**
- **Complete nutrient timing (pre-, during and post-exercise)**
- **Effects on hormonal and muscular responses in strength trained athletes**

Data collection shall include;

- **Dietary recall**
- **Strength testing (1RM)**
- **Body composition**
- **Neuromuscular assessments**
- **Blood sampling**
- **Muscle biopsy (data)**

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Science behind nutrient timing

Acute Study: Cross-over

Study 1  Effects of nutrient timing on acute responses to resistance exercise and recovery in strength trained athletes
Researcher: Tom Mabon

Study 2  Neuromuscular responses following nutrient timing in strength trained athletes
Researcher: Sarah Feebry

Training Study: Placebo-controlled

Study 3  Effect of nutrient timing and resistance training on hormonal and skeletal muscle adaptations in strength athletes
Researcher: Mitchell Pryde

Study 4  Effects of nutrient timing on muscle cell signalling and gene expression following resistance training in strength athletes

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Strength training program

Supervised, split-body part strength training protocol 4 x wk for 10-wks

Design by Jon Davie

- Designed by Jon Davie

✓ progressive resistance training principle, load increased as necessary to maintain appropriate training intensity 5 sets to failure

• Hypertrophy phase [15-12-10-8 reps per set]
• Strength phase [4-6-4-6 reps per set]

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Supplementation protocol

1. Pre-workout (PW)  
   - RE-ACTIVATE  
   - carbohydrate-based formula including EAA, arginine/alpha-ketoglutarate, Beta-alanine, caffeine and B-Group vitamins  

2. Intra-workout (IW)  
   - ELEVATOR  
   - carbohydrate-based formula including 6g of EAA  

3. Immediate Post-workout (IP)  
   - RE-GENERATOR  
   - protein fractions (whey & casein), carbohydrates, EAA, creatine monohydrate and glutamine  

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Study schedule

• **Study schedule**

May 24/05 start 21d supplement washout (no supplements)

June 7/06 Testing session
17/06 Session 1
28/06 Session 2

July 5/07 Muscle biopsy & testing session
12/7 Training study

Aug Training wk 4 - wk 8

Sept 16/09 Session 3
20/09 Muscle biopsy

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INFORMATION SHEET

NUTRIENT TIMING STRATEGIES AND THE STRENGTH ATHLETE: MECHANISMS AND ADAPTATIONS

Thank you for expressing interest in this research. Please read and retain this information sheet. Should you have any questions regarding this study, the Chief Investigators may be contacted at any time.

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Purpose

This study aims to examine the effects of 12-weeks of supervised strength training and the timed supplementation (pre-exercise, during exercise and post-exercise) of protein, amino acids and carbohydrates on hormonal and muscular responses in strength trained athletes.

Participant Requirements

Study Design

Participants will be strength trained athletes randomly assigned to one of two groups: a supplement group (SUPP) or placebo group (PLA), with all subjects following the same supervised, hypertrophy (muscle growth) strength training program, three times per week for 12-weeks. A progressive training principle will be followed, in that the weight is increased as necessary to maintain a training intensity at approximately 75% of each individual’s 1-ROM (i.e., 8-10 repetitions per set), with subjects progressing each set to failure. It is anticipated that each training session will be approximately 1.5 hours in duration. Each participant will be supervised one-on-one during the exercise session by a trained Exercise Science student volunteer.

Maximal strength assessment (one-repetition maximum - 1RM) and muscle biopsy sampling (obtained from the right thigh) shall be performed pre- (wk 0) and post-training (wk 12), while blood sampling and muscular strength assessment is performed at weeks 0, 6 and 12. Blood samples shall be collected pre-exercise, immediately post-exercise, and 30 min post-exercise for analysis of biochemical markers. Muscular strength shall be assessed for selected exercises in the strength training protocol, while peak isokinetic force of the knee extensors and knee flexors of the dominant leg is assessed using a KIN-COM isokinetic dynamometer.

Supplementation Protocol

The supplementation protocol (Step 1.2.3. Musashi, Notting Hill, Australia) is a three-step process including pre-workout, during workout and post-workout supplementation outlined below. The protocol shall be followed as per manufacturer’s instructions:

1. Pre-Workout (PRE-Activate) carbohydrate-based formula including essential amino acids, arginine-alpha-ketoglutarate, Beta-alanine, caffeine and B-Group vitamins.
2. During Workout (Elevate) carbohydrate-based formula including 6g of essential amino acids.
3. Post-Workout (Re-Generate) protein and carbohydrate blend including essential amino acids, creatine monohydrate and glutamine.

INFORMED CONSENT

NUTRIENT TIMING STRATEGIES AND THE STRENGTH ATHLETE: MECHANISMS AND ADAPTATIONS

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I, __________ (Name), hereby consent to participating in the research project titled nutrient timing strategies and the strength athlete: mechanisms and adaptations.

My consent to participate in this research is based on the following terms:

1. The purpose of the research has been explained to me, including the potential risks and discomforts involved.
2. I have read and understood the information sheet provided to me, and have retained a copy of the information sheet provided to me.
3. I have been given the opportunity to ask questions about the research and received satisfactory responses to all questions I have asked.
4. I am content that I understand what I will be required to do as research participant.
5. I understand that any information or personal details gathered in the course of this research about me are confidential and that neither my name nor any other identifying information will be used or published without my written permission.
6. I understand that I can withdraw my consent at any time before, during, or after testing, without any penalty.
Questions & Answers

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BLOOD SAMPLING


NEUROMUSCULAR ASSESSMENT - Isokinetic Knee Extension & Knee Flexion


DEXA ASSESSMENT - Body Composition

MUSCLE CSA: CHO+EAA and resistance exercise