

# Importance of Protein Timing and Distribution in Relation to Training State

## ABSTRACT

The stress placed on the body, purposeful or not, creates muscle protein breakdown. Protein supplementation and exercise together have been found to be most effective at stimulating MPS (Figure 1). Protein timing and distribution is essential when attempting to maximize performance and MPS. Trained individual benefit most from protein taken before and after resistance along with carbohydrates. Untrained populations do not benefit from specific protein timing protocols because of the overwhelming stimulus from exercise. An intermediate pattern consisting of 20 g doses of protein every 3 h is optimal for higher MPS throughout the day. Major gaps in the literature consist of long term studies, studies in older/diseased populations and with female subjects.

### Methodology

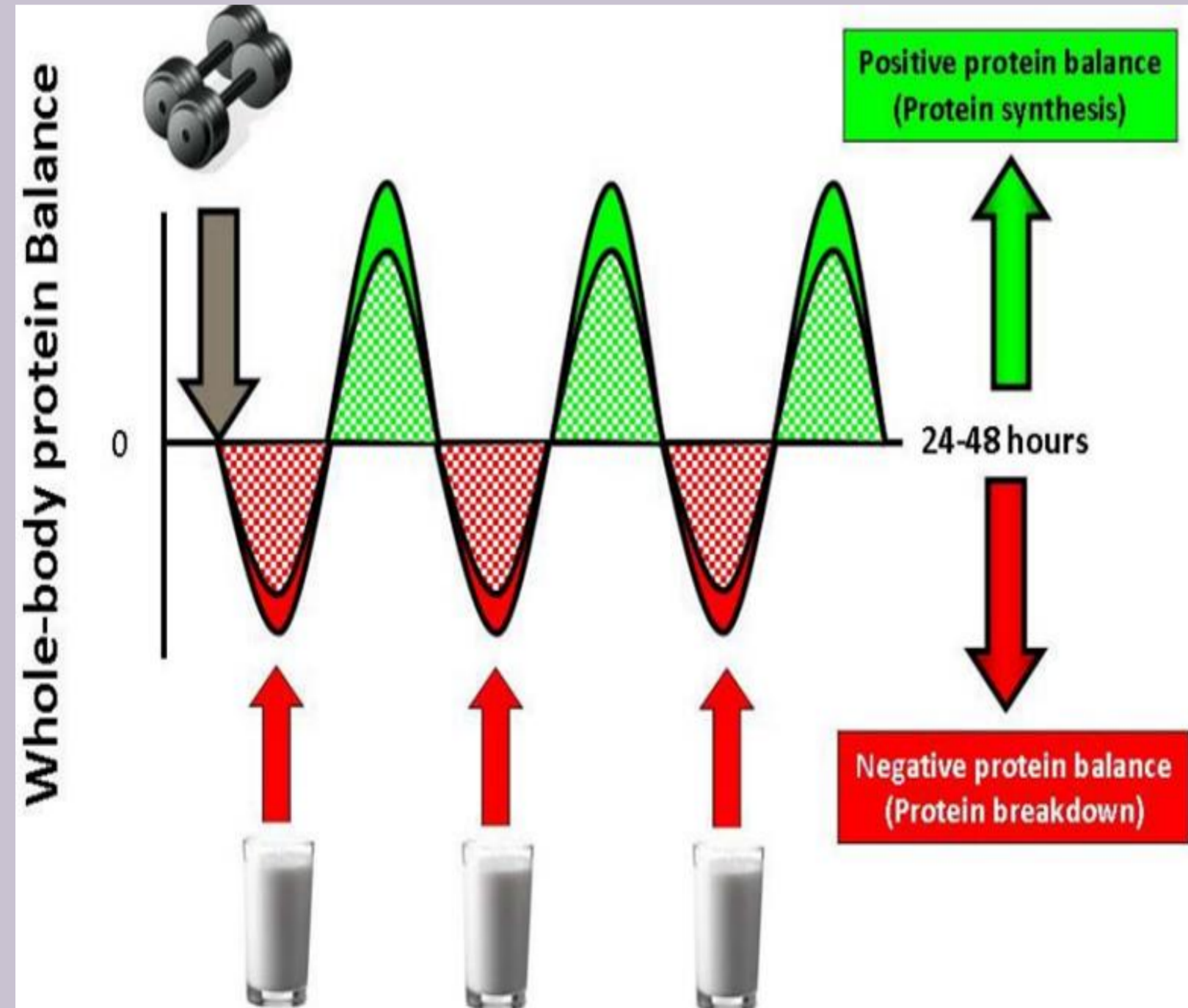
A literature review was completed in order to gather relevant research on protein timing and distribution. Research was gathered and organized by using Mendeley. Databases used for research were:

- PubMed
- Scopus
- Google Scholar

### Key Mechanism

#### Figure 1. Exercise and Protein Supplementation Together

(Phillips et al, Nutri 2004; 20:7-8:689-95 Hawley, RMIT University 2013)



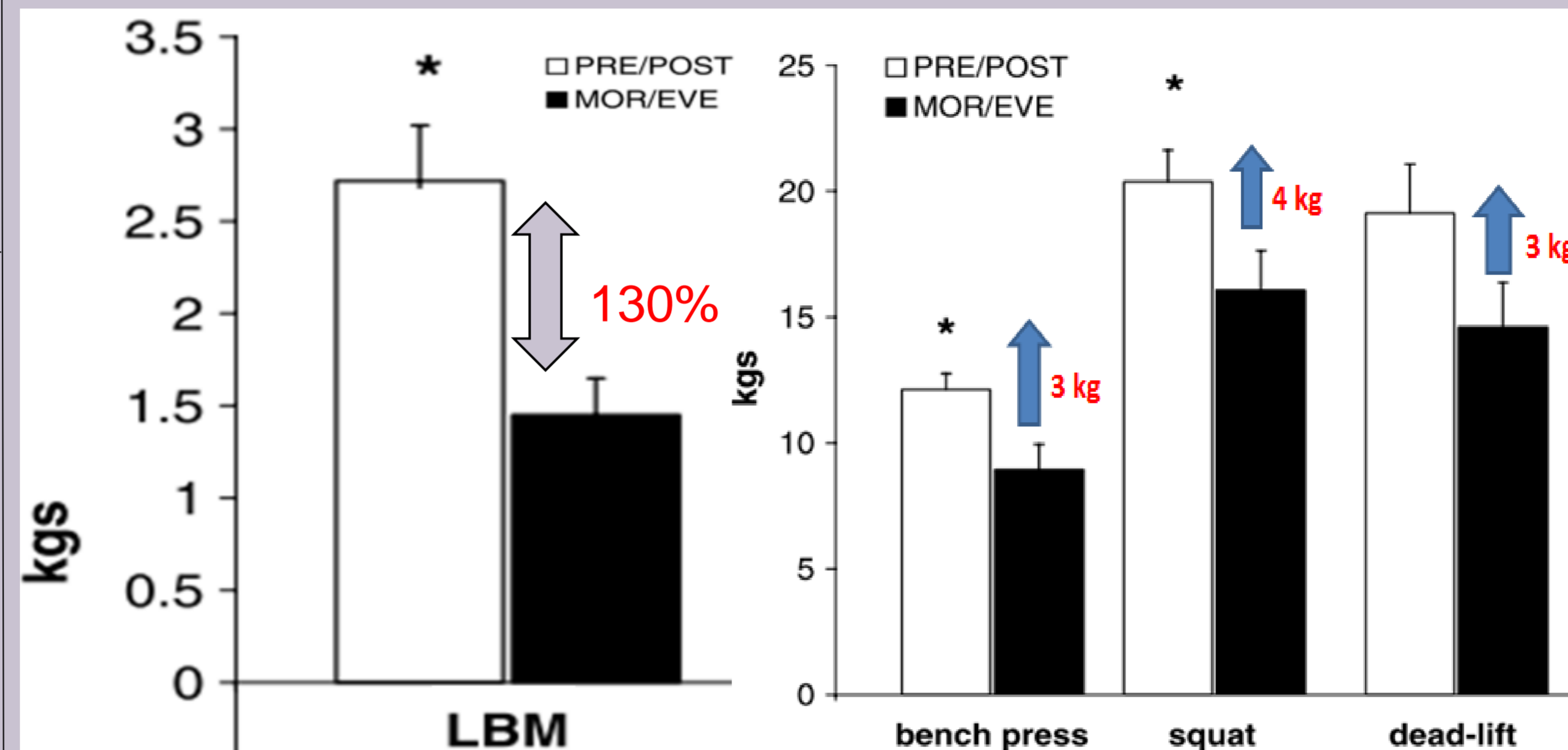
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### Protein Timing Key Study

#### Figure 2. Effect of Supplement Timing and Resistance Exercise on Skeletal Muscle Hypertrophy

(Cribb et al, Med Sci Sport Ex 2006; 38; 11; 1918-25)



### Protein Timing Discussion

Trained	Untrained
Combination PRO+CHO+Cr found to increase 1RM by 3 kg, LBM by 130% when taken pre/post workout vs AM/PM (Cribb et al, Med Sci Sport Ex 2006; 38; 11; 1918-25)	Fat free body mass increased by 43% in AM/PM vs. AM/ PRE-RE. Increases in 1 RM for Bench and Squat w/ no differences between groups (Burk et al. Nutr J 2009;29.6:405-413.)
Those who took protein immediately after a workout vs 6 hours later had 51 % higher MPB (Mori et al, J Phys Anthro 2014; 33: 1:24-26)	No difference in MPB between those who took protein immediately after a workout vs 6 hours (Mori et al, J Phys Anthro 2014; 33: 1:24-26)
<b>BOTTOM LINE:</b> Trained individuals should ingest protein supplementation before and after REX to optimized mTOR stimulation and NMPB.	<b>BOTTOM LINE:</b> Untrained individuals do not need to time protein ingestion with REX to optimize mTOR. However, it is crucial to ingest adequate protein throughout the day.

### Protein Distribution Key Study

#### Figure 3. Daytime pattern of post-exercise protein intake affects whole-body protein turnover in resistance-trained males-

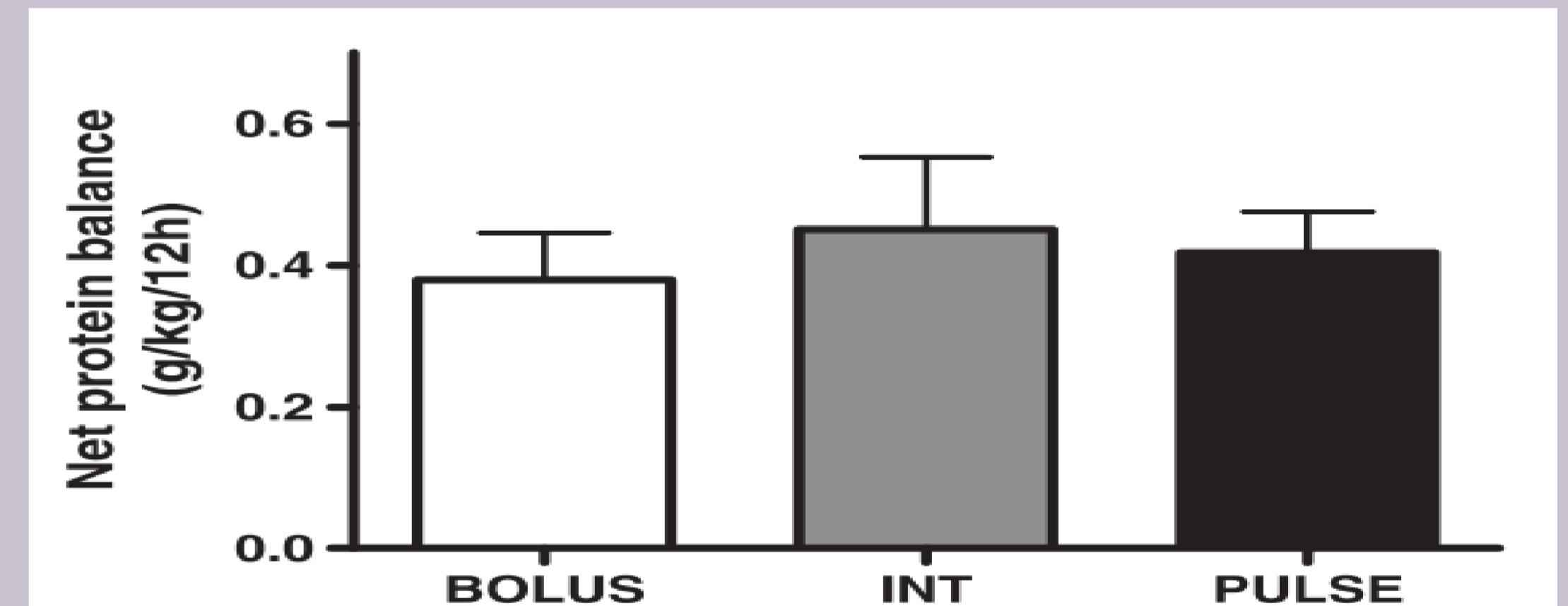
(Moore et al, Nutr Metab 2012)

- 8x10 g x 1.5h (PULSE)
- 4x20g x 3h (INT)
- 2x40g x 6h (BOLUS)

**PULSE 5% > BOLUS**

**INT 13% >PULSE**

**INT 17% >BOLUS**



### Protein Distribution Discussion

Trained	Untrained
20 grams of protein every 3 hours is most effective for increasing MPS after exercise. (Areta et al, J Physiol 2013;591:2319-31)	Western culture diets skew protein intake within major three meals towards dinner. (Maremarow et al, J Nutri 2014;144;6;876-880)
20 grams of protein every 3 hours is most effective for increasing net protein balance after exercise (Moore et al. Nutr Metab 2012; 9: 91-96)	Spreading protein intake throughout the day evenly will increase whole body mixed muscle FSR (Maremarow et al, J Nutri 2014;144;6;876-880)
<b>BOTTOM LINE:</b> Trained individuals should ingest protein in 20 gram increments every 3 hours to ensure optimal MPS.	<b>BOTTOM LINE:</b> Untrained individuals should ingest protein evenly throughout the day. This is important in ageing populations.