

Effects of 10-weeks of Dileucine Supplementation on Athletic Performance

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Abstract

Background: Absorption of amino acids, particularly the essential amino acids, is known to be a critical factor that influences changes in muscle protein synthesis rates leading to augmentation of adaptations to resistance training. Significant research has recommended an increased intake of dietary protein along with adequate intakes of the essential amino acid, leucine. Other research has indicated that ingestion of dileucine, a leucine-leucine dipeptide, can favorably increase circulating leucine levels and support maximal rates of muscle protein synthesis. Research, however, has yet to examine if dileucine supplementation can augment resistance training adaptations resulting in an increase in performance. The purpose of this study was to examine the impact of 10 weeks of dileucine supplementation has on changes in upper and lower-body maximal strength and endurance in resistance trained males.

Methods: 32 resistance trained males (28.4 ± 6.0 years, 176.3 ± 7.4 cm, 79.7 ± 12.5 kg, 25.7 ± 3.9 kg/m², 19.0 ± 5.7 % fat) were randomly assigned to ingest in a double-blind fashion either 2 grams of dileucine monohydrate (RAMPS™, Ingenious Ingredients, DILEU), 2 grams of leucine (LEU), or 2 grams of resistant starch as a placebo (PLA) for 10 weeks. Participants were assigned to complete a 4 day per week, split-body resistance training program targeting every major muscle group across 3-4 sets of 6- 10 repetitions at intensities from 70 – 85% 1RM. After 0, 2, 6, and 10 weeks of supplementation, participants were evaluated for changes in one-repetition maximum (1RM) and repetitions to failure (RTF) using the leg press (LP) and bench press (BP) exercises, as well as anaerobic capacity using the Wingate test and maximal voluntary contractions (MVC) using an isometric mid-thigh pull. Data were analyzed using mixed factorial ANOVAs using SPSS and one-way ANOVA using change scores from baseline. Data is presented as means ± SD.

Results: Significant main effects for time (p < 0.001) were realized for LP and BP 1RM as well LP and BP RTF providing evidence of a sound resistance training stimulus. A significant group x time interaction was identified (p = 0.027) for the changes in LP 1RM while no significant group x time interaction was observed for BP 1RM (p = 0.165). Tukey post-hoc comparisons revealed that greater increases were observed in DILEU when compared to PLA (95% CI: 5.6, 78.2 kg, p = 0.021) while no changes were observed between the other groups. Changes in LP RTF exhibited a significant group x time interaction (p = 0.047) while no significant interaction was observed for BP RTF (p = 0.11). Tukey post-hoc comparisons revealed that DILEU tended (95% CI: -0.21, 21.1 reps, p = 0.055) to complete greater repetitions when compared to LEU after completion of the study protocol. No significant group x time interaction effects were identified for Wingate peak power (p = 0.09), average power (p = 0.23), fatigue rate (p = 0.78), and total work (p = 0.23). Additionally, no significant group x time interaction was identified for isometric MVC (p = 0.33). A significant time effect was identified for isometric MVC indicated the peak force production increased similarly in all groups as a result of the study protocol.

Conclusion: Supplementation with 2 grams of dileucine for 10 weeks in healthy, resistance trained males leads to greater increases in lower body maximal strength when compared to placebo ingestion and tended to result in a greater number of leg press repetitions being performed when compared to leucine ingestion. All changes observed with leucine ingestion were similar to changes observed when a placebo was consumed.

Methods

Study Design

- Randomized, double-blind, placebo-controlled
- Participants supplemented daily for 10-weeks while following a 10-week resistance training program.
- Testing occurred at week 0, 2, 6, and 10

Participants

- 32 resistance trained males
 - 28.4 ± 6.0 years
 - 176.3 ± 7.4 cm
 - 79.7 ± 12.5 kg
 - 25.7 ± 3.9 kg/m²
 - 19.0 ± 5.7 % fat

Supplementation Protocol

- Double-blind, placebo controlled
- Participants supplemented daily for 10 weeks with either:
 - 2 grams dileucine
 - 2 grams leucine
 - 2 grams rice flour placebo

Performance Testing Protocol

- Leg press and bench press 1-repetition max (1RM)
 - 2-min rest between warm-up and 1RM attempts
- Leg press and bench press repetitions to failure (RTF)
 - RTF assessed using 80% of baseline 1RM; ≤2 sec rest between reps
- Isometric Maximal Voluntary Contraction (MVC) was assessed using an Isometric Mid-Thigh Pull (Pasco Scientific, Roseville, CA)
- Anaerobic capacity was assessed using a 30-second Wingate at 7.5% of participants body mass (Lode Excalibur Sport (Groningen, The Netherlands))

Resistance Training Program

- 10-weeks, 4 days per week

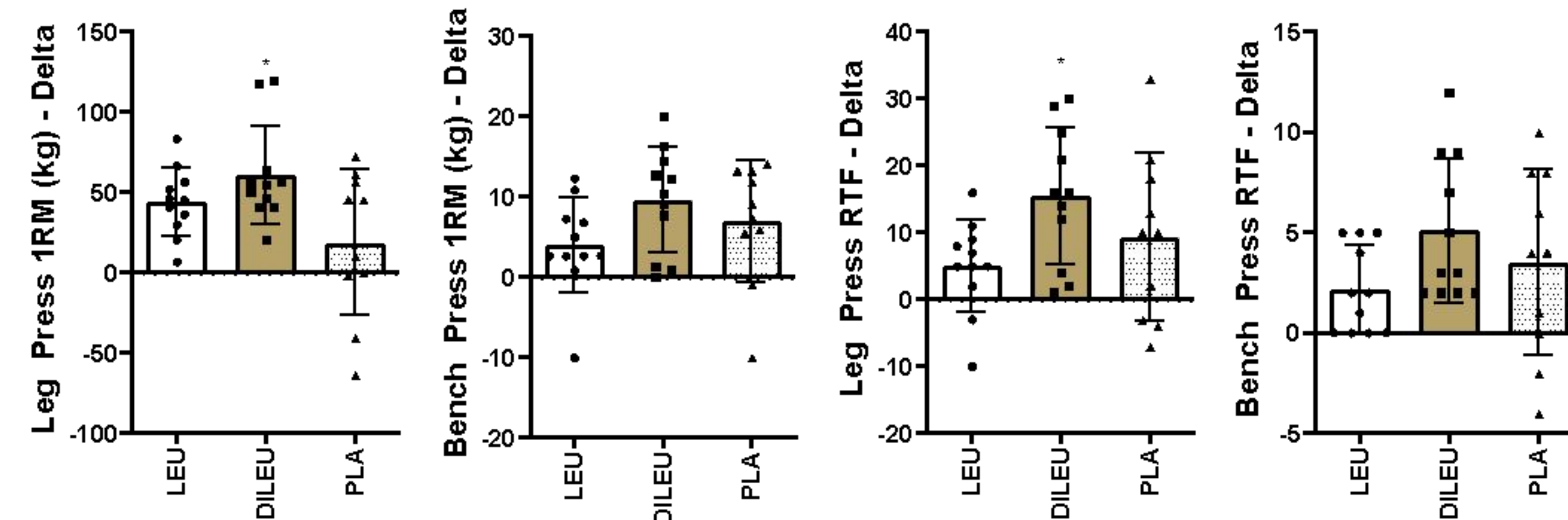
Table 1: Overview of Resistance Training Program

Weeks	Day 1, Day 3	Day 2, Day 4
1-6*	Bench press, 3x10 Chest flies, 3x10 Lat pull, 3x10 Seated row, 3x10 Shoulder press, 3x10 Shoulder shrugs, 3x10 Bicep curls, 3x10 Triceps extensions, 3x10	Back squat or leg press, 3x10 Leg extensions, 3x10 Deadlift, 3x10 Lunges, 3x10 Lying leg curls, 3x10 Calve raises, 3x10 Ab crunches, 3x25
7-10‡	Bench press, 4x6 Chest flies, 4x6 Lat pull, 4x6 Seated row, 4x6 Shoulder press, 4x6 Shoulder shrugs, 4x6 Bicep curls, 4x6 Triceps extensions, 4x6	Back squat or leg press, 4x6 Leg extensions, 4x6 Deadlift, 4x6 Lunges, 4x6 Lying leg curls, 4x6 Calve raises, 4x6 Ab crunches, 3x25

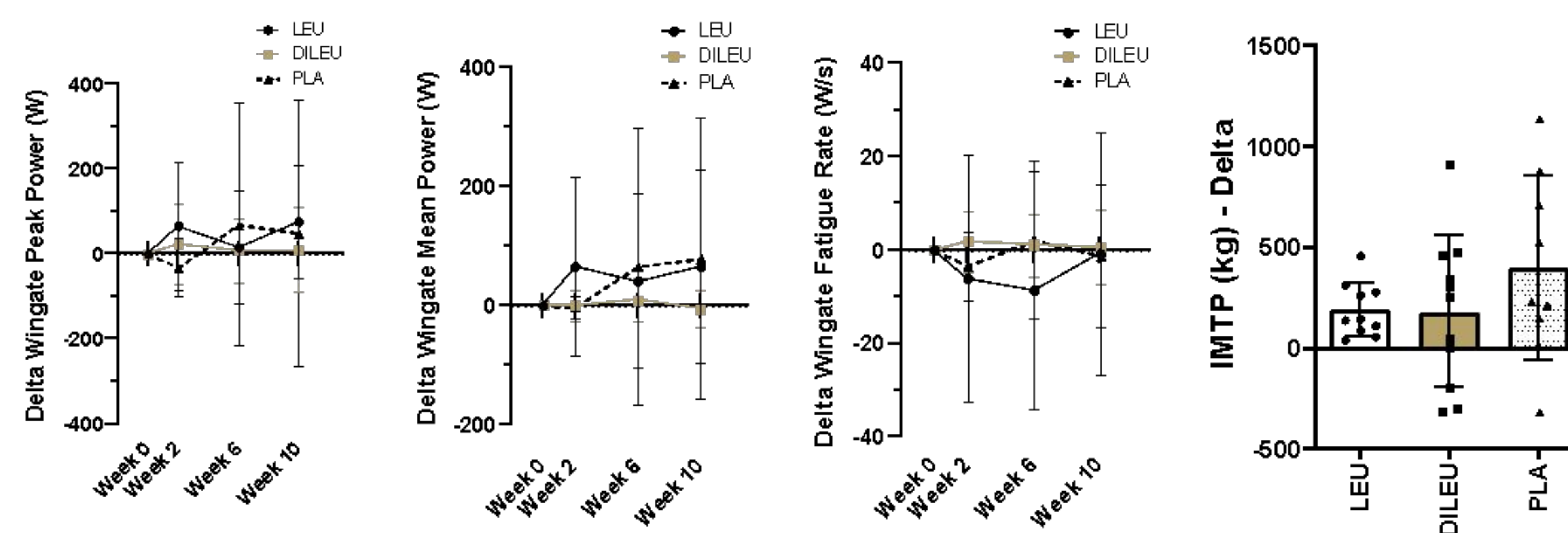
*One minute rest between sets ‡Two minutes rest between sets

Results

Figures 1-4: Leg Press and Bench Press 1RM and RTF



Figures 5-8: Wingate and Isometric MVC Performance Variables



Summary

- Supplementation with 2 grams of dileucine while following a resistance training program for 10 weeks in healthy, resistance trained males lead to greater increases in lower body maximal strength when compared to placebo ingestion.
- Supplementation with 2 grams of dileucine tended to result in a greater number of leg press repetitions performed when compared to leucine ingestion.
- All changes observed with leucine ingestion were similar to changes observed when a placebo was consumed.

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