

MENSTRUAL CYCLE PHASE MODULATES POST-EXERCISE RESTING ENERGY EXPENDITURE FOLLOWING STRENGTH-BASED RESISTANCE TRAINING IN WELL-TRAINED FEMALES.

Corinne C. Ellis, Michael R. Esco, & Alyssa L. Parten.

Exercise Physiology Laboratory, Department of Kinesiology, The University of Alabama

BACKGROUND

- Resting energy expenditure (REE) contributes to total daily energy expenditure and is an important consideration for weight management, metabolic health, and exercise recovery.
- Higher intensity exercise has been shown to enhance post-exercise REE and fat oxidation. Acute bouts of high-intensity training, particularly anaerobic or resistance-based modalities, can elevate REE up to several hours post-exercise. This prolonged energy demand is often accompanied by increased fat oxidation, contributing to a more favorable metabolic profile over time.
- Little is known about the combined effects of strength-based resistance training (STR) and menstrual cycle (MC) hormonal fluctuations on REE. While both STR and hormonal shifts across the MC have independently shown to influence fat metabolism, few studies have explored their interaction.

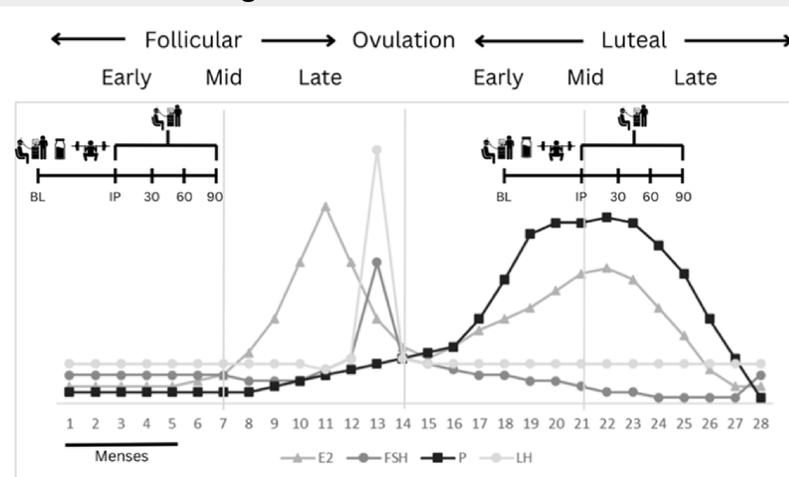
PURPOSE STATEMENT

- To compare an identical STR session during early-follicular phase (EFP; low estradiol and progesterone) and mid-luteal phase (MLP; high estradiol and progesterone) in well-trained, eumenorrheic females.

METHODS

- 22 well-trained eumenorrheic females completed an STR session consisting of back squat (BS), bench press (BP), and deadlift (DL).
- Sessions were completed during the EFP and MLP: 5 sets of 3 at 80-85% of 1RM in BS, BP, and DL
- Salivary hormone analysis confirmed MC phase and eumenorrheic status.
- REE was measured at baseline (BL), immediately post-STR (IP), and at 30-, 60-, and 90-min post-STR during both EFP and MLP.

Figure 1: Schematic Overview.



RESULTS

Training Status (NSCA)	Intermediate (n = 2)	Advanced (n = 11)	Highly Advanced (n = 9)	All (N = 22)
Age (y)	25.5 ± 7.8	24.2 ± 5.6	26.1 ± 5.9	25.1 ± 5.7
Height (cm)	167.3 ± 5.7	164.8 ± 5.7	163.3 ± 7.2	164.4 ± 6.2
Body Mass (kg)	66.0 ± 16.1	65.3 ± 6.3	67.7 ± 8.8	66.3 ± 7.9
Body Fat (%)	31.5 ± 6.6	32.3 ± 4.0	30.0 ± 5.2	31.3 ± 5.0
Fat Free Mass (kg)	44.3 ± 6.0	43.5 ± 4.7	46.2 ± 5.0	44.7 ± 4.9
MC Length (days)	30.0 ± 2.8	28.5 ± 3.4	30.6 ± 2.4	30 ± 3
Squat 1RM (kg)	56.8 ± 19.3	77.8 ± 11.0	106.4 ± 22.0	87.6 ± 23.5
Bench Press 1RM (kg)	43.6 ± 25.1	47.8 ± 9.1	62.0 ± 14.0	53.2 ± 14.2
Deadlift 1RM (kg)	71.6 ± 24.1	90.5 ± 16.2	122.8 ± 28.4	102.0 ± 28.4

Table 1. Subject descriptive statistics (N = 22; Mean ± SD).

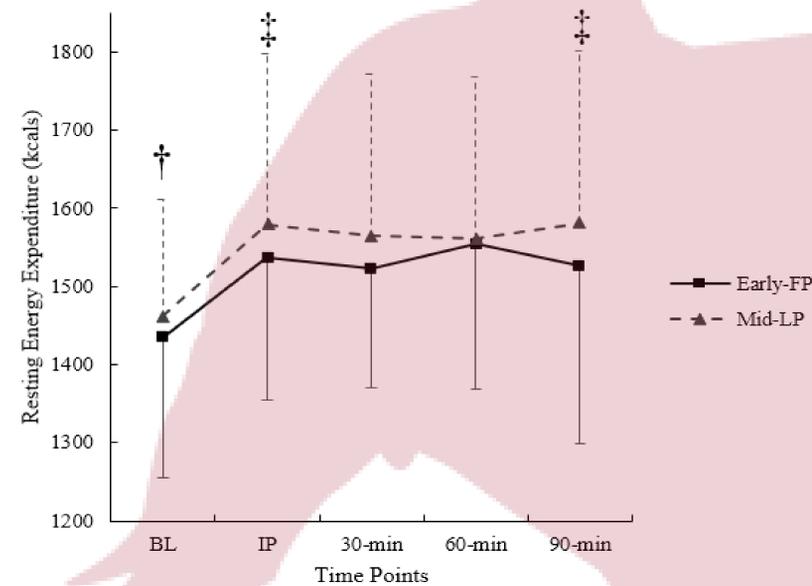


Figure 2. Resting energy expenditure between the EFP and MLP.

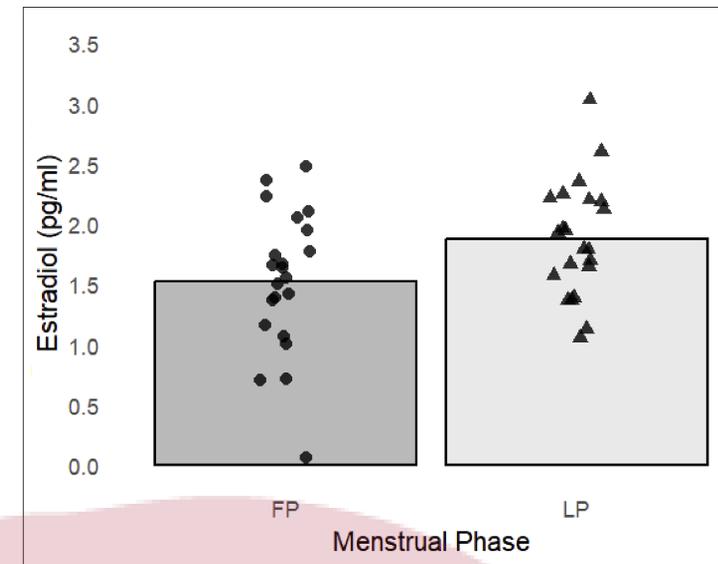


Figure 3a. Individual 17-β-estradiol responses.

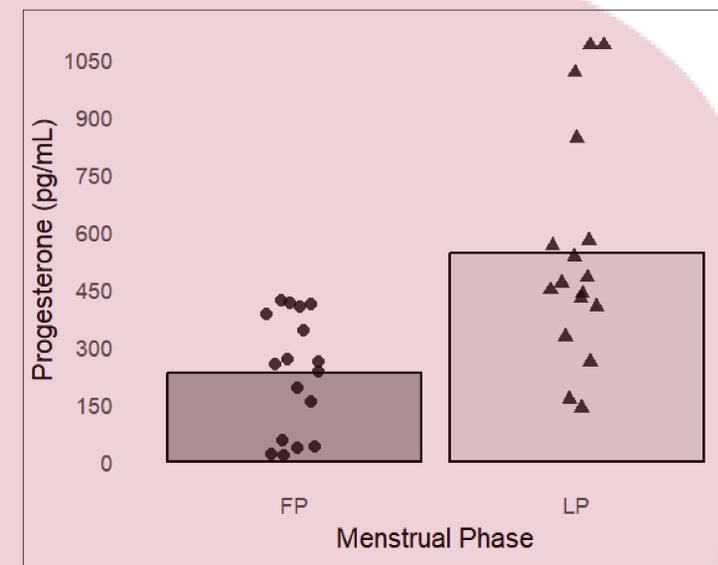


Figure 3b. Individual progesterone responses.

CONCLUSION

- STR causes significant acute increases in post-exercise REE in well-trained eumenorrheic females regardless of MC ($p < 0.05$) with an average increase of 7-7.5% (EFP = $1,535 \pm 186$; MLP $1,572 \pm 210$), and an average increase of 101 and 210 kcals 90-min post-STR in the EFP and MLP, respectively.
- The effect is greater at certain time points in the MLP compared to the EFP (IP: $p = 0.05$, $d = 0.2$; 90-min: $p = 0.04$, $d = 0.3$).
- Elevated REE in the MLP suggests a combined effect between STR-induced hormonal responses and MC hormones.
- STR is an effective strategy for increasing post-exercise REE across the MC, which may support metabolic health, weight management, and body composition in females.