



RELATIONSHIP BETWEEN ESTROGEN AND PROGESTERONE RATIO AND ANAEROBIC PERFORMANCE IN WOMEN: A PILOT ANALYSIS



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INTRODUCTION

- To date, there is conflicting evidence as to the effects of estrogen and progesterone on anaerobic performance.
- This may be partly due to the hormonal environment often being characterized at a single timepoint, which does not account for fluctuations in female sex hormones.
- Estrogen/progesterone ratio (E:P) over the days leading up to performance may provide greater insight into the potential influence of female sex hormones on exercise performance.

PURPOSE:

To explore the relationship between E:P and anaerobic performance (fatigue index (FI), peak power (PP), average power (AP), and power drop (PD)) in eumenorrheic (EUM) and oral contraceptive (OC) using women.

METHODS

- Healthy, recreationally active, EUM and OC users (Mean±SD; Age: 23.3±2.3yrs; %BF: 26.1±4.1%; White: 100%) (Table 1).

Table 1: Descriptive characteristics for EUM, OC, and all participants (n=6; Mean±SD).

	EUM (n=2)	OC (n=4)	ALL (n=6)
Age (yrs)	23 ± 1.4	23.5 ± 2.9	23.3 ± 2.3
BF (%)	22.8 ± 3.4	27.8 ± 3.5	26.1 ± 4.1

- Completed two repeated sprint ability tests (10 × [6s sprint: 30s rest]) on a friction-loaded cycle ergometer (Figure 1).
- Measures of FI (%) were recorded and PP (watts [W]), AP (W), and PD (W) were averaged across the 10 sprints.

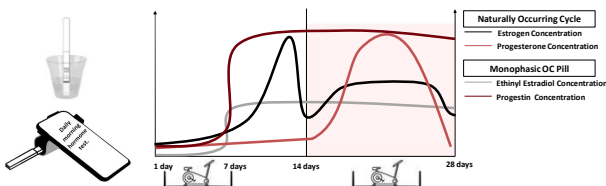


Figure 1: At-home urine hormone test procedures used to determine phase of cycle for testing.

Calculations:

$$E:P1 = \frac{AVG(E_{day-3} + E_{day-2} + E_{day-1})}{AVG(P_{day-3} + P_{day-2} + P_{day-1})}$$

$$E:P2 = \frac{E:P1 + E:P3}{2}$$

$$E:P3 = \frac{E:P1 + E:P2 + E:P4}{3}$$

$$E:P4 = \frac{E:P1 + E:P2 + E:P3 + E:P4}{4}$$

- Separate Pearson correlations were run for each method to evaluate the relationship between E:P and anaerobic performance.

RESULTS

Table 2: FI, PP, AP, and PD for EUM, OC, and all participants (n=7; Mean±SD).

	EUM	OC	ALL
FI (%)	40.63 ± 10.34	44.63 ± 4.17	42.91 ± 6.99
PP (W)	290.15 ± 95.73	297.88 ± 100.30	294.57 ± 90.01
AP (W)	251.57 ± 79.88	248.96 ± 92.65	250.07 ± 80.13
PD (W)	90.92 ± 52.66	115.68 ± 37.76	105.07 ± 42.57

Table 3: E:P values for EUM, OC, and all participants (n=7; Mean±SD).

	EUM	OC	ALL
E:P1	45.11 ± 8.74	67.53 ± 39.18	57.92 ± 30.61
E:P2	60.06 ± 61.20	51.55 ± 29.42	55.19 ± 41.26
E:P3	61.62 ± 59.22	66.45 ± 50.76	64.38 ± 49.64
E:P4	170.50 ± 134.24	213.28 ± 145.80	194.95 ± 130.99

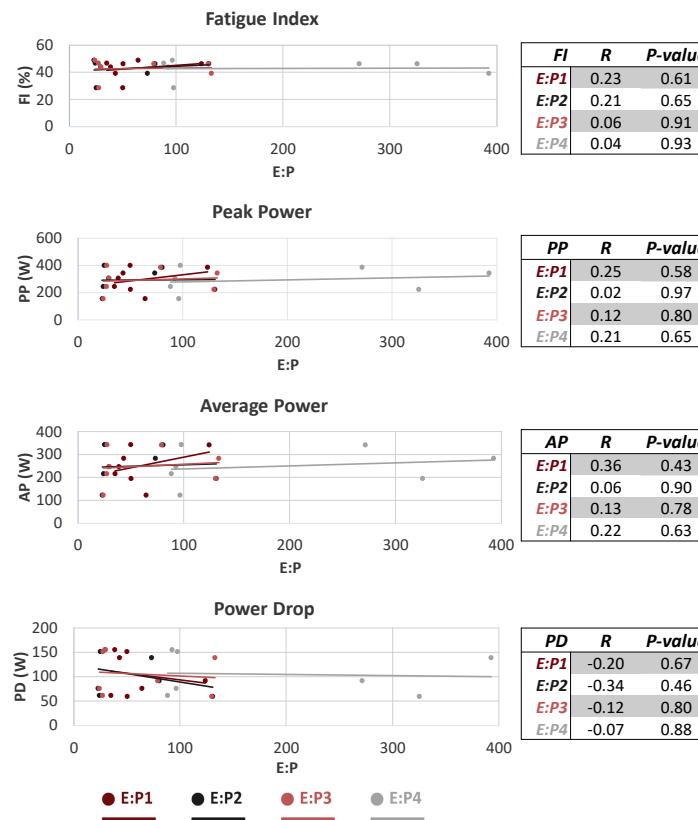


Figure 2: Correlation values (R and p-value) between the four estrogen progesterone ratio calculations (E:P) and fatigue index (FI), peak power (PP), average power (AP), and power drop (PD).

CONCLUSIONS

- Results suggest that E:P ratio is not significantly associated with anaerobic performance in EUM women and OC users, regardless of whether E:P was measured on the day of or the days leading up to performance.
- The current study implemented novel methods and approaches that allow for female hormone fluctuation to be accounted for.
- Future research should:
 - Explore these methods in a larger population.
 - Potentially explore relationships with estrogen and progesterone separately.
 - Explore other statistical modeling approaches to quantify fluctuations in the female hormonal environment.

PRACTICAL APPLICATIONS

To date, the **relationship between the female hormonal environment and sport and exercise performance** remains unclear.

Hormone tracking could be a useful tool to **individualize management strategies** for EUM and OC using female athletes and active women who experience performance detriments associated with their menstrual cycle or hormonal contraception.