

## THE EFFECTS OF THE TWO PHASES OF THE MENSTRUAL CYCLE ON TEMPERATURE RESPONSES TO EXERCISE IN THE HEAT IN HUMANS

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Eumenorrhic women have a biphasic rhythm in basal body temperature (BBT) during the menstrual cycle (MC). BBT is up to 0.5°C higher during the luteal phase, which is accompanied by an increase in core temperature threshold for sweating and cutaneous vasodilation. BBT remains elevated for approximately two weeks until it decreases again at the onset of menstruation. This study investigated whether the alteration in thermoregulatory set point during the MC affects the temperature response to exercise in the heat. Eleven recreationally active women volunteered to randomly undertake two exercise tests during one MC. One test was conducted during the follicular phase (day 3-6) and one test during the luteal phase (day 20-24). For each subject both tests were conducted at the same time of day. The subjects exercised for 45 minutes on a cycle ergometer at 60% of their  $VO_{2peak}$  in hot, humid conditions (32°C, 60% relative humidity). Rectal temperature ( $T_{re}$ ) and skin temperature ( $T_{sk}$ ) were measured. Mean  $T_{sk}$  was calculated according to Ramanathan (1964). Repeated measures ANOVA was used to compare  $T_{re}$  and mean  $T_{sk}$  between the two phases of the MC at 15 minute intervals. The average (SE) age, height and weight of the subjects was 24 (1.2) years, 167 (1.2) cm and 68 (3.1) kg respectively. No significant differences in mean  $T_{sk}$  were found between the MC phases at any time point.  $T_{re}$  did show a significant difference between the MC phases over time. Post hoc within subject contrasts showed a significant difference ( $p = 0.05$ ) between MC phases at 45 minutes of exercise. The Table shows the mean  $T_{re}$  (SE) in°C for both phases of the MC at the 4 time points.

$T_{re}$ in°C	Start	15 minutes	30 minutes	45 minutes
Follicular phase	37.01 (0.10)	37.34 (0.08)	37.76 (0.10)	38.12 (0.13)
Luteal phase	37.01 (0.11)	37.41 (0.09)	37.87 (0.08)	38.27 (0.11)

The mean  $T_{re}$  at the start of exercise was identical for both phases. This contradicts the expectations for an ovulatory MC and might indicate that some of the subjects did not ovulate during the testing cycle. Although the small difference in  $T_{re}$  between phases could also easily be masked by slight changes in pre test activity. The Table shows that  $T_{re}$  during the luteal phase increases at a slightly higher rate than during the follicular phase, which is confirmed by the significant higher  $T_{re}$  at 45 minutes during the luteal phase. This difference in the rate of increase between the two MC phases might be explained by the higher thermoregulatory set point during the luteal phase. The subjects started exercise at the same  $T_{re}$ , but since the threshold for sweating and vasodilation are higher during the luteal phase these effects would have started at a later time point during the test than during the follicular phase. Therefore for the present study  $T_{re}$  would have increased at a higher rate during the luteal phase than during the follicular phase.

Ramanathan, N.L., 1964. A new weighting system for mean surface temperature of the human body. J. Appl. Physiol. 19(3), 531-533.

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