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Resting heart rate fluctuations during the menstrual cycle in competitive female track and field athletes

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INTRODUCTION:
Early morning resting heart rate (rHR) is an important parameter for athletes to monitor the state of recovery. There are several parameters that might influence rHR, among them the menstrual cycle. The menstrual cycle can be divided into different phases by its hormonal fluctuations of estrogen and progesterone. Some aspects relevant to athletic performance are that estrogen, which peaks in the late follicular phase prior to ovulation can increase endothelium-dependent vasodilatation, while progesterone can increase cardiac excitability. The purpose of this study was to analyze the influence of the phase of the menstrual cycle on rHR in female elite athletes to gain more detailed knowledge on the interpretation of rHR in the context of load control and regeneration management.
METHODS:
In this controlled monitoring study, rHR was assessed at different phases of the menstrual cycle in 9 eumenorrheic competitive female track and field athletes with a total of 22 tracked menstrual cycles. Subjects did not take any hormonal contraception. During the study period, the athletes measured their HR each morning after awakening and documented the value in a monitoring APP. rHR of the 22 cycles were averaged in either 1) five (5-phase-model) or 2) three (3-phase-model) different phases of the menstrual cycle, namely: 1) menstruation (M), late follicular phase (lateF), ovulation (O), early luteal phase (earlyL), late luteal phase (lateL)), and 2) follicular phase (F), ovulation (O), luteal phase (L). Phases of the menstrual cycle were determined by the ovularing©. One-way ANOVA was used for the comparison of mean rHR of the different phases. The significance level was set $\alpha \leq 0.05$.
RESULTS:
The following rHR values were determined: 5-phase model: M: 57.0±6.2; lateF: 57.1±6.6; O: 57.4±6.2; earlyL: 57.6±6.5; lateL: 57.1±6.8 (1/min), $p>0.05$); 3-phase model (L: 57.0±6.2; O: 57.0±6.6; L: 57.5±6.3 (1/min, $p>0.05$). We could not detect any influence of the phase of the menstrual cycle on rHR in neither of the two models. Individual rHR profiles showed a high inter-individual variability.
CONCLUSION:
Despite known influences of female sex hormones on the cardiovascular system, no menstrual cycle-related influences of the variation in the blood concentrations of estrogen and progesterone on early morning rHR in elite athletes were detected in this study. As vagal influence might be higher in endurance athletes and their rHR accordingly lower, a larger number of female athletes from different disciplines (e. g. endurance, sprint, power/strength disciplines) should be recruited in follow-up studies. In addition, heart rate measurements should be performed with identical technically equipment to ensure more accurate determination. This study was part of an investigation about the implementation of menstrual cycle tracking in the German athletics association. This project was funded with research funds from the Federal Institute for Sports Science based on a decision by the German Bundestag.

Topic: Physiology

Presentation Poster