

The Effects of Menstrual Cycle Phases on Muscular Strength and Endurance in Female Swimmers

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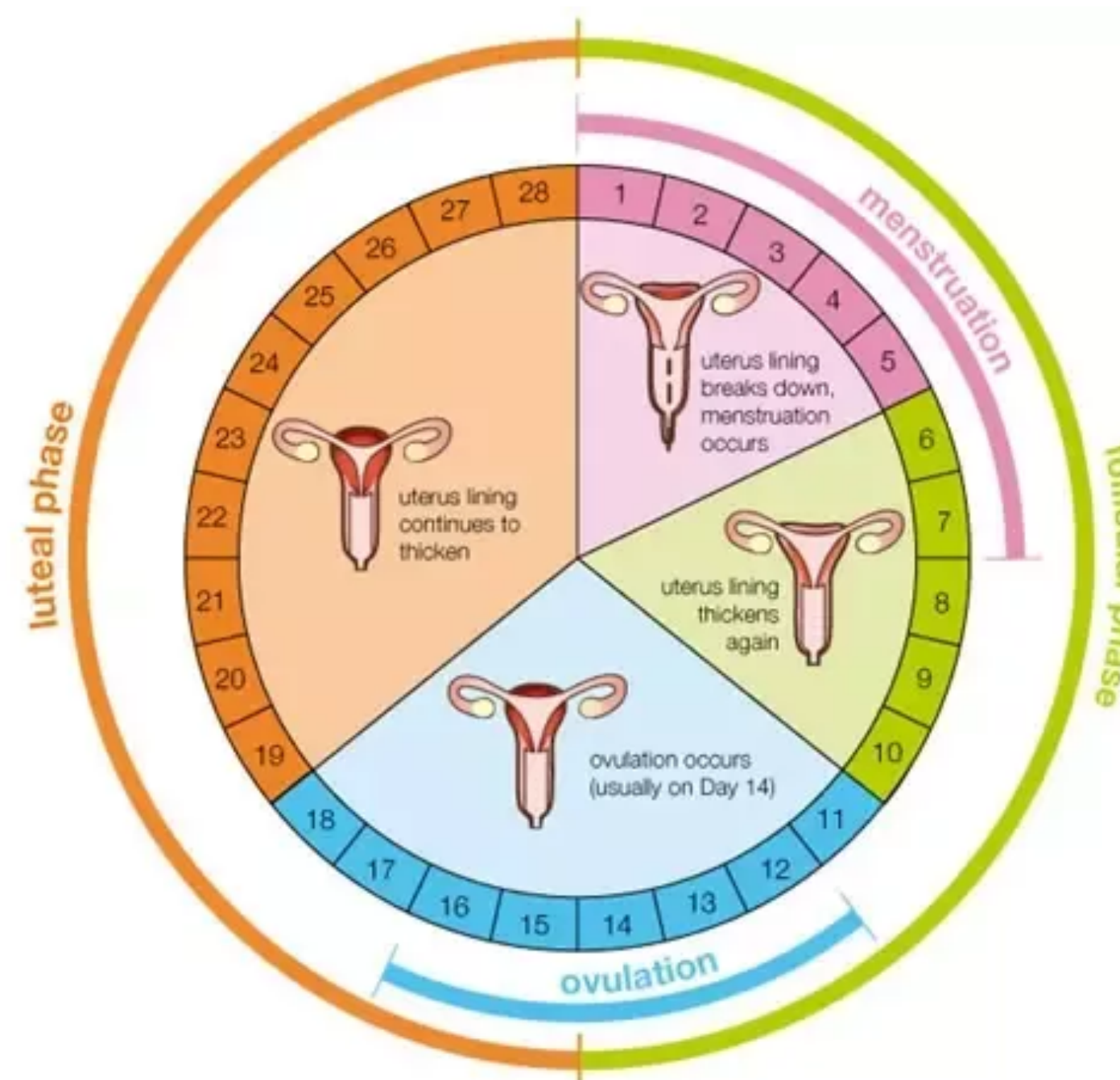
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Abstract

- As female participation in athletics increase, the effects of the menstrual cycle phases are being brought to the surface level.
- The changing concentrations of estrogen and progesterone help determine the four phases of the menstrual cycle.
- The **purpose** of this study was to determine the effects of the menstrual cycle phases on muscular strength and endurance in female swimmers
- The **hypothesis** was that the menstrual cycle will affect performance differently. With an increase in estrogen there will be increased performance while with an increase in progesterone there will be a decrease in performance
- 20 female swimmers from various travel swim teams participated
- Completed Counter-movement vertical jump test (CMJ) to measure muscle strength and Yo-Yo intermittent endurance test (Yo-Yo IET) to measure muscle endurance.

Introduction

- **Gap in the Literature:** While many studies have been conducted regarding menstrual cycle effects on athletic performance, there is an absence of studies conducted on female swimmers specifically.
- Past studies:
 - Julian et al. (2017): Menstrual cycle effects on female soccer players
 - McLay et al. (2007): Menstrual cycle effects on endurance athletes
 - Augustine et al. (2018): Menstrual cycle effects on acute resistance in women with a background in resistance exercise
- Three phases tested were the mid-follicular phase (days 2-6), ovulation phase (days 13-16) and mid-luteal phase (days 18-22).



Participants

- 20 female swimmers, aged 18-24 years, from various travel swim teams. All participants were consisted of to be eumenorrheic with regular cycles and had not taken oral contraceptives for 6 months prior to this study. Exclusion criteria included currently taking any oral or hormonal contraceptives, pregnant or trying to become pregnant, any serious injuries, irregular menstrual cycle, and ingesting supplements.

Instrumentation

- The Countermovement vertical jump test (CMJ) and the Yo-Yo intermittent endurance test (Yo-Yo IET). The CMJ test was conducted using a force plate. The jump height was determined using the center of mass displacement, calculated from recorded force and body mass. The Yo-Yo IET repeated 2x20m runs with a 180° turn in between with progressively increasing speed of audio beeps.

Procedure

- The participant's height and body weight were measured, and body mass index (BMI) was calculated. The CMJ and Yo-Yo IET was conducted during the ovulation, mid-luteal, and mid-follicular phases of the menstrual cycle. The participants tracked their menstrual cycles through the Clue app on their mobile devices. The CMJ was conducted for 3 trials and the measurements for each were averaged. The CMJ began with the participant in an upright position, then making a downward movement to a knee angle of approximately 90° while simultaneously beginning to push-off, while hands are placed on their hips, with a rest period of 30 seconds between efforts. During the Yo-Yo IET the participants ran each bout with a 5 second rest period. The total distance of completed runs were recorded as the test results. Termination of the test occurred of the participant failed to reach the finish line twice

Data Analysis

- Data analysis was conducted using the statistical software package SPSS v.20. All variables were normally distributed and expressed as means \pm standard deviations (SD). A Shapiro-Wilk test was used to test the data for normal distribution ($p > 0.05$). The differences in the performance data between the phases of the menstrual cycle were analyzed using one-way repeated-measures analysis of variance (ANOVA). The statistical threshold was set at $p < 0.05$. The effect size (es) was calculated to determine the magnitude of differences, interpreted as followed: trivial (<0.2), small (0.2-0.59), moderate (0.60-1.19), large (1.20-2.0), and extremely large (>2.0).

Conclusion

- This was an observational quantitative study design to explore the effects of the menstrual cycle phases on athletic performance. The independent variables were the menstrual cycle phases while the dependent variables were muscular strength and endurance.
- It will be assumed that the participants record their menstrual cycle on the Clue app on their mobile devices.
- There are several limitations to this study one being the sample size because of the exclusion criteria. This exclusion criteria pinpoints a very small sample. This study was not going to study the specific hormonal changes during the menstrual cycle or how the menstrual cycle as a whole effects athletic performance. For further investigation, this study should accumulate a larger sample size to increase validity in the results.

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