116 - CHANGES IN PHYSICAL FITNESS DURING MENSTRUAL CYCLE IN WOMEN PRACTICING RESISTANCE EXERCISE

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INTRODUCTION

The menstrual cycle is characterized for sequence of events that occur at various levels of the hypothalamic-pituitary-ovarian axis. For most women there is a regularity of the cycle menstrual that lasts 28 days, divided into 3 phases according to Speroff & Fritz (2005), as follows: Follicular Phase: onset of menstrual bleeding, and takes on average 15 days (ranging from 9 to 23 days). Ovulatory Phase: lasts 1 to 3 days and finishes at ovulation. Luteal Phase: lasts approximately 13 days and finishes with the menstrual bleeding.

Along the three phases the women body is undergoing significant changes hormonal that result in numerous alterations that go from variations of the body temperature until mood swings (CHARKOUDIAN e JOHNSON, 2000). According to Peterson et al. (2001), because of these changes that occur during the menstrual cycle, the resistance exercise programs should be adapted considering such changes.

The objective of this study was to investigate changes in physical fitness and perceived exertion that occur in each phase of the menstrual cycle in practicing women of resistance training.

MATERIALS AND METHODS

The sample consisted of 10 women from Gloss Bodybuilding Gym – Caçador/SC, that performed resistance exercises, with experience of at least 6 months prior to testing. After being informed about the suggestions of the research and procedures that they were submitted, agreed to participate of the research and all subjects signed the term of free and illustrious consent. This study was approved by the Ethics Committee of UNIARP, according to the Resolution of the National Health 196/96 research involving human beings.

Physical Fitness Evaluation

The tests were performed in three phases of the menstrual cycle: Follicular (FO), Ovulatory (OP) and Luteal (LP). In phase 1 (FO) the tests were performed between the 1 to 4 day, phase 2 (OP) in 14 day and phase 3 (LP) between the 26 to 28 day of menstrual cycle. To assess the physical fitness the following tests were performed:

- Flexibility: sit-and-reach test, or bench Wells (WELLS & DILLON, 1952), that specifically evaluates the posterior thigh regions, hip and lumbar spine was used. For the tests, the women with the palms facing down and in touch with the box, extended forward along the measuring scale trying to reach most possible distance, performing the movement so slow. There were performed three trials and for each one of them the distance was kept for about one second, being considered the best value achieved in the best of three trials. Flexibility was measured in centimeters.
- Cardiorespiratory Fitness (VO2máx.): For the test was used the protocol of KATCH & McARDLE (1984), using a wooden bench, with 40.6 cm tall and wide and length sufficient for the assessed could climb with both feet and keeping in balance. The evaluated performed bench's ups and downs during three minutes at the pace of 22 cyclos a minute and the end of third minute of exercise the women remained standing, being measured in 5 seconds after test the heart rate. It was applied the formula according to Katch & McArdle (1984), and the results were expressed as ml(kg.min)-1:

VO2máx = 65.81 – 0.1847 x FC final test

- Body Composition: To perform the evaluation of body composition by bioelectrical impedance method was used the protocol by Buscariolo (2008), using a tetrapolar scale brand Onhron, with 75 Omhns of power. Women observed a period of four hours of fasting before taking the measures, refraining from physical activity and alcohol for 24 hours preceding, that there was no interference in reading the data. Was registered on the scale of age, sex and height assessed, measured on a stadiometer (Sanny, Brazil) with accurately to 0.1 cm. Initially the scale recorded the weight and then performed the reading of the body fat and lean mass percentage.

Perceived Exertion (EPE)

To evaluate the EPE utilized a Likert scala with four classifications: very easy, easy, difficult and very difficult. The EPE was determined at the end of each test which was composed of execution of 1 series of 10 maximal repetitions in each equipment and end of the series the women reported on the scale indicating their perception of effort. The following tests were performed to determine the EPE of the upper and lower limbs:

Leg Press 45°

a)Initial Position: women seated in the machine, feet in lateral spacing and aligned with shoulders, hip flexed according to the angle provided by the equipment, knees extended, hands positioned on the support of the equipment.

b)Eccentric phase: from the initial position was carried out simultaneous flexion of knees and hips until reaching 90° of flexion angle between leg and thigh.

c)Concentric phase: after completing the eccentric phase, carried out the knee and hip extension, returning to original position.

Pulley

a)Initial Position: women seated in the machine, with the spine slightly tilted back, arms extended, holding bar, knees stuck in the equipment and feet resting.

b)Eccentric phase: from the initial position was carried out the movement of the traction bar toward the breast upper line, flexing arms.

c)Concentric phase: after completing the eccentric phase, carried out the extension of arms, returning to original

position.

Statistical analysis

Statistical analysis was performed by One-way ANOVA with repeated measures test and Post hoc tests were Tukey corrected for multiple comparisons. The data were analyzed using the Graph Pad Prisma software version 5.0. The results were presented as means ± SD. A value for P<0.05 was taken to indicate statistical significance.

RESULTS

Table 1 shows the characteristics of the sample. The mean age of women was 29.40 years ± 4.60 and height of 1.61mt ± 0.08.

Table 1. Characteristics of the sample

	Means ± SD
Age (years)	29.40 ± 4.60
Height (mt)	1.61 ± 0.08

Figure 1 shows the body weight in the three phases of menstrual cycle. There was no significant difference (p>0.05) in body weight between FO (69.44kg ± 12.48) and OP (69.07kg ± 12.35), however, in LP (70,32kg ± 12.39) compared to FO the women showed higher weight (0.0001), as well as, LP was higher than OP (p<0.0001).

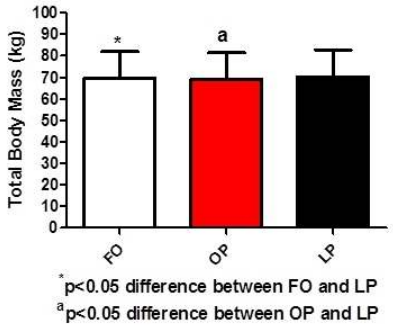


Figure 1. Evaluation of body weight in the different phases of the menstrual cycle (mean ± SD).

Figure 2 shows the results of VO2máx. In the OP the VO2máx. (36.85 ml.kg.min-1 ± 2.5) was higher compared to FO and LP (36.02 ml.kg.min-1 ± 2.7 and 34,80 ml.kg.min-1 ± 2.5, respectively, p< 0.0001).

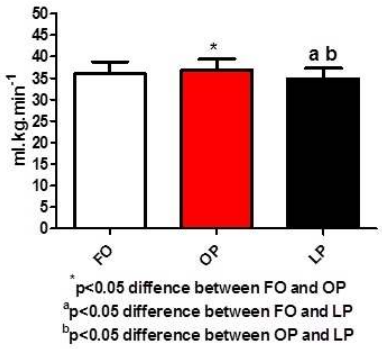


Figure 2. Assessment of VO2max in different phases of the menstrual cycle (mean ± SD).

Table 2 shows the results of Perceived Exertion (EPE) in three phases of menstrual cycle in the 10RM test in 45° Leg Press machine. The score of the EPE in the OP was higher compared to FO (2.40 ± 0.96 vs. 1.20 ± 0.63, respectively, p<0.05).

Table 2. Rating of perceived exertion test in 10 RM leg press 45 ° (Likert scale) in the different phases of the

	Very easy	Easy	Difficult	Very difficult	Mean ± SD	Value P
Follicular	-	-	9	1	1.20 ± 0.63	
Ovulatory	-	7	3	-	2.40 ± 0.06	P<0.05
Luteal	-	1	8	-	1.50 ± 1.08	

* P <0.05 the phase difference between FO and VO.

Table 3 are shows the results of Perceived Exertion (EPE) in three phases of menstrual cycle in the 10RM test in Pulley machine. There were no variation significant among the FO, OP and LP (1.20 ± 0.63; 1.60 ± 0.96; 1.80 ± 1.31, respectively, p=0.19).

Table 3. Rating of perceived exertion test in the 10 MR Pulley (Likert scale) in the different phases of the menstrual cycle.

	Very easy	Easy	Difficult	Very difficult	Mean ± SD	Value P
Follicular	9	-	1	-	1.20 ± 0.63	
Ovulatory	-	7	3	-	1.60 ± 0.96	P=0.19
Luteal	7	-	1	2	1.80 ± 1.31	

Figure 3 shows the results of body fat (%). The body fat in the FO (37.20% ± 5.6) was higher (p<0.0001) compared to OP (36.72% ± 5.8) and LP (34.80% ± 2.5), besides, in the OP the body fat was highest than LP (p<0.0001).

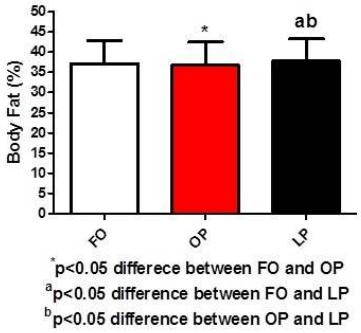


Figure 3: Changes in fat mass in the different phases of the menstrual cycle (mean ± SD).

Figure 4 shows the results of lean mass (%) in the three phases of menstrual cycle. In the OP (26.90% ± 2.2) the lean mass was higher (p<0.05) compared to LP (26.36% ± 2.1). There were no significant difference among FO (26.57% ± 2.2) compared to OP and LP (p>0.05)

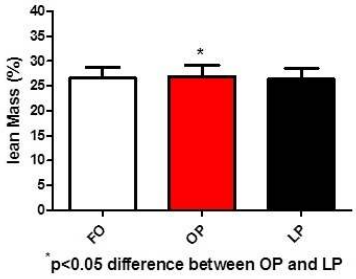


Figure 4: Variation of flexibility in the different phases of the menstrual cycle (mean ± SD).

Figure 5 shows the results of flexibility in the three phases of menstrual cycle. In the OP (29.40 cm ± 5.5) the flexibility was higher (p<0.05) compared to LP (28.60 cm ± 5.6). There were no significant difference among the FO (28.80 cm ± 5.4) compared to OP and LP (p>0.05).

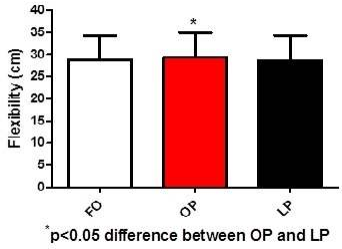


Figure 5: Variation of muscle mass in the different phases of the menstrual cycle (mean ± SD).

DISCUSION

Our study showed that during the three phases of menstrual cycle the physical fitness and exertion perceived are changes. In the OP of menstrual cycle were achieved the best results, according to Braun & Horton (2001), there is a consensus that the hormonal fluctuations that occur in women, are related to modifications of hormones estrogen and progesterone during menstrual cycle, affecting female physiology and perceived exertion.

With hormonal fluctuations that occur between the different phases of menstrual cycle, Lebrun (1994) indicates an improvement in performance in the ovulatory phase, explained by increased levels of estrogen and norepinephrine. Our data support with the findings by Lebrun (1994) through performance of physical fitness and exertion perceived accomplished during the ovulatory period from women practicing resistance exercise compared to other phases. According to Charkoudian & Johnson (2000), in this phase of the cycle the women still show a lower body temperature, causing less wear by loss of fluids and minerals compared to Follicular and Luteal phase.

Conclusion

In summary, our data show that during the luteal phase of the menstrual cycle occurs the greatest variation of weight, greater difficulty in exertion perceived, lower levels of VO2max. and changes in body composition. In ovulatory phase the women practicing resistance exercise showed a better performance of physical fitness. Concluded that resistance training programs should observe the variations presented in each phase of the menstrual cycle and be undulatory, changing the intensity and training volume.

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CHANGES IN PHYSICAL FITNESS DURING MENSTRUAL CYCLE IN WOMEN PRACTICING RESISTANCE EXERCISE

ABSTRACT

This study investigated the alterations in physical fitness during menstrual cycle in women practicing resistance exercise. The sample included ten women from Gloss gym, exercising to 6 months, age 29.4 years (± 4.6), height 1.61mt (± 0.08) and cycles of 28 days. Were evaluated the three phases of the menstrual cycle, starting by Follicular (FO) (1° to 4º day), after Ovulatory (OP) (14° day) and Luteal Phases (LP) (26° to 28° day). The following measurements were performed: total body mass, body fat (%), lean mass (%), flexibility, VO2máx. and perceived exertion (EPE) testing in the 10RM leg press 45° and pulley machines. The comparison of results at different times of the cycle was performed by one way ANOVA with repeated measures and significant level of p <0.05.Total body mass presented higher in the LP (70.32kg ± 12.39) compared to FO and OP (69.44kg ± 12.48 and 69.07kg ± 12.35, respectively, p<0.0001). EPE score in phase Ovulatory (2.40 ± 0.96) was higher compared to FO (1.20 ± 0.63) in the exercise leg press 45° (p<0.05). VO2máx. was significantly lower (p<0.0001) in the LP (34.80 ml/kg/min-1) compared to FO and OP (36.02 ml/kg/min-1 ± 2.7 e 36.85 ml/kg/min-1 ± 2.5, respectively). Body fat differed (p<0.0001) among all phases of the menstrual cycle (FO=37.20 % ± 5.6; OV=36.72 % ± 5.8 and LU 34.80% ± 2.5) and the lean mass was only significantly difference between OP and LP phases (26.90% ± 2.2 e 26.36% ± 2.1, respectively, p<0.05). OP phase the flexibility was higher compared to LP (29.40 cm ± 5.5 e 28.60 cm ± 5.6, respectively, p<0.05).Our findings show that physical fitness is influenced by different cycle menstrual phases.

KEYWORDS: Cycle menstrual, Resistance exercise, Physical fitness

ALTÉRATIONS DANS L´APTITUDE PHYSIQUE PENDANT LE CYCLE MENSTRUEL DES FEMMES PRATIQUANTES DES EXERCICES RESITÉS.

RESUMÉ

Cette étude a évalué des altérations dans l´aptitude physique pendant le cycle menstruel des femmes pratiquantes des exercices resistés. Ce sont participés dix volontaires de l´Académie Gloss (Caçador/SC) em se preparant il y a six mois, avec la moyenne âge de 29,4 ans (±4,6), haulter de 161 cm (±0,08) et cycles de 28 jours. Nous évaluons les trois phases du cycle em initiand pour la FOLIVULAR (FO)(1°ème au 4°ème jour), postérieurement l´ovulation (OV) (au 14°ème jour) et LÚTEA (LU) (26°ème au 28°ème jour). Nous avons évalué masse corporal total, pourcentage de graisse (%G), pourcentage de masse musculaire (%MM), flexibilité, VO2max et la perception subjetive de effort (PSE) em tests de 10RM dans le appareils LEG PRESS 45° et PULLEY. La comparison des résultads dans les différents moments du cycle a été realisé à travers de la Anova one way avec des mesures répete´s et miveau significativ de p<0,05. La masse corporel total a été majeur dans la phase LU(70,32Kg ±12,39) em comparaison des FO et OV (69,44kg ±12,48 et 69,07Kg ±12,35, respectivement, p<0,0001). Le score de PSE dans la OV (2,40 ± 0,96) dans l´exercice LEG PRESS 45° a été plus élevé (p<0,05) em comparaison à la FO (1,20 ± 0,63). Le VO2max. A été significativement mineur (p<0,0001) dans la LU (34,80ml/kg/min) em comparaison de FO et OV (36,02ml/kg/min ± 2,7 et 36,85ml/kg/min ±2,5 respectivement). O %G a différencé (p< 0,0001) parmi tous les phase du cycle menstruel (FO=37,20% ±5,6; OV=36,72% ±5,8 y LU 34,80% ±2,5) pourtant dans le %MM a eu variation significative parmiles OV

et LU (26,90%± 2,2 et 26,36%±2,1, respectivement, p<0,05). Dans la OV la flexibilité a monté si nous comparons à LU (29,40 cm ±5,5 et 28,60cm ±5,6 respectivement, p<0,05). Notre conclusion c´est que l´aptitude physique est influencé pour les diferentes phase du cycle menstruel.

MOTS CLÉ: Cycle Menstruel, Exercices Resistés, Aptitude Physique.

CAMBIO EN EL APITUD FISICA DURANTE EL CICLO MENSTRUAL EN EL EJERCICIOS DE RESISTENCIA

RESUMEM

Este estudio evaluó las alteraciones en la capacidad física durante el ciclo menstrual en mujeres que practican ejercicios de musculacion. Participaron 10 mujeres del gimnasio Gloss (Cacador/SC), entreinamiento 6 meses,com edad media de 29,4 anos (±4,6), estatura de 161cm (±0,08) y ciclos de 28 dias. Evaluados las tres fases del ciclo , iniciando em la Folicular (FO) (1° a 4° dia), Ovulatoria (OV) (siempre el 14 dia) Lutea (LU) (26°a 28° dia). Fueron analizados la masa corporal total, percentual de gordura (%G), percentual de masa muscular (%MM), flexibilidad, VO2max y la perseccion subjetiva del esfuerzo (PSE) em pruebas de 10RM en los equipos Leg Press 45 y Pulley . La coparación de resultados em los diferentes momentos del ciclo fue realizada por Anova one way con medidas repetidas con nível significativo adoptado de p<0,05. La masa corporal total fue mayor em la fase LU (70,32Kg ±12,39) comparando las fases FO y OV (69,44kg ±12,48 y 69,07Kg ±12,35, respectivamente ,p<0,0001). El score de la PSE em la fase OV (2,40 ± 0,96) en el ejercicio Leg Press 45 fue mas elevada (p<0,05) comparada a la fase FO (1,20 ± 0,63). La VO2max fue significativamente menor (p<0,0001) en la fase LU(34,80ml/kg/min) comparada a las fases FO y OV (36,02ml/kg/min ± 2,7 y 36,85ml/kg/min ±2,5 respectivamente). Em el %G hubo diferencia (p<0,0001) entre todas las fases del ciclo menstrual (FO=37,20% ±5,6; OV=36,72% ±5,8 y LU 34,80% ±2,5) entretanto em el %MM hubo variacion significativa solamente entre las fases OV y LU (26,90% ± 2,2 y 26,36% ±2,1, respectivamente, p<0,05). En la fase OV la flexibilidad fue mayor comparada a la fase LU (29,40 cm ±5,5 y 28,60cm ±5,6 respectivamente, p<0,05). Concluímos que la aptitud física es influenciada por las diferentes fases del ciclo menstrual.

PALABRAS CLAVE: Ciclo menstrual ,Ejercicios de resitencia, Aptitud fisica

ALTERAÇÕES NA APTIDÃO FÍSICA DURANTE O CICLO MENSTRUAL EM MULHERES PRATICANTES DE EXERCÍCIOS RESISTIDOS

RESUMO

Este estudo avaliou as alterações na aptidão física durante o ciclo menstrual em mulheres praticantes de exercícios resistidos. Participaram dez voluntárias da Academia Gloss (Caçador/SC), treinando há 6 meses, com média etária de 29,4 anos (± 4,6), altura de 161cm (± 0,08) e ciclos de 28 dias. Avaliamos as três fases do ciclo, iniciando pela Folicular (FO) (1° à 4º dia), posteriormente Fase Ovulatória (OV) (no 14° dia) e Fase Lútea (LU) (26° à 28° dia). Avaliou-se: massa corporal total, percentual de gordura (%G), percentual de massa muscular (%MM), flexibilidade, VO2máx. e a percepção subjetiva do esforço (PSE) em testes de 10RM nos aparelhos Leg Press 45° e Pulley. A comparação dos resultados nos diferentes momentos do ciclo foi realizada através da Anova one way com medidas repetidas e nível significativo de p<0,05. A massa corporal total foi maior na fase LU (70,32kg ± 12,39) comparado as fases FO e OV (69,44kg ± 12,48 e 69,07kg ± 12,35, respectivamente, p<0,0001). O escore da PSE na fase OV (2,40 ± 0,96) no exercício Leg Press (450) foi mais elevada (p<0,05) comparada à fase FO (1,20 ± 0,63). O VO2máx. foi significativamente menor (p<0,0001) na fase LU (34,80ml/kg/min) comparado as fases FO e OV (36,02 ml/kg/min ± 2,7 e 36,85 ml/kg/min ± 2,5, respectivamente). O %G diferenciou-se (p<0,0001) entre todas as fases do ciclo menstrual (FO=37,20 % ± 5,6; OV=36,72 % ± 5,8 e LU 34,80% ± 2,5), entretanto, no %MM houve variação significativa entre as fases OV e LU (26,90% ± 2,2 e 26,36% ± 2,1, respectivamente, p<0,05). Na fase OV a flexibilidade elevou-se se comparada a LU (29,40 cm ± 5,5 e 28,60 cm ± 5,6, respectivamente, p<0,05). Concluímos que a aptidão física é influenciada pelas diferentes fases do ciclo menstrual.

PALAVRAS-CHAVE: Ciclo menstrual, Exercícios resistidos, Aptidão física