

Correlation between menstrual cycle and performance

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Abstract

The objective of this research was to identify and demonstrate if there is a correlation between menstrual cycle and performance, particularly if during the menstrual phase the performance of the athletes decreases. For this study, 9 female athletes, aged 16-18, were subjected to a series of physical tests in two specific phases of the menstrual cycle: follicular (FP) and luteal (LP). The tests to which the athletes were subjected are the following: vertical jump test with Counter-Movement Jump (CMJ), sprint 3x30m and IET Yo-Yo. The results show that the athletes had a reduction in performance both during the follicular and luteal phase of the menstrual cycle during the performance of the IET Yo-Yo and not during jumping and sprinting performances.

Key words: athletics, running, athletes, menstrual cycle, performance, correlation

Introduction

In the last few decades the number of women who practice sports has increased considerably and this has led many scholars to carry out studies on the psycho-physical condition of women during the menstrual cycle. In fact, several studies have shown that hormonal changes, during the menstrual cycle, affect their performance.

Generally, a menstrual cycle is regular when it has a duration that goes from 25 to 35 days. The menstrual cycle is divided into 4 phases:

1. **Menstrual**, which lasts 4-6 days. In this period there is a low production of hormones (estrogen and progesterone) and abundant blood losses, so it is difficult to carry out intended work, in fact in this period we recommend low intensity workouts or rest;
2. **Follicular**, which goes from 6-7 days until around the 16th day. This period is characterized by a high production of estrogen hormones, so the body is more likely to do more intense work;
3. **Ovulation**, this phase lasts 36 hours and is characterized by a decrease in estrogen and an increase in progesterone. This phase coincides with the fertile period, in fact, the chances of becoming pregnant increase;
4. **Luteal**, which lasts about 11-16 days. In this period there is a lowering of the hormonal level and it is advisable to reduce the strength work.

Based on the above, it is essential to think of a training program taking into account an athlete's menstrual cycle, because the production of certain hormones, during specific phases of the cycle, make it more or less prone to certain types of work. In fact, an effective training program leads to a better performance response.

Method

To identify the correlation between menstrual cycle and sports performance, some physical tests were given to 9 athletes, such as:

- **Vertical jump test with Counter-Movement (or CMJ):** the athlete, with his hands resting on his hips, performing a "counter-movement", must quickly bend the lower limbs to 90 ° and jump as much as possible, falling back on the same place. The jump is made three times on a particular platform (Smart Jump) and the best jump is taken into consideration;
- **Sprint 3x30 meters:** the athlete, once positioned behind the white starting line, must perform three 30-meter running tests each with 2 minutes of recovery between one test and another. The best proof is taken into consideration;
- **Yo-Yo Intermittent resistance test (IET Yo-Yo):** the athlete must run repeatedly between one delimiting line and the other, placed at a distance of 20m, at a set speed. There are 5 seconds of recovery between each race. The test ends when the subject is no longer able to maintain this speed. The best proof is taken into consideration.

Results

Following the administration of the aforementioned physical tests to the 9 athletes, it appears that in most of them the performance of IET Yo-Yo has been influenced both during the follicular (FP) and luteal (LP) periods of the menstrual cycle, while the Sprint and CMJ performance were not affected in the two phases of the menstrual cycle. Below are the results. The results are shown below:

Subjects	Age	Height (cm)	Weight (kg) FP	Weight (kg) LP
1	16	160	51.9	52
2	16	168	64.3	64.5
3	16	166	63.2	63
4	16	170.5	73.5	73.1
5	17	156	49.8	49.5
6	18	162.5	61.3	60.5
7	17	160	51.9	52.2
8	16	152.5	51.5	51.3
9	16	153.5	56.5	57

Subjects	Cycle phase	CMJ (cm)	Sprint 5m (s)	Sprint 10m (s)	Sprint 30m (s)	Yo-Yo IET
1	FP	26	1.05	1.93	4.81	2330
2	FP	30	1.18	1.98	4.76	2650
3	FP	30	1.17	1.96	4.85	3370
4	FP	35	1.02	1.78	4.47	2250
5	FP	31	1.07	1.83	4.62	3890
6	FP	28	1.17	1.97	4.76	3210
7	FP	37	1.12	1.87	4.66	3290
8	FP	27	1.16	1.95	5.1	4570
9	FP	26	1.09	1.87	4.71	4130

Subjects	Cycle phase	CMJ (cm)	Sprint 5m (s)	Sprint 10m (s)	Sprint 30m (s)	Yo-Yo IET
1	LP	28	1.08	1.94	4.81	1970
2	LP	29	1.18	1.99	4.80	2210
3	LP	30	1.17	1.95	4.75	2730
4	LP	35	1.02	1.83	4.55	1770
5	LP	33	1.08	1.87	4.65	2250
6	LP	28	1.15	1.93	4.71	3490
7	LP	35	1.09	1.88	4.56	3170
8	LP	28	1.18	1.98	4.5	3330
9	LP	29	1.08	1.87	4.76	4570

T-test to estimate the CMJ in the two periods (Follicular and Luteal)

	Paired differences					t	gl	Sign. (two-tailed)
	Average	Standard deviation	Average standard error	95% confidence interval difference				
				Inferior	Superior			
VAR01 - VAR02	-,55556	1,58990	,52997	-1,77766	,66655	-1,048	8	,325

Level of significance set at $p > 0.05$ – There is no significant difference between the two performances in the two periods for the variable CMJ (0.325)

T-test to estimate the sprint (30 m) in the two periods (Follicular and Luteal)

	Paired differences					t	gl	Sign. (two-tailed)
	Average	Standard deviation	Average standard error	95% confidence interval difference				
				Inferior	Superior			
VAR03 - VAR04	,07222	,20825	,06942	-,08786	,23230	1,040	8	,329

Level of significance set at $p > 0.05$ – There is no significant difference between the two performances in the two periods for the variable Sprint 30 m (0.329)

T-test per stimare lo Yo-yo nei due periodi (Follicolare e Luteale)

	Paired differences					t	gl	Sign. (two-tailed)
	Average	Standard deviation.	Average standard error	95% confidence interval difference				
				Inferior	Superior			
VAR05 - VAR06	470,000	625,19330	197,70348	22,76365	917,23635	2,377	9	,041

Level of significance set at $p > 0.05$ – There is a significant difference between the two performances in the two periods for the variable Yo-Yo (0.041)

Discussion

The objective of the following research was to investigate whether the phase of the menstrual cycle influences the physical performance of female athletes. Through the administration of physical tests (vertical jump test with countermovement or CMJ, sprint 3x30m and IET Yo-Yo) to 9 athletes, aged between 16 and 18 years, it is possible to see from the data previously reported, that the menstrual cycle in part it influences the athletic performance of female athletes and more specifically during the performance of the EIT Yo-Yo in both phases of the menstrual cycle taken into consideration. In fact, the only significant difference ($p = 0.041$) was found in the Yo-yo test in the two periods under consideration (Follicular and Luteal). The data obtained from the first PQ and from the middle of the luteal phase, however, cannot be considered completely truthful as the associated hormones differ even shortly before ovulation in the late LP.

Conclusion

In conclusion, from the data obtained it is possible to note a potential reduction in the performance of maximum resistance during the LP of the menstrual cycle, but this reduction was not found in jumping and sprinting performances. In any case, it is appropriate to carry out further scientific studies based on accurate hormonal measurements, using more sophisticated methods, to better characterize the phases of the menstrual cycle and any effects they have on the performance of female athletes.

References

Aditi S. Majumdar, Robert A. Robergs (2011) The Science of Speed: Determinants of Performance in the 100 m Sprint, *International Journal of Sports Science & Coaching*, Volume 6, Number 3

Almini, C., Altavilla, G., Cassese, F.P., Cecilian, A., D'isanto, T. (2019) Physical and motor tests to estimate the improvement of the float serve, *Journal of Human Sport and Exercise*, 14 (Proc2), pp. S245-S250

Altavilla, G. (2014) Effects of the practice of muscle stretching [Učincivježbanjastretchingamuskulature] *Sport Science*, 7 (1), 66-67.

Altavilla, G., D'Elia, F., Raiola, G. (2018) A brief review of the effects of physical activity in subjects with cardiovascular disease: An interpretative key, *Sport Mont*, 16 (3), 103-106.

Altavilla, G., Furino, F., Marika, D.P., Raiola, G. (2015) Physical skills, sport learning and socio-affective education [Fizičkejveštine, sportskoučenje I društveno-afektivnoobrazovanje], *Sport Science*, 8, pp. 44-46.

Altavilla, G., Gaetano, R. (2018) Physiological effects of warm-up and problems related to team sports, *Sport Science*, 11, 83-88.

Altavilla, G., Mazzeo, F., D'Elia, F., Raiola, G. (2018) Physical commitment and specific work for each role in an elite soccer team, *Journal of Physical Education and Sport*, 18 (2), 570-574.

Cirillo, G., Nughes, E., Acanfora, A., Altavilla, G., D'Isanto, T. (2016) Physical and sport education testing by quantitative and qualitative tools in assessment in senior school: A proposal. *Sport Science*, 9, 97-101.

D'Elia, F. (2019) The training of physical education teacher in primary school. *Journal of Human Sport and Exercise*, 14, 00-104.

D'Isanto, T. (2016) Pedagogical value of the body and physical activity in childhood [Pedagoškavrijednostijelaitjelesneaktivnosti u djetinjstvu], *Sport Science*, 9, 13-18.

D'Isanto, T., D'Elia, F., Raiola, G., & Altavilla, G. (2019). Assessment of sport performance: theoretical aspects and practical indications. *Sport Mont*, 17(1), 79-82.

D'Isanto, T. (2019) Physical and sport education between Italian academic system and European Research Council structure panel. *Journal of Human Sport and Exercise*, 14, S66-S76.

D'Isanto, T., Pisapia, F., & D'Elia, F. (2019). Running and posture. *Journal of Human Sport and Exercise*, 14(4proc), S1058-S1064

Forte, D., Cecilian, A., Izzo, R., Altavilla, G. (2019) Transition period: Pilot study on performance reduction of ability to jump in volleyball, *Journal of Human Sport and Exercise*, 14 (Proc2), pp. S221-S227

Gaetano, R. (2012) Motor learning and didactics into physical education and sport documents in middle school-first cycle of education in Italy, *Journal of Physical Education and Sport*, 12 (2), 157-163.

- Gaetano, R., Rago, V. (2014) Preliminary study on effects of hiit-high intensity intermittent training in youth soccer players, *Journal of Physical Education and Sport*, 14 (2), 148-150.
- Kelee, R. L. (1984), Micro-Determinism and Concepts of Emergence. *Philosophy of Science*, 51(1), 44-63
- Nataša J. Janjić, Darko V. Kapor, Dragan V. Doder, Aleksandar Petrović & Slobodan Jarić (2017) Model for assessment of the velocity and force at the start of sprint race, *Journal of Sports Sciences*, 35:3, 302-309
- Pavone, M., (2014), L'inclusione educativa. Indicazioni pedagogiche per la disabilità, Mondadori Education S.p.A., Milano
- Pisapia, F., D'Isanto, T., (2018) Inclusive methods of adaptive training in sprints: a theoretical preliminary study, *Journal of Physical Education and Sport*, 18, Art 316, pp. 2101-2105
- Pisapia, F., Federici, A., Valentini, M., D'Isanto, T., (2019) Pilot study on sprint training methods in different types of athlete, *Journal of Human Sport and Exercise*, 14(2proc), S189-S197
- Pisapia, F., Cassese, F.P., Valentini, M., & D'Isanto, T. (2019). Comparison between sprint training methods in different types of athletes. *Journal of Human Sport and Exercise*, 14(4proc), S610-S617
- Rago, V., Pizzuto, F., Raiola, G. (2017) Relationship between intermittent endurance capacity and match performance according to the playing position in sub-19 professional male football players: Preliminary results. *Journal of Physical Education and Sport*, 17 (2), 688-691.
- Raiola, G. (2012) Bodily communication in volleyball between human and experimental sciences, *Mediterranean Journal of Social Sciences*, 3 (1), 587-597.
- Raiola, G. (2013) Body knowledge and motor skills, *Knowledge Cultures*, 1 (6), 64-72.
- Raiola, G. (2014) Motor control and learning skills according to cognitive and ecological dynamic approach in a vision on behaviorism, cognitive, Gestalt and phenomenology theories, *Mediterranean Journal of Social Sciences*, 5 (15), 504-506.
- Raiola, G. (2014) Teaching method in young female team of volleyball, *Journal of Physical Education and Sport*, 14 (1), 74-78.
- Raiola, G. (2017) Motor learning and teaching method, *Journal of Physical Education and Sport*, 17, 2239-2243.
- Raiola, G., (2012) Didactics of volleyball into the educate program for coaches/trainers/technicians of Italian Federation of Volleyball (FIPAV). *Journal of Physical Education and Sport*, 12 (1), pp. 25-29.
- Raiola, G., D'elia, F., Altavilla, G. (2018) Physical activity and sports sciences between European Research Council and academic disciplines in Italy, *Journal of Human Sport and Exercise*, 13, 283-295.