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Evaluation of explosive strength in female soccer players in different menstrual phases

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Abstract

The objective of the present study was to assess the explosive strength of female soccer players in three different menstrual phases. To conduct the study, 50 inter-university female soccer players were selected purposively. Only those female soccer players with no menstrual irregularity were selected purposively. The average age of selected female soccer players was 23.18 years. To assess explosive strength in inter-university female soccer players, a vertical jump test was used. Data analysis indicated that the explosive power of leg gets reduced before menstruation as well as during menstruation as compared to post menstruation condition. Based on results it was concluded that menstrual cycle affects explosive strength in female soccer players and should be trained in such a way that menstruation does not affect their explosive strength which is also an integral component of motor fitness.

Keywords: menstrual phase, explosive strength, soccer

Introduction

Explosive power is an integral part of soccer performance and a certain level of the explosive power of the lower limb is required to execute sports specific skills. It has been reported that certain training exercises are beneficial to enhance muscle groups for explosive strength (Lehnert *et al.*, 2009) [5]. Besides training, one aspect that affects physical fitness and other sports-related parameters in female soccer players in the menstrual cycle. The menstrual cycle is a natural phenomenon that occurs due to the female reproductive system. Luteinizing, follicle-stimulating and the sex hormones namely oestrogen and progesterone govern the three phases of the menstrual cycle. Due to fluctuating female sex hormones, muscle activity and metabolism gets affected differently in three menstrual cycle. Casey *et al.* (2014) [1] reported that muscle stretching reflex can fluctuate during different menstrual cycles and the neuromuscular coordination gets affected in the pre-ovulatory phase. Popova (2009) also observed that the physical capacity is least during menstruation period. Julian *et al.* (2017) [3] reported that endurance in female soccer players gets affected during mid-luteal phase of the menstrual cycle but the impact of menstrual cycle was not observed on sprint and jump performance of female soccer players. Constantini (2005) [2] revealed that female sex hormones affect exercise performance in different phases of the menstrual cycle. The findings on the association between the menstrual cycle and some sports specific tests are far from conclusive. As per the study of Williams and Krahenbuhl (1997) [8] reported that the slowest time was recorded before menstruation and during menstruation, while the timing becomes faster in postmenstrual period but few other scientists like Jurkowski, *et al.* (1996) [4] reported no change in vertical jump performance in three different phases of the menstrual cycle. The popularity of female soccer has increased immensely in recent times. Despite extensive research gender-specific difference in physical fitness parameters yields some contradictory results, hence the present study was planned to assess explosive strength in female soccer players in three different menstrual phases.

Objective

The objective of the present study was to assess the explosive strength of female soccer players in three different menstrual phases.

Hypothesis

It was hypothesized that the explosive strength of female soccer players will vary significantly across the menstrual cycle.

Methodology

The following methodological steps were taken to conduct the present study.

Sample

To conduct the study, 50 inter-university female soccer players were selected purposively. Only those female soccer players with no menstrual irregularity were selected purposively. The average age of selected female soccer players was 23.18 years.

Tools

Vertical jump test

To assess explosive strength in inter-university female soccer players, a vertical jump test was used. This test assesses leg power. Each subject was made to stand on one side of a wall and the subject was asked to touch the wall as high as possible with both feet firmly on the ground. Then the subject was asked to jump as high as possible. Different between standing position and jumping position mark on the wall gives a vertical jump score.

Procedure

50 inter-university female soccer players were subjected to a vertical jump test in a congenial environment. The score for the vertical jump test for each subject was recorded. The vertical jump test was administered to female soccer players 2 days before, during and 2 days after the menstruation. Scores on vertical jump test in three phases of the menstrual cycle was recorded. The data were analysed with the help of Repeated Measures ANOVA technique and these results are

given in table 1 and 2.

Result and Discussion

Table 1: Descriptive Statistics of Scores on Vertical Jump Test before, during and after Menstruation

Conditions	N	Vertical Jump	
		Mean	S.D.
Before Menstruation	50	26.34	7.39
During Menstruation	50	25.26	7.84
After Menstruation	50	26.90	7.71
F=10.82, p<.01			

The F=10.82, p<.01 reported in table 1 indicate that vertical jump performance of female soccer players prior to menstruation (M=26.34), during menstruation (M=25.26) and after menstruation (M=26.90) differ significantly.

The obtained results shown in table 1 and 1(a) were also confirmed by Least Significant Difference Test presented in table no. 2.

Table 2: Pairwise Comparisons of Mean Scores on Vertical Jump Test in three experimental conditions i.e. before, during and after menstruation Least Significant Difference Test with Significance Level .05

Mean (I)	Mean (J)	Mean Difference (I-J)
Before Menstruation	During Menstruation	1.080*
	After Menstruation	-.560*
During Menstruation	Before Menstruation	-1.080*
	After Menstruation	-1.640*
After Menstruation	Before Menstruation	.560*
	During Menstruation	1.640*

* Significant at .05 level

The results are also shown in figure 1.

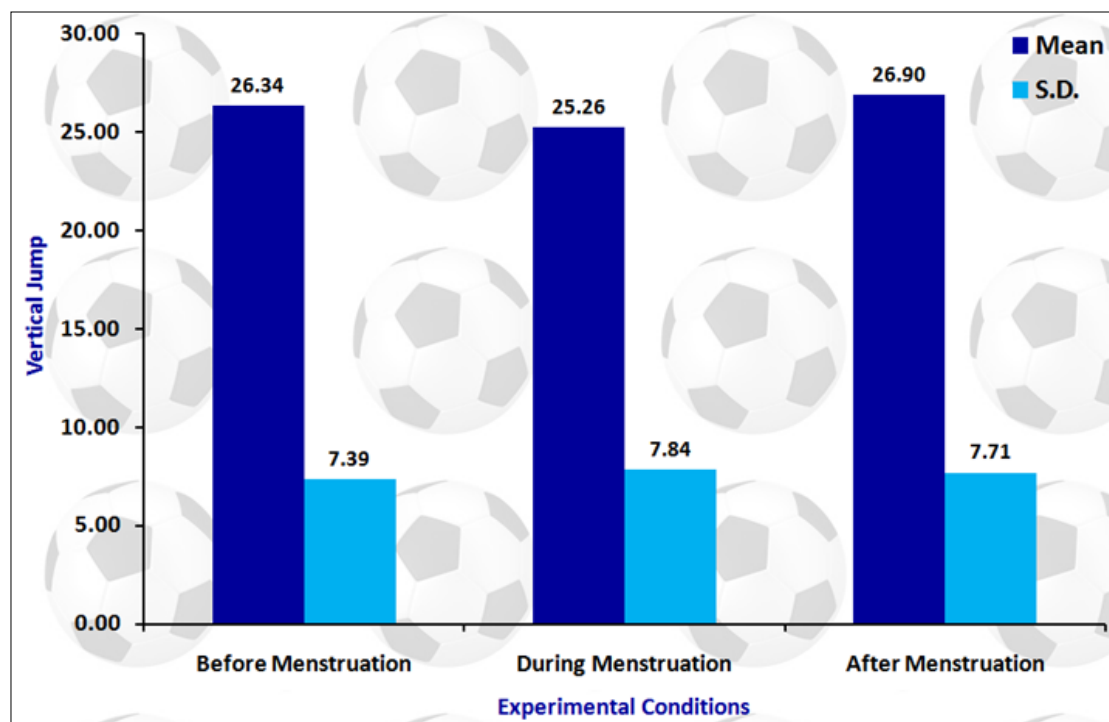


Fig 1: Bar Diagram Showing Mean Scores on Vertical Jump Test in three experimental conditions i.e. before, during and after menstruation

Statistical figures presented in table 2 draws the following inferences

- The vertical jump performance during menstruation (M=25.26) was found to be significantly inferior as compared to vertical jump performance before menstruation (M=26.34). The mean difference of 1.080 was found to be statistically significant at .05 level.
- The vertical jump performance was found to be significantly superior after menstruation (M=26.90) as compared to performance before the start of menstruation (M=26.34). The mean difference of .560 was found to be statistically significant at .05 level.
- The vertical jump performance was found to be significantly superior after menstruation (M=26.90) as compared to performance during menstruation (M=25.26). The mean difference of 1.640 was found to be statistically significant at .05 level.

Results are shown in table 1, 1(a) and 2 indicate that explosive power of leg gets reduced before menstruation as well as during menstruation as compared to post menstruation condition. The results are not surprising because muscle relaxation occurs significantly more in the ovulation phase due to the increase in the level of estrogen. It is scientifically known that serum estrogen levels fluctuate considerably throughout the menstrual cycle and affects not only ligament strength but muscle function also. The female sex hormone estrogen also has an impact on the central nervous system and it was observed that motor skills are decreased in the premenstrual phase as compared to the end of the luteal phase. The scientific evidence also tells that the electric activity of a neuron is affected by estrogen both peripherally and centrally. Studies have also shown that neuromuscular coordination is affected by different phases of the menstrual cycle with coordination at its best after the menstrual period as compared to the other two phases (Middleton and Wenger, 2006). Hence the results of the present study support the previous findings that the explosive strength of female soccer players gets decreased during menstruation and they are at their best after menstruation.

Conclusion

Based on results it was concluded that menstrual cycle affects explosive strength in female soccer players and should be trained in such a way that menstruation does not affect their explosive strength which is also an integral component of motor fitness.

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