

Influence of Menstrual Cycle Phases on Muscular Strength of Sportswomen

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Abstract

The aim of this study was to find out the influence of menstrual cycle phases on muscular strength of sportswomen. 60 sportswomen from different games and athletes from Andhra Pradesh in the age group of 22 - 25 years were selected and tested for their muscular strength through push up tests. Data were collected on normal day which formed initial scores and on 3rd, 9th, 14th and 21st day of menstrual cycle which formed menstruation phase (MP), follicular phase (FP), ovulation phase (OP) and luteal phase (LP) scores respectively. The collected data were statistically analysed using repeated ANOVA. The mean values of different phases of menstrual cycle proved that from the mean value of 19.07 at the initial stage, the muscular strength of the sports women decreased slowly with mean values of 19.02 at MP, 18.48 at FP, 18.37 at OP and at LP there seems to have some increase in strength with mean value of 18.83. These differences were tested for significance and the obtained F value of 9.85 was significant ($P < 0.05$). The post hoc analysis proved that comparing muscular strength at initial stage, there was significant decrease at FP and OP phases and there was no significant difference between initial stage and MP and initial stage and LP. Similar results were recorded when comparing menstrual phase muscular strength with FP and OP. The increase in muscular strength from OP to LP is also found to be significant. Thus, it was concluded that the slight decreases in muscular strength of the sportsmen at menstrual cycles FP and OP began to regain at LP, menstrual cycle is about to be completed.

INTRODUCTION

It is well recognized that average male is considerably stronger than the average female. In other words, on average general muscular strength in the female is approximately two-thirds that of the male. Female are weaker in the chest, arms and shoulder and stronger than the legs as compare to male. The reason for this is more likely related to the fact that both sexes use their legs to a similar degree, for example, standing, walking, running, climbing stairs, and cycling on the other hand, females use their upper limb muscle less for hard and resistive physical work in comparison to males. Females are poor in jumping and throwing events with exception to the discus throw, when their performances are adjusted according to body size both sexes are about equal. The common concept is that although weight training programmed increases strength, it also produces bulging muscles that turn into fat when the programmed discontinues. This concept has a bearing effect on females. Many women believe that strength training will make them look muscular and less feminine. Thus, it stated that muscularity and femininity are established by genetic inheritance and not by the amount of strength training.

During their reproductive years the hormone levels in women fluctuate due to the menstrual cycle. The four hormonal markers of the menstrual cycle (oestrogen, progesterone, follicle stimulating hormone (FSH) and luteinising hormone (LH)) change continuously throughout the cycle. These fluctuations in female steroid hormones affect the autonomic nervous system and metabolic functions (Florini, 1987). Therefore certain physiological parameters and athletic performance could change along with the menstrual cycle phases (Becker *et al.* 1982). However, the influence of the menstrual cycle phase on muscle strength, is unclear. Sarwar *et al.* (1996) tested skeletal muscle strength, relaxation rate and fatiguability of the quadriceps during the menstrual cycle and found no changes in these parameters for women taking oral contraceptives. Phillips *et al.* (1996) reported higher adductor pollicis strength during the follicular phase than during the luteal phase, with a rapid decrease in strength around ovulation. They suggested that oestrogen has a strengthening action on skeletal muscle, although the underlying mechanism is not clear. Greeves *et al.* (1999), however, reported the highest quadriceps strength during the mid-luteal phase and found a positive relationship between strength and progesterone concentration. Different other studies have found no changes in skeletal muscle strength over the menstrual cycle (DiBrezza *et al.* 1991 and Quadango *et al.* 1991).

When comparing strength over a period of time, such as in menstrual cycle research, it is especially important to ensure maximal neural activation during each test. A further problem encountered in research on the influence of the menstrual cycle on physical performance is the timing of the testing. Studied proved that there was further scope for research to find out the influence of menstrual cycle on muscular strength and muscular endurance of sports women.

METHODOLOGY

The subjects for this study were 60 sportswomen from different games and athletes from Andhra Pradesh. The age of the subjects ranged between 22 - 25 years. The subjects were selected on random basis. The subjects' menstrual cycles are counted from the first day of menstrual flow, because the onset of menstruation corresponds closely with the hormonal cycle. Subjects tested for their muscular strength through push ups test. The menstrual phases and the testing day of selected variables, muscular strength and muscular endurance of the subjects are presented in Table I.

Tab 1: MENSTRUAL PHASES AND THE AND THE TESTING PERIOD

Phases	Name of Phase	Days	Testing Period
A	Menstrual phase	1 to 4	3 rd day
B	Follicular phase	5 to 13	9 th day
C	Ovulation	14	14 th day
D	Luteal phase	15 to 28	21 st day

Thus data of initial stage, that is, 2 days before the first day of menstrual flow and 3rd day, 9th day, 14th day and 21st day on muscular endurance and muscular endurance were collected. The collected data was subjected to statistical treatment using repeated ANOVA. When significant F ratio was obtained, the results were further subjected to post hoc analysis using Scheffe's confidence interval test. In all cases 0.05 level was fixed to test the hypothesis of this study.

RESULTS

The influence of menstrual cycle on muscular strength of the sports women, the mean, standard deviation and range are presented in Table II.

Tab II: Muscular Strength Mean, Standard Deviation and Range during Menstrual cycle compared with initial scores

Menstrual Phases	Mean	SD	Range	
			Min	Max
Initial	19.07	± 1.31	16	21
Menstrual phase	19.02	± 1.31	16	20
Follicular phase	18.48	± 1.27	15	20
Ovulation phase	18.37	± 1.06	15	20
Luteal phase	18.83	± 1.97	15	23

Results presented in Table II shows that there was differences due to menstrual cycle phases. Statistical significance of the differences was tested through repeated ANOVA and results presented in Table III.

Tab III: Repeated ANOVA results Influence of Menstrual Cycle on Muscular Strength of Sportswomen

Source	SS	df	MS	F
Subjects	458.55	70		9.85*
Trials	23.78	4	5.95	
Residual	180.98	300	0.60	
Total	615.75	374		

* Significant

Since significant F value of 9.85 was obtained, the results were subjected to post hoc analysis using Scheffe's confidence interval test and the multiple comparisons of paired means presented in Table IV.

Tab IV: Multiple Comparisons of Paired Means of Scheffe's Post Hoc Analysis

Initial	Menstrual Phase	Follicular phase	Ovulation Phase	Luteal phase	MD	Reqd C.I
19.07	19.02				0.05	0.44
19.07		18.48			0.58*	0.44
19.07			18.37		0.70*	0.44
19.07				18.83	0.23	0.44
	19.02	18.48			0.53*	0.44
	19.02		18.37		0.65*	0.44
	19.02			18.83	0.18	0.44
		18.48	18.37		0.12	0.44
		18.48		18.83	0.35	0.44
			18.37	18.83	0.47*	0.44

* Significant

DISCUSSIONS ON FINDINGS

The mean values presented in Table II of different phases of menstrual cycle proved that there exists difference in muscular strength of the sportswomen. From the mean value of 19.07 at the initial stage, the muscular strength of the sports women decreased slowly with mean values of 19.02 at menstrual phase, 18.48 at follicular phase, 18.37 at ovulation phase and at luteal phase there seems to have some increase in strength with mean value of 18.83. These differences were tested for significance and the obtained F value of 9.85 was significant ($P < 0.05$). The post hoc analysis proved that comparing muscular strength at initial stage, there was significant decrease at follicular and ovulation phases and there was no significant difference between initial stage and menstrual phase and initial stage and luteal phase. Similar results were recorded when comparing menstrual phase muscular strength with follicular, ovulation and luteal phases. The increase in muscular strength from ovulation to luteal phase is also found to be significant. Thus, the results of this study proved that the slight decreases in muscular strength of the sportsmen at menstrual cycles began to regain while the cycle is about to be completed. Wiecek et.al. (2016) compared the indicators of starting speed, anaerobic endurance and power in women to investigate whether the values of these indicators differ in women during the follicular and luteal phases of the menstrual cycle and found lower power decrease during follicular and luteal phases and the findings of this study is in agreement with this finding..

CONCLUSION

It was found that the low level decrease in muscular strength recorded in the menstrual cycle phases reaches its peak at ovulation phase and began to regain at luteal

phase so that muscular strength of the sportswomen gained their normal muscular strength after the menstrual cycle.

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