ANALYSIS OF CIRCADIAN VARIATION IN SELECTED PHYSIOLOGICAL PARAMETERS AND SPORTS SKILLS OF FOOTBALL PLAYERS

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Abstract

The purpose of the present study was conducted to analysis of circadian variation in selected physiological parameters and sports skills of football players. Twenty (N = 20) male intercollegiate football players of D.C.P.E., Amravati, Maharashtra (India) were taken as the subjects for the study. The age of the subjects ranged from 18 to 23 years and were randomly selected. Three (3) circadian parameters (heart rate, respiratory rate, vital capacity and two (2) football skills (dribbling and kicking a rolling ball for accuracy) were measured. One Way Analysis of Variance (ANOVA) was use to analysed the data. Results of the study reveals that significant difference were found in circadian variation as well as in sports skills of football players.

Keywords: Football, Circadian Variation, Heart rate, Respiratory rate, Vital capacity and Sports Skills.

INTRODUCTION

Football is also known as soccer in a team game playing between two teams consisting of eleven (11) players in each team. It is one of the most inspired game by the spectators of the world. This game can be played almost everywhere like in streets, school playgrounds, parks or even beaches etc. It is a family game of sports that involve, to proving degrees, kicking a ball to score a

goal. It helps to improve strength in our lower and upper body. Our upper body advances due to running on the field, shooting, dribbling, jumping and tackling etc.

Circadian rhythms is a variation of various physiological parameters, such as heart rate, peak expiratory flow rate, grip strength of hands, finger counting speed, time estimation, oral/skin temperature, blood pressure, random number addition speed, subjective drowsiness, fatigue and attention can be monitored externally by using simple device.

METHODS

Selection of the Subjects:

For the purpose of this present study, twenty (N = 20) male intercollegiate football players from D.C.P.E, Amravati were selected as subjects for the study. The age of the subjects ranged from 18 to 23 years.

Selection of Tools:

The criterion measures for the selected variables were chosen are given below:-

• Heart rate was counted in number by experiencing palpation of the radial artery in one minute.

• Vital capacity was measured by using dry spirometer and the score was recorded in litres.

• The respiratory rate was recorded in number by observing the up and down movements of the abdomen due to exhalation or inhalation in one minute.

• Dribbling ability was measured by using dribbling test of (L.Health and E.G Rodger 1983) and score was recorded in seconds.

• Kicking a rolling ball for accuracy was assessed by employing the test suggested by L.Health and E.G.Rodger (1983) and score was recorded in number.

Collection of Data:

Before collecting the data, the method and procedure of performing each tests was clearly explained and demonstrated to the subjects. The information pertaining to this study were collected by administer to test on the selected variables.

Data Analysis:

The data was analyzed by using Statistical Package of Social Sciences (SPSS) were computed to examine the differences regarding heart rate, respiratory rate, vital capacity, dribbling and kicking. One Way Analysis of Variance (ANOVA) was also computed to find out the mean significant differences circadian variation and sports skills of football players. Least Significant Difference (LSD) post-hoc test comparison was also made wherever F-ratio was found significant to determine the significant difference among ordered paired means at 0.05 level.

RESULTS

Results pertaining to the circadian variations in selected physiological parameters and sports skills of football players are presented in the tables given below:-

Table – 1
One way analysis of variance for the data on heart rate of football players due to circadian variation

	SS	Df	MS	F-ratio
Between the group	1420.44	3	473.48	22.37*
Within the group	1608.45	76	21.16	
Total	3028.89	79		

*Significant at 0.05 level   Tabulated $F_{0.05 (3, 76)} = 2.728$

Table -1 reveals that there is significant difference among the means value of heart rate due to circadian variation as the calculated F-value of 22.37 is quite higher than the tabulated F-value of 2.728 at 0.05 level for the 3/76 degrees of

freedom. Since the obtained F-ratio is found to be significant, therefore Least Significant Difference (LSD) post hoc test was employed to determine the paired mean difference in the selected variable of heart rate of football players due to different timing of testing conditions and it has been presented in Table -2.

Table-2
Paired mean difference for the variable of heart rate of football players due to circadian variation

Means of Heart Rate				M.D.	C.D.
6am-8am	10am-12noon	2pm-4pm	6pm-8pm		
64.55	67			2.45	2.88
64.55		64.85		0.30	2.88
64.55			74.95	10.40*	2.88
	67	64.85		2.15	2.88
	67		74.95	7.95*	2.88
		64.85	74.95	10.10*	2.88

*Significant at 0.05 level

It is evident from the above Table-2 that mean difference of the heart rate in between 6:00 AM to 8:00 AM and 6:00 PM to 8:00 PM (MD = 10.45), in between 10:00 AM to 12:00 PM and 6:00 PM to 8:00 PM (MD = 7.95) and in between 2:00 PM to 4:00 PM and 6:00 PM to 8:00 PM (MD=10.10) was statistically significant because all the aforesaid values are higher than the critical difference value of 2.88 at 0.05 level.
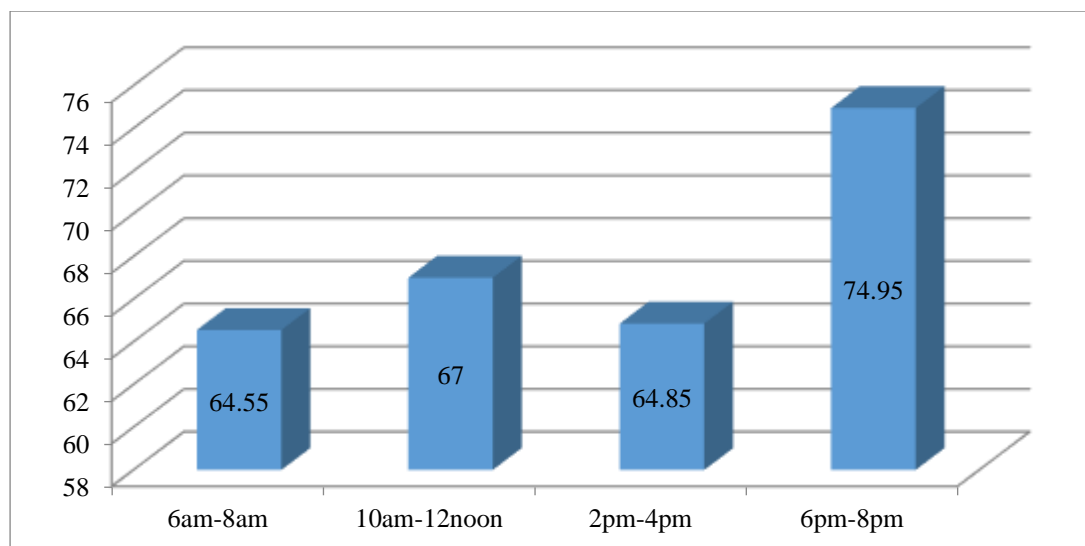
Fig.2. Mean Difference of Heart Rate of Football Players Due to Circadian Variation.

Table – 3
One way analysis of variance on respiratory rate of football players due to circadian variation

	SS	Df	MSS	F-ratio
Between the group	127.65	3	42.55	2.76*
Within the group	1171.1	76	15.40	
Total	1244.75	79		

*Significant at 0.05 level   Tabulated $F_{0.05 (3, 76)}$ = 2.728

Finding of table-3 reveals that there was significant difference among the means of respiratory rate due to circadian variation, as the calculated F-value 2.76 is higher than the tabulated F-value of 2.728 at 0.05 level for the 3/76 degrees of freedom. Since the obtained F-ratio was found to be significant, therefore Least Significant Difference (LSD) post-hoc test was employed to determine the paired mean difference in the selected variable of respiratory rate of football players due to different timing of testing conditions and it has been presented in Table-4.

Table -4

Paired mean difference for the variable of respiratory rate of football players due to circadian variation

Means of respiratory Rate				M.D.	C.D.
6am-8am	10am-12noon	2pm-4pm	6pm-8pm		
15.35	16.6			1.25	2.47
15.35		15.2		0.15	2.47
15.35			18.35	3.00*	2.47
	16.6	15.2		1.4	2.47
	16.6		18.35	1.75	2.47
		15.2	18.35	3.15*	2.47

*Significant at 0.05 level

It is evident from the above Table-4 that mean difference in the respiratory rate in between 2:00 PM to 4:00 PM and 6:00 PM to 8:00 PM (MD = 3.15) and in between 6:00 AM to 8:00 AM 6:00 PM to 8:00 PM (MD = 3.00) was statistically significant as all the aforesaid values are higher than the critical difference value of 2.47 at 0.05 level. whereas no significant differences was found in the respiratory rate readings in between 6:00 AM to 8:00 AM and 10:00 AM to 12:00 PM (MD = 1.25) 6:00 AM to 8:00 AM and 2:00 PM to 4:00 PM (MD = 0.15) 10:00 AM to 12:00 PM and 2:00 PM to 4:00 PM (MD = 1.4) and 10:00 AM to 12:00 PM and 6:00 PM to 8:00 PM (MD = 1.75) as all obtained mean difference value was less than that of critical difference value of 2.47 to be significant at 0.05 level. The mean difference have been graphically presented in Figure-4.
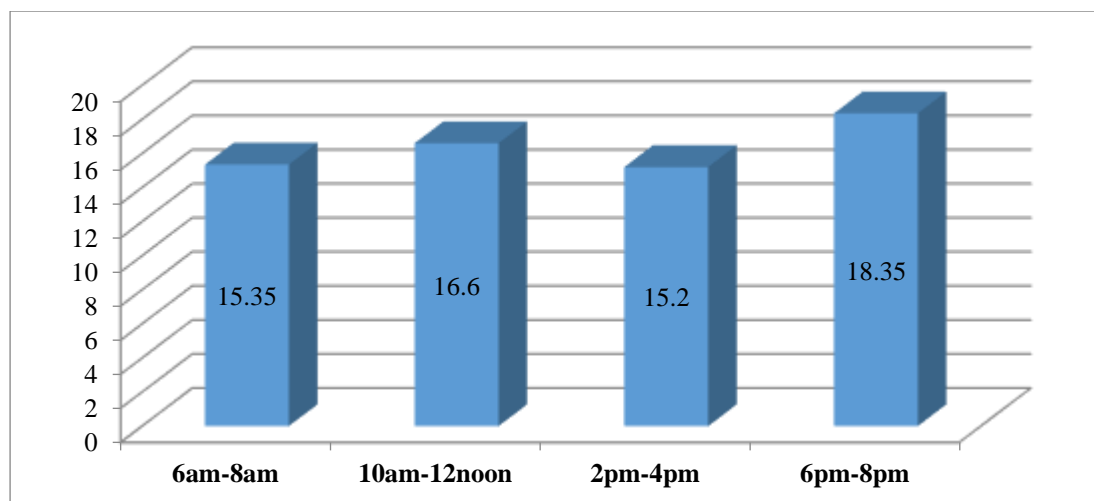
Fig.4. Mean Difference of Respiratory Rate of Football Players Due to Circadian Variation.

Table – 5

One way analysis of variance on vital capacity of football players due to circadian variation

	SS	**Df**	**MSS**	**F-ratio**
Between the group	22358340	3	7452780	22.935*
Within the group	24696080	76	324948.42	
Total	47054420	79		

*Significant at 0.05 level   Tabulated $F_{0.05\ (3,\ 76)} = 2.728$

Table-5 indicates that there is significant difference among the means of vital capacity due to circadian variation, because the calculated F-value of 22.935 is quite higher than the tabulated F-value of 2.728 at 0.05 level for the 3/76 degrees of freedom. Since the obtained F-ratio is found to be significant, therefore Least Significant Difference (LSD) post-hoc test is employed to determine the paired mean difference in the selected variable of vital capacity of football players due to different timing of testing conditions and it has been presented in Table-6.

Table -6
Paired mean difference for the variable of vital capacity of football players
due to circadian variation

Means of vital capacity				M.D.	C.D.
6am-8am	10am-12noon	2pm-4pm	6pm-8pm		
4740	4066			674*	359.07
4740		4615		125	359.07
4740			5545	805*	359.07
	4066	4615		548*	359.07
	4066		5545	1479*	359.07
		4615	5545	930*	359.07

*Significant at 0.05 level

It is evident from the above Table-6 that mean difference in the vital capacity between 10:00 AM to 12:00 AM and 6:00 PM to 8:00 PM (MD = 1479), in between 2:00 PM to 4:00 PM and 6:00 PM to 8:00 PM (MD = 930), in between 6:00 AM to 8:00 AM and 6:00 PM to 8:00 PM (MD = 805), in between 6:00 AM to 8:00 AM and 10:00 AM to 12:00 PM (MD = 674) and in between 10:00 AM to 12:00 PM and 2:00 PM to 4:00 PM (MD = 549) was statistically significant as all the aforesaid values was higher than the critical difference value of 359.07 at 0.05 level. Whereas no significant difference was found in the vital capacity reading in between 6:00 AM to 8:00 AM and 2:00 PM to 4:00 PM (MD =125) as the obtained mean difference value of 359.07 to be significant at 0.05 level. The mean differences have been graphically presented in Figure-6
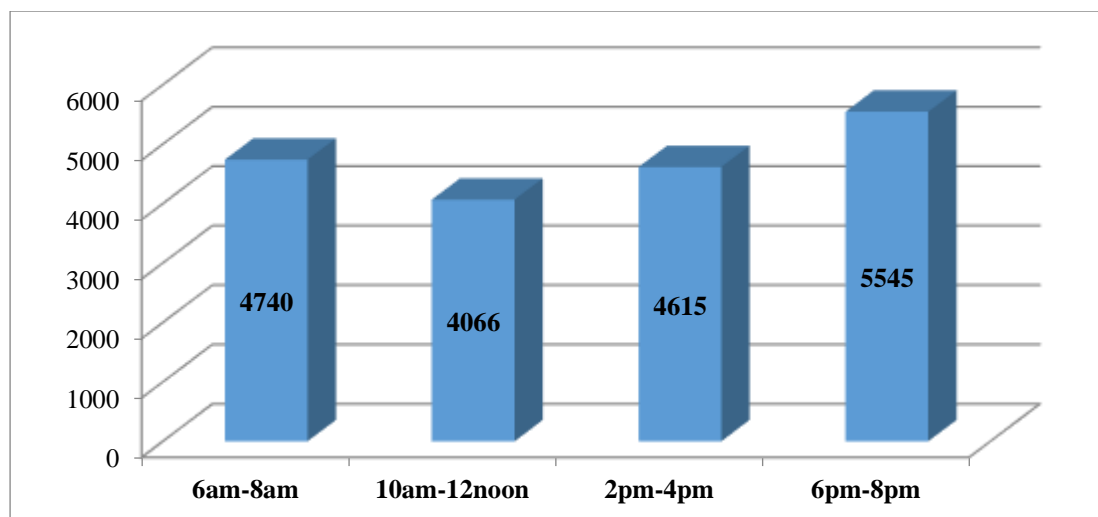
Fig.6. Mean Difference of Vital Capacity of Football Players Due to Circadian Variation.

Table – 7

One way analysis of variance on dribbling of football players due to circadian variation

	SS	Df	MSS	F-ratio
Between the group	64.62	3	21.54	43.08*
Within the group	37.93	76	0.50	
Total	102.55	79		

*Significant at 0.05 level   Tabulated $F_{0.05\ (3,\ 76)} = 2.728$

Table -7 shows that significant difference was found among the means of dribbling performance of football Players due to circadian variation, as the calculated F-value of 43.08 was quite higher than the tabulated F-value of 2.728 at 0.05 level for the 3/76 degrees of freedom. Since the obtained F-ratio was found to be significant, therefore Least Significant Difference (LSD) post-hoc test was employed to determine the paired mean difference in the selected variable of dribbling of football players during different timing of testing conditions and it has been presented in Table -8.

Table -8
Paired mean difference for the variable of dribbling of football players due to circadian variation

Means of Dribbling				M.D.	C.D.
6am-8am	10am-12noon	2pm-4pm	6pm-8pm		
8.72	9.48			0.76*	0.45
8.72		9.14		0.42	0.45
8.72			7.14	1.58*	0.45
	9.48	9.14		0.34	0.45
	9.48		7.14	2.34*	0.45
		9.14	7.14	2*	0.45

*Significant at 0.05 level

From the above Table-8 that mean difference in the performance of dribbling between 10:00 AM to 12:00 PM and 6:00 PM to 8:00 PM (MD = 2.34), in between 2:00 PM to 4:00 PM and 6:00 PM to 8:00 PM (MD = 2), in between 6:00 AM to 8:00 PM and 6:00 PM to 8:00 PM (MD = 1.58), in between 6:00 AM to 8:00 AM and 10:00 AM to 12:00 PM (MD = 0.76) was statistically significant as all the aforesaid values was higher than the critical difference value of 0.45 at 0.05 level. whereas no significant differences was found in the dribbling in between 6:00 AM to 8:00 AM and 2:00 PM to 4:00 PM (MD = 0.42) and 10:00 AM to 12:00 PM and 2:00 PM to 4:00 PM (MD = 0.34) as the obtained mean difference value was less than that of critical difference value of 0.45 to be significant at 0.05 level. The mean differences have been graphically presented in Figure-8.
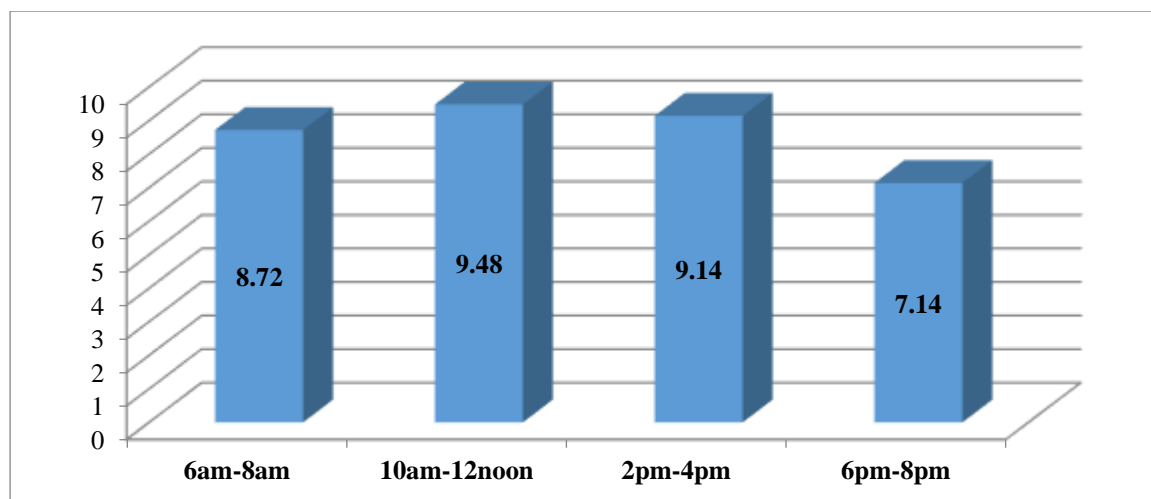
Fig.8. Mean Difference of Dribbling Performance of Football Players Due to Circadian Variation.

Table – 9

One way analysis of variance on kicking a rolling ball for accuracy of football players due to circadian variation

	SS	Df	MSS	F-ratio
Between the group	264.6	3	88.2	
Within the group	261.6	76	3.44	25.63*
Total	526.2	79		

*Significant at 0.05 level   Tabulated $F_{0.05\ (3,\ 76)} = 2.728$

Table-9 reveals that significant difference was found among the means scores of kicking for accuracy due to circadian variation, as the calculated F-value of 25.63 was quite higher than the tabulated F-value of 2.728 at 0.05 level for the 3/76 degrees of freedom. Since the obtained F-ratio was found to be significant, therefore Least Significant Difference (LSD) post-hoc test was employed to determine the paired mean difference in the selected variable of kicking a rolling ball for accuracy of football players due to different timing of testing conditions and it has been presented in Table -10.

Table -10

Paired mean difference in the variable of kicking a rolling ball for accuracy of football players due to circadian variation

Means of kicking for Accuracy				M.D.	C.D.
6am-8am	10am-12noon	2pm-4pm	6pm-8pm		
14.6	12.8			1.8	1.15
14.6		13.6		1.00	1.15
14.6			17.6	3.00*	1.15
	12.8	13.6		0.8	1.15
	12.8		17.6	4.8*	1.15
		13.6	17.6	4.00*	1.15

*Significant at 0.05 level

It is evident from the above Table-10 that the kicking a rolling ball for accuracy in between the testing timing of 10:00 AM to 12:00 PM and 6:00 PM to 8:00 PM (MD = 4.8), in between 2:00 PM to 4:00 PM and 6:00 PM to 8:00 PM (MD = 4) and in between 6:00 AM to 8:00 PM and 6:00 PM to 8:00 PM (MD = 3) was statistically significant as all the aforesaid values was higher than the critical difference value of 1.15 at 0.05 level. whereas no significant differences was found in the kicking in between 6:00 AM to 8:00 AM 10:00 AM to 12:00 PM (MD = 1.8) 6:00 AM to 8:00 AM and 2:00 PM to 4:00 PM (MD = 1) and 10:00 AM to 12:00 PM and 2:00 PM to 4:00 PM (MD = 0.8) as all obtained mean difference value was less than that of critical difference value of 1.15 to be significant at 0.05 level. The mean differences have been picturesquely presented in Figure-10
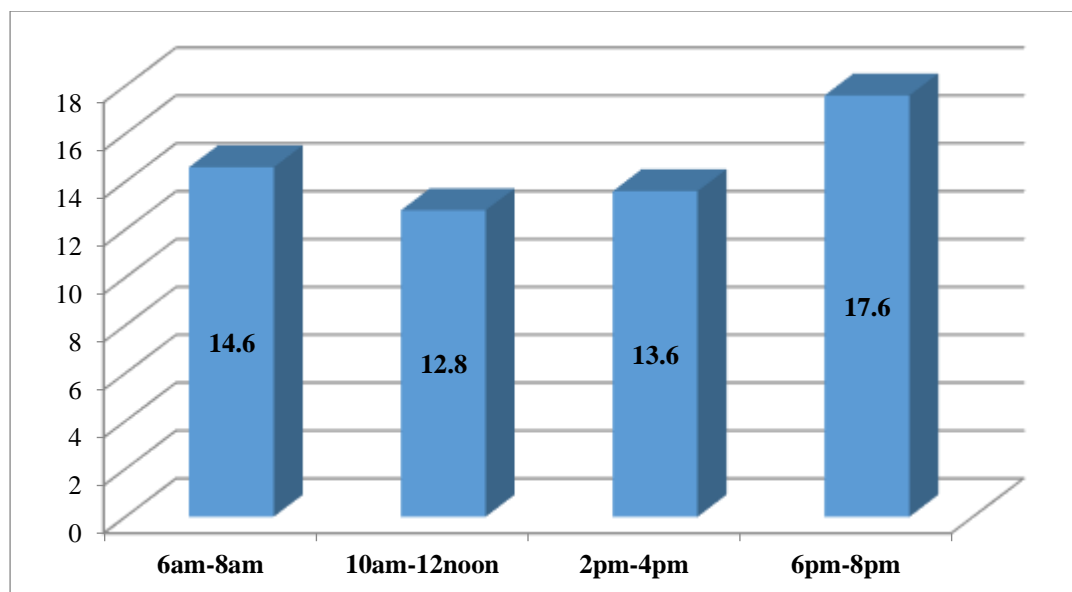
Fig.10. Mean Difference of Kicking a Rolling Ball for Accuracy of Football Players Due to Circadian Variation.

DISCUSSIONS

According to the results of statistical analysis it was clearly stated that the selected physiological variables and skills of football significantly differed while tested in different timings, moreover the selected physiological variables of heart rate and respiratory rate showed significantly less beats/min during 6:00 AM to 8:00 AM and 2:00 PM to 4:00 PM than the 10:00 AM to 12:00 PM and 6:00 PM to 8:00 PM, it may be attributed to the fact that the selected subjects were chosen from the professional college of physical education who had participated at the intercollegiate level, where the subjects were kept themselves busy with their physical activities during morning (7:00 AM-8:00 AM) and evening (4:30 PM-6:30 PM) session. Hence, prior to those periods candidates Circulatory system keep remain in resting condition and such results found in the study. Whereas football skills were performed by the subjects significantly better during 6:00 PM to 8:00 PM, it may be because all the footballers have regular match practice in

the afternoon session (5:00 PM-7:00 PM) has shown best performance in the above mentioned timing of 6:00 PM-8:00 PM.

CONCLUSIONS

On the basis of the results, the following conclusions may be drawn.

i.   Significant difference was found in the physiological variables of heart rate, respiratory rate and vital capacity of football players due to circadian variation.

ii. Significant difference was found in dribbling and kicking a rolling ball for accuracy of football players due to circadian variation.

iii. It was observed that football players showed significantly higher vital capacity, heart rate, respiratory rate during 6:00 PM to 8:00 PM.

iv. It was also found that skills of football players i.e. dribbling and kicking a rolling ball for accuracy significantly showed highest performance during 6:00 PM to 8:00 PM.

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