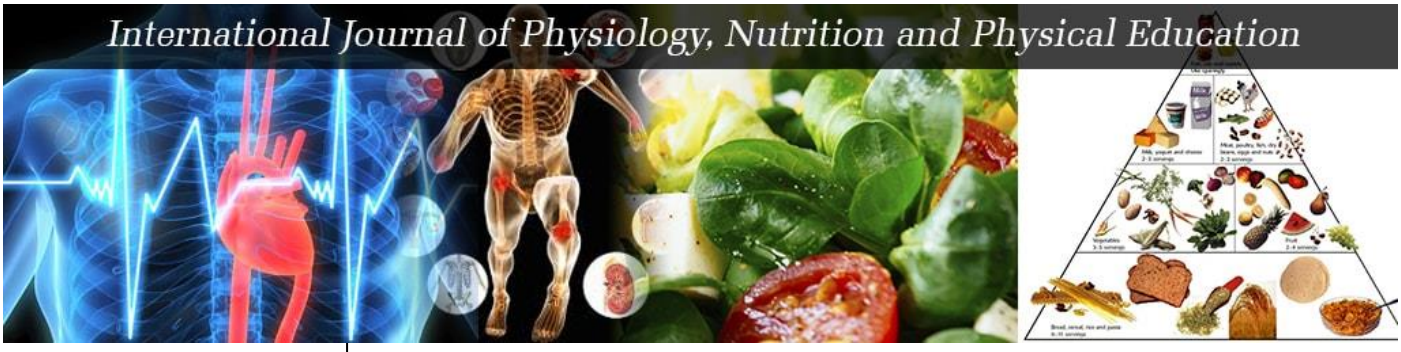

ISSN: 2456-0057
IJPNPE 2018; 3(2): 171-174

www.journalofsports.com
Received: 22-05-2018
Accepted: 24-06-2018

C Sumanta Das
Research Scholar,
Dept of Physical Education,
Jadavpur University, Kolkata,
West Bengal, India

Dr. Atanu Ghosh
Assistant Professor,
Dept of Physical Education,
Jadavpur University, Kolkata,
West Bengal, India

Corresponding Author:
C Sumanta Das
Research Scholar,
Dept of Physical Education,
Jadavpur University, Kolkata,
West Bengal, India

Effect of circadian rhythm on selected motor fitness heart rate and body temperature of sprinter in winter month

C Sumanta Das and Dr. Atanu Ghosh

Abstract
Circadian rhythm is a 24-hour psychological and physiological fluctuations. The purpose of this investigation was to evaluate the circadian effect on selected motor fitness components, heart rate and body temperature of the sprinter in winter month. Ten male sprinters (MEAN±SD; age23.88±1.35year; weight60±1.61kg, height165±1.42cm, with 3.0±2.0 year training period)were chosen. The motor fitness, heart rate and body temperature were chosen as variables. One way repeated measure ANOVA was used to find out mean difference is significant or not at three different time of day (8am, 12:00 pm and 4:00pm). Post-hoc test was used to identify differences between three different times of day (08am, 12:00pm and 4:00pm).The result of the investigation showed no significant circadian impact on speed, agility, explosive leg power and heart rate but significant difference was observed on body temperature. Where as speed, agility, explosive leg power, heart rate showed significantly mean variation. It is concluded that selected motor fitness and heart rate variables indicated no significant circadian effect but significant effect was observed on body temperature of male sprinters.

Keywords: Circadian rhythm, body temperature, heart rate, motor fitness, and sprinter

Introduction
One of the most sensational characteristic of the world in which we live is the example of day and night. Correspondingly, essentially all species show daily changes in their behavior as well as physiology. These daily rhythms are not only a response to the 24-hour changes in the state of being constrained by the earth turning on its rotate in any case, rather, rise up out of a timekeeping system inside the living thing. This timekeeping system, or biological "clock," allows the living being to imagine and get ready for the adjustments in the state of being that are connected with day and night, along these lines ensuring that the living being will "settle on the best choice" at the opportune time.

The biological clock likewise gives internal temporal association and guarantees that inner changes happen in coordination with each other. The concept of circadian rhythms in human physical execution has been comprehensively investigated. Physical activities including anaerobic fitness, aerobic fitness, fine and gross motor aptitudes have indicated clear circadian rhythms (Bessot *et al*., 2007; Reilly *et al*., 2006) [1, 2].

As such, there has been incredible enthusiasm for attempting to clarify the components responsible for the differentiation in exercise execution for the duration of the day. In people, the essential circadian pacemaker is the suprachiasmatic nucleus (SCN). The SCN, situated inside the hypothalamus, gets direct input regarding the solar cycle from the retina (Hastings, 2004) [3]. With this data gave through the retino-hypothalamic pathway, the SCN co-ordinates daily biological rhythms (ie. hormone emission, temperature change, neural activation) in accordance with the sun oriented time and sleep wake cycle (Buijs *et al*., 2003; Waterhouse *et al*., 2005) [4, 5, 8, 12]. These rhythmic motions of biological processes administer a significant number of our propensities and activities, and furthermore impact the exercises that we perform during the day.

Numerous physiological capacities related with athletic performance have additionally been appeared to follow a particular CR (Winget *et al*., 1985) [6, 18, 20]. For example, resting levels of sensorimotor, perceptual, and subjective execution and a few neuromuscular, social,

cardiovascular, and metabolic factors have been found to happen in the early evening, in accordance with peak body temperature rhythm. (Cappaert, 1999) [7, 17]. It is basic and interesting to know whether individuals show peak motor performance just during a specific hour of day,whether exists circadian rethyam in execution of motor task and physical fitness all these inquiry have incited the researcher to take up the present study. The result were required to illuminate significant viewpoint for arranging training program and finish schedule for the field of sports and game. Anyway there has been no consideration paid to investigation of time of day impact on physical fitness and physiological factor.Therfore the reason for this study was to explore the effect of circadian rhythm on some motor fitness factor, heart rate and body temperature in sprinter.

Purpose of The Study

The purpose of the study was to investigate effect of circadian rhythm on selected motor fitness heart rate and body temperature of sprinter in winter month.

Materials and Methods Subjects

Ten male sprinters were selected from Department of Physical Education, Kalyani University. These selected subjects, studying B.P.Ed and M.P.Ed students who practice athletics regularly and take part in competition and their age range between 21 to 24 years.

Table 1: Personal Data of the Subjects

Variable	Mean ±SD
Age (year)	23.88 ± 1.35
Weight (kg)	60 ± 1.61
Height(cm)	165 ± 1.42 cm

The study was conducted in the month of January has cold and high humid natural environment. All the subjects had been acclimatized to this environment for years.

Table 2: Meteorological condition of different time of day

Variable	8 am	12 PM	4 PM
Temperature	13° c	20 °c	24°c
Humidity	74%	62%	42%

Selection of test items

As per available literature, the following standardized test were used to collect data for selected Motor Fitness components, Body Temperature and Heart rate variables.

Table 3: Test Items/Instrument

S. No	Component	Test items	Unit of measurement
1	Speed	50 m dash	In seconds
2	Agility	Shuttle run	In seconds
3	Explosive leg power	Standing broad jump	In meter
4	Body temperature	Digital thermometer	Fahrenheit
5	Heart rate	Digital heart rate monitor	In number

Analytical Procedures

After collecting the data the calculation are done through statistical analysis accordingly. The obtained data in the form of digital scores will be treated statically to get results and to draw conclusion. The mean and SD will be calculated as descriptive statistics. Statistical significance of mean difference will be tested by ANOVA and post hoc test.

Results

At first the data regarding performance of the subject has been presented in table no.4

Table 4: Performance of 50m Dash of the Subjects at different time of day

Variable	Time	N	Mean	Std. Deviation	Std. Error
Speed	8:00 AM	10	6.56	0.35	0.113
	12 PM	10	6.25	0.36	0.112
	4:00 PM	10	6.24	0.34	0.114
	Total	30	6.409	0.368	0.067

Table-4 reveals that mean and SD with regard to speed in the different time of day6.56±0.35,6.25±0.36,6.24±0.34 respectively. It was seen from the table that the mean score in 50 m. dash was better during 4.00 Pm.Thus it was considered that performance was higher in 4pm. In order to find out whether mean difference is significant or not ANOVA was calculated. Table 5 shows the result

Table 5: significance of statistical difference in speed among different time of day

ANOVA						
Variable		Sum of Squares	Df	Mean Square	F	Sig.
Speed	Between Groups	0.481	2	0.24	1.886	0.171
	Within Groups	3.439	27	0.127		
	Total	3.92	29			

From table 5 it was clear that there was no significant difference exist in speed among the different time of day as because the calculate value was higher than at 0.05.

Table 6: Performance of agility of the Subjects at different time of day

Variable	Time	Number	Mean	Std. Deviation	Std. Error
Agility	8AM	10	8.41	0.51	.16423
	12.00 PM	10	8.30	0.48	.13271
	4 PM	10	8.22	0.41	.15375
	Total	30	8.3160	0.46672	.08521

Table-6 reveals that mean and SD with regard to agility in the different time of day (morning, noon and afternoon), which were recorded 8.41±0.51, 8.30±0.48 and 8.22±0.41 respectively. It was seen from the table that the mean score in agility was better during 4.00 Pm.Thus it was considered that performance was higher in 4 pm. In order to find out whether mean difference is significant or not ANOVA was calculated. Table 7 shows the results.

Table 7: Significance of statistical difference in agility among different time of day

ANOVA						
Variable		Sum of squares	Df	Mean square	F	Sig
Agility	Between Groups	.177	2	.088	.388	.682
	Within Groups	6.140	27	.227		
	Total	6.317	29			

From table 7 it was clear that there was no significant difference exist in agility among the different time of day as because calculate value was higher than at 0.05.

Table 8: Performance of explosive leg strength of the Subjects at different time of day

Variable	Time	Number	Mean	Std.Dev	Std.Error
Explosive leg power	8AM	10	2.72	0.31	.09950
	12.00 pm	10	2.74	0.32	.10435
	4PM	10	2.75	0.32	.10224
	Total	30	2.7093	0.31413	.05735

Table-8 reveals that mean and SD with regard to explosive leg strength in the different time of day (morning, noon and afternoon), which were recorded 2.72 ±0.31,2.74±0.3 and 2.75±0.32 respectively. It was seen from the table that the mean score in explosive leg strength was better during 4.00 Pm. thus it was considered that performance was higher in 4 pm.

In order to find out whether mean difference is significant or not ANOVA was calculated. Table 9 shows the results.

Table 9: Significance of statistical difference in explosive leg strength among different time of day

ANOVA						
Variable		**Sum of squares**	**Df**	**Mean square**	**F**	**Sig**
Explosive leg power	Between Groups	.050	2	.025	.239	.789
	Within Groups	2.812	27	.104		
	Total	2.862	29			

From table 9 it was clear that there was no significant difference exist in explosive leg power among the different time of day as because the calculate value was higher than at 0.05.

Table 10: Mean and SD value of body temperature of the Subjects at different time of day

Time	N	Mean	Std. Deviation	Std. Error
8 AM	10	97.5700	.43982	.13908
1 2 PM	10	98.2300	.43218	.13667
4 PM	10	98.9400	.53996	.17075
Total	30	98.2467	.72954	.13320

Table-10 reveals that mean and SD with regard to body temperature in the different time of day (morning, noon and afternoon), which were recorded 97.57±0.43,98.23±.43 and 98.94±0.53 respectively. It was seen from the table that the mean score in temperature was better during 4 Pm. In order to find out whether mean difference is significant or not ANOVA was calculated. Table 11 shows the results.

Table 11: Significance of statistical difference in body temperature among different time of day

ANOVA						
Variable		**Sum of squares**	**df**	**Mean square**	**F**	**Sig**
Body temperature	Between group	9.389	2	4.694	20.964	.000
	Within group	6.046	27	.224		
	total	15.435	29			

From table 11 it was clear that there was significant difference exist in body temperature among the different time of day as because the calculate value was lower than at 0.05.

In order to find out the exact difference between different times of day post hoc test were apply. Table -12 showed the result.

Table 12: Post hoc test for difference between the paired means on body temperature

(I) Time	(J) Time	Mean Difference (I-J)	Std. Error	Sig.
8 AM	12 PM	-.66000*	.21163	.004
	4 PM	-1.37000*	.21163	.000
12 PM	8 AM	66000*	.21163	.004
	4 PM	-.71000*	.21163	.002
4 PM	8 AM	1.37000*	.21163	.000
	12 PM	.71000*	.21163	.002

From the table value it was clear that significant difference in body temperature was exist between 8am and 12pm,12pm and 4 pm and 4 pm and 8am.

Thus from the table value it was conclude that mean value of body temperature was significantly higher at 4 pm. (as mean body temperature was higher at that time).

Table 13: Mean and SD value of heart rate of the Subjects at different time of day

Variable	Time	Number	Mean	Std. deviation	Std. error
Heart rate	8 AM	10	76.90	6.38	2.01
	12.00 PM	10	73.20	7.81	2.47
	4 PM	10	72.00	8.24	2.60
	Total	30	74.03	7.56	1.38

Table-13 reveals that mean and SD with regard to heart rate in the different time of day (morning, noon and afternoon), which were recorded

76.90±6.38,73.20±7.81 and 72.00±8.24 respectively. It was seen from the table that the mean score in heart rate was better during 4 Pm.

In order to find out whether mean difference is significant or not ANOVA was calculated. Table 14 shows the results.

Table 14: Significance of statistical difference in heart rate among different time of day

ANOVA						
Variable		**Sum of squares**	**Df**	**Mean square**	**F**	**Sig**
Heart rate	Between group	130.47	2	65.23	1.15	.331
	Within group	1528.50	27	56.61		
	Total	1658.96	29			

From table14 it was clear that there was no significant difference exist in heart rate among the different time of day as because the calculate value was higher than at 0.05.

Discussion

The aim of this study was to observe the effect of circadian rethyam on selected motor fitness, heart rate and body temperature of sprinter.

Body temperature

In the investigation, when the subjects body temperature at various time were estimated, it was discovered that body temperature increased bit by bit from morning to night. The body temperature measured at 4 pm was seen as statistically higher than the body temperature level estimated at 8.00 am and 12.00 pm. Similar result have been reported by (Venugopal *et al*. 2010) [10]. This may be the reason that during afternoon hours the physical, physiological variablesand Metrological condition were found to be superior than that of other times of the day. There are an incredible number of studies in writing that help this finding. Reilly and Brooks (2005) [2] expressed that the body

temperature expanded at evening hours when contrasted with the morning hours and the body temperature came to is most elevated level between the periods of 16. 00-19.30.pm

Heart rate

According to Afonso *et al*., (2009) resting heart rate changes during the dayAkkurt (1996) observed that heart rate was higher in the afternoon in comparison to the morning, whereas in another study Özdamar (2009) found it for the evening period. In the present study, heart rate was found higher in the period 4 pm. Heart rate may adapt to physiological or environmental conditions at different times of the day. This difference occurring in heart rate is considered to be related to body temperature and autonomic activity (Burgess *et al*., 1997)

Motor fitness

In the present examination which distinctly show that selected motor fitness variables like speed, explosive leg power agility dependent on circadian rhythm were examine, speed, explosive leg strength and agility at 4 pm were seen as statistically higher than those measured at 8 am and 12 pm. Similar result have been reported by wingate (2005). The result of the present study in the nature of circadian rethyam of motor fitness does show a continuous increase tendency from morning to evening.

This may be due to the fact that there were two basic rethyam which are related to exercise and sports performance. The first of these was body temperature while the second one was sleep wake cycle. (Venugopal, R., Gupta, O., & Patel, H. 2010) [10], According to review by Atkinson and Reilly (1996) [14] noted that the majority of components of sports performance vary with time of day and peak in the early evening close to the daily maximum in body temperature. In our current examination competitor were presented to warm up followed by the test, impact of warm up, sleep wake cycle life style, cronotype, which couldn't controlled and may impact the outcome

.

Conclusion

Within the limitations of the study. It is concluded that The result of the investigation showed no significant circadian impact on speed, agility, explosive leg power and heart rate but significant effect was observed on body temperature which was significantly higher at 4 pm.

References

1. Bessot N, Moussay S, Clarys JP, Gauthier A, Sesboüé, B, Davenne D, *et al*. The influence of circadian rhythm on muscle activity and efficient force production during cycling at different pedal rates. Journal of Electromyography and Kinesiology 2007;17(2):176-183.
2. Reilly T. The science of training–soccer: A scientific approach to developing strength, speed and endurance. Routledge 2006.
3. Evans WDG Hastings. Public Health Brandfng. Applying Marketing for Social Change, Oxford, Oxford University Press 2004.
4. Buijs RM, Eden CV, Goncharuk VD, Kalsbeek A. Circadian and Seasonal Rhythms-The biological clock tunes the organs of the body: Timing by hormones and the autonomic nervous system. Journal of Endocrinology 2003;177(1):17-26.
5. Waterhouse J, Atkinson G, Edwards B, Reilly T. Circadian rhythms in sports performance—an update. Chronobiology international 2005;*22*(1), 21-44
6. Winget CM, DeRoshia CW, Holley DC. Circadian rhythms and athletic performance. Medicine & Science in Sports & Exercise 1985.
7. Cappaert TA. Time of day effect on athletic performance: An update. The Journal of Strength & Conditioning Research 1999;13(4):412-421.
8. Waterhouse J, Atkinson G, Edwards B, Reilly T. Circadian rhythms in sports performance—an update. Chronobiology international 2005;*22*(1):21-44
9. Fenoglio-Simeone KA, Wilke JC, Milligan HL, Allen CN, Rho JM, Maganti RK, *et al*. Ketogenic diet treatment abolishes seizure periodicity and improves diurnal rhythmicity in epileptic Kcna1-null mice. Epilepsia 2009;50(9):2027-2034.
10. Venugopal R, Gupta O, Patel H. Temporal pattern of circadian rhythm in sportsmen. Journal of Exercise Science and Physiotherapy 2010;6(1):1.
11. Shephard RJ. Sleep, biorhythms and human performance. Sports Medicine 1984;1(1):11-37.
12. Waterhouse J, Atkinson G, Edwards B, Reilly T. Circadian rhythms in sports performance—an update. Chronobiology international 2005;22(1):21-44
13. Edwards BJ, Atkinson G, Waterhouse J, Reilly T, Godfrey R, Budgett R, *et al*. Use of melatonin in recovery from jet-lag following an eastward flight across 10 time- zones. Ergonomics 2000;43(10):1501-1513.
14. Atkinson G, Reilly T. Circadian variation in sports performance. Sports medicine 1996;21(4):292-312.
15. Souissi N, Bessot N, Chamari K, Gauthier A, Sesboüé B, Davenne D, *et al*. ffect of time of day on aerobic contribution to the 30-s Wingate test performance. Chronobiology international 2007;24(4):739-748.
16. Ebben WP, Bierwirth T, Azmus E, Garceau LR. October. Diurnal Variation in Stretch Shortening Cycle and Non-Stretch Shortening Cycle Jumping Performance. In ISBS-Conference Proceedings Archive 2014.
17. Cappaert TA. Time of day effect on athletic performance: An update. The Journal of Strength & Conditioning Research 1999;13(4):412-421.
18. Winget CM, DeRoshia CW, Holley DC. Circadian rhythms and athletic performance. Medicine & Science in Sports & Exercise 1985.
19. Powers SK, Howley ET. Exercise physiology: Theory and application to fitness and performance (pp. 303-308). New York, NY: McGraw-Hill 2007.
20. Winget CM, DeRoshia CW, Holley DC. Circadian rhythms and athletic performance. Medicine & Science in Sports & Exercise 1985.
21. Rahnama N, Sajjadi N, Bambaeichi E, Sadeghipour HR, Daneshjoo H, Nazary B, *et al*. Diurnal variation on the performance of soccer-specific skills. World J Sport Sci 2009;2:27-30.