



ISSN: 2456-0057

IJPNPE 2020; 3(1): 2199-2201

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Received: 18-11-2017

Accepted: 20-12-2017

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## Influence of circadian rhythm on selected motor fitness and heart rate of jumper

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### Abstract

Biological rhythms are defined as cyclic change that recurs regularly over a given time and circadian rhythm refers to variations recurring periodicity of 24 hours. The purpose of this investigation was to evaluate the influence of circadian rhythm on selected motor fitness and heart rate of the jumper. Ten male jumper (MEAN±SD; age $21.77\pm 1.35$ year; weight $61\pm 1.61$ kg, height $162\pm 1.42$ cm, with  $5.0\pm 2.0$  year training period) were chosen. The selected motor fitness and heart rate were chosen as variables. One way repeated measure ANOVA was used to find out mean difference is significant or not at three different times 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 power and heart rate. Whereas speed, agility, explosive power, heart rate showed significantly mean variation. It is concluded that selected motor fitness and heart rate variables indicated no significant circadian effect of male jumper.

**Keywords:** Circadian rhythm, heart rate, motor fitness, and jumper

### Introduction

The term circadian comes from the Latin phrase *circa diem* which means around a day. (Manfredini *et al.*, 1998) <sup>[1]</sup> and refers to the psychological and physiological changes that occur during the 24-hour time frame (Hardin, 2000) <sup>[2]</sup>. Circadian rhythm has been concentrated in numerous fields (Bessot *et al.*, 2007; Febbraio *et al.*, 1996; Galliven *et al.*, 1997) <sup>[3, 4]</sup>.

Sports specialists who considered the effect of circadian rhythm on sport execution have stressed that many parameters change during the day (Afonso *et al.*, 2006; Bougard *et al.*, 2009; Briswalter *et al.*, 2007; Burgess *et al.*, 1997) <sup>[5, 6]</sup>. Athletic competitions start in the morning and keep during the evening. Circadian rhythm affects many physical and physiological features during the day; and therefore, may affect physical and physiological attributes of jumper athletes both in a competition and in training sessions. Although there are studies carried out on circadian rhythm in different branches of sport in the literature (Chittababu, 2013; Kline *et al.*, 2007; Özdamar, 2009; Reilly *et al.*, 2007) <sup>[8, 10, 9]</sup>, no study has been found examining the effect of circadian rhythm particularly in jumper athlete.

For this reasons we aimed to evaluate with this in mind, it is unclear if the small physiological changes in heart rate, and motor fitness resultant from circadian rhythm alone, may influence the performance in jumper athletes. Particularly in athletes who are accustomed to training/competing within a wide time frame across the day. This performance information is important to both coach and athlete as strategies; Therefore, we examined the influence of circadian rhythm on selected motor fitness and heart rate on jumper athlete.

### Tools and techniques used

#### Subjects

Ten male jumper athletes were selected from Department of Physical Education, west bengal state University. These selected subjects, studying B.P.ED who practice athletics regularly and take part in competition and their age range between 19 to 23 years. There was no dropout in the study and all the subjects cooperated well during experimentation and testing periods.

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**Table 1:** Personal Data of the Subjects

Variable	MEAN ±SD
Age (year)	21.77 ± 1.35
Weight (kg)	61 ± 1.61
Height(cm)	162 ± 1.42 cm

The study was conducted in the month of April has hot and average 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	27°C	33 °c	30°C
Humidity	94%	78%	76%

**Selection of test items**

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

**Table 3:** Test Items.

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

**Results**

After collecting the data the calculation are done through statistical analysis accordingly. 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	Different time of day	N	Mean	Std. Deviation
SPEED	8:00 AM	10	6.29	0.35
	12 PM	10	6.56	0.34
	4:00 PM	10	6.27	0.33
	Total	30	6.40	0.36

Table-4 reveals that mean and SD with regard to speed in the different time of day (morning, noon and afternoon),which were recorded 6.29 ±0.35,6.56±0.34 and 6.27±0.33 respectively. It was seen from the table that the mean score in 50 m. dash was better during 4.00 Pm.(as higher sign indicate lower performance) 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 results

**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	0.47	2	0.23	1.87	0.18
	Within Groups	3.42	27	0.12		
	Total	3.91	29			

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

**Table 6:** Performance of explosive leg strength of the Subjects at different time of day

variable	Different time of day	number	mean	Std.deviation
Explosive leg strength	8AM	10	2.76	0.33
	12.00 AM	10	2.68	0.31
	5PM	10	2.78	0.34
	Total	30	2.75	0.35

Table-6 reveals that mean and SD with regard to explosive leg strength in the different time of day (morning, noon and afternoon), which were recorded 2.76±0.33, 2.68±0.31 and 2.78±0.34 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 7 shows the results.

**Table 7:** 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 strength	Between Groups	.06	2	.024	.238	.788
	Within Groups	2.82	27	.105		
	Total	2.862	29			

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

**Table 8:** Performance of agility of the Subjects at different time of day

Variable	Time	Number	Mean	Std.Dev.
AGILITY	8AM	10	8.30	0.47
	12.00 PM	10	8.39	0.50
	4 PM	10	8.24	0.40
	Total	30	8.319	0.46672

Table-8 reveals that mean ± SD with regard to agility in the different time of day (morning, noon and afternoon),which were recorded 8.30 ±0.47,8.39±0.50 and 8.24±0.40 respectively. It was seen from the table that the mean score in agility was better during 4.00 Pm.(as higher sign indicate lower performance) 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 agility among different time of day

ANOVA						
Variable	Between Groups	Sum of squares	Df	Mean square	F	Sig
AGILITY		.178	2	.087	.387	.681
	Within Groups	6.15	27	.228		
	Total	6.33	29			

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

**Table 10:** Mean and SD value of heart rate of the Subjects at different time of day.

Variable	Time	number	Mean	Std. deviation
Heart rate	8 AM	10	70.80	6.37
	12.00 PM	10	72.20	7.72
	4 PM	10	75.00	8.20
	Total	30	73.02	7.49

Table-10 reveals that mean and SD with regard to heart rate in the different time of day (morning, noon and afternoon), which were recorded  $70.80 \pm 6.37$ ,  $72.20 \pm 7.72$  and  $75.00 \pm 8.20$  respectively. It was seen from the table that the mean score in heart rate was better during 8 am. 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 heart rate among different time of day

ANOVA						
Variable	Between group	Sum of squares	Df	Mean square	F	Sig
Heart rate		131.47	2	65.23	1.14	.332
	Within group	1527.50	27	56.61		
	Total	1658.96	29			

From table 11 it was clear that there was no significant difference exist among the different time of day as because the significant p value was higher than at 0.05.

## Discussion

The aim of this study was to observe the influence of circadian rhythm on motor fitness and heart rate on jumper.

The analysis of data reveals that no significant effect of circadian rhythm on explosive leg strength, speed and agility. Similar result have been reported by Chittibabu, B. (2014) [14].

It may be due to the training session of athletes. Because all the players participate in training sessions during morning and evening. that is reason they had given same execution in the morning, and afternoon. Man's performance in sports or some other field relies upon its movement- oriented conduct. All these activities which can be noted by other with or without the support of instruments and which have their foundation in the biological fact. As it were the exhibition of an individual is the aftereffect of the incorporated and agreeable working of the few powerful cycle of the body, which are physiological, mental and psycho-physiological and are biomechanical in nature.

## Heart rate

According to Afonso *et al.*, (2009) resting heart rate changes during the day. Akkurt (1996) saw that heart rate was higher toward the afternoon in contrast with the morning, though in another investigation Özdamar (2009) [10] discovered it for the evening period. In the present study, heart rate was discovered higher in the period 4 pm. Heart rate may adjust to physiological or natural conditions at various time of the day. This distinction happening in heart rate is considered to be related to body temperature and autonomic activity (Burgess *et al.*, 1997) [6].

## Conclusion

Within the limitations of the study. it is concluded that

1. In case of jumper athlete the preferred motor fitness variables specifically speed, explosive leg strength and agility were showed no significant circadian effect at different time of day.
2. In case of jumper athlete the preferred physiological variables namely heart rate was found no significant circadian effect at different time of day
3. Further investigations are needed to determine the mechanisms in the origin of the cause of circadian variation in these parameters.

## References

1. Manfredini R, Manfredini F, Fersini C, Conconi F. Circadian rhythms, athletic performance, and jet lag. *British journal of sports medicine*. 1998; 32(2):101-106.
2. Kaneko M, Park JH, Cheng Y, Hardin PE, Hall JC. Disruption of synaptic transmission or clock-gene-product oscillations in circadian pacemaker cells of *Drosophila* cause abnormal behavioral rhythms. *Journal of neurobiology*. 2000; 43(3):207-233.
3. Souissi N, Bessot N, Chamari K, Gauthier A, Sesboüé B, Davenne D. Effect of time of day on aerobic contribution to the 30-s Wingate test performance. *Chronobiology international*. 2007; 24(4):739-748.
4. DeRijk R, Michelson D, Karp B, Petrides J, Galliven E, Deuster P *et al.*, Exercise and circadian rhythm-induced variations in plasma cortisol differentially regulate interleukin-1 $\beta$  (IL-1 $\beta$ ), IL-6, and tumor necrosis factor- $\alpha$  (TNF $\alpha$ ) production in humans: high sensitivity of TNF $\alpha$  and resistance of IL-6. *The Journal of Clinical Endocrinology & Metabolism*. 1997; 82(7):2182-2191.
5. Bougard C, Bessot N, Moussay S, Sesboüé B, Gauthier A. Effects of waking time and breakfast intake prior to evaluation of physical performance in the early morning. *Chronobiology International*. 2009; 26(2):307-323.
6. Burgess HJ, Trinder J, Kim Y, Luke D. Sleep and circadian influences on cardiac autonomic nervous system activity. *American Journal of Physiology-Heart and Circulatory Physiology*. 1997; 273(4):H1761-H1768.
7. Akilan N, Chittibabu B. Evaluation of anaerobic capacity and fatigue index at different times of the day on male handball players. *International Journal of Physical Education, Fitness and Sports*, 2013, 42.
8. Kline CE, Durstine JL, Davis JM, Moore T A, Devlin TM, Zielinski MR *et al.* Circadian variation in swim performance. *Journal of Applied physiology*. 2007; 102(2):641-649.
9. Atkinson G, Edwards B, Reilly T, Waterhouse J. Exercise as a synchroniser of human circadian rhythms: an update and discussion of the methodological problems. *European journal of applied physiology*. 2007; 99(4):331-341.
10. Sönmez MF, Narin F, Akkuş D, Özdamar S. Effect of melatonin and vitamin C on expression of endothelial NOS in heart of chronic alcoholic rats. *Toxicology and industrial health*. 2009; 25(6):385-393.
11. Burgess HJ, Trinder J, Kim Y, Luke D. Sleep and circadian influences on cardiac autonomic nervous system activity. *American Journal of Physiology-Heart and Circulatory Physiology*. 1997; 273(4):H1761-H1768.
12. Can E, Kutlay E, Özkol MZ, Çetinkaya C. The effect of circadian rhythm on some physical and physiological parameters in male taekwondo athletes. *Pamukkale Journal of Sport Sciences*. 2016; 7(1):12-24.
13. Rai V, Tiwari LM. Diurnal variation on the performance of selected motor fitness components of volleyball Players. *International Journal of Physical Education, Sports and Health*. 2015; 2(2):86-88.
14. Chittibabu B. Diurnal variations on motor fitness and core temperature of male handball players, 2014.