International Journal of Research in Economics and Social Sciences (IJRESS)
Available online at : http://euroasiapub.org
Vol. 6 Issue 9, September - 2016, pp. 218~228
ISSN(o): 2249-7382 | Impact Factor: 6.225 , | Thomson Reuters ID: L-5236-2015

EFFECT OF DIURNAL VARIATION ON THE PERFORMANCE OF SELECTED MOTOR FITNESS COMPONENTS OF SOCCER PLAYERS

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Abstract

Purpose: The purpose of the study was to investigate the "Effect of Diurnal variation on selected motor fitness components of university level male soccer players of Punjab"

Method: The study was conducted on 50 male soccer players of Punjabi University Patiala, Punjab, India, age ranging from 17 to 24 years. The subjects were selected from soccer match practice group. The data was collected by administration of standard test for selected motor components. The subjects were tested two times (one time in morning (between 7 AM to 9 AM) and one time in evening (between 5 PM to 7 PM). The standing broad jump test was used for measuring explosive strength, 30 yard dash test was used for measuring speed ability and Illinois agility test was used for measuring agility of the subjects. It was hypothesized that diurnal variation would significantly affect the performance of the subjects on selected motor fitness components. The data collected on motor fitness components was analyzed by dependent "t" test. The level of significance for testing the hypothesis was set at 0.05 level of confidence.

Findings: The results have shown that significant time of day (diurnal variation) effect was found for explosive strength (t_{cal}=5.59>t_{tab}=2.01) and the mean values of explosive strength in morning and evening were 2.08 meter and 2.16 meter respectively. Significant time of day (diurnal variation) effect was found for speed ability (t_{cal}=7.82>t_{tab}=2.01) and the agility (t_{cal}=7.53>t_{tab}=2.01). The mean values of speed in morning and evening were 4.49 seconds and 4.43 seconds respectively

and the mean values of agility in morning and evening were 17.60 seconds and 17.00 seconds respectively. The result has shown that diurnal variation affect the performance of soccer players on selected motor fitness components.

Key Words: Diurnal variation, Time of day, Motor fitness, agility, soccer players.

1. Introduction

Biologic rhythms refer to cyclic changes that regularly over a given time and are related to underlying physiologic process. The science concern with the analysis of biologic rhythms is known as chronobiology. The performance of an individual is the result of the integrated and harmonious functioning of the several dynamic process of the body which are physiological, psychological, and psycho-physiological and are biochemical in nature. Along with these, the environmental conditions such as climate, altitude, temperature, time of day and seasons etc. may also have their effect on performance of an individual. Variation in the daily rhythm of the functional capacity of different systems which are synchronized to a 24 hour day, observe two peculiar aspects. One of them is the prime dependent alteration in the levels of physiological process, expressed as circadian range or circadian amplitude. Human have ingrained timing mechanisms where by cycles in physiological functions coincide with the period of light and darkness. The diurnal variation (The daily rhythm, which is a major source of variability in performance) may disturb all the components of athlete. Thus training of the athletic performance seems to be an important factor which needs careful investigation. Diurnal variation is the fluctuations of anything which is happening or occurring during daylight.

Numerous studies have demonstrated the existence of diurnal variation in human physical performance especially for athletes in training and competition. Souissi *et al*. (2004) studied the time of day effect on anaerobic performance and oral temperature using force-velocity test and Wingate test and reported that body temperature, maximal power, peak power and mean power varied concomitantly during the day. For endurance performance, hamstring flexibility and isometric strength of quadriceps and handgrip time of day effect were observed. Kline *et al*. (2007) examined the circadian rhythm in swim performance across 8 times of day independent of environmental and behavioral masking effects such as sleep, ambient temperature and energy intake. They reported a significant pattern in swim performance relative to both environmental and circadian time of day. Brisswalter J. et al. (2007) studied the effect of both an active warm up and

the diurnal increase in body temperature on muscular power. 8 male subject performed maximal cycling sprint in the morning (7 to 9 AM) and afternoon (5 to 7 PM) either after active warm up or controlled condition. Muscular power was higher in the afternoon than in the morning. Muscular power was higher after active warm up than in controlled condition. Deschenes *et al*. (1998) observed the same pattern for maximal aerobic exercise performance. Atkinson and Spears (1998) assessed diurnal variation in tennis service and reported that the time of day affected the performance of tennis serves. Gintchin L.D (1998) studied diurnal variation in strength and endurance performance among resistance trained males. The maximal strength and muscular endurance performance do not appear to be greatly affected by time during the day when measured in the resistance trained individuals. Dalton *et al*. (1997) indicated that while some biological rhythms are presented, VO max was not affected by circadian rhythms.

2. Methods

2.1. Subjects

50 male soccer players, age ranging from 17 to 24 years were randomly selected from soccer match practice group of Punjabi University Patiala, Punjab India. All subjects filled out a consent form. Subjects were non-smokers and they did not use any form of oral ergogenic aids or supplementations at least for 6 months before the study.

2.2. Hypothesis

It was hypothesized that diurnal variation would significantly affect the performance of the subjects on selected motor fitness components.

2.3. Collection of data

The subjects were tested two times (one time in morning (between 7 AM to 9 AM) and one time in evening (between 5 PM to 7 PM)). Necessary instructions were being passed on to the subject before the administration of test.

2.4. Criterion Measures

The following tests were selected and their scores were considered as criterion measures for this study: -

- Explosive strength was measured by standing broad jump performance was recorded in meters.
- Speed was measured by 30 yard dash test and performance was recorded in nearest 1/10 of the second.

- Agility was measured by Illinois agility test and performance was recorded in nearest 1/10 of the seconds.

2.5. *Administration of the test*

2.5.1. Standing Broad Jump:

Purpose: The aim of this test is to determine Explosive Power of the Legs.

Equipment required: Measuring tape, non-slip floor for takeoff and soft landing area preferred.

Description / Procedure: The athlete will stands behind a line marked on the ground with feet slightly apart. A two foot take-off and landing is used, with swinging of the arms and bending of the knees to provide forward drive. The subject attempts to jump as far as possible with landing on both feet without falling backwards. Three attempts are allowed.

Scoring: The measurement will be taken from take-off line to the nearest point of contact on the landing (back of the heels). Record the longest distance jumped, the best of three attempts.

2.5.2. 30 yard Dash:

Purpose: The aim of this test is to determine speed of the subject.

Equipment Required: Measuring tape, stopwatch, and flat surface of at least 50 yards.

Description / Procedure: The test involves running a single maximum sprint over 30 yards, with the time recorded. A thorough warm up should be given, including some practice starts and accelerations. The athlete will stands behind a line marked on track. On clapper, He will start from a stationary position.

2.5.3. Illinois Agility Test:

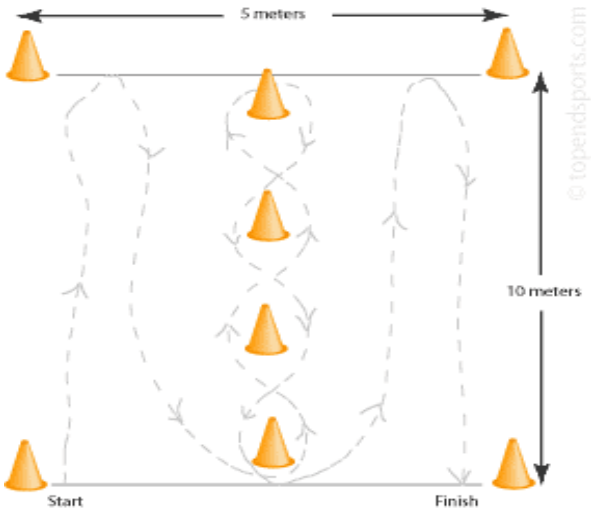
Purpose: The aim of this test is to determine the athlete's agility.

Equipment Required: Flat Non-Slip Surface, Marking Cones, Stopwatch, Measuring Tape.

Description: The length of the course is 10 meters and the width (distance between the start and finish points) is 5 meters. Four cones are used to mark the start, finish and the two turning points. Another four cones are placed down the center an equal distance apart. Each cone in the center is spaced 3.3 meters apart.

Procedure: Subjects should lie on their front On the 'Go' command the stopwatch is started, and the athlete gets up as quickly as possible and runs around the course in the direction indicated, without knocking the cones over, to the finish line, at which the timing is stopped.

Figure 1. Illinois Agility Test



2.6. *Statistical Analysis*

In this study, SPSS was used to analyze the data. A paired sample t-test was used to compare diurnal variation between the two phases of the day. The data collected on motor fitness components was analyzed by dependent "t" test. The level of significance for testing the hypothesis was set at 0.05 level of significance ($p < 0.05$).

2.7. Tester's Competency and Reliability of test

Tester's Competency was established by test retest method where as consistency of result was obtained by product moment correlation. The data collected from a random selection of male soccer players by test- re-test process were computed for each variable and are presented in Table-1.

Table-1

Relationships of co-efficient of test re-test

Scores

S. No.	Test items	Co-efficient of test re-test
1-	Explosive strength	0.90

2-	Speed	0.92
3-	Agility	0.90

3. Findings

The Mean±SD values of the dependent variables in both the time of day are given in Table 2.

Table -2

The Mean±SD values for Motor Fitness Components

Variables	Morning (7 AM to 9 AM)	Evening (5 PM to 7 PM)
Explosive Strength (m)	2.08±0.16	2.16±0.10
Speed (s)	4.49±0.23	4.33±0.19
Agility (s)	17.60±1.14	17.00±1.09

Findings pertaining to each of the selected variables in different time of day which were subjected to the't' ratio has been given in Table 3 to 5.

Table -3

Significant Difference of the Mean of Explosive Strength on Different Time of Day

	Morning	Evening
Mean	2.08	2.16
Variance	0.0256	0.0104
Stand. Dev.	0.16	0.10
n	50	50
t	5.59*	
degrees of freedom	49	
critical value	2.011	

Table 3 reveals that mean and standard deviation with regard to explosive strength in the morning and evening, which were recorded as 2.08±0.16 and 2.16±0.10 respectively. Whereas"t" value

which was calculated as 5.59, it was greater than the critical value (t = 2.011). So the results showed that there has been significant effect of diurnal variation on explosive strength between different times of day.

Table -4

Significant Difference of the Mean of Speed on Different Time of Day

	Morning	Evening
Mean	4.49	4.33
Variance	0.0544	0.0387
Stand. Dev.	0.23	0.19
n	50	50
t	7.82*	
degrees of freedom	49	
critical value	2.011	

It again reveals that mean and standard deviation with regard to Speed in the morning and evening, which were recorded as 4.49±0.23 and 4.33±0.19 respectively. Whereas"t" value was calculated as 7.82, it was greater than the critical value (t = 2.011). So the results showed that there has been significant effect of diurnal variation on speed between different times of day.

Table -5

Significant Difference of the Mean of Agility on Different Time of Day

	Morning	Evening
Mean	17.60	17.00
Variance	1.3036	1.1972
Stand. Dev.	1.14	1.09
n	50	50
t	7.53*	

degrees of freedom	49
critical value	2.011

At the last table-5 reveals that mean and standard deviation with regard to Agility in the morning and evening, which were recorded as 17.60±1.14 and 17.00±1.09 respectively. Whereas"t" value was calculated as 7.53, it was greater than the critical value (t = 2.011). So the results showed that there has been significant effect of diurnal variation on Agility between different times of day.

4. Discussion of Findings

The analysis of data reveals that significant effect of diurnal variation on explosive strength, speed and agility was found at the 0.05 level of significance, which establishes that diurnal variation; affect the performance of athlete on different motor fitness components.

It may be due to the circadian rhythm of human which changes in different time of day during 24 hours cycle. There is much indirect evidence that sports-performance capability is highest close to the time that body temperature nears its peak value. Athletic records tend to be set in the late afternoon or evening. This partly reflects the fact that record attempts in track and field events are usually scheduled for evening meeting when the environmental temperature is more favorable for performance than at midday or in the early afternoon . Nevertheless, athletes prefer evening contests and consistently achieve their top performance at this time of day.

The work-rate of male soccer players reflected this preference during indoor five-a-side games sustained for 4 days (Reilly T, Walsh T. 1981). The pace of play reached its highest intensity at about 18:00 hours and a trough at 05:00 to 06:00 hours on each day.

The types of interventions demanded by experimental designs are not feasible in sports competitions; consequently, research workers have tended to consider the effects of time of day on performance in time trials or simulated contests. Six runners, three weight-throwers, and three oarsmen were found to perform better in the evening than in the morning (Conroy RTWL, O' Brien M. 1974).

Swimmers produced faster times over 100 m at 17:00 hours compared with 07:00 hours in three of four strokes studied (Rodahl A. et al. 1976). The speed of running in a 5-minute test also was found to vary in close correspondence to the circadian curve in body temperature (Reilly T. 1987). The better performances of swimmers in the evening also apply to multiple efforts. Performances in front crawl were 3.6% and 1.9% faster for 400-m and repeated 50-m swim trials, respectively, at 17:30 hours than at 06:30 hours. This time-of-day effect also was observed through 3 successive

days of partial sleep deprivation (Sinnerton S, Reilly T. 1992). It is clear that evening is best for sprint swimmers, particularly if time-trial results are attributed importance, such as in achieving championship-qualifying standards.

Hill and Smith (1991) measured anaerobic power and capacity with a modified version of the Wingate 30-s cycle ergometry test at 03:00, 09:00, 15:00 and 21:00 hours. Peak power in evening was 8% higher than at 03:00 hours. Similar results were found for mean power over the 30 second test period. Vigorous warm-up procedures that increase both arousal and muscle temperature may "swamp" any existing rhythm in short-term power output. This suggests that proper warm-ups are needed when athletes train or prepare for competitions earlier in the day than they are accustomed to. This warm-up effect, coupled with lack of sensitivity of the ergometry used, may explain the failure in some studies to detect small-amplitude circadian rhythms.

Reilly and Down (1986) investigated whether performance in jumping shows a circadian rhythm. When individual differences in performances were controlled for, significant circadian rhythmicity was found for length of jump, with an acrophas of 17:45 hours and amplitude of 3.4% of the 24-hour mean value. Similar rhythm characteristics have been reported by the same authors for anaerobic power output on a stair-run test. In view of the tact that margins of victory in Competitive jumping event are usually only a few centimeters, time of day should be recognized as a significant factor in competitive attempts or in the ability to meet certain performance standards to qualify for major championship.

Man's performance in sports or any other field depends on his movement- oriented behavior- All these actions which can be noted by other with or without the aid of instruments and which have their roots in the biological phenomenon. In other words the performance of an individual is the result of the integrated and harmonious functioning of the several dynamic process of the body, which are physiological, psychological and psycho-physiological and are biomechanical in nature. But the research studies showed that the diurnal variation significantly affect the performance of soccer players on selected motor fitness components.

5. Discussion of Hypothesis

In the light of findings of the study, the hypothesis that diurnal variation would significantly affect the performance of the subjects on selected motor fitness components was accepted.

6. Conclusions

Within the limitations of the study, it is concluded that, the diurnal variation affect the performance of soccer players on explosive strength, speed and agility and the soccer players showed better performance on speed, agility and explosive strength during evening time of day.

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