

ORIGINAL RESEARCH

ANALYSIS THE DIURNAL VARIATIONS ON SELECTED PHYSICAL AND
PHYSIOLOGICAL PARAMETERS

Dr. A. MAHABOOBJAN, Director and Principal, Faculty of Physical Education, Vinayaka Missions University, Salem, Tamilnadu.

Address for correspondence: Faculty of Physical Education, Vinayaka Missions University, Salem, Tamilnadu., India
e-mail: john.vmcpe@gmail.com

Abstract

The purpose of the study was to analyze the diurnal variations on selected physical and physiological parameters such as speed, explosive power, resting heart rate and breath holding time among college students. To achieve the purpose of this study, a total of twenty players (n=20) from Government Arts College, Salem were selected as subjects To study the diurnal variation of the players on selected physiological and performance variables, the data were collected 4 times a day with every four hours in between the times it from 6.00 to 18.00 hours were selected as another categorical variable. One way repeated measures (ANOVA) was used to analyze the data. If the obtained F-ratio was significant, Seheffe's post-hoc test was used to find out the significant difference if any among the paired means. The level of significance was fixed at.05 level. It has concluded that both physical and physiological parameters were significantly deferred with reference to change of temperature in a day.

Key words: physical parameters, physiological parameters

Introduction

The scope of this study is to analyze the circadian rhythm on selected variables which have the main contributions of sports performance. Each variable has its own peak time and trough time. This will also vary between men and women. But if the peak times of all these selected variables would be predicted and if their peak times are closer together then that time would be the better time for peak performance of that particular individual or group.

Circadian rhythmicity of many variables has been established in previous research works. Not much works have been carried out to find to what extent these rhythmicity varies between men and women. There is no notable research works in this area conducted to analyze the circadian rhythmicity on flexibility, anaerobic power, aerobic power, body temperature, resting heart rate, blood variables and total mood disturbance (TMD) in a combined way and among group of both gender. Moreover, studies on circadian rhythm of mood states of athletes are also done to a lesser extent and the results are equivocal.

If any one has the knowledge of peak time for performance of an individual then one can go accordingly to plan training methods and strategies to improve further and exhibit on highest performance in the competition. On the basis of this knowledge and as a continuation of this research, selected variables were determined under normal schedules conditions in an attempt to gain an insight into the mechanisms of the diurnal variations on selected physical and physiological factors.

Methodology

The purpose of the study was to analyze the diurnal variations on selected physical and physiological parameters such as speed, explosive power, resting heart rate and breath holding time among college students. To achieve the purpose of this study, a total of twenty players (n=20) from Government Arts College, Salem were selected as subjects. Diurnal variations usually form sinusoid within a period about 24 hours. But only four different times of the day during the day time i.e 06:00 hours, 10:00 hours, 14:00 hours and 18:00 hours were selected as another categorical variable. The following standardized tests were used to collect relevant data on the selected dependent variables and they were presented in the Table-I.

TABLE -I
Tests Selection

| S. No. | Variables | Test Items | Unit of Measurement |
|--------|---------------------|---------------|------------------------------|
| 1. | Speed | 50 meters run | 1/10 th of a sec. |
| 2. | Explosive Power | Vertical jump | Centimeters |
| 3. | Resting Heart Rate | Manual method | In Numbers |
| 4. | Breath holding time | Manual method | 1/10 th of a sec. |

To study the diurnal variation of the players on selected physiological and performance variables, the data were collected 4 times a day with every four hours in between the times it from 6.00 to 18.00 hours. Subjects' diet and activity prior to the exercise tests were controlled. No strenuous exercise was permitted within 24 hours of testing. The last meal prior to any test session was taken at least three hours before the exercise. One way repeated measures (ANOVA) was used to analyze the data collected from the subjects at four different times of the day. If the obtained F-ratio was significant, Seheffe's post-hoc test was used to find out the significant difference if any among the paired means. The level of significance was fixed at.05 level.

Analysis of Data

Table - II

One way analysis of variance with repeated measures on speed explosive power resting heart rate and breath holding time

| Times of the day | | | | | |
|---------------------|-------|-------|-------|-------|---------|
| Variables | 06:00 | 10:00 | 14:00 | 18:00 | F-ratio |
| Speed | 7.07 | 6.88 | 7.02 | 6.62 | 08.40* |
| Explosive Power | 37.45 | 40.65 | 39.85 | 42.52 | 25.06* |
| Resting Heart Rate | 70.12 | 75.42 | 74.25 | 72.02 | 82.20* |
| Breath Holding Time | 50.92 | 43.42 | 42.25 | 45.33 | 12.10* |

* SIGNIFICANCE OF 0.05 LEVEL.

It is observed from the above table that the obtained repeated measures 'F' ratio value on speed was 8.40, explosive power was 25.06 resting heart rate was 82.20, breath holding time was 12.10 which were higher than the table value of 2.77 required for significant difference with df 3 & 57 at 0.05 level of confidence. Hence it is understood that there existed significant difference with reference to different time of the day on the performance of speed, explosive power, resting heart rate and breath holding time among intercollegiate level players.

From the table it is also understood that the speed, power and endurance performances were better during 18.00 hours followed by 10.00 hours. This indicates that evening hours may be the suitable time for sprint, power and endurance performances.

To find out the paired means of different time of the day, for speed, explosive power, resting heart rate and breath holding time the Seheffe's and post-hoc test was applied and is presented in Table - III.

TABLE - III

Scheffe's test for difference between the paired means on speed explosive power resting heart rate and breath holding time

| Variables | 6.00 Vs 10.00 | 6.00 Vs 14.00 | 6.00 Vs 18.00 | 10.00 Vs 14.00 | 10.00 Vs 18.00 | 14.00 Vs 18.00 | C.I |
|---------------------|---------------|---------------|---------------|----------------|----------------|----------------|------|
| Speed | 0.19* | 0.05 | 0.45* | 0.14* | 0.26* | 0.40* | 0.13 |
| Explosive Power | 3.20* | 2.40* | 5.07* | 0.80 | 1.87* | 2.67* | 1.58 |
| Resting Heart Rate | 5.30* | 4.13* | 5.80* | 1.17 | 0.50 | 2.23* | 1.83 |
| Breath Holding Time | 7.50* | 8.67* | 5.59* | 1.17 | 1.91* | 3.08* | 1.48 |

Significant at 0.05 level

It is also observed from the table-III that majority of the paired means are greater than the confidence interval value. Hence it is clearly indicated that the speed, explosive power, resting heart rate and breath holding time performances were significantly influenced by the change of temperature in a day.

The mean values of speed, explosive power, resting heart rate and breath holding time performance with reference to different times of day were represented graphically in Figure-I to IV.

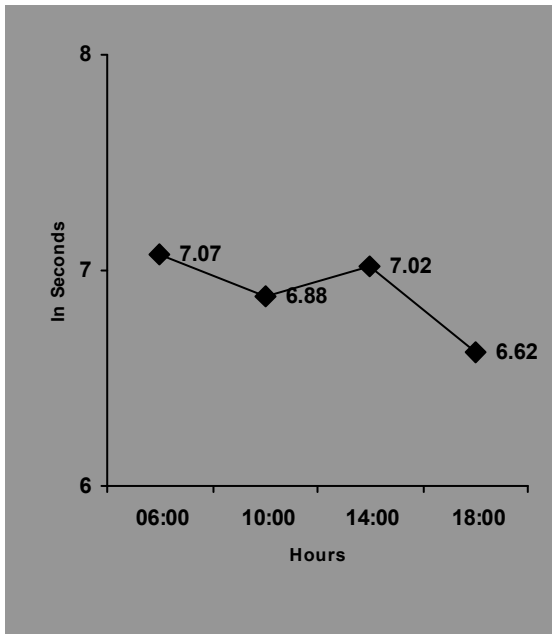


FIGURE I: Mean Scores of SPEED at Different Times of the Day

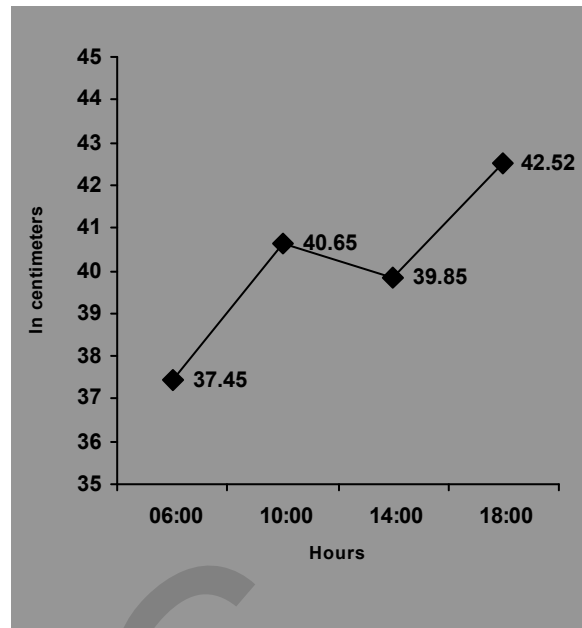


FIGURE-II: Mean Scores of explosive power at Different Times of the Day.

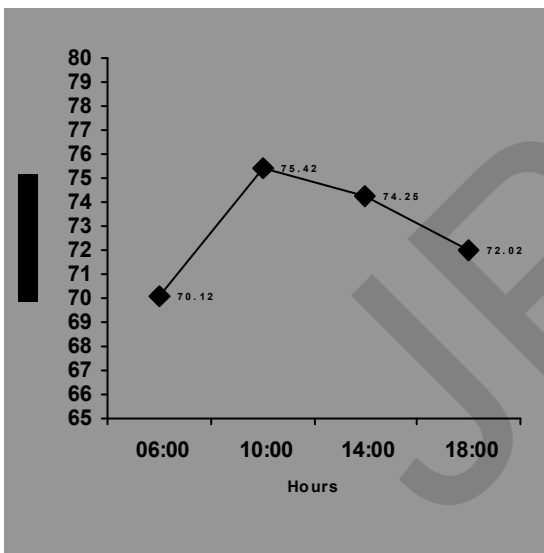


FIGURE-III: Mean Scores of RESTING HEART RATE at Different Times of the Day.

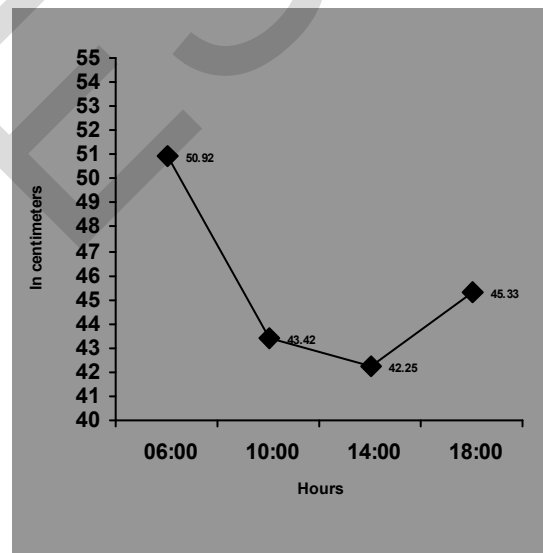


FIGURE-IV: Mean Scores of BREATH HOLDING TIME at Different Times of the Day.

Discussion on findings

Geographically the temperature is not constant throughout the day. Hence both physical and physiological qualities are varied according to the change of temperature in a day.

According to Reilly (1992), there is a close relationship between body temperature and motor performance. The optional core and muscle temperature required for exercise is about 38.3°C to 40°C. Navamani (2004) proved that both physical and physiological variables were significantly differed with reference to change of temperature in a day. He also found that the above physical variables were significantly higher during the evening hours (14.00 hrs). Reilly (1994) had also documented that many components of exercise performance are closely related to body temperature curve which peaks in the early evening. This may be the reason that during evening hours the physical and physiological variables were found to be superior than that of other times of the day. Reilly (1994) suggested that circadian rhythms affect the functions of the lungs, cardio vascular system, kidneys, muscular activity and cognitive abilities. Athletes feel very easy to perform aerobic activities during the early morning hours due to the moderate temperature prevailing in the atmosphere. This may be

reason in which both resting heart rate and respiratory rate were found to be better in the early morning hours (6.00 hours).

Conclusion

It was found that both physical and physiological parameters were significantly deferred with reference to change of temperature in a day.

The selected physical parameters namely speed and explosive power were found to be better during the early evening hours i.e. 18.00 hours.

The selected physiological parameters namely resting heart rate and breath holding time were found to be better during the early morning hours i.e. 6.00 hours.

References

1. Amita Sehgal, (2004) *Molecular biology of circadian rhythms*. United States: Wiley-IEEE Publisher.
2. Claude Bouchard, Stevel N. Blair and William L. Haskell, (2007) *Physical activity and health*. United States: Human Kinetics.
3. Edward M. Winter, (2006) *Sport and exercise physiology testing guideline*. London: Taylor & Francis Publishers.
4. Kenneth D. McClatchey, (2002) *Clinical laboratory medicine*. 2nd Ed. Philadelphia: Lippincott Williams & Wilkins Publisher.
5. Scott Roberts, Robert A. Robergs and Peter Hanson, (1997) *Clinical exercise testing and prescription*. New York: CRC Press Boca Raton Publisher.
6. Sean Walsh and Emma King, (2007) *Pulse Diagnosis: A Clinical Guide*. Philadelphia: Elsevier Health Sciences Publisher.
7. Steven L. Jones, (2000) *Clinical Laboratory Pearls*. Philadelphia: Lippincott Williams & Wilkins Publisher.
8. Steven L. Jones, (2001) *Clinical Laboratory Pearls*. Philadelphia: Lippincott Williams & Wilkins Publisher.
9. Theresa Overfield, (1995) *Biologic variation in health and illness: race, age, and sex differences*. New York: CRC Press Publisher.
10. William E. Garrett and Donald T. Kirkendall, (2000) *Exercise and sports science*. Philadelphia: Lippincott Williams & Wilkins Publisher.
11. William F. Ganong, (2005) *Review of medical physiology*. New York: McGraw-Hill Professional Publisher.
12. Reilly, (1992) Investigation of circadian rhythms in Anaerobic Power and Capacity of the Legs”, *Journal of Sports Medicine and Physical Fitness*, Dec; 32(4): 267-72.
13. Reilly T, (1994) “Human circadian rhythms and exercise”, *Critical Review in Bio-medical Engineering*, May; 18(4): 65-74.
14. Jim Reeves Silent Night D., (2003) “Influence of Circadian Rhythms on Selected Physical, Physiological and Psychological variables”, *Unpublished Thesis*, 2003.
15. Maryam Muhammed Amin, (2006) “Influence of Circadian Rhythm on the Physical and Mental Performance”, *Unpublished Thesis*.
16. Navamani.N., (2004) “Analysis of Circadian changes on Selected Physiological and Performance variables”, *Unpublished Thesis*.