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# DIURNAL VARIATION ON THE PERFORMANCE OF COORDINATIVE ABILITIES OF SOCCER PLAYERS

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**Abstract:**

The purpose of the study was to investigate the "Diurnal variation on the performance of coordinative abilities of soccer players". The study was conducted on 50 male soccer players of Punjabi University Patiala, Punjab India, and age ranging from 17 to 24 years. The subjects were selected from soccer match practice group. The data was collected by administration of Coordinative Ability test as suggested by Peter Hirtz (1985). 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 Coordinative abilities includes Orientation ability, Differentiation Ability, Reaction Ability, Balance Ability and Rhythm Ability which was measured by Numbered Medicine Ball Run Test, Backward Medicine Ball Throw Test, Ball Reaction Exercise Test, Long Nose Balance Test and Sprint at the given Rhythm Test respectively. It was hypothesized that diurnal variation would significantly affect the performance of the subjects on Coordinative abilities. The data collected on Coordinative abilities was analysed by dependent "t" test. The level of significance for testing the hypothesis was set at 0.05 level of confidence. The mean values of Orientation ability in morning and evening were 7.44 seconds and 7.30 seconds respectively. Significant time of day (diurnal variation) effect was found for the Orientation ability ($t_{cal}$=2.42>$t_{tab}$=1.99). The mean values of Reaction ability in morning and evening were 166.60 Centimetres and 160.70 Centimetres respectively. Significant time of day (diurnal variation) effect was found for the Reaction Ability ($t_{cal}$=4.56>$t_{tab}$=1.99). The mean values of Balance ability in morning and evening were 7.26 seconds and 7.01 seconds respectively. Significant time of day (diurnal variation) effect was found for the Balance Ability ($t_{cal}$=4.15>$t_{tab}$=1.99). The mean values of Rhythm ability in morning and evening were 0.51 seconds and 0.44 seconds respectively.

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Rhythm Ability ($t_{cal}$=5.50>$t_{tab}$=1.99) shown significant time of day (diurnal variation) effect among soccer players whereas the mean values of differentiation ability in morning and evening were 15.14 seconds and 14.80 respectively. No significant time of day (diurnal variation) effect was found for differentiation ability ($t_{cal}$=1.04<$t_{tab}$=1.99) among soccer players. The result showed that diurnal variation significantly affect the performance of soccer players on Orientation ability, Reaction Ability, Balance Ability and Rhythm Ability whereas differentiation ability showed insignificant diurnal effect among soccer players.

**Keywords:** diurnal variation, time of day, coordinative abilities, dependent t test, soccer

## Introduction

According to Atkinson G and Reilly T. (1996), circadian rhythms refer to variations that repeat every 24 hours. Many psycho-physiological circadian rhythms at rest are endogenously controlled and persist when an individual is isolated from environmental fluctuations. Unlike physiological variables, human performance cannot be monitored continuously in order to describe circadian rhythmicity. Experimental studies of the effect of circadian rhythms on performance need to be carefully designed in order to control for serial fatigue effects and to minimize disturbances in sleep.

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 favourable 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.

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 behavioural 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 Coordinative abilities.

### 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 Coordinative ability tests were selected and their scores were considered as criterion measures for this study: -

- The Orientation ability was recorded in seconds by Numbered Medicine Ball Run Test.
- The Differentiation Ability was recorded in total point scored by the subject with the help of Backward Medicine Ball Throw Test.

- The Reaction Ability was recorded in centimetres by Ball Reaction Exercise Test.
- The Dynamic balance was recorded in terms of the nearest 1/10 of a second by Long Nose balance test.
- The Rhythm Ability was recorded in terms of the nearest 1/10 of a second by Sprint at the given Rhythm Test.

### 2.5. Administration of the test

The necessary data was collected by administering various coordinative ability tests as suggested by Peter Hirtz (1985).

#### 2.5.1. Numbered Medicine Ball Run Test

**Purpose**: To determine orientation ability of the subjects.

**Equipment Required:** Five Medicine balls each weighing 3 Kg, One Medicine ball weighing 4 Kg., Stop Watch, Five Metallic numbered plates, Clappers, Pencil pad and paper

**Description / Procedure:** All the medicine balls weighing 3 kgs were arranged as shown in figure -2 on an even ground in a semi-circle with a distance of 1.5 meters between those balls. The sixth medicine ball weighing 4 Kgs. kept 3 M. away from the medicine balls behind all the medicine balls of 3 kgs Weight. Metallic number plates of 1 Sq. foot size kept from 1 to 5. Before the start of test, the subjects were asked to stand behind the sixth medicine balls facing towards the opposite direction. On signal, subject turned and ran towards the number called by the tester and touched the medicine ball and run back sixth medicine ball immediately another number was called. Similarly, a total of three times the number called by the tester and the subjects performed accordingly.

**Scoring**: The time taken to complete the course was noted in seconds. Two trials were given to each subjects and the better one was recorded as score.

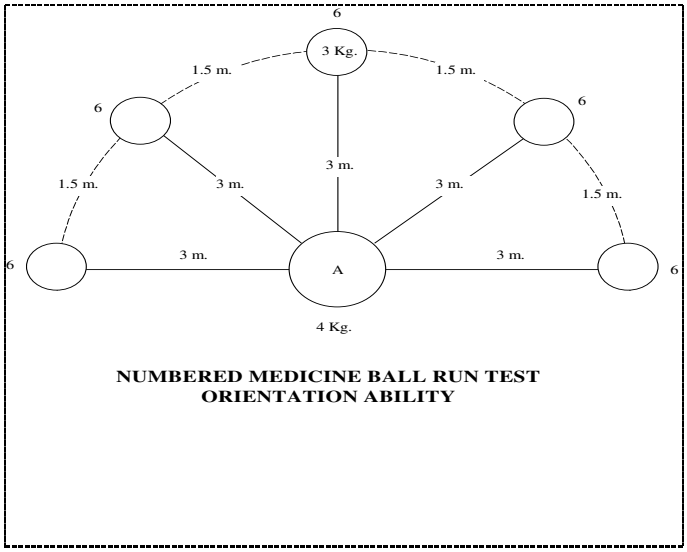


**Figure 1:** Number of medicine Ball Run Test

### 2.5.2. Backward Medicine Ball Throw Test

**Purpose**: To assess the differentiation ability of the subjects.

**Equipment Required:** A gymnastic mat, size 3x6, One Medicine ball weighing 2 Kg, Five Medicine ball weighing 1 Kg. each

**Description / Procedure:** A Gymnastic mat kept 2 M. away from the starting line as shown in figure-3. A circle of 40 cm. radius was drawn in the middle of the mat and a medicine ball of 2 kgs kept at the centre of the circle. The subjects were asked to stand behind the starting line facing the opposite direction. They were asked to throw five medicine balls (1 kgs) over the head to hit the 2 Kg. balls kept on the mat, one after another by using both the hands.

**Scoring**: Medicine ball touching the mat:-1 point was awarded.

Medicine ball touching the circle line: - 2 points were awarded.

Medicine ball touching inside the circle:-3 points were awarded.

Medicine ball touching the 2 kg Medicine ball kept at the center of the circle:-4 points were awarded. Points were decided considering the 1st pitch of the ball. The total points scored in all the five throws were the final score of the subject.

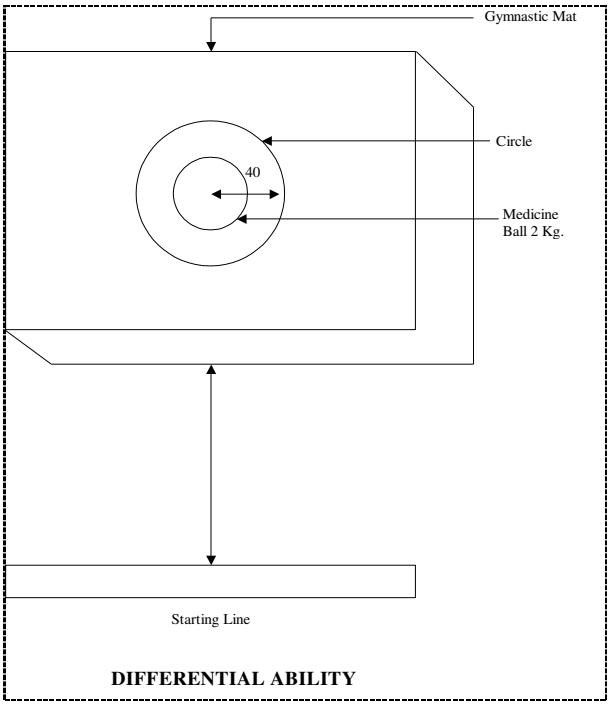


**Figure 1:** Backward Medicine Ball Throw Test

### 2.5.3. Ball Reaction Exercise Test

**Purpose**: To measure the reaction ability of the subjects.

**Equipment Required:** Two wooden planks each of 4 cm. length, one inflated volleyball, a supporting stand.

**Description / Procedure:** Two wooden planks of four meters each kept in a lined by a supporting stand having a height of one meter and twenty centimetres as shown in figure-4 so that it could enable volleyball to roll freely from a height of 1.20 m. The lower ends of the planks were graduated in centimetres. Volleyball was kept by the tester at the top of the planks. The subject was asked to stand behind the starting line, facing opposite to the planks. On clapping the subject took a turn and ran towards the planks and stopped the ball with both the hands which was dropped on the signal.

**Scoring**: The distance was measured in cms. from the top of the planks to a point where the subject stopped the ball.

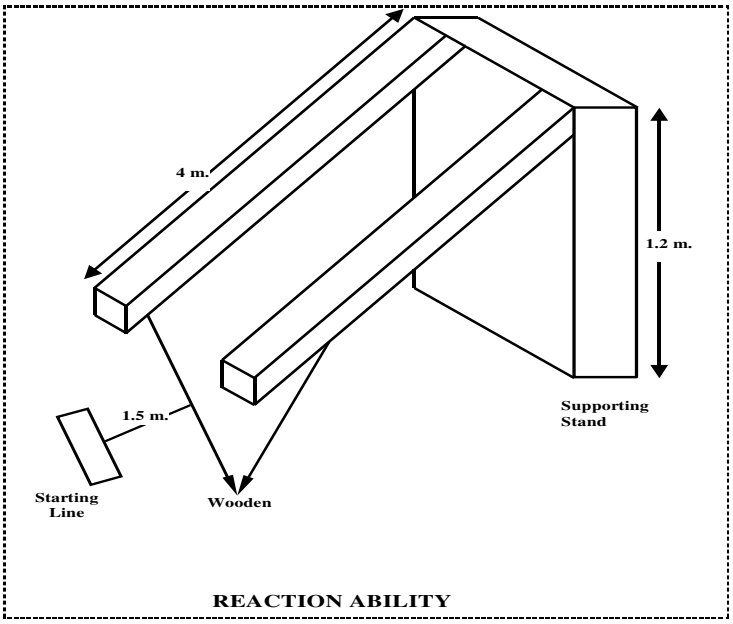


**Figure 3:** Ball Reaction Exercise Test

### 2.5.4. Long Nose Balance test

**Purpose**: To assess the ability to balance the body in dynamic condition.

**Equipment Required:** Balancing beam, One Medicine ball weighing 2Kg, One Medicine ball Weighing 1Kg, Stopwatch, Paper and Pencil.

**Description / Procedure:** A balancing beam of standard size was kept on the floor, one and half mete away from the starting line as shown in figure-5. The subject was asked to stand behind the starting line with one kg. Medicine ball on his strong hand fully stretched forward and the other hand holding the opposite ear lobe. On clapping, the subject moved over the balancing beam towards the two Kg. Medicine Ball which was kept at the other end of the beam pushed down the medicine ball with any of the leg and then come back of the starting line without losing the balance.

**Scoring**: The time taken in seconds to complete the course was the final score of the subject. The score is the best of three attempts.

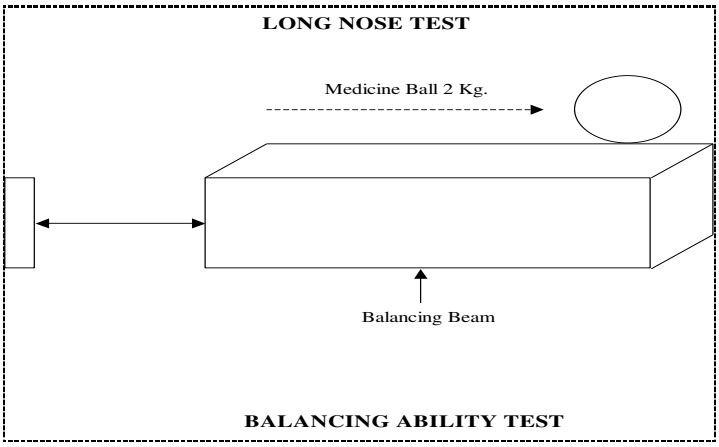


**Figure 4:** Long Nose Balance Test

### 2.5.5. Sprint at the Given Rhythm Test:

**Purpose**: To measure the rhythm ability of the subjects.

**Equipment Required:** Eleven gymnastic hoops each 1 M. in diameter, One Stop Watch, One Measuring taps.

**Description / Procedure:** The subject had to run a distance of 30 m. with maximum sprinting speed marked between two lines. The sprinting time of the subject was recorded by stop watch. In the second attempt the subject had to run at particular rhythm with maximum speed through eleven hoops which were arranged systematically as shown in figure-6. Three hoops were kept in a sequence adjacent to each other at a distance of 5 M. from the finishing line. Five more hoops were kept in a sequence in the middle of the running distance.

**Scoring**: The difference between the timing of 1st and 2nd attempt was the final score of the subject.

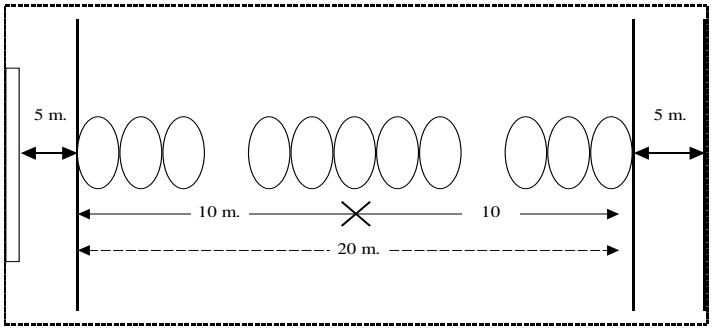


**Figure 4:** Sprint at the Given Rhythm Test

### 2.6. Statistical Analysis

In this study, SPSS was used to analyse the data. A paired sample t-test was used to compare diurnal variation between the two phases of the day. The data collected on

Coordinative abilities was analysed 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 whereas consistency of result was obtained by product moment correlation. The data collected from a random selection of male volleyball 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. | Orientation ability | 0.92 |
| 2. | Differentiation Ability | 0.93 |
| 3. | Reaction Ability | 0.89 |
| 4. | Balance Ability | 0.92 |
| 5. | Rhythm Ability | 0.88 |

## 3. Findings

Findings pertaining to each of the variables in different time of day which were subjected to the 't' ratio has been given in Table 2.

**Table 2:** Significant Difference of the Mean of Coordinative Ability on Different Time of Day

| Variables | Mean±SD (Morning) | Mean±SD (Evening) | t value |
|---|---|---|---|
| Orientation ability | 7.44±0.63 | 7.30±0.70 | 2.42* |
| Differentiation Ability | 15.14±1.65 | 14.40±1.71 | 1.04 |
| Reaction Ability | 166.60±18.08 | 160.70±15.02 | 4.56* |
| Balance Ability | 7.26±1.00 | 7.01±0.80 | 4.15* |
| Rhythm Ability | 0.51±0.20 | 0.44±0.21 | 5.50* |

df= 98

Level of significance at 0.05 $t_{tab}$= 1.99

N=50

Table 2 reveals that mean and standard deviation with regard to Orientation ability in the morning and evening, which were recorded 7.44±0.63 and 7.30±0.70 respectively, whereas t value which was calculated as 2.42, it was greater than the table value (t =

1.99). So the results showed that there has been significant effect of diurnal variation on Orientation ability between different times of day.

It again reveals that mean and standard deviation with regard to Differentiation Ability in the morning and evening, which were recorded as 15.14±1.65 and 14.40±1.71 respectively, whereas t value which was calculated as 1.04, it was less than the table value (t = 1.99). So the results showed that there has been no significant effect of diurnal variation on Differentiation Ability between different times of day.

The table also reveals that mean and standard deviation with regard to Reaction Ability in the morning and evening, which were recorded 166.60±18.08 and 160.70±15.02 respectively, Whereas t value which was calculated as 4.56, it was greater than the table value (t = 1.99). So the results showed that there has been significant effect of diurnal variation on Reaction Ability between different times of day.

It further reveals that mean and standard deviation with regard to Balance Ability in the morning and evening, which were recorded 7.26±1.00 and 7.01±0.80 respectively, Whereas t value which was calculated as 4.15, it was greater than the table value (t = 1.99). So the results showed that there has been significant effect of diurnal variation on Balance Ability between different times of day.

At last, Table 2 reveals that mean and standard deviation with regard to Rhythm Ability in the morning and evening, which were recorded 0.51±0.20 and 0.44±0.21 respectively Whereas t value which was calculated as 5.50, it was greater than the table value (t = 1.99). So the results showed that there has been significant effect of diurnal variation on Rhythm Ability between different times of day.

## 4. Discussion

Man's performance in sports or any other field depends on his movement-oriented behaviour, 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 coordinative abilities.

The analysis of data reveals that significant effect of diurnal variation on Orientation ability, Reaction Ability, balance ability and rhythm ability was found at the 0.05 level of significance, which establishes that diurnal variation; significantly affect the performance of soccer players on different coordinative abilities. The analysis of data also reveals that no significant effect of diurnal variation on differentiation ability

was found at the 0.05 level of significance, which establishes that diurnal variation, does not affect the performance of athlete on differentiation ability.

Researcher could not justify the findings of the study due to lack of literature available related to effect of diurnal variation on coordinative abilities. It may be due to the fluctuation of biological clock or circadian rhythm of athlete.

## 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 coordinative abilities was accepted except differentiation ability.

## 6. Conclusions

Within the limitations of the study, it is concluded that, the diurnal variation affect the performance of soccer players on Orientation ability, Reaction Ability, balance ability and rhythm ability whereas diurnal variation does not affect the performance of soccer players on differentiation ability. Soccer players showed better performance in the evening on Orientation ability, balance ability, rhythm ability and differentiation ability whereas exhibited better performance in the morning on reaction ability.

## Author Profile

**Lalit M. Tiwari** received the B.P.Ed. from Lucknow Christian College and M.P.Ed. from Banaras Hindu University Varanasi in 2007 and 2009, respectively. He is working as an Assistant Professor of Physical Education in the Department of Physical Education Punjabi University Patiala, Punjab India. His are of specialization is exercise physiology, sports psychology and volleyball.

## References

[1] Atkinson, G. and L. Speirs, (1998). Diurnal variation in tennis service. Percept Mot. Skills, 86: 1335-1338.

[2] Brisswalter J., Bieuzen F. (2007) "Morning to Evening differences in oxygen uptake kinetics in short duration cycling exercise", chronobiology international, 24(3): 495-507

[3] Conroy, R.T.W.L. and O.M. Brien, (1974) "Diurnal variation in athletic performance". J. Physiol., 236: 251.

[4] Dalton, B., L. Mc Neughton and B. Davoren, (1997). "Circadian rhythms have no effect on cycling performance". Intl. J. Sports Med., 18: 538-542.

[5] Deschenes, M.R., J.V. Schorma, K.T. Brittingham, D.J. Casa, L.E. Armstrong and C.M. Maresh, (1998). "Chronobiological effects on exercise performance and add to marked selected physiological responses". European Journal of Physiology, 77: 249-256.

[6] Drust, B., J. Waterhouse, B. Edwards and T. Reilly, (2005) "Circadian variation in sports performance-an update". Chronobiol. Intl., 22: 21-44.

[7] Gintchin L.D (1998) "Diurnal variation in strength and endurance performance among resistance trained males", Medicine and science in sports and exercise, 74: 229-235.

[8] Kline, C.E., J.L. Durstine, J.M. Davis, T.A. Moore, T.M. Devline, M.R. Zielinski and S.D. Youngstedt, (2007). "Circadian variation in swim performance". J. Applied Physiol., 102: 641-649.

[9] Souissi, N., A. Gauthier, B. Sesboüe, J. Larue and D. Davenne, (2004). "Circadian rhythms in two types of anaerobic cycle leg exercise: Force-velocity and 30-Wingate test". Intl. J. Sports Med., 25: 14-19.

[10] Singh, A.K., Mohammad, A., & Mishra, A.K. (2014). A comparative study of selected coordinative abilities between kho-kho and kabaddi players. SCOOP International Journal of Sports Science & Applied Sciences, 1(1), 61-63.