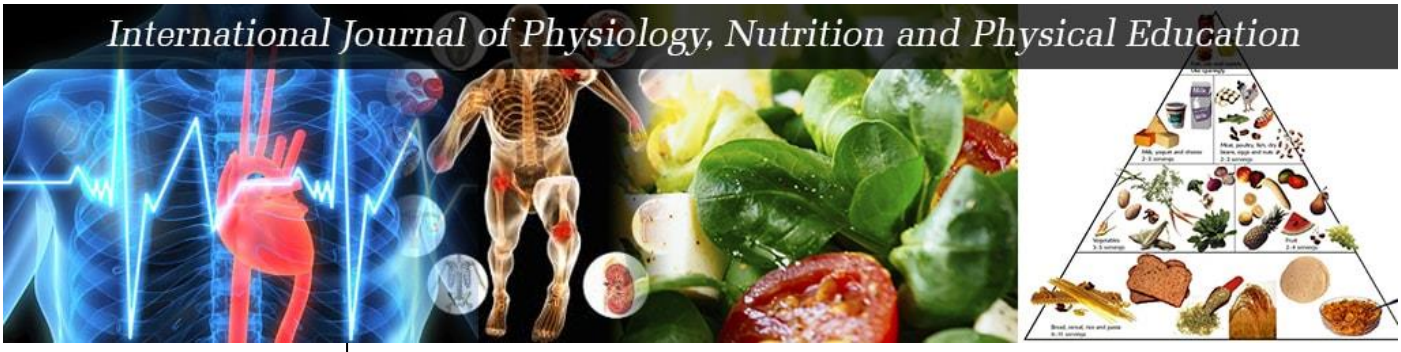

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Influence of circadian chrono-type and diurnal variation on the time of peak performance components among track & field athletes

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Abstract
There are considerable differences in chronotype distribution when comparing different populations from around the world. Chronotype distribution has also been shown to differ with regard to latitudinal distribution or geographic location. The aim of this study was to determine how far the chrono-type and diurnal variation is influencing the performance components among track & field athletes" Essentially, the study would support to find the differences in chronotype distribution when comparing different populations from around the world. Chronotype distribution has also been shown to differ with regard to latitudinal distribution or geographic location the magnitude to which chrono-type influencing on performance, at different times of the day.

Keywords: chrono-type, diurnal variation, circadian typology

Introduction
Excelling in the performance of his or her chosen sport is the major aim of any elite athlete. The drive to win, the desire to succeed and the ambition to push beyond the present limits of performance are all essential features of achieving excellence in elite sport. Athletes must constantly strive to attain peak levels of performance to reach and subsequently stay at the top. In field sports, players must now move faster, anticipate better, demonstrate greater levels of technical and tactical ability and persist longer than competitors from the past. The commitments made by club, coach and player in attempting to attain perfection undeniably necessitate an extensive amount of time and financial contribution, especially as the gap between winning and losing grows ever smaller. The foundations for training and competing can no longer be based on simple subjective views of how well athletes perform or on traditional methods passed from one generation of coach to another. The success in sports, are measured by competitive performance and are dependent upon a number of significant variables such as mental and physical components, stomata types, motor skills, age, national status, physiology, psychology, training level, genetic endowment and injury risk are the major variables influencing performance of sports persons. Physical performance in sports depends on his/her movement-oriented behaviour and all these actions have their roots in biological phenomena. These biological phenomenons are the foremost and that fluctuates periodically and has relatively a greater influence on sports physical performances, since, sports take place at different times of the day. Present study provided the first indication that has the chrono-type and diurnal variation influenced the time of peak performance components among Track & Field Athletes" By understanding these it will be a useful tool for coaches and athletes with regards for improving training and racing principles.

Methodology
Subjects
The sample for the study was selected randomly from the state-level athletes who participated in the 59th Kerala State Senior Athletic Championship. The data was collected from 120 athletes (male N = 60 and female N = 60) who participated in different track and field events include sprint, middle distance, long-distance, jump vertical, jump horizontal, and throw

distance. This sample was a representative of fourteen districts of Kerala. The age was ranging from 17 to 25 years with the mean age of 22:59 _ 0:9. The selected Athletes had more than three years of experience in the competition were selected for the study.

Tools

1. Morningness-Eveningness questionnaire (Horne JA and Ostberg. O, 1976)

Circadian rhythm type among the athletes was measured using morningness-eveningness questionnaire (MEQ) to evaluate the time the athlete get up and go to bed, self-reported preferred times for physical and mental activity, and also the subjective alertness. The MEQ contains total nineteen questions with Likert-type responses and four choices of answer were given, indicating; definite morning type (D_{MT}), moderate morning type (M_{MT}), moderate evening type (M_{ET}), definite evening type (D_{ET}) and Intermediate type (IT). The choices for each answer were clear and were equally semantically placed from each other. In a few questions, a time scale is used. This scale is clearly divided in to periods of fifteen minutes over a seven-hour time range. The order of questions was important and a logical sequence of question topics was arranged. The order of choices from morningness to eveningness within each answer was balanced over the whole questionnaire in order to avoid any fixed response pattern. The importance was given in phraseology, clarity and shortness of questions and the avoidance of leading or embarrassing question, which might give false answers. Questions were given a loading factor based upon the putative powers of discrimination of morningness-Eveningness determined from the item analysis. For simplicity of scoring these loading factors were rounded off in to whole numbers. The scores range from 16-86.The highest scores between the 70-86 numbers indicated definite morning type (D_{MT}) between 16-30 indicates definite evening type (D_{ET}) between 59- 69 indicated moderate morning type (M_{MT}) between 31 - 41 indicate moderate evening (M_{ET}) and score between the range 42-58 indicates intermediate type (IT) neither belong to MT nor ET. The time scales were assigned a 1-5 range, in the direction of high eveningness to high morningness. The scoring for the questions 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 19, where the appropriate score for each response is displayed besides the answer box. For questions, 1, 2, 10 and 18 the cross-made a long each scale is referred to the appropriate score value range below the scale. For question 17 the most extreme cross on the right hand side is taken as the reference point and the appropriate score value range below this point is taken. The scores are added together and the sum converted in to a five point.

2. Digital Thermometer (Model No MT-101)

Axillary temperature (A_T) was measured by inexpensive (IE) temperature devices (model no MT-101 Stupendous Handheld DT Manufacturers, based in India) used according to the method instruction manuals, placed high in the central axillary region (A_R) with the subject's right arms adducted after being wiped free of sweat with antiseptic lotion. DTM ensures high durability, robust structure and accurate measurement of temperature. The display range: 32.0 to 42.0 °C (90 to 107.6°F) Accuracy: ±0.1 °C (±0.2°F) Minimum Scale: 0.1 Measurement time: 60 ±10 seconds in oral, 100 ±20 seconds underarm. Beeper function, auto shut-off. Capacity: 1.5V button battery (LR/SR-41) Memory: last measuring reading LCD size: 15.5 x 6.5mm Size: 127 x 18 x 10mm and Net weight: 10.5g

Procedure

Prior to the test, a meeting of all the participants were held and they were explained regarding the objectives of the study, test procedure and effort they had to put in. The necessary data was collected by administering the tests for the chosen variables.

Statistical Analysis of Data

All statistical analyses were conducted using SPSS (release 2.0, SPSS, Chicago, IL). ANOVA was used to determine the difference between the subjects under the study.

Results

The results of the study were collected and analysed the chrono-type of the athletes and its influence over the day time variation in temperature and performance components of the athletes. All statistical analyses were conducted using SPSS (release 2.0, SPSS, Chicago, IL). The result showed that chrono type had insignificant difference over diurnal variation and significant difference prevailed among the performance components of the athletes. The present result goes hand in hand with the study conducted by the study conducted by Zani *et al*., (1984) and Lastella *et al*., (2010) [1] shows that a significant difference in chronotype distribution has been observed when comparing different sports. Present result also goes hand in hand with the finding by Burgoon *et al*., (1992) [2] on chrono type and running performance in 26 untrained males showed no significant differences in maximum exercise performance according to chronotype. Similar finding also by the author, Rossi *et al*. (1983) [3] compared chronotype and performance of male golfers and water-polo players, showed the result [4]. lt with no differences in chronotype between low-performing and high-performing individuals when comparing the two sports. Further the result shows that chronotype had no differences over diurnal variation. However a significant difference prevailed over the time peak of performance components among track and field events. The graphical representation of the mean score of diurnal variation and the time peak of performance components presented below in Fig 1, 2, 3 and 4

Table 1: Diurnal variation on Chrnotype

Dependent variable	Circadian rhythm type	Mean	Std. Deviation
Diurnal variation (Temperature)	Definitely Morning	96.95	1.10
	Moderate Morning	96.20	.78623
	Definitely Evening	97.24	.82411
	Moderate Evening	96.88	1.06
	Total	97.00	1.00

Table 2: Performance components on Chrnotype

Dependent variable	Circadian rhythm type	Mean	Std. Deviation
Diurnal variation (Performance)	Definitely Morning	622.96	136.385
	Moderate Morning	567.50	78.60
	Definitely Evening	602.37	132.689
	Moderate Evening	606.42	122.253
	Total	606.84	126.776

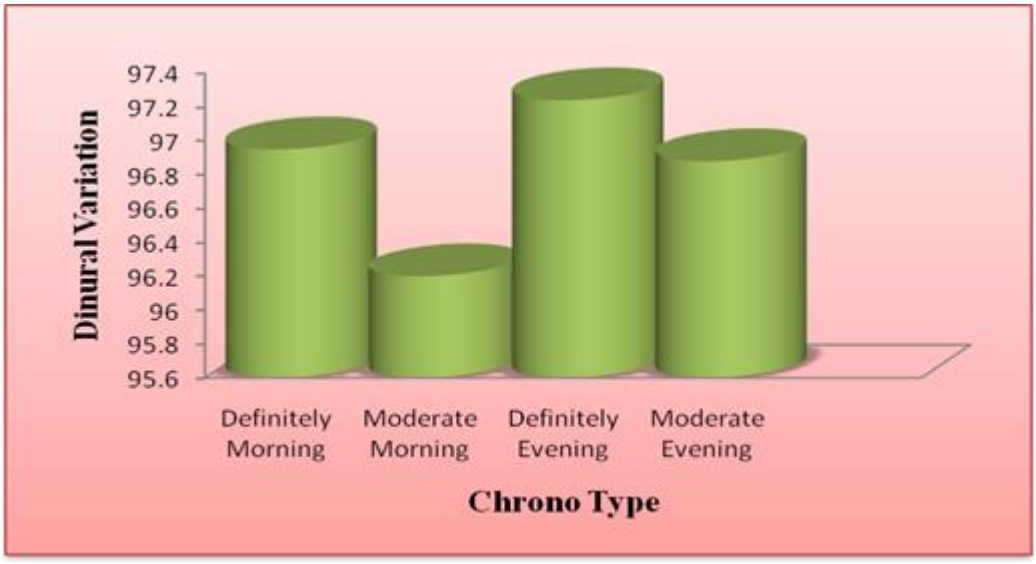

Fig 1: Diurnal variation on Chronotype

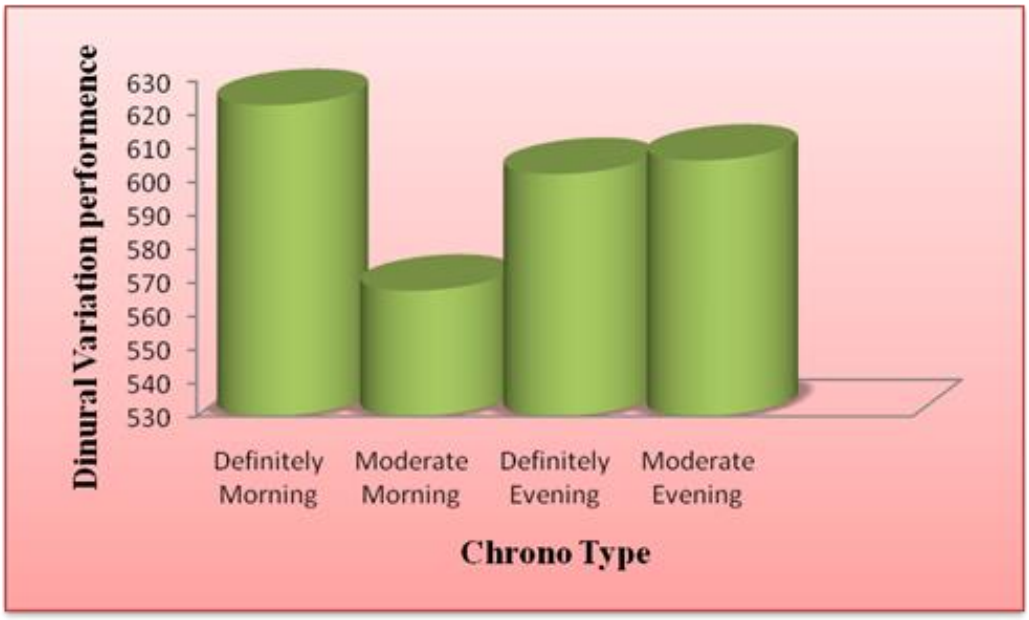

Fig 2: Performance variation on Chronotype

Table 3: Anova on Chrono type with diurnal variation

Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig (P- value)
Diurnal Variation (Temperature)	6.729	3	2.243	4.046	.010
	37.700	68	.554		
Diurnal Variation (Performance)	16023.747	3	5341.249	.354	.787
	1026620.517	68	15097.361		

Table 4: Diurnal variation on Events

Dependent variable	Circadian rhythm type	Mean	Std. Deviation
Diurnal variation (Temperature)	Sprint	97.17	1.07037
	Middle Distance	96.75	.98268
	Long Distance	96.51	.89432
	Jump Vertical	97.04	.95362
	Jump Horizontal	97.36	.95238
	Throw Distance	97.17	1.07037

Table 5: Diurnal variation on Performance

Dependent variable	Circadian rhythm type	Mean	Std. Deviation
Diurnal variation (Temperature)	Sprint	615.95	54.880
	Middle Distance	655.95	90.379
	Long Distance	638.05	110.115
	Jump Vertical	647.60	81.879
	Jump Horizontal	611.15	151.408
	Throw Distance	472.35	152.544

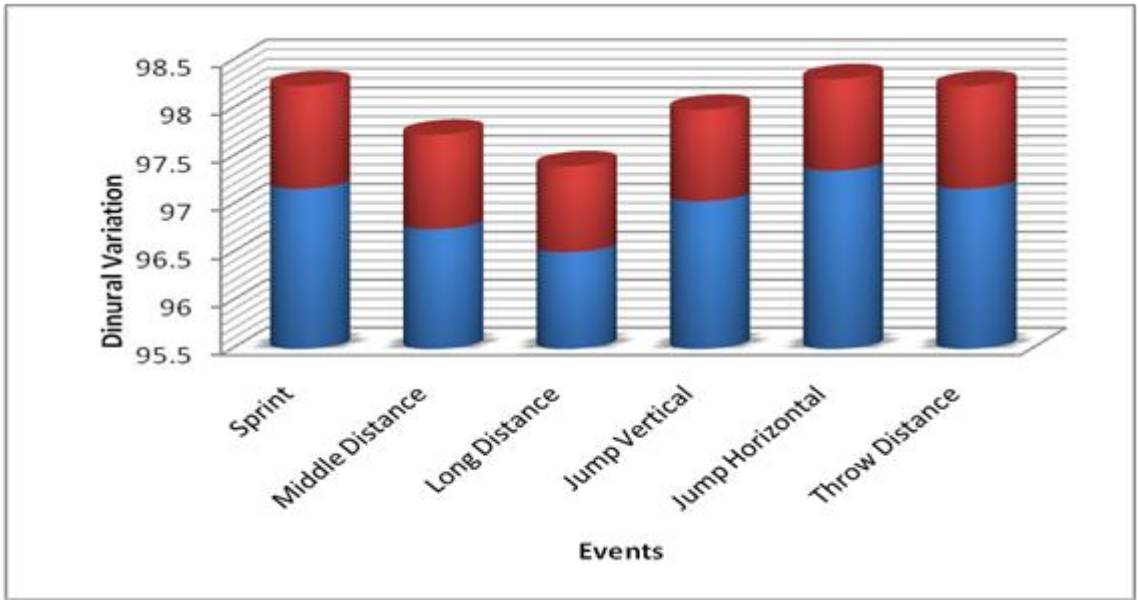

Fig 3: Diurnal variation on Events

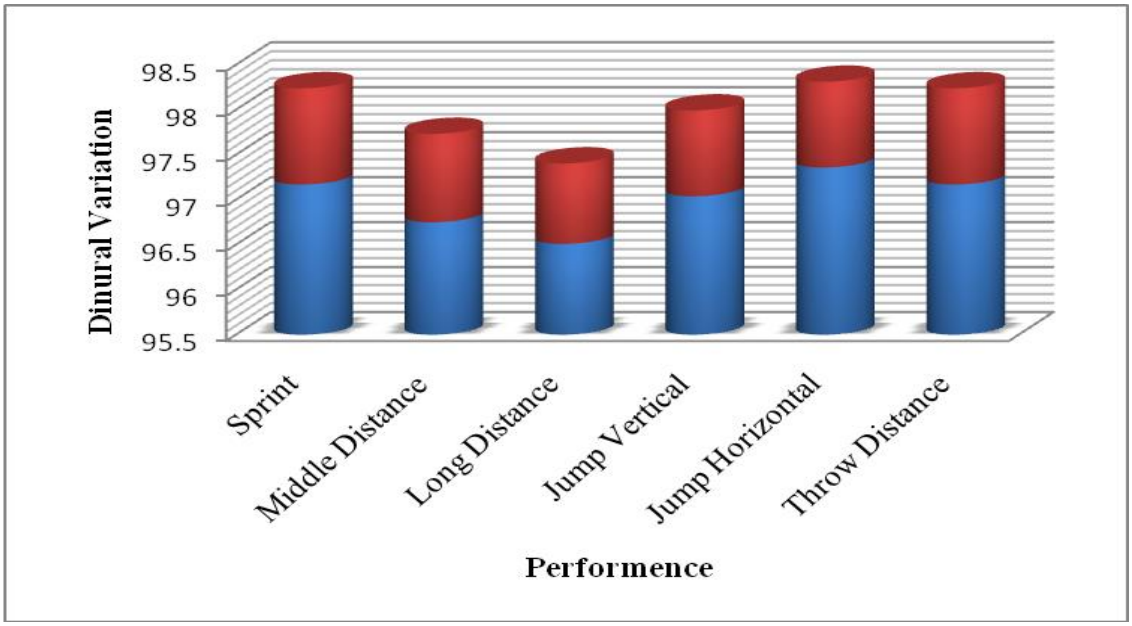

Fig 4: Diurnal variation on Performance

Discussion

The result showed that the influence of diurnal variation over the circadian typology was found to be insignificantly satisfied but it had a significant difference over the events. The result also showed that definity evening and moderate evening had significant difference concern with diurnal

variation which had greater influence over jump horizontal, jump vertical, throw distance due to the fact that event discuss, hammer, javelin and shot-put which involves high velocities of projectiles and dynamic explosive, rather than sustained effort for activities which depend more on central nervous system arousal than on the curve in body temperature and the period for high performance levels may be closer to mid-day. Also the diurnal variation had a positive influence over the events sprint, middle distance and long is concerned. This due to the facets that these events required high gross motor skills and involving high velocities of projectiles scheduled between 14.00hrs and16.00hrs, not later than 17.00hrs, at which physical, physiological, biomechanical and psychological components along with the body temperature; strength, anaerobic power output, and joint flexibility are high at it maximum, along with the environmental temperature and meteorological conditions are its maximum favourable, and the physiological functions such as sleep-wake cycle, glucose uptake, core body temperature, neurotransmitter function, heart rate, and circulating and gross motor peak its maximum during late afternoon or early evening along with the had an demand of media will advantage for the performance component to peaks at its maximum.

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