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Effect of Body Temperature and Sweating in Volley Ball Players

The purpose of the study was to compare the effect of body temperature and sweating in state level Volley ball players. The study was restricted to fifty male subjects. All were state level volley ball players from various selected state participated in state level volley ball tournament. The data collected on body temperatures and sweating (body weight) before and after the game .In order to analysis the data obtained, paired 't' test was employed, the level of significance was chosen at .05. The results from the data revealed that there were significant differences in oral body temperature between, before the game and after the game. Oral body temperature increased significantly after the game. The results from the data collected on body weight revealed that there was significant difference in body weight before the game and after the game. Body weight decreased significantly after the game which in turn indicated a significant increase in the amount of sweat. ***Keywords : Oral temperature, Body temperatures, Sweating.***

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Introduction :

In the contemporary competitive sports every sportsmen and sports women is in a constant race to excel over the other. Competitions have become a fundamental mode of human expression as competitive sport is one of the very important factors of state and interstate recognition and prestige.

Performance of the sportsmen in competitive sports depends upon various causes such as the physical fitness, technique based upon scientific principles, scientific training programmer and diet etc. Apart from these, some conditions which are beyond the limitation of training parts specifically environmental diversities like heat, cold, high - low altitude and humidity also have an incredible influence on the performance of the sportsmen. Normal temperature is difficult to identify for a normal human, while assessment of temperature many persons have shown a range of normal temperature from approximately 97°C to 99°C, when measured by rectum, approximately 1 T greater that the oral temperature. The average normal body temperature is generally considered to be 98 .6°F (37 °C) when measured orally. The vigorous exercise performed in extremes environmental conditions and surrounding brings variations in body temperature. When excessive heat is produced in the body by strenuous exercise, the rectal temperature can rise to as high as high as 101' to 104' F (Belding and Herting, 1962), which indicate the change in normal body temperature.

When the exercise is performed under comfortable environmental conditions, the only problem is the elimination of excess heat of the metabolism. It appears that the rise in body temperature in exercise is the result of a "resetting" of the hypothalamic "thermostat" at a higher level just as in clinical fever. The mobilization of neutrophilic leucocytes in to the circulation (well known to occur in exercise) would make the cells available for phagocytes of damaged tissue cells with release of pyroxenes, so that the heat loss balances heat production at a higher body temperature. Furthermore, since most of the excess heat is produced in the active muscles, their temperature is certainly greater than that of the whole body, as reflected in the oral and rectal temperatures (Admas and Dewitt Norton, 1985). A rise in body temperature that is well tolerated by an exercising man may cause great distress in a resting man, and in fact, athletic performance is actually improved by a moderate rise in body temperature. The increased tolerance to hyperthermia in exercising persons is due to the fact that increased cardiac output permits the maintenance of an adequate cerebral blood flow, whereas exposure to heat without exercise is associated with a decreased cerebral blood flow because of decreased cardiac output and cerebra; vasoconstriction resulting from respirator alkalosis (Buskirk and Beethaml, 1962). The beneficial effects of an elevated muscle temperature during exercise may perhaps be attributed to the resulting increase in the breakdown of ox hemoglobin and delivery of oxygen

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to muscle fibers and to the decreased internal viscosity of the muscle protoplasm. If the structural rearrangements that take place during contraction and relaxation of muscle fibers are facilitated by the elevated temperature greater tension might be developed before the state of excitation of the fiber is over (Davis, 1979).

The body temperature increased during performing the work and this elevation in body temperature may be interpreted as the result of an active regulation. The difference between "energy output" and heat production is an expression of mechanical efficiency and the difference between "heat production" and "total heat lost" is the consequence of the elevated body temperature. The heat production in muscular work can increase 1 0 to 20 times more than the heat produced a person at rest. During work at a neutral environment, there is an increase in body temperature up to a maximum of 40° C or slightly higher at maximum workloads (Libert et a/., 1978 and Gregory, 1980).

During heavy exercise, glycogen is the preferred fuel. About 2.7 g of water is stored together with each gram of glycogen and this water becomes free as the glycogen is combusted, (including water of oxidation) will be closed to 800ml (Hancock, 1981). Assuming a mechanical efficiency of about 25 %, 900 kcal of the 1200 kcal should be dissipated as heat. An exclusive evaporative heat loss demands the evaporating of about 1500ml of water to eliminate 900kcal, under these conditions only approximately half of the necessary water volume must be taken from body "stores" for the rest is apparently liberated in the process producing the heat. It should be emphasized that more sweat may be secreted than evaporated from the skin. On the other hand, radioactive and connective heat exchange may reduce the demand on the evaporative heat loss. When glycogen depots are -again restored, extra water is certainly needed. During prolonged and physically heavy training or during participation in certain competitive sports, the sweat rate may be very high as 2 liters/hr. An adequate water balance plays an important role in maintaining optimal performance capacity (Ouellette, 1974).

Methodology :

The subjects selected were fifty male volley ball players with mean age of 24.6 ± 1 .74 year participated at the state level volley ball tournament. The volley ball players were selected randomly from top five teams on the bases of their performance in last year state level volley ball tournament. The selected subjects were explained the purpose of the study and the subjects were willingly prepared to take part in the research study. For the study, the oral body temperature and body weight were taken, the data were collected in relation with selected variable i.e. oral body temperature and body weight fifteen minute prior to the volley ball matches and immediately after the end of the match. A subject was asked to sit on a chair, the channel of the digital temperature indicator was set and the rod was placed under the tongue of the subjects, when the temperature on the digital temperature indicator became constant the reading was noted. Readings were taken before and immediately after the exercise. Sweating was measured with the help of body weight. A subject was weighed before the exercise with minimum possible cloth and immediately after the exercise. The subject was asked to wipe off all the sweat with the help of a towel and then weighed in minimum possible clothes after the exercise. The statistical model used for calculation of the data was paired 't' test which was calculated by SPSS version 17.0.

Observations and Discussion :

Descriptive statistic exposed the mean and standard deviation of oral temperature before the game and after the game. The body weight before and after the game of fifty volley ball players are presented in Table 1.

Table 1 shows that, mean and standard deviation of pre oral temperature and post oral temperature was 37.3942± 0.48796 and 37.8596± 0.75268. The table further indicates that mean and standard deviation of per body weight and post body weight was 64.8200±1.83 and 63.2152 ± 1,97 (kg), respectively. (Fig. and after end of volley ball match, paired was applied.

Table 2 indicates that there was statistical significant difference in oral body temperature before and after the end of the volley ball match. The calculated value was 4.34 which was highly significant at 0.05 level of significance at the degree of freedom 49.

Table 2 also indicates that, there was statistical significant difference in body weight before and after the end of the volley ball match. The calculated 't' value was 5.76 which was highly significant at 0.05 level of significance at the degree of freedom 49.

Normal human body temperature, also identified as normothermia or euthermia, is a concept that depends upon the place in the body at which the measurement is made, and the time of day and level of activity of the person. There is no single number that represents a normal or healthy temperature for all people under all circumstances using any place of the measurement. The variation in time of day and other circumstances also affects the normal body's temperature (Gregory, 1980).

Table 1 : Mean and standard deviation of oral temperature and body weight before the volley ball match and after the volley ball match.

	Mean	N	Std. Deviation	Std. Error Mean
Pre oral body temperature	37.3942	50	0.48796	0.06901
Post oral body temperature	37.8596	50	0.75268	-0.10644
Pre body weight	64.8200	50	1.83715	0.25981
Post body weight	63.2152	50	1.97538	0.27936

Table 2 : Significant differences between selected variables i.e. oral temperature and body weight before and after end of volley ball match.

	Paired differences							
	Mean	Std. Deviation	Std. Error Mean	95% confidence interval of the difference		't'	d.f.	Sig. (2-tailed)
				Lower	Upper			
Pre oral body temperature Post oral body temperature	-0.46540	0.75847	0.10726	-0.68095	-0.24985	-4.339	49	0.000
Pre body weight Post body weight	1.6048	0.96938	0.13709	0.51451	10.6549	5.763	49	0.0000

The analysis of data clearly reveals that there was a significant difference in oral temperature between before the game and after the game. And the analysis of data also clearly reveals that there was significant difference in sweating between before and after the end of the game. Similar findings have been shown by Saltin etal. (1969). Though skin temperature would have increased during the early part of the game, after the end of the game it again came down to the same level as before the game. It may be due to the change in evaporative sweating which cooled down the surface temperature of the body. In addition, the skin temperatures are toner related to the ambient temp Increase in orat (y temperature, that is core temperature during muscular work is associated with increase in metabolic rate. Since the mechanical efficiency varies from 0.25 per cent depending upon the work at least 75 per cent of the energy produced is converted into heat, which causes an increase in oral temperature.

The analysis of the data collected on sweating clearly revealed that there is loss of significant amount of sweat during the match inform of body fluid, which is related to increase in body temperature during muscular work under such adverse conditions, to balance with this condition, blood vessel of the skin dilates and more blood is directed to the periphery. The sweat glands of the skin are then activated and sweat is absorbed from the blood and excreted (Maron et a/. 1977). Sweating is more after finishing the exercising than do while exercise. More than 70 per cent of the energy that powers the muscles is lost as heat, causing the body temperature to rise during exercise. To keep the body temperature from rising too high, heart pumps the heat in the blood from the muscles to the skin, sweat and it evaporates to cool the body (Masatoshi et al, 1979).

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Comparison of Anthropometric Measurement among District level Athlete

The purpose of the study was to determine the differences on the dependent variables such as standing height, sitting height, upper leg length, lower leg length among the categorical variables of 100m, 200m and 400m sprinters. For the purpose of this study, subjects were selected from District level Athletic Championship held at Pune. In this athletic championship, 583 male athletes of 32 District participated. Out of these athletes, all 47 male sprinters who have qualified for the semi-finals and finals of 100m, 200 m and 400 m were selected as subjects. Thus, the present study comprised of 16 sprinters from 100m, 13 sprinters from 200 m and 18 sprinters from 400 m. The sprinters who have participated more than one sprinting events were not included in this study. Further, one way ANOVA was applied followed by scheffe S.' Post Hoc Test if necessary, to find out the differences between the dependent variables among the three groups of sprinters (independent variables). The results of the study revealed that 400 rn sprinters were significantly taller than 100 m sprinters and ankle girth was significantly more for 200 m sprinters than 100 m sprinters. Besides, other dependent variables have taken for this study did not differ significantly among the three categories of sprinters.
Keywords : Anthropometric characteristics, District, Sprinters.

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Introduction :

Anthropometry is a technique to measure physical characteristics (body size, shape of specific body parts and proportion) of living beings, including men. Anthropometry has been widely applied in a broad range of disciplines, such as ergonomics and health sciences. Because of its convenience, anthropometry has also been applied to understand physical characteristics of athletes in the field of sports science which targets improvement of athletic performance. Since correct application of anthropometric techniques and interpretation of the Information assist management of health status in athletic and also improves the maintenance it is important that supporting staff in the athletic maintenance it is important that supporting staff in the athletic held's including sports dieticians share the know with . To date the measurement protocol proposed by the International Society for the Advancement of Kinanthropometry (ISAK) has been recognized as an international standard for anthropometric measurements in health and sports science and has been applied across many countries. It is hoped that the international measurement protocol such as that by ISAK to be recognized widely In the sports sciences also and will lead to development of human resources skilled in anthropometry (Masaharuand Kagawa. 2008). Sprinting is the short distance race which remained important part of competitive play of world a important civilization. Sprinting considered to be the oldest form. Athletic competative specific terms. It is not cased even possible to give become a successful sprinter. However, on the basis of top class sprinters, some of these qualities can be mentioned. Generally an athlete of long height can become an outstanding sprinter easily; His weight should not be more than 170 pounds. For fast sprinting, drive power is very important irrespective of the fact (hat whether the type of muscle length athletes possess, Le., short or long (Sharma, 2005).

Methodology :

The purpose of the study was to determine the differences on the dependent variables such as standing height, sitting height, upper leg length, lower leg length, among the three categorical independent variables of 100 m, 200 m and 400 m sprinters.

For the purpose of this study, subjects were selected from District Athletic Championship held at Nagpur. In this athletic championship,583 male athletes from32 District participated. Out of these athletes, all 47 male sprinters who

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Table 1 : One way ANOVA for standing height, sitting height, upper leg length and lower leg length among 100m, 200m and 400m inter district sprinters								
Variable	**Sprinter groups**	**Mean**	**S.D.**	**N**	**SS**	**df**	**MS**	**'F' Ratio**
Standing	100m	170.0313	5.133312	16	358.493	2	179.246	
height	200m	172.2308	5.76128	13	1382.667	44	31.424	5.704*
	400m	176.4167	5.88680	18				
Sitting height	100m	123.8437	3.89752	16	69.079	2	34.539	
	200m	125.1923	3.934556	13				
	400m	126.6944	3.57746	18	631.198	44	14.345	2.408
Upper leg	100m	45.9063	8.78677	16	167.450	2	83.725	
length	200m	49.3056	5.37205	13	3501.987	44	79.591	1.052
	400m	45.3056	10.83993	18				
Lower leg	100m	42.0937	4.83811	16	59.131	2	29.566	
length	200m	43.2308	4.30898	13				1.500
	400m	44.7222	4.15587	18	867.528	44	19.717	

have qualified for the semi-finals and finals of 100 m, 200 m and 400 m were selected as subjects. Thus, the present study comprised of 16 sprinters from 100 m, 13 sprinters from 200m and 18 sprinters from 400 m. The sprinters who have participated more than one sprinting events were not included in this study.

Observations and Discussion :

The data collected on standing height, sitting height, upper leg length, lower leg length for 100 m, 200 m and 400 in Inter District sprinters were subjected to one way analysis of variance to determine any significant difference on dependent variable among the three categories of sprinters. Whenever the ratio was found to be significant, Scheffe S' post hoc test was applied to find out the significant difference among the paired mean. The results obtained are presented in Table 1.

Table 1 shows that the means and standard deviations on standing height among 100 m, 200 m and 400 m Inter District sprinters were 170.03 ± 5.13* 172,23 ± 5.76 and 176.42 ± 5,89, respectively. The obtained F ratio 5,70 was greater than the table value of 3.21 required for significance at .05 level of confidence for df 44 and 2. It is inferred from the results of the study that there was a significant difference in standing height among three categories of sprinters.

To find out which of the paired mean differences were significant, Scheffe s' post hoc test was applied and the results are presented in Table 2;

The mean difference on standing height between 100 m and 200 m sprinters was 2.20 and it was less than the confidence interval of 5.31 required for significance at .05 level of confidence. The mean difference on standing height between 100 m and 400 m sprinters was 6.39 and it was higher than the confidence interval required for significance at .05 level of confidence. The mean difference between 200 m and 400 m sprinters on standing height was 4.19 and it was less than the confidence interval required for significant at .05 level of confidence. It is inferred that 400 m sprinters were significantly taller than 100 m sprinters but there were no significant differences in standing height between 100m and 200 m sprinters and 200 m and 400m sprinters.

Table 2 : Scheffic's post hoc test for differences between paired means on standing height among 100m, 200m, and 400m inter District sprinters				
100 m sprinters	**200 m sprinters**	**400m sprinters**	**Mean differences**	**Confidence interval**
170.03	172.23	-	2.20	5.30
170.03		176.42	6.39*	4.91
	172.33	176.42	4.19	5.11

Table 1 also indicates that the means and standard deviations on sitting height among 100 rn, 200 m and 400 m Inter district sprinters were 123.84±3.90, 125.19±3.93 and 126.69 ±3,58, respectively. The obtained F ratio 2.41 was less than the table value of 4,91 required for significance at .05 level of confidence for df 44 and 2. It. is inferred from the results of the study that there was no significant difference in sitting height among three categories of sprinters.

Table1 also indicates that the means and standard deviations on upper arm length among 100 m, 200 m and 400 m Interdistrict sprinters were 30.50 ±1.18,32.35 ± 6.06 and 31.42 ± 1.96, respectively. The obtained F ratio 1.03 was less than the table value of 5.11 required for significance at .05 level of confidence for df 44 and 2. It is inferred from the results of me study that there was no significant difference in upper arm length among three categories of sprinters.

Table I further indicates that the means and standard deviations oh lower arm length among 100m, 200 m and 400 m Interdistrict sprinters were 27.50-± 2.58,29.77 ± 6.74 and 28.42 ± 3.28 respectively. The obtained F ratio 0.98 was less than the table value of 3.21 required for significance at .05 level of confidence for df 44 and 2. It is inferred from the results of the study that there was no significant difference in lower arm length among three categories of sprinters.

There are many factors that determine athletes success in sprint events and the most important are the anatomic morphological and physiological parameters Baechle 1994; powder & fl., 1992; Dintimanefa., 1997; Javer, 1995; Telez, 1994). Further Hay (1993) has stated that the skill of sprinting is actually depending upon athletes' ability to combine the action of the lags, trunk, and arms so on into a smoothly coordinated whole action. Hence, the upper leg length, lower leg length, sitting height and standing height as dependent variables and in addition three categories of sprinters namely

100 m, 200 m and 400 m sprinters as independent variables or categorical variable. It is also stated that greater relative muscle mass in the thighs with strong quadriceps muscles will result in strong driving force for sprinter. Hence, in addition to the standing height, sitting height, upper leg length and lower leg length an addition of three more variables, were than the stride length whereas as the distance of the run increases the length of the stride plays relatively more role even at the cost of reduced stride frequency. In this study, though there was no significant difference in upper leg length lower leg length and sitting height, the standing height was significantly higher for 400 m sprinters than 100 m sprinters. It is also interesting to note that the trend of the score also showed that the upper leg length, lower leg length and sitting height increased as the distance of sprint increased. To understand a clear picture either application of MANOVA or computation of ratio of leg length relative to standing height and also ratio of upper leg length and lower leg length relative to the total height would give a clear picture about influence of lower and upper leg length to sprint performance.

Conclusion :

The following conclusions were drawn within the limitation of the present study :

(1) 400 m sprinters were significantly taller than 100 in sprinters. **(2)** There was no significant difference in standing height between 100 m and 200 m sprinters and also between 200 m and 400 m sprinters. **(3)** There was no significant difference in sitting height, upper arm length and lower arm length among three categories of sprinters.

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