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Effect of handball game on body temperature and sweating in handball players

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ABSTRACT

The purpose of the study was to compare the effect of handball game on body temperature and sweating in national level handball players. The study was restricted to fifty male subjects. All were national level handball players from various selected state participated in national level handball 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.

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Key words : Oral temperature, Body temperatures, Sweating

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 national and international 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 °F greater than 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 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 pyrogens, 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 Beetham1, 1962) . The beneficial effects of an elevated muscle temperature during exercise

may perhaps be attributed to the resulting increase in the breakdown of oxyhemoglobin and delivery of oxygen 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 fibre 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 10 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 40^0 C or slightly higher at maximum workloads (Libert *et al.*, 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, radiative 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 litres/hr. An adequate water balance plays an important role in maintaining optimal performance capacity (Ouellet, 1974).

METHODOLOGY

The subjects selected were fifty male handball players with mean age of 24.6 ± 1.74 year participated at the national level handball tournament held at Gwalior 2009-10. The handball players were selected randomly from top five teams on the bases of their performance in last year national level handball 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 handball 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 handball 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. 1)

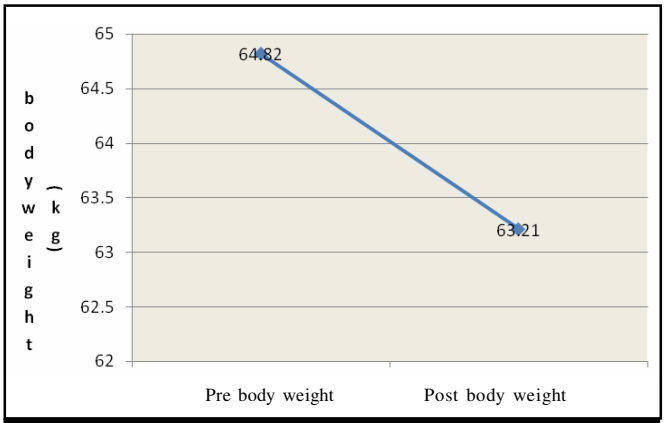

Fig. 1: Mean of body weight before handball match and after the handball match

To find the statistical significant difference between selected variables *i.e.* oral temperature and body weight before

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

	Paired differences					t	d.f.	Sig. (2-tailed)
	Mean	Std. deviation	Std. Error mean	95% confidence interval of the difference				
				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	1.06549	5.763	49	0.000

and after end of handball match, paired't' was applied.

Table 2 indicates that there was statistical significant difference in oral body temperature before and after the end of the handball match. The calculated't' 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 handball 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).

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 *et al.* (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 more related to the ambient temperature. Increase in oral body 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 al.,* 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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