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Impact of aerobic exercise on electrolyte response amonged trained and untrained men

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Abstract
The study was undertaken to assess the impact of aerobic exercise on electrolyte response among trained and untrained men. To achieve the purpose fifteen south zones inter university place holders from football, kabaddi and hockey teams were selected as trained groups and fifteen students were selected from Department of Political Science, Population Studies and Library Science, Annamalai University, who did not participated any organized types of physical activity as untrained group. Their age ranged between 20-24 years. All the subjects were under went aerobic exercise for a period of 45-60 min/day for 12 w/3 days. And the subjects were performed 15 minutes running on treadmill. The 5 ml of blood sample were collected before and after exercise and analyzed by ion sensitive technique with the help of AUL 983 electrolyte analyzer. To find out exercise induced changes paired't' test was used before and after exercise and ANOVA was employed to find out significant variation on aerobic exercise induced changes in electrolytes for trained and untrained group. The level of confidence was fixed at 0.05. The results of the study indicated that an elevation in sodium, potassium and chloride for trained subjects than untrained before and after the aerobic exercise were noticed.

Keywords: aerobic exercise, trained, untrained, dehydration

Introduction
Minerals are inorganic compounds and important for proper functioning of the body. Minerals are termed electrolytes because they are dissolved in the body as electrically charged particles called ions [1]. Minerals include calcium, phosphorus, potassium, chloride and sodium etc. Although they are present in small amounts the minerals are nevertheless indispensable to body functioning. It serve as constituents in building and give rigidity to the hard tissue of the body [2]. Sodium and chloride are contained large amounts in the extra cellular fluid, potassium contained in the intra cellular fluid, and together they perform important roles in maintaining the normal osmotic pressure of the body. The chloride ions assist in the regulation of the acid balance of the body [3]. Minerals play three broad role in the body. They provide structure in the formation of bones and teeth. In a functional sense they are intimately involved in maintaining normal heart rhythm, muscular contractibility, neural conductivity and the acid-base balance of the body. It also plays a regular role in cellular metabolism, enzymes and hormonal activity [4].

Sports training is a process of preparation of sportsman based on scientific and pedagogical principles for higher performance [5]. An important consequence of prolonged exercise, especially in hot weather, is the less of water and mineral salts, primarily sodium and some potassium chloride in sweat. Excessive water and electrolyte losses impair heat tolerance and can lead to sever dysfunction in the form of heat cramps, heat exhaustion, or heat stroke. It is common for an athlete to lose anywhere from 1 to 5 kg of water during each practice session or during a game as result of sweating. This fluid loss corresponds to depletion of 1.5 to 8 gram of salt. Because each kilogram of sweat (1kg) generally contains about 1.5 gram of salt [6].

A proper balance of electrolytes between intra cellular and extra cellular fluids not only ensure normal nerve conduction, but also ensures neuromuscular irritability to stimuli, muscle contractibility, energy metabolism, cardiac conduction of impulses, bone growth, regulation of blood volume and normal kidney functions [7]. Maintenance of plasma calcium level within the normal range is of vital importance because, certain fundamental process like

membrane permeability, neuromuscular excitability and coagulation are dependent on the plasma calcium level [8].

Electrolytes and athletic performance is an area of special interest among sports scientists. Research in this area will evolve to develop apt techniques to minimize the negative aspects of electrolytes loss, thereby enhancing the efficiency of the human machine especially in the field of sports where peak level performance is the ultimate aim. The purpose of the present investigation was to find out the impact of aerobic exercise on electrolyte response among trained and untrained men.

Methodology

The purpose of the study was to find out the impact of aerobic exercise on electrolytes (Sodium, potassium and chloride) response among trained and untrained man. To achieve the purpose fifteen south zone inter university place holders from football, kabaddi and hockey teams were selected as trained group and fifteen students were selected from Department of Population Studies, Library Science and Political Science, Annamalai University, who did not participated any organized types of physical activity as untrained group. Their age ranged between 20 to 24 years. All the (N=30) subjects were underwent aerobic exercise for a period of twelve weeks. The number of session per week was restricted to 3 days and the duration of exercise was 45-60 minutes.

Both experimental groups were performed 15 minutes treadmill running.

The inclination of treadmill was set at 5% and speed was gradually increased to 10 km/hour. The blood sample of 5 ml from each subjects were collected before and immediately after the aerobic exercise. The samples were analyzed by ion sensitive techniques (serum) with the help of AUL 983 electrolyte analyzer at RMMCH, Annamalai University. To find out the exercise induced changes paired 't' test was used before after exercise and ANOVA was computed to find out significant variation on exercise induced changes in electrolytes for trained and untrained groups. The level of confidence was fixed at 0.05.

Results

Table 1: Analysis of changes on electrolytes as a result of aerobic exercise between trained and untrained men

Variables		Trained group		Untrained group		SOV	S.S	Df	M.S	F
		Before exercise	After exercise	Before exercise	After exercise					
Sodium (M Eq/L)	$\bar{x}$	139.61	141.29	140.35	142.34	B	0.736	1	0.736	0.09
	Mean gain	1.67		1.99		W	228.21	28	7.15	
	't'	2.87*		3.71*						
Potassium (M Eq/L)	$\bar{x}$	4.29	4.53	4.42	4.69	B	0.001	1	0.001	0.155
	Mean gain	0.24		0.28		W	1.761	28	0.006	
	't'	3.17*		3.87*						
Chloride (M Eq/L)	$\bar{x}$	101.05	102.57	101.59	103.50	B	0.003	1	0.003	0.007
	Mean gain	1.02		1.01		W	11.6	28	0.414	
	't'	9.49*		4.85*						

T.V = ('t' = 2.14) (F = 4.20) for 0.05 level of confidence.

The table I show the impact of aerobic training on the level of electrolytes (sodium, potassium and chloride) of trained and untrained men before and after the aerobic exercise. From the results it is clear that all the three electrolytes are significantly increased in blood serum due to aerobic training. However the ANOVA value found to be insignificant. Hence, it is inferred that, serum electrolyte level is increased due to aerobic exercise for untrained men when compared with trained.

Discussion

The change in the electrolytes composition of the extra cellular fluids will have direct effect on neural function. Fluctuation in sodium or potassium ion concentration due to dehydration may facilitate or depress neural activities. Inadequate or exercise concentrations of calcium ions will affect sympathetic function directly by reducing or exaggeration the amount of neurotransmitter released at the presynaptic membranes [9]. Minerals are important in activating numerous reactions that release energy during breakdown of carbohydrate, fats and proteins [10].

Chemical substances that dissolved into electrically charged particles called ions, when placed in water are called electrolytes. When sodium chloride is placed in water, the sodium breaks away from the chlorine the result is positively charged sodium ion Na^+ and Cl^-. The distribution of these ions in the intra and extra-cellular fluids is relatively more positive ions (cations) act outside the cell and more negative ions (anions) inside. The main electrolyte in the extra cellular fluid are sodium and chloride, potassium is the main electrolyte in the intra cellular fluid [11].

In addition when athletes exposed to heavy exercise, in the desert has demonstrated another electrolyte problem, the problem of potassium loss. Potassium loss results mostly from the increased secretion of aldosteron during heat acclimatization, which increase the loss of potassium in the urine as well as, in the sweat [12]. The homeostasis of Na^+, K^+ and Cl^- are inter related. Chloride is important in the formation of hydrochloric acid in gastric juice, chloride ions are also involved in chloride shift. Excretion of Cl^- through urine is parallel to Na^+ renal threshold.

A major function of these electrolytes is to modulate fluid exchange within the body's various fluid compartments [13].

Increase in sodium concentration in plasma is associated with increase in concentration of plasma lactate which contributed to large part of hyper-osmolality observed during high intensity exercise [14]. The volume of sweat increases, reabsorption from the kidnies reaches its peak; the concentration of sodium in the sweat increase progressively [15]. Acute effects of aerobic exercise increase potassium level [3]. The intensity of exercise is related to the peak post exercise potassium concentration. The elimination of potassium to that of sodium and potassium pump that exist in the cellular metabolism. The extra cellular potassium is

directly linked to the pump stimulus and the rate of re-uptake is proportional in the extra cellular accumulation [16]. The concentration of extra and intra cellular potassium in skeletal muscle cell function are also important determination of cardiovascular and respiratory function. Exercise results in a release of K^+ ions from contracting muscle, which produces a decrease in intra cellular K^+ concentration and an increase in plasma concentration [17].

The result of the study shows that there is a significant difference on acute treadmills exercise for both trained and untrained group on sodium, potassium and chloride. An elevation was noticed in the post exercise condition. The aerobic exercise did not found any statistical difference between trained and untrained group on sodium, potassium and chloride.

Conclusion

There is a significant increase in sodium, potassium and chloride for trained and untrained subjects as a result of acute exercise on treadmill running at a speed of 10 km/h for 15 minutes at 5% inclination. However the elevation in sodium, potassium and chloride was greater for untrained subjects than the trained subjects, before and after aerobic exercise (training) of twelve weeks.

Implication

Electrolytes are susceptible to changes to the changing environmental conditions. It may change based on body surface area, blood volume and so on. Hence it will be suggested to have electrolyte supplementation along with fluid replacement to maintain pre-exercise serum electrolyte level among athletes.

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