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Effect of Aerobic and Anaerobic Training on Vital Capacity among Soccer Players with Special Reference to Prakriti (Psycho-somatic constitution)

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Abstract

Background: Regular physical activity is one of the most important things for maintaining good health of sports person. Cardio respiratory fitness helps in the improvement of playing performance. In respiration, Vital capacity is the maximum amount of air, a person can expel from lung after a maximum inhalation. The various muscles are involved in Vital capacity. Present scenario of soccer is totally different to old. Aerobic and anaerobic training with ball is more important in present Soccer training. Higher level of performance depends upon higher level of physical fitness and specific positional game's techniques and tactics.

Method: Total 107 male Soccer Players were registered for this study from Varanasi District, aged mean 15.60±0.960 years. Total 107 subject were randomly divided into three groups namely Aerobic Group (N=36), Anaerobic Group (N=36) and Control Group (N=35) and farther divided in three sub group *Vataj ,Pittaj and Khaphaj* Moreover , to analysis' the effect of aerobic and anaerobic training on different type of prakriti. Out of 107,17 players dropped out from the study. Further 90 Soccer Players were continued/participated in study [Aerobic Group (N=30), Anaerobic Group (N=30) and Control Group (N=30)]. On alternate days, training was given accordingly to Aerobic and anaerobic group. Control group did not participate in training they continued their regular training.

Result: The mean value of vital capacity in Aerobic Group from pre to post intervention was 3.59 and 4.31 respectively, which was found statistically significant (p=0.003). Although, in anaerobic group, the Mean value was increased from pre to post intervention, 3.34 & 3.85 respectively, which was also found statistically significant (p=0.032). Further applying ANCOVA, pair wise group comparison result showed statistically significant difference between aerobic and control group (P=0.000). In *Prakriti* wise Comparison of Aerobic group, pre to post intervention, statistically significant difference was found in *Pittaj* and kaphaj prakriti.

Conclusion: It is concluded that both (Aerobic and Anaerobic) procedures bring positive effect on vital capacity. In aerobic group, training shows more improvement in comparison to anaerobic group. After training, better improvement was observed in *Pittaj Prakriti* persons in comparison to *Kapahaj prakriti and Vataj Prakriti* of Aerobic group.

Key Words: Aerobic, Anaerobic, *Kapahaj prakriti and Vataj Prakriti Pittaj prakriti.*

1. Introduction:

Game is an important part of our life to maintain health. Soccer is one of the most popular games in the world. It is the new form of exercise, as many type of exercise are involved in Soccer. During a Soccer match, players perform different type of exercise such as running, kicking, jumping and tackling etc. It is played regardless of such factors as age, sex, race, fitness level or sports performance. Soccer requires the repetition of runs alternated with short to long periods of recovery, which could be active or passive. Intensity of running periods can be alternative at any time according to demands of the match. *(Gregory dupont et.al, 2012).* It also depends upon number of factors such as technical and tactical skills, mental readiness and physiological factors .Therefore, the development and high level of physical capacity cannot be the only single indicator of a successful player, but represent the fundamental prerequisite of game performance (Chamari et al., 2004).

Efficacy of respiratory and pulmonary functions has a direct relationship with general health. Furthermore, regular physical activity is much important for good health of people, especially young people. Since cardio-respiratory

endurance is a key component of physical fitness and physical activity can lead to physical fitness, so it can improve cardio-respiratory endurance.(Maryam Khosravi et.al.,2012)

According to *Ayurveda* every individual is unique due to their *Prakriti*. The word *Prakriti* is a feminine term which maximally represents "the nature of an individual". In vedic litreture, *(Brahman* and *Upnishad Granth) Prakriti* is used for meaning like *Swabhava, Sharir* and *Utpatti* etc. Each individual has different Size and shape. Their physiological and psychological characters are different. *Prakriti* is such factor, which affects the physical activity of sports person. Depending on the predominance of *Dosha,* they are categorized as; *Vata, Pitta,* and *Kapha Prakriti*.

Although, all factors of *Prakriti* influence the Vital capacity, Aerobic and Anaerobic type of training in Soccer. Vital capacity is the maximum amount of air, a person can expel from lung after a maximum inhalation. *Vital Capacity= Irv+Tv+Erv.* In soccer, present demand is short and long distance running, with or without football.

Aerobic training is performed at moderate level of intensity over a relatively long period of time in the presence of adequate amount of oxygen. Aerobic capacity is the maximum amount of oxygen which can be consumed by the working muscles in one minute (Vo_2 max). (V. sundermoorty 2008)

Anaerobic training is performed at moderate level of intensity over a relatively short period of time in absence/deficient oxygen level.

2. Research Process and Methodology:

2.1 Selection of Subject:

Total 107 male Soccer Players were registered for this study from Varanasi District, aged between 15 to 18 years. Total 107 subject were randomly divided into three groups namely Aerobic Group (N=36), Anaerobic Group (N=36) and Control Group (N=35). Out of 107, 17 players dropped out from the study. Further 90 Soccer Players continued/participated in study [Aerobic Group (N=30), Anaerobic Group (N=30) and Control Group (N=30)]. and farther divided in three sub group *Vataj ,Pittaj and Khaphaj* Moreover , to analysis' the effect of aerobic and anaerobic training on different type of prakriti. Training was given in the DLW stadium. In the beginning, before taking pre test, rules, pros and cons regarding this research work were explained to the soccer players. The study was approved by the research ethical committee of Institute of Medical Science, Banaras Hindu University, Varanasi. Those players, who fulfill the inclusion criteria, were then requested to give written consent to participate in the study. All the soccer players, who voluntarily willing to participate, were screened for their physical fitness by physician/resident doctor through clinical examination using a predefined Proforma.

2.2 Selection of Variables:

A: Independent variable:
Prakriti, Aerobic and Anaerobic training (Soccer Specific)

B: Dependent Variable:
Vital Capacity

2.2 Criterion Measures:

S.No.	Tests	Parameters	Units	Equipments
01	Pulmonary faction test (PFT)	Vital Capacity	Liters	Digital Spirometer, (Computerized software)

2.3 Experimental design:

For the study, pre- test, post test randomized group deign was used in which the pre-test was taken prior to the Aerobic and Anaerobic training (Soccer specific) and post test was taken after twelve weeks of pre- test.

2.4 Administration of training programme:

Total 107 male Soccer

Training Schedule

Aerobic Training

Intensity-65-70 %MHR

Duration of effort-40-45 Min

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SET-1 Aerobic circuit training Duration -45 Min

SET-2 Aerobic game Duration -45 Min

SET-3 fartlek training Duration -45 Min

SET-4 Slow continuous running with ball and without ball DURATION: 45minute

Anaerobic Training

Intensity -80-90%

Recovery -30-45 seconds

Rest between repetitions 1:10-1:20

Rest between set 6 min (active recovery) Acceleration runs for 40-50 meters 5-8 time.

SET-2

 Progressive acceleration run (with Football).

20 meters→30 meters→40 meters→30 meters→20 meters

 Salalom run (zig-zag running) with ball and without ball

20 meters→30 meters→40 meters→30 meters→20 meters

SET-3

 1 v/s 1 dribble and shooting in the goal post.

Give 5 chances to each player i.e one repetition

 Reaction training

SET-4

 Shooting in the goal post.

Anaerobic Circuit Training

 Make 5 stations:

Station: 1- stair high knee→ Station: 2- pushups→ Station: 3- over stepping on the ball→ Station: 4- zig –zag running→ Station: 5- sit up .

Complete all station in the same manner.

Intensity-90-95% MHR

Recovery -50-60 seconds

Rest between repetition 1:10-1:20 min

Rest between set- 6 min (active recovery)

In each station do activity 30 seconds and change the station.

Complete all station in the same manner.

Administration of Training Programme

All the subjects were assembled at D.L.W Soccer Ground in Varanasi and brief detail was explained on the general objective and requirement of Aerobic and anaerobic training (soccer specific). On alternate days, training was given accordingly to Aerobic and anaerobic group.

Control group did not participate in training, they continued their regular training.

2.3 Statistical Procedure/Method

The data collected from all the three groups 1.*Experimental (group-I - Aerobic), 2.Experimental (group-II - Anaerobic), & 3.Control (group-III), b*efore and after experimentation. Data was statistically analyzed by applying the following tests as per requirement. Paired t-test and ANCOVA were applied. Level of significance was fixed at 0.05.

In ANCOVA statistical technique, post-test as a depended variable, Group as a factors or independent and pre test as a covariate.

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3. Results of the Study:

Table No.(01) Demographical Distribution of Subjects

Groups	Prakriti (psycho somatic consitution)			Physical		
	Vataj	*Pittaj*	*Kaphaj*	Age Mean±SD	Height (cm) Mean±SD	Weight (Kg) Mean±SD
Aerobic Group (N=30)	5 (16.66%)	17 (55.66%)	8 (26.66%)	15.60±0.960	168.23±1.042	56.76±7.897
Anaerobic group (N=30)	8 (26.66%)	14 (46.66%)	8 (26.66%)	15.60±0.960	163.90±1.240	50.90±7.603
Control group (N=30)	5 (16.66%)	18 (60.00%)	7 (23.33%)	15.60±0.960	165.18±1.110	53.61±7.443
Total No- 90	18 (20.00%)	49 (54.44%)	23 (25.55%)			

Table No. (02) Group wise pre and post test Comparison of Subjects showing Effect of Aerobic and Anaerobic Training on Vital Capacity

Groups	Vital capacity (Lt) Mean ± SD		Within the group comparison Paired t- test
	pre	post	
Aerobic Group (N=30)	3.59 ± 1.137	4.31 ± 1.044	0.720 ± 1.201 t = 3.230 p=0.003
Anaerobic Group (N=30)	3.34 ± 0.763	3.85 ± 1.049	0.513 ± 1.249 t = 2.248 p= 0.032
Control Group (N=30)	3.23 ± 0.930	3.28 ± 0.606	0.493 ± 0.880 t = 0.307 p=0.761

The mean value of vital capacity in Aerobic Group from pre to post intervention was 3.59 and 4.31 respectively. It was tested by paired t – test, which was found statistically significant (p=0.003).

Although, Mean value increased in anaerobic group from pre to post intervention, which was 3.34 & 3.85 respectively, it was tested by paired t-test, which was found statistically significant (p=0.032).

The Mean value of vital capacity in control group from pre to post intervention was 3.23 and 3.28 respectively, and observed value was (0.761), which was found statistically insignificant.

Table No. (03) Pair wise Group Comparison of Subjects showing Effect of Aerobic and Anaerobic Training on Vital Capacity

Groups	Post vital capacity Marginal mean ± standard error	ANCOVA Pre vital capacity : covariate, Group: factor				
		SV	SS	df	MSS	F	P
Aerobic Group	4.258[a] ±0.164	Vital Capacity Pre	8.867	1	8.867	11.128	0.001
Anaerobic Group	3.866±0.163						
Control Group	3.323 ± 0.164	Group	12.926	2	6.463	8.111	0.001
Pair wise Group comparison	Aerobic v/s Anaerobic P=0.285						
	Aerobic v/s Control P=0.000	Error	68.525	86	.797		
	Anaerobic v/s Control P=0.062	Total	90.318	89			

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Table 3. shows, between the groups comparison of post vital capacity by applying ANCOVA taking pre value as covariate, which showed statistically significant difference between group (F= 8.111), Further pair wise comparison of group result (p=<0.01) shows that statistically significant difference was found between aerobic and control group.

Table No. (04) *Prakriti* wise Comparison of Subjects showing Effect of Aerobic and Anaerobic Training on Vital Capacity

Groups	Prakriti	Vital Capacity(lt.) Mean ± SD		Within the group comparison Paired t- test
		Pre	Post	
Aerobic Group (N=30)	**Vataj**	3.30 ± 1.148	3.31 ± 0.824	0.014 ± 0.473 t = 0.066 p= 0.950
	Pittaj	3.56 ± 1.260	4.33 ± 1.059	0.782 ± 1.352 t = 2.387 p= 0.030
	Kaphaj	3.85 ± 0.913	4.87 ± 0.699	1.028 ± 1.182 t = 2.461 p= 0.043
Anaerobic Group (N=30)	**Vataj**	3.14 ± 0.619	3.35 ± 0.845	0.211 ± 0.853 t = 0.700 p= 0.507
	Pittaj	3.34 ± 0.797	3.93 ± 1.120	0.591± 1.200 t = 1.908 p = 0.077
	Kaphaj	3.57 ± 0.876	4.26 ± 1.00	0.690 ± 1.779 t = 1.026 p= 0.344
Control Group (N=30)	**Vataj**	2.87 ± 0.999	3.34 ± 0.823	0.476 ± 0.855 t = 1.244 p= 0.285
	Pittaj	3.033 ± 0.661	3.26 ± 0.587	0.228 ± 0.765 t = 1.265 p= 0.223
	Kaphaj	3.99 ± 1.171	3.28 ± 0.583	0.716 ± 0.814 t = 2.324 p= 0.059

Aerobic Group-

1. The mean value of vital capacity, in *Vataj Prakriti* of aerobic Group at pre and post intervention was 3.30 and 3.31 respectively. This mean, when tested by paired t – test, was not found statistically significant.

2. The mean value was increased in *Pittaj Prakriti* of aerobic group at pre and post intervention, values were 3.56 and 4.33 respectively, it was tested by paired t-test and found statistically significant (p= 0.030*).

3. The mean value was increased in *Kaphaj Prakriti* of aerobic group at pre and post intervention, values were 3.85 and 4.87 respectively, it was tested by paired t-test, and found statistically significant (p= 0.043*).

Anaerobic Group – Among all group of *Prakriti* in Anaerobic group statistically significant difference was not found.

Control Group - In control group, statistical difference was not found Significant in any group of *Prakriti*.

4. Discussion:

In the present study, vital capacity has improved significantly in both experimental groups (Aerobic and Anaerobic) after 12 weeks of aerobic and anaerobic training protocol. It is found that the vital capacity under pre and post test intervention for experimental aerobic, anaerobic and control group, in which aerobic and anaerobic group were statistically significant and control group was statistically not significant. The P values of different group are - aerobic group (p=0.003), anaerobic group (p=0.032) and control group (p=0.761). Level of significance was higher in Aerobic group (p=0.003) in comparison to Anaerobic group (0.032).It may be due to more flexibility of thoracic cage during Aerobic respiration. In Aerobic training/ respiration, muscles of the chest feel less exhaustion due to availability of adequate amount of oxygen.

Further, ANCOVA technique shows difference in aerobic group v/s anaerobic group (p=0.285), aerobic v/s control (p=0.00) and anaerobic v/s control (p=0.062) in pair wise group comparison. Which indicate significant difference between aerobic and control group.

Adaptation of training would certainly increase the capacity of the trained muscles to generate ATP aerobically. The specificity of aerobic improvement may also result from greater regional blood flow in active tissues because of both in increased microcirculation and more effective distribution of cardiac output.

In accordance with this study, Cecil M. Burchfiel, Paul L. Enright, Dan S. Sharp, et al. concluded that people with higher levels of physical activity tend to have higher levels of fitness and generally accepted that physical activity can improve cardio respiratory fitness.

The various muscles are involved in respiration aid in both inspiration and expiration, which require changes in the pressure within the thoracic cavity. The principal muscles are the diaphragm, the external inter costal and the interchondral part of the internal intercostal muscles. Both the external intercostal muscles and the intercondral elevate the ribs, thus increasing the width of the thoracic cavity, while the diaphragm contracts to increase the vertical dimensions of the thoracic cavity, and also aids in the elevation of the lower ribs.

Maximal inspiration results from contraction of the diaphragm downward and the movement of the ribs upward and outward, both of which expand the chest cavity. Forced expiration is the result of the rapid contraction of chest and abdominal muscles, as well as the relaxation of the diaphragm.

Moreover, we saw that in *Prakriti* wise comparison, statistically significant difference was found in aerobic group of *Pitta Prakriti* (p=0.030) and *Kapha Prakriti* (0.043). Level of significance of *Pitta Prakriti* was found superior in all the groups of Aerobic group. As *Pitta Prakriti* person have more flexibility and heat in their body. BMR always remains higher in *Pitta Prakriti* persons in comparison to *Kapha* and *Vata Prakriti* person. It is also observed that vital capacity of *Kaph Prakriti* persons of aerobic group was also improved.

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