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## Influence of wall ladder exercise and circuit training on selected physiological variables

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### Abstract

The purpose of the research was to find out the influence of wall ladder exercise and circuit training on physiological variables. To achieve the purpose of this research, 60 students at school level, male football players in the age group of 13 to 17 years. The selected subjects were divided into three groups of twenty each. Thus, wall ladder exercise and circuit trainings were selected as independent variables and physiological variables namely Vital capacity and cardiovascular endurance were selected as dependent variables. The training period was delimited to twelve weeks, in which wall ladder exercise and circuit trainings were given to respective experimental groups (Group-I & Group-II). The group-III acted as control and did not participate in any systematic training. Data were collected before and after training programme on Vital capacity and cardiovascular endurance. The collected data were statistically treated by using ANCOVA. When the obtained 'F' ratio was significant, Scheffe's post hoc test was used to find out the significant paired mean differences. In all the cases, 0.05 level of confidence was fixed to test the significance. It is inferred that the twelve weeks of wall ladder exercise and circuit training programs have significantly improved Vital capacity and cardiovascular endurance. The result further reveals that the wall ladder exercise group has shown significant improvement in Vital capacity has compared to the circuit training group, circuit training group shows significant improvement in cardiovascular endurance when compared to wall ladder exercise group. Participation in wall ladder exercise and circuit trainings resulted in a significant development in experimental groups when compared to control group.

**Keywords:** Wall ladder exercise, circuit training, vital capacity, cardiovascular endurance

### Introduction

Football is most likely the most popular game worldwide and millions of people play football across the world. In many countries, it has been ranked as one of the top-level competition sports. Football stands ahead in the list of professionally played sports and is widely accepted amongst people of all ages. It is reported that in every sports event, top level performers require a particular body size and shape, while other aspects could be nearly similar (De Garay *et al.*, 1974).

Football is characterized as vigorous, high intensity, intermittent, ball and contact sport. Well-designed activities include acceleration, deceleration, jumping, pivoting, kicking and heading the ball. It is obvious that the game of football puts many demands on the technical and physical skills of the individual player. Football is one of the most popular sports with over approximately 1, 28, 983 professional players and 3, 903 clubs in 186 countries registered with the International Federation of Football Association (FIFA, 2019). Further there is estimated to be more number of unlicensed football players worldwide.

In Asian football confederation, there are 16, 533 professional players and 681 clubs where India is at 5<sup>th</sup> place with 33 professional clubs. In India, there are 88% in domestic and 12% foreign players in the top tier competition. As per FIFA, there is not even one professional player and India have never participated in the world cup till now. However, In India, the pace of football was a failure to appreciate the commercial and professional value attached to the sport. Also, there was little effort to become integrated with mainstream professional football centering on the World Cup (Gautam Ahuja & Eric, 2018). Since then, the advancements made have been impressive but there is still limited precise information available about advancement in training

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### Wall ladder exercise

Wall ladder (also known as gymnastic wall bar, Swedish ladder or stall bars) was invented during the 19<sup>th</sup> century which is used for therapeutic needs (Broomfield, 2011) [8]. It is a multifunctional device which is used for resistance training, abdominal exercise, coordination skills and flexibility training. It can be used for advanced training in sports (Rouchhausen, 2009) [9]. Football players can make great use of the wall ladder for improving isometric strength and also a great tool for improving overall fitness (Mitchell & Wildenthal, 1974) [5]

Wall Ladder training is the multi-directional training, because the elements of strength, power, balance, agility, co-ordination, proprioception, core and joint stability, foot speed, hand eye co-ordination, reaction time and mobility. Each component should be combined into daily training session. Ladder exercise are exciting and efficient ways to teach movement skills. Even though linear and lateral movements are modest in biomechanical, their combination can be compound and many times overwhelming for the athlete. By teaching the mind and body to understand a variety of foot combinations, the chance for confusion and subsequent error decreases. Ladder drills are learned in a slow controlled pace. Introducing movement skills too rapidly can ingrain poor motor patterns that may be difficult to override. Skilled movement should be optimized before the drill is advanced. These drills focus on quickness endurance and utilize a constant rhythm throughout the ladder and also focus on improving the reactive speed components of the lower leg.

### Circuit training

Circuit training is the most and effectual way to enhance cardiovascular fitness and muscle endurance. Circuit training is a method of physical conditioning or resistance training using high intensity training. It aims to build the strength and muscular endurance. An exercise circuit is one accomplishment of all suggested exercises in the training. When one circuit is completed, again the first exercise for the next circuit will be started. By tradition, in circuit training, the time between exercises is very short, with the rapid movement to the next exercise. (Tapp & Signorile, 2014) [1].

Circuit training is often erroneously portrayed as an intensive and stressful form of exercise, with a drill sergeant-type in the middle of a circuit bellowing orders at weary recruits. Circuit training is an effective, fun and very safe approach to training that can be enjoyed by sports person. It is very attractive to men and women, younger and older age groups, sports people and the general populations. (Monaco, 2018) [2]

Circuit training may be designed to increase muscular strength and power, muscular endurance, flexibility. Though the physiological effects depend to a large extent on the type of circuit exercise that is planned Circuit consisting only of weight resistance exercise produces substantial gain in strength but very minimal improvements in cardio respiratory

endurance. Circuit training is an effective training technique for altering muscular strength and cardio respiratory endurance, and to a limited extent, flexibility and cardio respiratory endurance.

### Importance of physiological variables on football performance

Physiological parameters influence a lot on the performance of football players. Physiological system of the body must function well enough to support the specific activity that is performed by an individual. High level of performance in sports and games might be dependent upon the physiological make up and it was recognized that physiological proficiency was needed for the high level performance.

The Vital capacity test is the oldest and best common respiratory tests. The measurement of vital capacity (VC) requires large breath of air expelled from the lungs into a spirometer. Thus, the three components of the total lung volume, are inspiratory reserve volume (IRV), tidal volume (TV) and expiratory reserve volume (ERV). While performing the vital test, it provides an indirect indication of the lung size, even though it is not a complete measure of the entire lung size because it does not account for residual volume. Vital capacity relate to three uncontrolled physiognomies which are age, stature and gender. The static and dynamic components of cardiovascular stress vary depending upon the demands of football, involve substantial dynamic and static (or resistance) components.

### Methodology

The purpose of the study was to find out the effect of wall ladder exercises and circuit training on selected physiological variables among school level male football players. The subjects selected were sixty students at school level, male football players in the age group of 13 to 17 years. The subjects were from the St. Peter's (ICSE) School, Mumbai, and Maharashtra, India. The selected subjects were assigned into two experimental group and a control group. Each group consisted of twenty subjects (n=20). Group I acted as Experimental Group I-(Wall Ladder Exercise), Group II acted as Experimental Group II-(Circuit Training) for a period of 12 weeks and Group III acted as a Control group. Pre-test was conducted for all the subjects on selected physiological variables namely vital capacity and cardiovascular endurance. For both experimental group, exercise were explained and demonstrated to the subjects. 10 minutes was allotted for warm up and 5 minutes for stretching was performed by the subjects prior to the training sessions. After the warm up the wall ladder exercise were given for 45 minutes. During the first three weeks the intensity was fixed 60% for their training and the subjects was performed in 45 minutes. The intensity was increased by 5% once in every three weeks.

### Results on vital capacity

**Table 1:** Computation of Analysis of Covariance on Vital Capacity

Test	EX1	EX2	CG	SV	SS	df	MS	F
Pre test	1954.50	1995.00	2046.75	Between	85522.50	2	42761.250	2.54
				Within	960808.75	57	16856.29	
Post test	2178.00	2050.00	2019.00	Between	284173.33	2	142086.67	7.51
				Within	1077900.00	57	18910.53	
Adjusted	2221.14	2053.66	1972.20	Between	595414.72	2	297707.36	101.36
				Within	164479.567	56	2937.14	

\*Significant at 0.05 level of confidence for df (2, 57) and (2, 56) are 3.16

**Table 1:** Shows that the obtained F value on pre test scores on Vital capacity was 2.54 lesser than the required value of 3.16 to be significant at 0.05 level. This proves that there is no significant difference between the groups at the initial stage and the randomization at the initial level are equal. The obtained posttest F value of 7.51 was greater than the required F value of 3.16. Further the obtained F value of 101.36 was greater than the required F value of 3.16.

**Table 2:** Scheffe's post hoc test on vital capacity

EX1	EX2	CG	MD	CI
2221.14	2053.66	-	167.49*	42.67
2221.14	-	1972.20	248.95*	42.67
-	2053.66	1972.20	81.46*	42.67

\*Significant at 0.05 level of confidence

The influence of Wall ladder exercise and Circuit training on Cardiovascular Endurance is presented in Table 3. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F-value 101.36 was greater than the required table F-value to be significant at 0.05 level. Since significant F-value was obtained, the results were further subjected to post-hoc analysis and the results presented in Table 4 proved that there was significant difference between Wall ladder exercise group and Circuit training group (MD: 167.49), Wall ladder exercise group and control group (MD: 248.95) and Circuit training group and Control group (MD: 81.46). Thus, it was found that Wall ladder exercise was significantly better than Circuit training and control group of the school level male football players.

### Results on cardiovascular endurance

**Table 3:** Computation of analysis of covariance on cardiovascular endurance

Test	WLTG	CTG	CG	SV	SS	df	MS	F
Pre test	1745.00	1760.00	1825.00	Between	72333.33	2	36166.667	1.42
				Within	1455000.00	57	25526.32	
Post test	2185.00	2015.00	1714.00	Between	2754333.33	2	1377166.67	51.21
				Within	1533000.00	57	26894.74	
Adjusted	2199.59	2022.68	1718.73	Between	3028881.29	2	1514440.64	69.29
				Within	1224017.010	56	21857.45	

\*Significant at 0.05 level of confidence for df (2, 57) and (2, 56) are 3.16

**Table 3:** Shows that the obtained F value on pre test scores on Cardiovascular Endurance was 1.42 lesser than the required value of 3.16 to be significant at 0.05 level. This proves that there is no significant difference between the groups at the initial stage and the randomization at the initial level are equal. The obtained posttest F value of 51.21 was greater than the required F value of 3.16. Further the obtained adjusted post mean F value of 69.29 was greater than the required F value of 3.16. This proved that the differences between the posttest means and adjusted mean of the subjects were significant.

**Table 4:** Scheffe's post hoc test on cardiovascular endurance

WLEG	CTG	CG	MD	CI
2199.59	2022.68	-	101.91	116.41
2199.59	-	1718.73	551.87*	116.41
-	2022.68	1718.73	374.95*	116.41

\*Significant at 0.05 level of confidence

The influence of Wall ladder exercise and Circuit training on Cardiovascular Endurance is presented in Table 3. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F-value 69.29 was greater than the required table F-value to be significant at 0.05 level. Since significant F-value was obtained, the results were further subjected to post-hoc analysis and the results presented in Table 4 proved that there was significant difference between Wall ladder exercise group and control group (MD:551.87) and Circuit training group and Control group (MD: 374.95). Comparing between the treatments groups, it was found that there was no significant difference between Wall ladder exercise and Circuit training group. Thus, it was found that Wall ladder exercise and Circuit training were significantly better than control group in Cardiovascular Endurance of the school level male football players.

### Conclusion

Within the limitations and delimitations of this study, the following conclusions were drawn based on the results of the study. It was concluded that the wall ladder exercise and circuit training groups significantly improved Vital capacity and cardiovascular endurance. However, Group I (wall ladder exercise) has significant increase in vital capacity, when compared to Group II (circuit training). Group II (circuit training) significant increase in cardiovascular endurance when compared to Group I (wall ladder exercise). Hence, it is put forward that, performed appropriately, the wall ladder exercise and circuit training can afford significant improvement on selected physiological variables on experimental group compared to the control group.

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