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# **Twelve week effects of circuit exercise training on selected health related physical fitness: In case of Dambi Dollo University Second Year Students, Oromia, Ethiopia**

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**Abstract**---This paper aimed to examine the effects of circuit training on cardiovascular endurance and muscular endurance in the case of Dambi Dollo University, second-year students. Forty students 19-23 years old were purposively taken. 20 students were selected into an experimental group and 20 students were selected into a control group. The training program was held for twelve weeks. The training program was given three days within a week for 45 minutes. Pre-test and post-test were taken on physical fitness parameters such as cardiovascular endurance (step test) and muscular endurance (push-ups). The study comprised participants who completed a questionnaire about their health history and were between 19 and 23 years old. Statistical Package for Social Sciences (SPSS) software was used, and their changes were observed in their physical fitness by scheming measures of central tendency like mean and standard deviation to estimate the significant difference at  $P < 0.05$ . The outcomes displayed, there is a mean difference for the experimental group, and there was no significant difference for the control group for both muscular endurance and cardiovascular endurance. The outcome of the current study displayed, that it is possible to improve both muscular endurance and cardiovascular endurance by utilizing a twelve-week circuit training program.

**Keywords**---Circuit training, Cardiovascular, endurance, Muscular endurance.

## **Introduction**

Physical fitness, according to Haible *et al.*, (2020) is a set of characteristics that a person possesses in terms of his or her ability to perform physical activities that

require aerobic fitness, endurance, strength, or flexibility, and determined by a combination of regular exercise and genetically inherited ability. According to Tavoian (2020), the advantages of physical fitness include increased strength, energy, stamina, an improved sense of wellbeing, and better injury protection because strong, well-developed muscles protect bones, internal organs, and joints, and keep moving parts limber, and improved cardiorespiratory function. Physical fitness plays a noble role in preserving good health. It inhibits the onset of a range of diseases, develops a capacity to fight infections and some other diseases, and aids in the prevention of major cardiovascular diseases, among other things. It also helps to avoid mental illness by promoting a healthy mental state (Nikolaenko *et al.*, (2021). Ekelund, *et al.*, (2020) stated that higher levels of physical fitness reduce the likelihood of early death, while lower levels of fitness increase risk. According to Ward, *et al.*, (2020), contributors with the best physical condition at the starting point who preserved or increased fitness over time posed the least danger of premature death (Ward, *et al.*, (2020). A little improvement in physical fitness was associated with major improvements in health in previously sedentary adults (Myers *et al.*, 2021). According to Huertas *et al.*, (2019), every individual must be physically healthy to do their everyday tasks and participate in numerous activities effectively.

Circuit training is a series of physical activities with specific goals that take into account design, rationing, and load variation principles as well as the players' characteristics. It provides an excellent opportunity for the development of education. The circuit training emphasizes self-reliance, work, and self-adjudication. There are numerous educational benefits of circuit training, including the opportunity to build respect for each other among individuals and to respect modest skills and talents on the similar level as those with great abilities (Hermassi *et al.*, 2020).

In-circuit training, a number of factors, including individual diversity, the athlete's level of competence, and the fate of progressively increasing the load level are taken into account. Furthermore, it provides opportunities to focus on one particular aspect of fitness that should be promoted; this provides opportunities for self-examination. It is also a mechanism that saves energy and time. Because the primary goal of the performance is to achieve the best possible result in the shortest amount of time, several people can be trained at the same time (Orhan & Ma 2019).

Circuit training programs as a type of exercise, it has risen in popularity in recent years. Rasooli, *et al.*, (2021) investigated how a circuit exercise program combined with behavioral therapy and motivational interviewing reduces obesity and risk variables for type 2 diabetes in Latino adolescents. The study asked subjects to participate in a 16-week workout program twice a week. The results showed a significant improvement in cardiorespiratory fitness and leg strength, while waist circumference, subcutaneous fat, visceral fat, fasting insulin, and insulin resistance decreased significantly in comparison to a control group. Based on the results, a circuit training program can be an effective first step in reducing fat deposits and improving insulin resistance in overweight/obese individuals.

According to the results of another study examining a circuit training program's consequences versus a school-based upkeep program for muscular endurance and cardiovascular endurance, a circuit practice schedule was active in growing and preserving muscular and cardiovascular endurance in students (Mola & Bayisa, 2020). Circuit training also aids women in achieving and maintaining their goals for a long time than other forms of exercise. From a health standpoint, Shah & Shah (2019) state that this experiment proves that this circuit of exercise can be performed.

## Materials and Methods

**Research Design:** Experimental research design was employed.

Table 1  
The Study design layout

Treatments	Circuit training exercise
Frequency	3 days/week
Total Duration	12 weeks
Duration/session	45 minutes
Exercise days	Monday, Wednesday and Friday

**Target Population of the Study:** Dambi Dollo University second year, Natural and Computational Science college students between the ages of 19 and 23 years old.

**Sample size:** Forty students; twenty students were designated as experimental group and twenty students were designated as a control group.

**Sampling Techniques:** Purposive sampling technique was applied.

**Source of Data:** The data were collected from the subjects of experimental study group through pre and post tests on the effects of circuit exercise training on muscular endurance (Push-ups) and cardiovascular endurance (step test

**Data Collection Instruments:** Step test and push-ups test were used as data collection instruments for cardiovascular endurance and muscular endurance respectively.

**Inclusion and Exclusion Criteria:** Students who were fulfilled a questionnaire for a history of healthy status and whose ages were 19 and 23 years old were included in this study and students who had any recent physical injury and medical condition were not participated in this study.

**Methods of Data Analysis:** SPSS-software was used by computing measures of central tendency like mean and computing measures of dispersion like standard deviation

## Results

Table 2  
The circuit training results (for experimental group)

S/N	Fitness components	Variables	Scores	Mean	Std. Deviation	t-value	Sig	95% CI of mean difference
1	Muscular	Push	Pre	10.6	2.39	-	0.00	(-7.48, -

2	Endurance	ups	Post	17.15	2.46	14.75	5.62)
	Cardiovascular	Step test	Pre	114.45	11.97	13.76	0.00 (12.42,
	Endurance		Post	99.8	8.61		16.9)

According to above table, item 1 shows the mean difference (10.6), standard deviation (2.39) during the pre-test and mean difference (17.15) and standard deviation (2.6) during post-test. The t-value for a push-ups test was -14.75 at  $P < 0.05$  for muscular endurance. According to above table, item 2 shows the mean difference (114.5), standard deviation (11.97) during the pre-test and mean difference (99.8), standard deviation (8.61) during post-test. The t-value for a step test was 13.76 at  $P < 0.05$  for cardiovascular endurance. Generally, according above table, there is mean difference between pre-test and posttest for both muscular endurance and cardiovascular endurance.

Table 3  
The circuit training result (for control group)

S/N	Fitness components	Variables	Scores	Mean	Std. Deviation	t-value	Sig	95% CI of mean difference
1	Muscular Endurance	Push ups	Pre	9.7	2.6	-1.28	0.217	0.217
2	Cardiovascular Endurance	Step test	Pre	115.05	11.63	1.55	0.138	0.138
			Post	113.75	10.87			

According to above table, item 1 shows the mean difference (9.7), standard deviation (2.6) during the pre-test and the mean (10.05) and standard deviation (2.01) during post-test. The t-value for a push-ups test was -1.28 at  $P < 0.05$  for muscular endurance. According to above table, item 2 shows the mean (115.05), standard deviation (11.63) during the pre-test and mean (113.75), standard deviation (10.87) during posttest. The t-value for step test was 1.55 at  $P < 0.05$  for cardiovascular endurance. According to above table, there is no mean difference between pre-test and posttest for both muscular endurance and cardiovascular endurance.

## Discussion

The outcomes of the current study display that it is possible to improve both muscular endurance and cardiovascular endurance by means of twelve weeks circuit training package. The above results also shows there is mean difference for pre-test and posttest for students under experimental group and there is no mean difference between pre-test and posttest for students under control group.

According to Cogley (2019) and Pignato, *et al.*, (2019), the positive outcome of circuit training is to develop muscular endurance. Ramos-Campo *et al.*, (2021), and Pignato, *et al.*, 2019), also suggested circuit training is an ultimate technique for muscular endurance. Muscular endurance training was initiated to increase the oxidative volume of the muscle (Clark, *et al.*, 2019). Hastie (2020) recommended a participation program that included physical activities three or more days per week for 20 minutes per session at a heart rate of at least 60% of

maximum heart rate. The sort of physical activity and length varied depending on the sport and the participants, whether athletes or non-athletes. Circuit training is another technique to increase health-related fitness (Engel et al., 2019; Wild *et al.*, 2020; Kumar, 2021; Martins et al., 2020). Muscle strength, muscular endurance, flexibility, cardiovascular fitness, and body composition can all be improved through circuit training (Kumar, 2021 & Martins *et al.*, 2020).

## Conclusions

The aim of this paper was to examine the twelve week effects of circuit training on cardiovascular endurance and muscular endurance. Circuit training refers to a process in which students can perform selected exercises in a sequence or in a circuit at each station before moving on to the next. The experimental group's cardio-vascular endurance improved significantly as a result of the circuit training program. The control group, which did not receive the circuit training program, showed no significance improvement in muscular and cardiovascular endurance.

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