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Effects of Eight weeks of calisthenics training on physical fitness qualities of male u-17 tesfa football trainees

Haileyesus Bazezew Belete*

Department of Sport Science, Sport Academy, Bahir Dar University, Bahir Dar, Ethiopia

*Correspondent email henokbazezew5@gmail.com, hbazezewbelete@yahoo.com

Abstract

Football was characterized as a physically demanding, sporadic competitive activity that calls for high-intensity movements including sprinting, jumping, and direction changes. For both young and adult football players to succeed competitively, high standards of fitness are crucial. Thus, the objective of this study was to investigate the effect of Eight weeks calisthenics training on the sprinting speed, explosive power and muscular strength of male under-17 TESFA football academy trainees. The total subjects of the study were twenty-four (n =24) male football trainees of the TESFA Football Academy. As the population of the study is small, comprehensive sampling techniques were used, the study's sample was divided into two equal groups: an experimental group (n = 12) and a control group (n = 12). While both the experimental group (EG, n = 12) and the control group (CG, n = 12) took part in the usual football training, only EG engaged in extra calisthenics exercises three times a week for a total of Eight weeks of 40-minute training sessions. A true experimental research design and a quantitative research approach were employed to meet the study's goal. Pre- and post-field tests measuring muscular strength, vertical jump, and 30-meter sprint time were used to get the results. The study employed SPSS version 23 software to analyze the data obtained from the participants. A paired t-test was performed with a significance level of 0.05. The findings demonstrated a substantial ($p<0.05$) increase in sprinting speed ($p = 0.043$), muscle strength ($P = 0.01$), and vertical jump after ($P = 0.01$) after calisthenics exercise. The findings suggest that calisthenics exercise, administered for eight weeks, can enhance the sprinting speed, muscle strength, and vertical jump ability of football players. As a result, coaches and football players are advised to use this kind of training regimen to increase the physical fitness of players.

Key words: *calisthenics exercise, sprinting speed, muscular strength, explosive power*

1. Introduction

1.1. Background of the Study

Football was described as an intermittently competitive, physically demanding sport that requires high-intensity actions like changing direction, jumping, and sprinting. High standards of fitness levels are very important factors for competitive success in both young and adult football players (Dave V., 2019; Castaner M., 2016). Moreover, football is a fast-moving and physically

demanding competitive team sport that necessitates the involvement of athletes in longer periods of continuous vigorous physical combat to win the championship (Sporis G., 2009). Although it requires a range of motor skills, such as running, vertical jumping, sprinting speed, dribbling, kicking the ball and changing direction (Dave V, 2019) the most basic skill in football game is the coordinate and control the body to accurately pass the ball to the team mates, in the other side the optimum performance also requires to effectively compete in the game such as sprinting speed, explosive power and muscular strength (Castaner M, 2016). Soccer players frequently perform passing, shooting, and dribbling activities during the match and have to maintain their balance while running and make quick adjustments to their positions. Additionally, to push an opponent, wing aerial ball and win the space by sprinting over the opponent, all football players' must have muscular strength, explosive power, and sprinting speed ability over the opponent's players (Genc H, 2020).

When football players tend to become less competent during the match, the coach should organize an appropriate physical training program for the players, which may play a significant role in promoting the development of their physical fitness and helping them regain their competency during the game (Guerra, 2019). This continuing attention to fitness has inspired the creation of many exercise plans and programs designed to help achieve the goal of fitness for football players (Guerra, 2019). There is currently a great deal of interest in identifying the most effective approaches to training that help improve the sprinting speed, muscular strength, and explosive power of football players, which is a significant task for football coaches. In this regard, Jayasivarajan (2021) and Irineu et al. (2021) advised that resistant training has a great impact on the neuromuscular physical fitness quality of footballers'. On the other side, Saharuddin et al. (2018) argued that plyometric training has a positive effect on the improvement of muscular strength, speed, and explosive power in football players.

Calisthenics is a type of exercise that consists of a variety of movements that are practically performed without the need for equipment or apparatus that use your body weight. It is designed to increase the neuromuscular ability of the athletes through movements such as swinging, twisting, jumping, kicking, or bending; it uses only body weight for resistance (Genc H, 2020). There are many different variations, such as different gymnastic movements, bounce exercises, push-ups, shuttles, pull-ups, lunges, planks, dip squats, step-ups, crunches, and mountain climbers. In line with this, Castron M. (2016) demonstrated that, calisthenics is a smooth, rhythmic, and fun exercise that is easy to implement alone or in a group and can be modified according to the subject's fitness levels. Calisthenics working out can develop all the physical fitness qualities of individuals. Through calisthenics training, one can gain more strength, speed, and explosive power (Erkmen N., 2010). Despite the proven benefits of calisthenics training, relevant studies in grass-roots football settings are uncommon. Including calisthenics training

in young football player's fitness programs has been shown to be effective in improving and maintaining neuromuscular muscle adaptation of football players (Bressel E, 2007). As the power output in sprinting speed activities is impaired by fatigue, soccer-specific speed training tends to focus on anaerobic conditioning, resistance training, and the biomechanics of running (Little T., 2005; Tiwari LM, 2016). Explosive power is another vital limitation of football players, which is defined as the capability of a muscle or group of muscles to quickly move for a particular action like jumping. High power output is required for sprinting and jumping movements, and therefore these are essential elements for the better performance of football players (Dave V, 2019).

Since the researcher had the opportunity to see Tesfa Football Academy's training regimen and game performance, the coach mostly concentrated on-the-ball drills and technical skill performance. Because of this, the researcher observed a problem with sprinting speed and muscular strength to win the ball in a one-on-one competition. The researcher also noticed a problem with vertical jumping to win the areal ball against the opponents. Therefore, the aim of the present study is to determine whether a calisthenics training program is sufficient to prompt significant changes in sprinting speed, muscular strength, and explosive power ability in Bahir Dar Tesfa U17 football trainees.

1.2. Objectives of the Study

1.2.1. General Objective

The general objective of the study was to examine the effect of eight weeks callisthenic training on sprinting speed, muscular strength, and explosive power ability of Bahir Dar Tesfa U17 football trainees.

1.2.2. Specific Objectives

In addition to the general objective, the research addressed the following specific objectives:

1. Measure the effect of eight week's calisthenics training on the sprinting speed of football trainees.
2. Examine the effect of eight week's calisthenics training on the muscular strength of football trainees.
3. Determine the effect of eight week's calisthenics training on the explosive power of football trainees.

1.3. Hypotheses

To put it clearly, this research was an attempt to test the following hypotheses:.

1. Eight-week calisthenics training has a significant effect on the sprinting speed ability of football trainees.
2. Eight-week calisthenics training has a significant effect on the muscular strength and ability of football trainees.
3. Eight-week calisthenics training has a significant effect on the explosive power abilities of football trainees.

1.4. Significance of the Study

This research would be a source of information for coaches, professionals, and

trainers related to the effect of eight-week calisthenics training on selected physical fitness performances of football trainees. This study may also provide new concepts for coaches, teachers, physical education professionals, and sport professionals to train their athletes to improve their performance. Moreover, the findings of this study would add knowledge of the coach in the area of calisthenics training to football trainees. Furthermore, this study serves as a guideline for coaches, experts, instructors, and other professionals to plan their training programs. Likewise, this study will help coaches know the methods of evaluating, assessing, and comparing players' physical fitness. Finally, it may motivate other professionals and scholars to take up similar studies in the area of football training.

Delimitation of the Study

This study was designed to investigate the effects of eight-week calisthenics training on sprinting speed, muscular strength, and explosive power in Tesfa football trainees at Bahir Dar. Some physical fitness variables were selected from several types of fitness qualities in football games. So, to satisfy the purposes of the current study, because the selected variable is the foremost fitness component to differentiate successive football players from the ordinary one, this study was limited to preferential dependent variables such as sprinting speed, muscular strength, and explosive power; whereas, independent variables were limited to calisthenics training. In addition to this, the designed training program was limited to 8 weeks, 3 days per week, with a 60 minute duration per session. This study was conducted in the intervention season of 2022-2023 G.C.

2. Methodology

2.1. Study area

This study was conducted on the under-17 Tesfa football academy in Bahir Dar city, which is found in the Amhara region, the northern part of Ethiopia, and 564 kilometers away from the capital city of Ethiopia.

2.2. Study design and approach

The study used a true experimental research design to evaluate the effects of eight-week calisthenics training on sprinting speed, explosive power, and muscle strength of the under-17 Tesfa football trainees at Bahir Dar. In order to conduct the study focusing on cause-and-effect phenomena, a quantitative research approach was employed.

2.3. The target population

The target population of the study was twenty-four (24) soccer players who were being trained in the under-17 Tesfa soccer project at Bahir Dar city.

2.4. Sample size and sampling technique

Because of the small number of participants and to get reliable information from the participants' compressive sampling method was used. The sample size of this study was a total of twenty-four (24) Bahir Dar Tesfa U17 football trainees. The researcher equally grouped the samples into

experimental and control groups through a random sampling method.

Inclusion and exclusion criteria

Healthy, voluntary, and accessible players who have been participating in the football academy during 2023 E.C. only male players in Bahir Dar Tesfa football academy and age group 15–16 years are included in the study, while individuals with bone and joint problems, diabetes, and those taking medications are excluded from the study.

Selection of variables

There are a number of variables that contribute to the physical fitness of football trainees. However, the researcher had decided to concentrate on the following very crucial physical fitness qualities: sprinting speed, explosive power, and muscle strength. This is because these three fitness qualities are very essential to winning the ball from the opponents and gaining ball possession for a longer time. In this study, the independent variable was calisthenics training, and the dependent variables were sprinting speed, explosive power, and muscle strength of football trainees.

Sources of data

In order to determine the participants' level of physical fitness and compare the impact of eight weeks of callisthenics training on the sprinting speed, explosive power, and muscular strength of football players, the study was applied. primary data from pre-test and post-test measurements of both experimental and control groups in the field and fitness center before and after the eight-week callisthenics training program. Therefore, the researcher employed primary data sources to obtain sufficient information about the effect of eight weeks of callisthenics training on football players' muscular strength, explosive power, and sprinting speed.

Collection of data

The data was collected by taking a pre-test before training and a post-test after training. This evaluation took place at the Bahir Dar stadium and Girma fitness center, which are very attractive and comfortable for the accomplishment of this task.

Exercise prescription and Experimental procedure

The researcher gets ready after completing the pretest. The experimental group of study participants underwent an eight-week callisthenics training program with the goal of improving their sprinting speed ability, explosive power (vertical jump), and muscle strength at the Tesfa Football Academy in Bahir Dar, Ethiopia. Proper recuperation is ensured by the training. The study's experimental group warmed up with a 5-minute jog before the main workout, and then they performed dynamic stretching activities for 10 to 15 minutes to get ready for it. Static stretching and cooling down were done after the main activity.

Weeks 1-2: To build general body strength, begin with foundational exercises. The body's weight squats, pull-ups, push-ups, lunges, and planks should all be a part of each training session, which should take place three days a week. Keep form in mind

and try to complete each exercise in three sets of ten to fifteen repetitions. To avoid injuries, use active warm-ups and cool-down stretches.

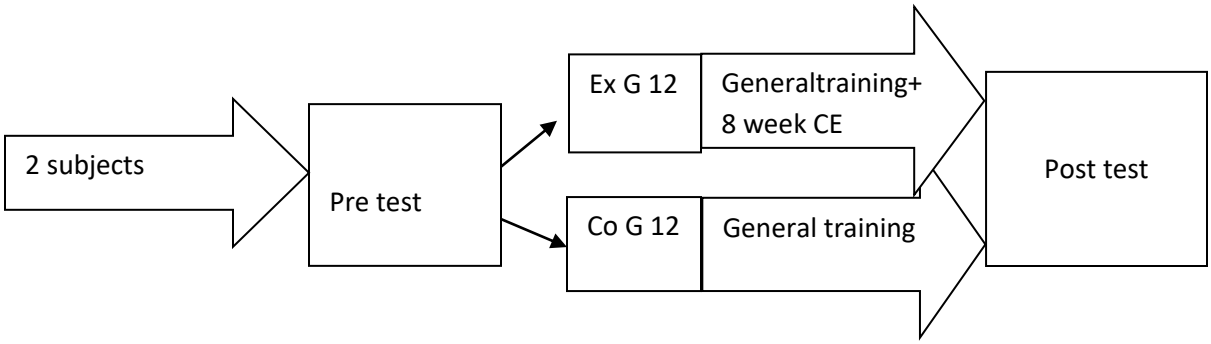
Weeks 3–4: Incorporate variations into the foundational workouts to kick up the intensity. Introduce activities such as pull-ups, side lunges, decline push-ups, and jump squats. Reduce the rest period between sets to more and raise the number of sets to four while keeping the weekly frequency of three sessions constant. Increase the experimental group's speed and footwork by incorporating running exercises like cone and ladder drills.

Weeks 5 and 6: Put your attention on developing your vertical leaping and explosive power. Exercises like burpees, box jumps, and explosive push-ups are all part of the program. Make sure that players are challenged with higher repetitions (12–15) and shorter rest periods by sticking to three sessions per week. To combine muscular strength, explosive power, and sprinting (various push-ups, jump squats, and ladder drills), use circuit training. This allows players to move quickly between workouts.

Weeks 7-8: Stress functional strength and movements specific to football. Integrated football-like activities like medicine ball throws, single-leg squats, and lateral bounds. Don't exceed three sessions per week. The researcher made sure the athletes were drinking enough water and suggested that they concentrate on their diet in order to enhance their training.

To keep participants interested and motivated, the researcher tracked their progress throughout the program and changed the level of difficulty as necessary (Progression: Gradually increase reps or sets as players gain strength). Encourage collaboration and friendship throughout sessions to establish an efficient training atmosphere. Break for 30 to 60 seconds between sets. Hydration: Throughout the training, ensure that players stay hydrated during the training session.

The study's experimental phase took place at Bahir Dar Stadium and Girma Fitness Centre in Bahir Dar between October 1, 2023, and November 30, 2023. Twenty-four male soccer players under the age of 17 were selected using the compressive sampling technique in order to fulfil the study's objectives (N = 24). The training was given for eight weeks, three times per week for 40 minutes. In this study, the subjects were tested on sprinting speed, explosive power, and muscular strength, before and after eight weeks' calisthenics training, which means no testing was conducted during training. The researcher has collected quantitative data through the appropriate physical fitness tests, such as a 30-meter speed run test for sprinting speed, a standing vertical jump test (for explosive power), and a pull-up test for muscular strength. Before the experimental groups were going to the calisthenics exercise, pre-tests were taken from both the control and experimental groups. A post-test was also taken from both groups after eight weeks of calisthenics training to the experimental group.



Ex G= experimental group, Co G= control group, CE= Calisthenics exercise

Dependent and independent variables

In this study, eight weeks of calisthenics training were used as independent variables, whereas sprinting speed, explosive power, and muscle strength were the dependent variables.

2.5. Method of data analysis

A quantitative method of data analysis was applied to the collected data from the performance test. After administering a test on selected variables before and immediately after the intervention of calisthenics training, the researcher recorded this quantitative data in the form of pre-test and post-test results. The collected data was analyzed and interpreted into a meaningful idea using a computer in order to compare physical fitness variables and observe variations among groups. The significance level of the study was set at $p \leq 0.05$. Measures of central tendency like mean and measures of dispersion like standard deviation were used to summarize and describe the findings, and the researcher used a t-test (paired sample). SPSS version 24 was employed to analyze the collected data.

Ethical issues and code of conduct

The study dealt with ethical issues; it protected the privacy of research participants and made guarantees and confidentiality at risk of harm as a result of their participation. Therefore, the study was conducted according to Bahir Dar University rules, policies, and codes relating to research ethics.

3. Result

Table 1. Descriptive Statistics of physical fitness qualities.

EG Mean± Std. Deviation			CG Mean± Std. Deviation	
Fitness variable	PT	POT	PT	POT
Sprinting speed	5.215±0.3436	4.95±0.378	5.023±0.3632	5.277±0.3609
Muscular strength	8.85±1.908	16.38±3.280	9.31±2.689	9.46±2.332
Vertical jump (explosive power)	42.38±1.758	45.69± 1.702	42.1538±2.07550	42.5385±2.14536

Key: - EG=Experimental group, CG= Control group, PT= pre-test, POT= post test

The above table shows the pre-test and post-test results of sprinting speed, muscular strength, and vertical jump (explosive power) for both the experimental and control groups of the study. 5.215±0.3436 and 5.023±0.3632 are the pre-test sprinting speed results of EG and CG, respectively. Whereas the post-test scores of sprinting speed for both EC and CG are 4.95±0.378 and 5.277±0.3609, respectively. The presented data indicate that there is a significant difference in the sprinting speed ability of players between the pre- and post-test results of the experimental group, on the other hand, the control group shows no improvement in their sprinting speed ability, which means calisthenics training has a significant effect on the improvement of football players sprinting speed ability. Additionally, the pre-test results of muscle strength of the EG and CG were 8.85±1.908 and 9.31±2.689, respectively, while the post-test scores of the EG and CG were 16.38±3.280 and 9.46±2.332. The result showed that, there is a significant difference between the pre- and post-results of EG on their muscular strength, but no improvement is shown in the muscular strength of the control group of the study. Moreover, for the vertical jump (explosive power), the pre-test score of EG was 42.38±1.758 and the pre-test result of CG was 42.1538±2.07550. While the post-test result of EG was 45.69± 1.702, the post-test result of CG was 42.5385±2.14536. The data demonstrate that there is a significant difference between the pre- and post-test results of the experimental group, but no significant difference is observed between the pre- and post-test results of the control group of the study. In general, the result in the above table dictates that eight weeks of calisthenics training have a significant effect on the improvement of sprinting speed, explosive power, and muscular strength abilities of Bahir Dar Tesfa U17 football trainees.

Table 2. Paired sample t-test results of fitness variables for the two groups of pre and post test.

Paired differences 95% Confidence Interval of the Difference									
Variable	Subject		MD	Std. Deviation	Std. Error Mean	Lower	upper	df	sig. (2-tailed)
Sprinting	EG	PT-POT	0.2615	0.4174	0.1158	0.0093	0.5138	12	0.043

speed	CG	PT-POT	-0.2538	0.5410	0.1500	-0.5808	0.0731	12	0.116
Muscular strength	EG	PT-POT	-7.538	2.025	0.562	-8.762	-6.314	12	0.001
	CG	PT-POT	-0.154	1.519	0.421	-1.072	0.764	12	0.721
Vertical jump	EG	PT-POT	-3.308	2.016	0.559	-4.526	-2.089	12	0.001
	CG	PT-POT	-0.38462	1.93815	0.53755	-1.55583	0.78659	12	0.488

The result of the present study reveals that eight weeks of calisthenics exercise has had a significant enhancement on the sprint speed performance of the football trainees and was presented as EG (MD =0.2615, SD = 0.4174, p = 0.043) compared to CG (MD = -0.2538., SD = 0.5410, p = 0.16). The reduction in sprinting speed shows a significant enhancement of sprinting performance on EG. It was observed that after eight weeks of calisthenics training, football trainees reduced their 30m sprint time by 0.2615 seconds lower than the pre-test time. But the pre- and post-test results of CG did not show any statistically significant reduction in time ($p > 0.05$). Hence, the researcher accepted the hypothesis at the $p<0.05$ level of confidence.

The findings of the current research showed that eight weeks of calisthenics training have had a significantly greater effect on the muscular strength performance of football trainees (MD = 7.538, SD = 2.025, p = 0.001) than CG (MD = 0.154, SD = 1.519, p = 0.721). It was observed that after the training, football trainees increased the number of correctly performed pull-ups by 7.53. This shows us that eight weeks of calisthenics training have had a significant effect on the improvement of the muscular strength of Bahir Dar Tesfa U17 football trainees (P = 0.01). In contrast with the experimental group, the pre- and post-test results of the control group did not show any statistically significant enhancement ($p > 0.05$) in their muscular strength. Hence, the researcher accepted the hypothesis at ($p<0.05$) level of confidence.

The above table reflected that EG (MD = 3.308, SD = 2.016, p = 0.001) was higher than CG (MD =0.38462, SD = 1.93815, p = 0.488). The result demonstrated that, after eight weeks of calisthenics training, football trainees jumped 3.308 cm higher than the pre-test score. On the other side, there is no significant difference between the pre- and post-test results of the control group. Therefore, the findings of the study revealed that eight weeks of calisthenics exercise had a positive effect on the vertical and jump (explosive power) of football trainees and improved the players' vertical jumping performance. Hence, the researcher accepted the hypothesis at the $p<0.05$ level of confidence.

4. Conclusions

This study shows that eight-week calisthenics training could be a useful and effective tool for improving printing speed, muscular strength, and explosive power (vertical jump) performances of football players. Thus, eight-week calisthenics training is an effective method to enhance sprinting speed, muscular strength, and explosive power (vertical jump) in football players.

Recommendations

- As calisthenics training was found to have a positive impact on developing a football player's physical fitness, it is highly recommended that coaches include a scientific method of calisthenics training in their training sessions.
- Football coaches should give proper attention to calisthenics exercises for the improvement of player's physical fitness.
- This research was conducted in an 8-week training program to investigate the effects of calisthenics training on sprinting speed, muscular strength, and explosive power (vertical jump). Therefore, a similar study could be conducted by including other variables that weren't included in this study.

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