

Effect of Varied Intensity of Football Specific Circuit Training on Agility, Speed and Explosive Strength among U-17 Football Players in Ethiopia

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Abstract

Objective: The purpose of this study was to examine the effect of high intensity and moderate intensity football specific circuit training on selected motor fitness variables among football players in Ethiopia.

Method: For the purpose of this study random group design was implemented. To achieve this objective 60 football players were taken as the subjects of the study. These subjects were distributed into three high intensity football specific circuit training group (N1=20), moderate intensity football specific circuit training group (N2=20) and control group (N=20) using random sampling technique. The high intensity football specific circuit training group and moderate intensity football specific circuit training group were engaged in high intensity football specific circuit training and moderate intensity football specific circuit training respectively. The selected variables were agility, explosive strength and speed. The data was collected using the standardized tests such as zigzag run test for Agility, 30 meter speed test for Speed and Standing long jump test for Explosive strength. The data was analyzed using ANCOVA and Bonferroni post hoc test for paired mean comparison when significant difference exists.

Result: Our finding indicated that the HICT group increased significantly in agility, explosive strength and speed than the control group with a mean difference made (-.743, P=.000), (.360, P=.000) and (-.725, P=.000) respectively. The MICT group also showed significant difference on speed, explosive strength and speed than the control group with a mean difference made (-.562, P=.000), (.236, P=.000) and (-.367, P=.000) respectively. Moreover the difference made between the HICT group and MICT group on explosive strength and speed was significant with a mean difference made (.125, P=.000) and (-.358, P=.000) respectively. Whereas the HICT group and MICT group didn't show significant difference on their agility with a mean difference of (-.180, P = .099).

Conclusion: From the finding we concluded that the intensity of circuit training is very crucial for the magnitude of adaptation in circuit training. Thus for the effectiveness of circuit training the plan of trainers or coaches should seriously consider the intensity to bring the intended or required changes.

Keywords: High intensity circuit training, moderate intensity circuit training, Agility, Explosive strength and Speed.

Introduction

[1,2] During football match players perform a large number of explosive bursts such as shooting, jumping, tackling, sprinting and pace changing in conjunction with high intensity actions such as sprinting, jumping and directional changes which is important to sprint,

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accelerate and decelerate alongside change of direction which is commonly known as agility.^[3] Successful sport performance at elite levels of competition often depends on high levels of technical, tactical and physical skills including aerobic and anaerobic power, muscle strength, flexibility, and agility are heavily on the explosive leg of the athletes

^[6]During the process of training athlete's body adapts to loading or adjustment to specific environmental conditions.^[7] Indeed external loading is determined by sports trainers prescribing their trainees the corresponding sports training plans.^[8] The sport training plan includes a sequence of sport training sessions for a specific period of sports training, thus sports training session is determined by exercise types, duration, intensity and frequency. ^[9] Adaptation of sport training plan is a very important task of real sport trainers, especially for those who are not very experience. There for coaches are required to approach each training session with a well-structured plan and method of training. ^[10] Among the trainings which coaches use to train youth is circuit training.^[10,11] Circuit training was developed at the University of Leeds England. From that time on wards it becomes one of the important method to improve the physical fitness qualities of athletes Circuit training has gained popularity as a training strategy due to its improvement in different physical fitness qualities. ^[12] Circuit training is an excellent way to improve mobility and develop strength and stamina. However some researchers recommend that increasing the intensity of circuit training may acquire better benefits. ^[13] Limited studies are found on the comparative effect of varied intensity of circuit training. Some studies indicated that higher levels of speed, agility and flexibility and the combination of their quality contribute for the explosive strength of the athletes. Hence ^[14,15] the current study focused on the effect of varied intensity football specific circuit training on speed, agility and explosive strength of the leg. ^[16] The explosive strength is an action that is accomplished with maximum effort in a minimum amount of time. ^[17] The basis for explosive strength is in speed, strength, a physical quality displayed in many sport skills such as jumping for a maximum height, hitting for maximum power or distance.

Materials and Method

Study setting and ethical approval: Ethical clearance was obtained from Mekelle University College of Health Sciences; Health Research Ethics

Review Committee (HRERC) with Ref. ERC 1236/2019 dated 7/03/2019 and the written assent and consent was obtained from all participants and their guardians respectively and the physical activities readiness questionnaire was fulfilled by the participants. The study was conducted in Adigrat city which is found in eastern zone of Tigray region Ethiopia with an elevation of 2,457 meters above sea level. It is located at longitude and latitude 14°16'N and 39°27'E.

Study design and participants: This study was an experimental with Randomized control group pretest-posttest design which aimed to study on the effect of high intensity and moderate intensity football specific circuit training on selected Motor fitness variables among Under-17 football players. For the purpose of this study from a total of ninety (90) players of Adigrat city sixty (60) players were taken as a sample size using the Cochran^{18&19} corrected formula for finite population.

I.e. $n = \frac{no}{1 + \frac{no-1}{N}}$ to meet 80% of power where= n is

new adjusted sample size; no is Cochran's sample size recommendation at p=0.2 variance; 95% confidence and ±5 precision; N is population size. In this study male players who are at the age of 15-17 years and volunteers to give their assent and consent from their guardian were included. The sixty (60) players were distributed into the experimental N₁=20(high intensity circuit training group), N₂=20(moderate intensity circuit training group) and N=20 (control groups) using the simple random sampling technique.

Procedures: For the purpose of this study pre-test was taken to collect base line data from the experimental groups and control group and after sixteen week of training three times per week in the Moderate intensity training (75% to 85% of HRmax) and High intensity training (85% to 90% of HRmax) for Moderate intensity group and High intensity group respectively post-test was also taken place. To collect the data from the subjects at both pre and posttests standardized tests were used. The tests or instruments were zigzag run test for Agility, 30 meter speed test for Speed and Standing long jump test for Explosive strength. In addition to the testers' competency the subjects were well informed about all the experimental procedures to perform strictly the tests to make the tests reliable.

Training: For the purpose of this study pilot study was taken to determine the required intensity. The intensity was determined based on a relationship

between the work intensity and HR²⁰. For the purpose of this study intensity was set at 75% to 85% of HRmax for Moderate intensity and 85% to 90% of HRmax for high intensity training using the heart rate monitor. The training program was designed based on the required intensity. The two experimental groups of HICT group and MICT group were engaged in the high intensity circuit training (HICT) and Moderate intensity circuit training (MICT) respectively for sixteen(16) week three times per day whereas the Control group did not engage in the circuit training.

Data Analysis: Descriptive statistics was employed for mean, standard deviation, minimum and maximum of the data and P-P-plot was used to check the normality of the continuous data. To check significance difference among the groups analysis of covariance (ANCOVA) was employed and its assumptions were checked. In the result that showed significant difference bonferroni post hoc test was used for paired mean comparison to identify which group significantly differs from the others. [21] All statistical analyses were performed using IBM-SPSS version. Significant level was set at 0.05 levels of significance.

Results

Table 1: Demographic characteristics of the participants

Variables	HICT group (n=20)	MICT group (n=20)	Control group (n=20)	F' ratio	Sig
Age in years	16.20±.69	16.30±.73	15.95±.68	1.30	.297
Weight in Kg	51.70±2.90	50.55±4.01	49.75±4.03	1.41	.253
Height in meters	1.62±.041	1.64±.049	1.60±.064	2.43	.097
BMI in Kg/m ²	19.55±.93	19.42±1.15	19.14±1.73	.497	.611

From the above table the F-ratio found for the Age, Weight, Height and BMI of the participant is (1.30, P=.297), (1.41, P=.253), (2.43,P=.097) and (.497,

P=.611) respectively. This showed that the groups had no significant difference on their demographic characteristics. They were homogenous groups.

Table 2: Analysis of covariance on the Agility, Explosive strength and Speed of the three groups.

Variables	Source of variance	Sum of squares	Df	Mean square	F-ratio	sig	
Agility	Adjusted posttest mean	Between	5.942	2	2.971	44.635*	.000
		Within	3.728	56	.067		
Explosive strength	Adjusted posttest mean	Between	1.228	2	.614	101.453*	.000
		Within	.339	56	.006		
Speed	Adjusted posttest mean	Between	4.754	2	2.377	43.118*	.000
		Within	3.087	56	.055		

The F-ratio for the adjusted means was found 44.635 which is significant at 0.05 level this shows significant difference among the groups. There for the result should be subjected to the bonferroni post hoc tests paired mean comparison to identify which group is different from the others.

The analysis of covariance for Explosive strength indicated that F-ratio for the adjusted means was found 101.453 which is significant at 0.05 level this shows significant difference among the groups. There for the

result was subjected to the bonferroni post hoc tests for paired mean comparison to identify which group is different from the others.

The analysis of covariance for speed indicated that The F-ratio found for the adjusted means was found 43.118 which is significant at 0.05 level this shows significant difference among the groups. There for the result was subjected to the bonferroni post hoc tests for paired mean comparison to identify which group is different from the others.

Table 3: Post hoc test result of paired mean comparison

Variables	HICT group	MICT group	Control group	Mean difference	Sig
Agility in seconds	7.812	7.993		-.180	.099
	7.812		8.555	-.743*	.000
		7.993	8.555	-.562*	.000
Explosive strength in meters	2.256	2.131		.125*	.000
	2.256		1.896	.360*	.000
		2.131	1.896	.236*	.000
Speed in seconds	4.006	4.364		-.358*	.000
	4.006		4.731	-.725*	.000
		4.364	4.731	-.367*	.000

From the above table it is evident that the mean difference of HICT group and Control Group: MICT group and Control Group of the agility were found to be significant at 0.05 levels. The mean difference made by MICT group and MICT group showed statistically no significant difference between them however the mean difference showed that the HICT group improved better than the MICT group.

The mean difference of HICT group and Control Group: MICT group and Control Group of Explosive strength were found to be significant at 0.05 levels. The mean difference made by MICT group and MICT group also showed significant difference.

The mean difference of HICT group and MICT group as well as HICT group and Control Group showed significant difference: MICT group and Control Group were also found to be significant at 0.05 levels.

Figure 3: Descriptive statistics of speed

Discussion

The aim of this study was to get clear information to understand on the effect of moderate intensity football specific circuit training and high intensity football specific circuit training on agility, explosive strength and speed. In this study it was hypothesized that there would be a significant difference on the effect of varied intensity football specific circuit training on agility, explosive strength and speed among U-17 football trainees. The result of the study yielded that the HICT group and MICT group showed significant improvement on agility, explosive strength and speed. This result is obtained as the result of engaging in the selected exercises in the circuits training which is supported by the findings However the

HICT group showed significant difference from even the MICT group on explosive strength and speed. This means that our finding make clear understanding that the high intensity football specific circuit training is better training to improve the explosive strength and speed this is due to that the high intensity circuit training was with more repetitive activities as well as relatively more strenuous exercises. The finding of this study strengthen the finding that had ensured as an intensive sport specific endurance circuit training is an effective enough to bring changes on speed and power. Thus from the finding of the current study we conclude that varied intensity brings varied magnitude of adaptation.

Conclusion

From the finding we concluded that the intensity of circuit training is very crucial for the magnitude of adaptation in circuit training. Thus for the effectiveness of circuit training the plan of trainers or coaches should seriously consider the intensity to bring the intended or required changes.

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