

# The Impact of Performance Related Fitness on Shooting Accuracy among High School Basketball Players in the Cape Coast Metropolis, Ghana

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## Abstract

Basketball coaches in the Cape Coast Metropolis have long been struggling with their basketball players' shooting accuracy especially those in the senior high schools. This is because it does not compare well to the standards of players in the same age group because players in the metropolis have poor shooting rates. There is strong evidence from literature indicating that athletes with high levels of fitness, particularly performance related fitness, also known as skill-related fitness, do better than their peers in the various games and sport. The purpose of this study therefore was to find out the effect that performance related fitness training will have on shooting accuracy of senior high school basketball players in the Cape Coast Metropolis'. The researchers randomly sampled and assigned twenty (20) male and twenty (20) female basketball players to the experimental and control groups by same means. The males had a mean age of 17.15yrs, weight of 73.20kg, and height of 1.79m, and the females had a mean age of 17.15yrs, weight of 68.65kg, and height of 1.64m. The control group went through mini-clinic that concentrated on passing and dribbling as a placebo, while the experimental group participated in a series of drills over a twelve-week period intended to improve their performance related fitness. Standardized tests were employed for the performance related fitness tests and the researchers modified the tests used by Uzicaninet *al.* for shooting accuracy. Data was analyzed using the t test.

There was a statistically significant difference in the shooting accuracy of the male experimental group between Pretest and Week six  $t(9) = 0.568, P = < 0.001$ . Pretest mean (M) = 3.67, SD = 1.19; Week six mean (M) = 5.06, SD = 1.13). There was also a statistically significant difference in the shooting accuracy between Pretest and Week nine  $t(9) = 0.685, P = < 0.001$  Pretest mean (M) = 3.67, SD = 1.19; Week nine mean (M) = 6.67, SD = 0.77). Statistical significant difference was also observed between Pretest and Week twelve  $t(9) = -13.062, P = < 0.001$ , Pretest mean (M) = 3.67, SD = 1.13; Week twelve mean (M) = 7.06, SD = 0.68. Nonetheless, There was no statistically significantly between Pretest and Week three ( $t(9) = -0.844, P = 0.388$ ; Pretest mean (M) = 3.67, SD = 1.19; Week three mean (M) = 3.96, SD = 1.37). A similar finding was found for the female as well. Between the experimental group of male and female the researchers found no statistically significant differences them after the twelve weeks of intervention. Basketball coaches should as part of their plan design a program that intends to improve on their players' performance related fitness, particularly during the conditioning phase of preparation for tournaments. They should also conduct regular assessment of the players throughout the season to

identify when fitness especially performance related fitness begin to go down to find ways of improving on it.

**Keywords:** Fitness, Performance related fitness, Shooting rate, Shooting accuracy, High school basketball.

### 1.Introduction:

Basketball players of senior high schools in the Cape Coast Metropolis have shooting accuracy that falls short of the standards for players of the same age group. Preliminary observation by the researchers showed that most of them are shooting at the rate of 33% and very few at 50%. A good free throw shooter should be able to shoot over 80%, according to Kelbick's (2015). High school students must be able to shoot over 70% to be classified as good shooters. He stated that anyone between the ages of fifteen (15) and eighteen (18) years (the senior high school age range in Ghana) that shoots below 70% cannot be considered as good shooters. Semidara, (2012) and Eculj & Supej (2006) propounded that shooting accuracy is a key ability that determines what makes a great basketball player. Basketball players consider shooting accuracy as one of the most important skills that makes an individual successful in the game (Okazaki, Rodacki, & Satern, 2015; Pojskić, Šeparović, Muratović, & Užičanin, 2014). Basketball is one of the sports where players must move often during the game and at the same time perform sets of activities that are physically very demanding though there are short periods of breaks that serve as recovery (Abdelkerim, Fazaaa, & Ati, 2006).

A successful basketball player needs to be physically prepared with high agility, power, speed, and other fitness components (Pojskic, *et al.*, 2014). Basketball players need a high level of leg and arm strength, sprint speed, and general kinesthetic ability to manage play. Basketball players must be very physically fit in order to be able to control the game, which requires a high level of variation in motions of play (Guimarães, Baxter-Jones, Maria, Fonseca, Santos, Santos, & Janeira, 2019; Ramesh, 2015). Basketball players should be in good physical shape with abilities like speed, speed endurance, agility, explosive power, flexibility, and coordination. When players have these fundamental characteristics at a certain level it enables them to perform better throughout the game. In addition, a player's physical attributes, such as height, arm length, and leg length, are crucial in determining their effectiveness during play (Karthi & Kumar (2018; Lloyd, Oliver, Radnor, Rhodes, Faigenbaum & Myer 2015). Best performance by an individual in a basketball game also depends on physical traits including strength, speed, agility, flexibility, power, endurance, balance, and coordination (Andrieieva, Yarmak, Kyrychenko, Ravliuk, Tsurkan, Zavgorodnia & Potop, 2020).

Skills in the game like dribbling, passing, layups, rebounding, and faking or feinting are said to be highly skilled moves so need to be perfected for a successful game. In view of that worthwhile to investigate the factors that improve shooting accuracy particularly in young basketball players of the Cape Coast Metropolis where we have identified that most players have poor shooting rate. Players' ability to manage their physical requirements for the game depends on their overall level of physical fitness, which also enables them to apply some level of technical and tactical play effectively (Bompa, & Claro, 2015; Babu & Reddy, 2009). Basketball players must have a certain level of the fundamental physical attributes like speed, agility, balance, explosive power, flexibility, and coordination which help them to perform better during play.

Therefore, the goal of this study was to investigate the hypothesis that;

1. There will be no significant difference in the shooting accuracy of the experimental group of male and female basketball players in the Cape Coast Metropolis between Pretest and Week three, Pretest and Week six, Pretest and Week nine and between Pretest and Week twelve after twelve weeks of intervention.
2. There will be no significant difference in the shooting accuracy of males and females of the experimental group after twelve weeks of training to improve on their skill related fitness.

### 1.1. Material and methods:

The researchers used pretest-posttest control group design, a method which is used in the study to determine the effects of one or more variables on the other variable (s). In this research to assess the impact on shooting accuracy, performance related fitness indicators were applied in this study. The control group participated in a mini-clinic that concentrated on dribbling and passing, while the experimental group participated in training sessions which aimed at improving on their performance related fitness three times each week two hours each day.

The player's levels of physical fitness were assessed using standardized fitness tests. The Illinois agility test was used as well as the Flamingo test, 40-meter dash, the alternate hand wall toss, the standing broad jump and seated medicine ball were used for testing. Participants had three trials for each of these tasks, and the average used for analysis. All of these batteries are high dependability Eurofit test batteries. The researchers modified the tests used by Pojskic et al. (2011) and Uzicanin et al. (2014) to create basketball shooting tests that are more appropriate for competitive settings.

There were four types of shooting tests used and these are static free throw, dynamic free throw, static two points and dynamic two points.

The participants for the study were twenty (20) male and twenty (20) female basketball players, with average ages of 17.15yrs, weights of 73.20kg and 1.79m for males and 16.5yrs, 68.65kg and 1.64m for females. They were randomly sampled and randomly assigned to the experimental and control groups. These players played regularly for their school teams located in the metropolis. All of the players were in good physical condition and were very familiar with all procedures because they had just finished the yearly interschool basketball competition a few days before to the study. All of the players' medical records were obtained from the various school infirmaries and carefully examined before the study started to ensure that no player had any conditions that may prevent them from fully participating. All participants received thorough verbal and written information regarding the purpose and requirements of the study, any known health risks, and what they could expect to gain from it. Written consent was provided to participants to sign and parents who requested were provided and also gave their approval for their children participating in the study. The researchers had the approval of the University of Cape Coast Ethical Review Board to conduct the study after all needed documents were perused. The approval reference number is **UCCIRB/CES/2019/28**

Using standardized fitness tests, the participants' performance(skill)-related fitness levels and shooting accuracy were tested. Agility was measured using the Illinois agility test, balance with the flamingo test, speed with 40m dash, reaction time with the ruler test, coordination with the alternate hand wall toss, power with standing broad jump and seated medicine ball for lower and upper body respectively. Each participant went through three trials for each test and the average used for analysis. These performance related fitness tests used are all *Eurofit* test batteries which has a high reliability coefficient. The researcher also used basketball shooting tests that are suitable for competitive settings as that of

(Pojskiet *al.*, 2011; Uzicaninet *al.*, 2014). These are static free throw, dynamic free throw, static two points, and dynamic two points.

After simple random sampling has been used to put the participants into experimental and control groups, performance related and shooting accuracy tests were carried out. Participants warmed up and stretched for fifteen minutes before each test. After the pre-test, the control group went through a mini-clinic on dribbling and passing, while the experimental group participated in drills three times a week to improve on their performance related fitness. The researchers chose overlapping drills (those that had the tendency of improving more than one fitness component at a time). Ladder, step, and dot drills, jump rope, box jumps, target throwing, ball tossing, wheelbarrow, and medicine ball rotational throws are some of the drills. The control group joined the experimental group to be retested at the end of the third, sixth, ninth, and twelfth weeks. After Week three, Week six, Week nine, and Week twelve of the intervention, performance related fitness and shooting accuracy tests were conducted in addition to the Pretest. The results were analyzed using the paired sample t test. The statistical package software performed the interpretation at a significance level of 0.05.

**1.1.1.Results:**

Ten basketball players made up the experimental group for the male category. Presentation on table 1 shows the descriptive statistics as well as the pretest and posttest results of the performance related fitness tests.

**Table 1: Descriptive statistics of the experimental group (Male) category**

	<i>N</i>	<i>Min.</i>	<i>Max.</i>	<i>Mean</i>	<i>+/-score</i>
Age(yrs)	10	16.00	18.00	17.00	.667
Weight(kg)	10	62.00	88.00	71.80	8.02
Height(m)	10	1.70	1.90	1.81	.074
Agility Pretest	10			18.24	
Posttest				17.49	
Balance Pretest	10			3.17	
Posttest				2.76	
Coordination Pretest	10			21.20	
Posttest				23.76	
Lower Power Pretest	10			3.82	
Posttest				4.10	
Upper Power Pretest	10			2.67	
Posttest				3.16	
Reaction time Pretest	10			9.85	
Posttest				7.67	
Speed Pretest	10			6.98	
Posttest				6.01	

**Source: Field survey**

Table 2 presents the ten female basketball players for the experimental group their descriptive statistics and pretest and posttest results for the performance related fitness tests conducted.

**Table 2: Descriptive Statistics of the Experimental group (Female) category**

	<i>N</i>	<i>Min.</i>	<i>Max.</i>	<i>Mean</i>	<i>+/-score</i>
Age(yrs)	10	16.00	19.00	17.50	0.745
Weight(kg)	10	56.50	88.00	73.20	8.76
Height(m)	10	1.65	1.85	1.79	0.075
Agility	10			20.43	
Pretest					
Posttest				19.01	
Balance	10			4.89	
Pretest					
Posttest				3.89	
Coordination	10			18.00	
Pretest					
Posttest				21.66	
Lower Power	10			3.25	
Pretest					
Posttest				3.93	
Upper Power	10			2.12	
Pretest					
Posttest				2.57	
Reaction time	10			8.58	
Pretest					
Posttest				5.86	
Speed	10			8.20	
Pretest					
Posttest				7.53	

Source: Field survey

Results of the study for the male experimental group showed a statistically significant difference in the shooting accuracy of the players between Pretest and Week six  $t(9) = .568, P = .001$ . (Pretest mean = 3.67, SD = 1.19; Week six mean = 5.06, SD = 1.13) There was also a statistically significant difference in the shooting accuracy between Pretest and Week nine  $t(9) = .685, P = <.001$  (Pretest mean = 3.67, SD = 1.19; Week nine mean = 6.67, SD = .77) and also between Pretest and Week twelve  $t(9) = 13.06, P = <.001$ , (Pretest mean = 3.67, SD = 1.13; Week twelve mean = 7.06, SD = .68) Nonetheless there was no statistically significant difference in the shooting accuracy of the experimental group between Pretest and Week three  $t(9) = -0.844, P = .388$ , (Pretest mean = 3.67, SD = 1.19; Week three mean = 3.96, SD = 1.37)

**Table 3: Shooting accuracy of the experimental group (male) from Pretest to Week three, Week six, Week nine and Week twelve of intervention.**

	<i>N</i>	<i>Mean</i>	<i>+/-score</i>	<i>t</i>	<i>df</i>	<i>Sig.</i>
Pretest	10	3.67	1.19	-.884	9	.388
Week three		3.96	1.37			
Pretest	10	3.67	1.19	.568	9	.001
Week six		5.06	1.13			
Pretest	10	3.67	1.19	.685		<.001
Week nine		6.67	0.77		9	
Pretest	10	3.67	1.19	-13.06		<.001
Week twelve		7.06	0.68			

Source: Field survey

With the female experimental group, there was a statistically significant difference in the shooting accuracy of the players between Pretest and Week six  $t(9) = .563, P = .002$ . (Pretest mean = 3.57, SD = 1.19; Week six mean = 5.00, SD = 1.11) There was also a statistically significant difference in the shooting accuracy between Pretest and Week nine  $t(9) = .655, P = .001$  (Pretest mean = 3.57, SD = 1.17; Week nine mean = 6.60, SD = 0.75) and also between Pretest and Week twelve  $t(9) = -11.10, P < .001$ , (Pretest mean = 3.57, SD = 1.17; Week Twelve mean = 7.00, SD = 0.65) Nonetheless there was no statistically significant difference in the shooting accuracy of the experimental group between Pretest and Week three  $t(9) = -.874, P = .375$ , (Pretest mean = 3.67, SD = 1.17; Week three mean = 3.96, SD = 1.35).

**Table 4: Shooting accuracy of the experimental group (female) from Pretest to Week three, Week six, Week nine and Week twelve of intervention.**

	<i>N</i>	<i>Mean</i>	<i>+/- score</i>	<i>T</i>	<i>df</i>	<i>Sig.</i>
Pretest	10	3.57	1.17	-.874	9	.375
Week three		3.76	1.35			
Pretest	10	3.57	1.17	.563	9	.002
Week six		5.00	1.11			
Pretest	10	3.57	1.17	.655	9	.001
Week nine		6.60	0.75			
Pretest	10	3.57	1.17	-11.102		<.001
Week twelve		7.00	0.65			

Source: Field survey

**Table 5: Group statistics of shooting accuracy for the experimental group (male and female)**

<i>Variable</i>	<i>Sex</i>	<i>Mean</i>	<i>+/- score</i>
Static Free Throw	Female	6.80	0.63
	Male	6.90	0.74
Dynamic Free Throw	Female	6.20	0.79
	Male	6.10	0.74
Static Two Points	Female	6.50	0.82
	Male	6.80	0.92
Dynamic Two Points	Female	8.70	0.97
	Male	9.00	0.91

Source: Field survey

The results showed no statistical significant difference between the experimental group of male and female for static free throw  $t(19) = -.325, P = .749$ , (male (M) = 6.90, SD = .74; female mean = 6.80, SD = 0.63), dynamic free throw  $t(19) = -2.635, P = .017$ . (male mean = 6.10, SD = .738; female mean = 6.20, SD = 0.788) and no statistical significant difference for static two points  $t(19) = -2.282, P = .216$  (male mean = 6.80, SD = 1.05; female mean = 6.30 SD = 0.966) and dynamic two points  $t(19) = -3.54, P = .012$  (male mean = 9.00, SD = 1.05; female mean = 8.70, SD = 0.97). After they had all undergone the same amount of time and type of intervention, the results of all four shooting tests did not statistical

significantly differentiate between male and female participants. The findings of the study show that there was no statistically significant difference in shooting accuracy between the male and female participants who underwent twelve weeks of intervention to improve on their performances related fitness.

**Table 6: Shooting Accuracy of the Experimental Group of male and female**

<i>Shooting tests</i>	<i>f</i>	<i>t</i>	<i>Sig.</i>
Static Free Throw	.099	-0.325	0.749
Dynamic Free Throw	.258	-2.635	0.017
Static Two Points	.009	-1.282	0.216
Dynamic Two Points	.006	-3.539	0.012

**Source: Field survey**

From the results above, there was no statistically significant difference between the experimental group of male and female with all the in the four types of shooting accuracy tests used for the study. After twelve weeks of training to improve on their performance related fitness, the experimental group of males and females showed no statistically significant difference for the static free throw, dynamic free throw, static two points, static two points and dynamic two points. The hypothesis that there would be no statistically significant difference in shooting accuracy between the experimental group of males and females after twelve weeks of intervention was not rejected.

#### **Discussion:**

The improvement in the performance related fitness levels of the players during the training period can be said to be the reason for the players' increased shooting accuracy after the sixth week of intervention. According to Foster and Foster (2019), improvements will occur when training adheres to the proper methods and last for a certain period of time. This is because the needed adaptations would have taken place. The players had developed a certain degree of speed, power, explosiveness, and agility after the sixth week, which is necessary for them to improve on their shooting accuracy. This finding concurs with that of Kariyawasam, Ariyasinghe, Rajaratnam, & Subasinghe (2019); Kozar, et al. (1994), who claimed that elements of skill (performance) related fitness are necessary for playing the game of basketball. At a point where their performance related fitness has improved to an appreciable level their shooting accuracy also improved. Because the players' performance related fitness had peaked by the intervention on the twelfth week their shooting accuracy also got better at that time. The participants were able to achieve some appreciable level of speed, agility, balance, coordination, power, and reaction time after the twelve weeks intervention.

Players that possess these fitness traits get better performance for their chosen sport. This is in line with Boone and Bourgois' (2013) who argue that players will perform better during a basketball game if they have the requisite fitness variables. According to Mancha-Triguero, Garcia-Rubio, Calleja-Gonzalez, and Ibáñez (2019), basketball players must be physically fit in addition to having strong technical and

tactical skills for greater performance. The level performance basketball players can put up in any game is highly dependent on their levels physical fitness an aspect which has been regarded by many as a crucial aspect of the game. To achieve a strong jump during rebounds in both offense and defense, leg power is really helpful. For the best performance in the game of basketball, players must have the necessary technical, tactical, and physical fitness. All these qualities should be present at a time because at any point one of them is lacking a team is more likely to be dominated by the opponent.

Based on the findings, the researchers conclude that an intentional effort made by coaches to increase performance related fitness of their basketball players within the metropolis will lead to an improved shooting accuracy. The degree of improvement between the sexes and its effects will not differ when male and female are put for same intervention. Male and female will therefore have similar gains in their shooting accuracy when put through same activities within same period to improve on their performance related fitness.

### Authors' contribution:

Dr Kodwo Owusu proofread the whole article and made corrections and suggestion on the technical presentation of the various concepts.

Mr Alexander Kweku Eshun wrote the article because the ideas were his and understands how the presentation of the paper should be.

Mr Khalid Attah-Osei advised on the analysis tools and the interpretation of the output and how it should be presented.

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