European Journal of Fitness, Nutrition and Sport Medicine Studies
ISSN: 2668 - 9758
ISSN-L: 2668 - 9758
Available on-line at: www.oapub.org/hlt

DOI: 10.46827/ejfnsm.v1i2.83 Volume 1 | Issue 2 | 2020

EFFECT OF WHOLE BODY VIBRATION TRAINING ON SELECTED HEALTH RELATED COMPONENTS AMONG AMATEUR PLAYERS IN THE POLYTECHNIC, IBADAN FOOTBALL TEAM, IBADAN, NIGERIA

Festus A. Adegoju[1],
Joseph Kolawole Abon[2i]
[1]Exercise Physiology Unit,
Department of Human Kinetics,
Faculty of Education,
University of Ibadan,
Ibadan, Nigeria
[2]Ohio University,
Athens, Ohio,
United States of America

Abstract:
Numerous studies have made attempt at identifying adequate recovery stratagem for amateur athletes. But little or no study has assessed the prolonged effects of whole-body vibration (WBV) as a recovery technique on selected health components after performance. This study investigated the effects of whole body vibration training on some selected health related fitness components among amateur players in The Polytechnic, Ibadan football team, Ibadan, Nigeria. The study was carried out using pretest posttest control group experimental research design. Twenty (20) participants partook in the research; they were placed into two groups; the experimental group (A) who undertook eight weeks of whole body vibration training while the participants in group B form the control group. Pretest and posttest values were elicited and then subjected to empirical analysis. Numerous studies have made attempt at identifying adequate recovery stratagem for amateur athletes. But little or no study has assessed the prolonged effects of whole-body vibration (WBV) as a recovery technique after performance. This study therefore investigated the effects of whole body vibration training on some selected health related health fitness components among amateur players among The Polytechnic, Ibadan football team, Ibadan, Nigeria. Descriptive statistics of mean, percentages, chats and inferential statistics of analysis of covariance (ANCOVA) were used to test all hypotheses at 0.05 alpha level of significance. The results revealed a significant difference in the pretest and posttest scores of players with muscular endurance ($F(1, 18) = 10.047$; $p<0.05$; $\eta 2=.137$) and muscular strength ($F(1, 18) = 19.317$; $p<0.05$; $\eta 2=.327$). However, the effect of

[i] Correspondence: email festosnap@gmail.com, joseph_southafrica@live.com

WBV was not significant on flexibility ($F(1, 18) = 1.006$; $p > 0.05$; $\eta 2 = .062$). So, the hypothesis was not rejected. It was concluded that whole body vibration training significantly improved the muscular endurance and muscular strength recovery of the participants, but was not significant on flexibility. It was therefore recommended that football coaches should incorporate whole body vibration training more into their training programme as muscular endurance and muscular strength are essential health fitness components needed to play football game.

Keywords: physical fitness, health related physical fitness components, cardiovascular endurance, cardiovascular strength, and flexibility

1. Introduction

One of the main objectives of most competitive games is for a team to score more goals that the opponent. There is no better ecstasy, euphoria, fulfillment, and achievement in football game for players and supporters of a team than when their team wins. But before a match is won by scoring more goals than the opponent, there are some major qualities football team players must possess. It is a common knowledge that a winning team must play as a unit and also have individual players who possess substantial mastery of the basic skills of the game. However, the mastery of the game and acquaintance of several skills which underpin scoring prowess can never be achieved if those players are not equipped with some health-related physical fitness components. Another important quality is the ability of the individual players to maintain a high-level physical fitness component necessary for achieving consistent high-quality performance.

Diverse authors have attempted to define physical fitness in several but pertinent ways. Physical fitness is seen as the capacity to carry out daily optimum activities without excessive fatigue and with sufficient energy in reserve for emergencies and allied chores. Tremblay, Colley, Saunders, Healy and Owen (2010) see physical fitness as a state of health and well-being and, more specifically, the ability to perform aspects of sports, occupations and daily activities. Fagerstrom (2011) submits that physical fitness is generally achieved through proper nutrition while Malina (2010) believed that physical fitness is achieved through moderate-vigorous physical exercise, and sufficient rest.

Before the industrial revolution, fitness was defined as the capacity to carry out the day's activities without undue fatigue. However, with automation and changes in lifestyles, physical fitness is now considered a measure of the body's ability to function efficiently and effectively in work and leisure activities, to be healthy, to resist hypokinetic diseases, and to meet emergency situations (President's Council on Physical Fitness and Sports Definitions for Health, Fitness and Physical Activity, 2012). Physical fitness components are generally grouped into two major distinctions. This statement is corroborated by Fahey, Roth and Insel (2010) who stated that components of physical fitness are grouped into health-related components and skill/performance related components. Skill related components of physical fitness have a relationship with enhanced performance in sports and motor skills. Skill related components of fitness, also referred to as performance related components, enhance athleticism and improve efficiency at everyday tasks. These components are agility, speed, power, balance, coordination and reaction time (Fahey, Roth and Insel, 2010).

The benefits of physical fitness are numerous. An individual who is physically fit has greater amount of strength, energy and cardiovascular endurance, an improved sense of wellbeing, better protection from injury because of presence of strong well-developed muscles and safeguard bones to guard internal organs and joints. A physically fit person also has improved cardiorespiratory function. The (CDC) Center for Disease Control and Prevention (2020) links regular physical activity to a reduced risk of cardiovascular disease, type 2 diabetes, some cancers, improved bone health, enhanced mental health, and improved quality of life with age.

It is necessary for every individual to be physically fit to perform his or her daily work with ease and to take part in various activities effectively. Everyone should be fit enough through participation in physical activities to develop the different physical fitness components. The five components of health-related fitness are: Cardiovascular endurance, Muscular strength, Muscular endurance, Flexibility and Body composition. Creating a fitness plan that incorporates each of these elements can help ensure that one gets the most health benefits from individual or collective routines.

Williams (2020) reported that the health related physical fitness components are the blueprint for the American College of Sports Medicine's (ACSM's) physical activity guidelines and serve as a helpful tool for organising and executing well-balanced workout routine for both individual and group which lead to optimum performance. According to Jitendra (2015), health related physical fitness is concerned with the development of those qualities that often protect against disease and frequently are associated with physical activity. This aspect of physical fitness concerns the development of qualities necessary to function efficiently and maintain a healthy life style. Spiraling health care costs and realization of benefits to be gained from participation in health and fitness activities have prompted many colleges, corporations and other organizations to establish programmes for their students and clients. They have found that such programmes promote good health and also make economic sense since poor health leads to other costs in terms of illness, primitive death, poor productivity and absenteeism (Cole and Neumayer, 2006).

Cardiovascular endurance is the ability to perform prolonged, large muscle, dynamic exercise at moderate to high levels of intensity (Fahey, Roth and Insel, 2010). It is the body’s ability to continue exertion while getting energy from the aerobic system used to supply the body with energy. According to Grabowski and Derrickson (2011) this is the system that kicks in third after the phosphagen and the glycogen lactic acid system, and so the one that supplies energy to the human circulatory system and the muscles over extended periods. It also shows the ability of the body to deliver oxygen and nutrients to tissues and to remove wastes.

Cardiovascular endurance is most useful for long distance sports; for marathon training, long distance running, jogging and swimming, however it will also be useful for everyone else and a lack of it will lead to individuals becoming quickly tired and out of breath. In a marathon, the person who comes first (while allowing for injury or general poor technique) will generally be the person with the best cardiovascular fitness. To fully understand the definition of cardiovascular endurance, it's important to understand how the body utilises energy to power its muscles. Grabowski and Derrickson (2011) reveal that all energy in the body of every living organism comes from a substance called 'ATP', the 'energy currency' of life on Earth. ATP stands for 'Andenosine Triphosphate', a name that describes the chemical composition of the substance. ATP is an adenine nucleotide made up of three phosphates attached by powerful high-energy bonds. When these bonds are broken, they release energy, which the body then utilises to power the muscles and which forms the basis of the phosphagen system, powering the body for 3 seconds using the ATP stored in the muscles. Muscular endurance is the ability to resist fatigue and sustain a given level of muscle tension for a given time (Fahey, Roth and Insel, 2010). In other words, it is the ability of a muscle or group of muscles to sustain repeated contractions against a resistance for an extended period of time. It is one of the components of muscular fitness, along with muscular strength and power. In strength training, muscular endurance often refers to the number of repetitions of a single exercise an individual can do without needing to stop and rest. Examples include how many times a full squat, a sit-up, or a bicep curl with a light-to-moderate weight can be done before breaking form.

Muscular strength can be defined as the capability of the muscles to lift weight. Participating in weight training exercises every alternate day increases the muscle mass of the body. Quinn (2004) submits that muscular strength is one of the five key components of physical fitness. Strength is defined as the maximum force that can be developed in a muscle or group of muscles during a single maximal contraction. An example would be the heaviest weight that can be lifted in a bicep curl with good form. This can also be referred to as one repetition maximum (1RM). When an individual lifts a weight or pushes a load, more mechanisms are involved than simply having big muscles. The physiological strength of a muscle is influenced by how big the muscle is, the cross-sectional area, and the types of muscle fibers in that muscle, fast twitch or slow twitch.

Muscles need strong neural connection, as the motor neurons must fire to cause muscle contraction (Grabowski and Derrickson, 2011). They have to fire in a coordinated way, therefore, more of the muscle fibers are triggered at once. One also needs to be able to use that muscle efficiently to move a joint, and that means having healthy and strong joints, bones, ligaments, and tendons. Other muscles work to assist and oppose the action of a muscle so it is controlled. Posture and positioning are critical for being able to exert the force of the muscle to maximum effect. A small shift one way or another can make a big difference in the amount of strength that can be exerted. Wood (2010) established that muscular strength is a fitness component important for success in many sports. Success in football performance is hinged directly on availability of muscular strength. Kicking, dribbling, heading and other skills in football game require that players must have muscular strength to be able to perform them.

Flexibility can be referred to as the component which checks the ability of the joints in the body to move to their full range of motion. Flexibility refers to the range of movement in a joint or group of joints, and length in muscles that cross the joints to induce a bending movement or motion. Hockey (1996) posits that flexibility is the maximum range of motion possible at a joint. Flexibility varies between individuals, particularly in terms of differences in muscle length of multi-joint muscles. Flexibility in some joints can be increased to a certain favourable degree by exercise, with stretching to maintain or improve on flexibility. Quality of life is enhanced by improving and maintaining a good range of motion in the joints. Overall flexibility should be developed with specific joint range of motion needs as the individual joints vary from one to another. Loss of flexibility can be a predisposing factor for physical issues such as pain syndromes or balance disorders. For example, a study conducted by Henderson, Barnes and Portas (2010) discovered that for every degree, decrease in the unilateral leg raise, the propensity for injury increased by 1.29. Flexibility is important in fitness because it allows for better performance when playing sports or exercising, and during day-to-day activities, it makes bending, walking, and lifting easier (Hockey, 1996). Performance of any skill in sport is enhanced by improving and maintaining a good range of motion in the joints of the human body.

Whole body vibration (WBV) comprises the transfer of relatively low-frequency environmental vibration to the human body through a broad contact area. These frequencies are in the range of 0.5 to 80 Hz (ANSI, 2002). Transmission occurs through the feet when standing, the buttocks when sitting or the reclining body when in contact with the vibrating surface. There has been an increasing scientific interest in whole body vibration exercise (WBVE) where mechanical vibrations are transmitted when a subject is in contact with an oscillating/vibratory platform (OVP). WBVE has been used as a safe and accessible exercise and important reviews have been published about the use of this exercise to manage diseases and to improve physical conditions of athletes (Kurt and Pekünlü, 2015). It has also been seen to be effective in preventing muscle atrophy and osteoporosis (Rittweger, 2002); (Roelants, 2004) and (Verschueren, 2004).

Rittweger (2002) revealed that WBV was researched upon for potential therapeutic and sport performance benefits. It is assumed that whole body vibration with amplitude of 2mm to 6mm and frequency of 20 Hz to 30 Hz evokes muscle contractions which are probably induced through the monosynaptic stretch reflex. Some studies conducted on well-trained/elite athletes showed an acute performance-enhancing effect of WBVE on vertical jump height, mechanical power (Wyon, Guinan and Hawkey, 2010; Kurt and Pekünlü, 2015), flexibility (Osawa and Oguma, 2013; Dallas, Paradisis, Kirialanis, Mellos, Argitaki, and Smirniotou, 2015) and muscular activity (Cochrane, 2011; Marín and Rhea, 2010). Acute WBV has also been investigated as a potential ergogenic aid amongst coaches to induce immediate performance benefits prior to performance (Bullock, Martin, Ross, Rosemond, Jordan and Marino, 2008) or during half-time rest periods in soccer to help prepare for the second half performance (Lovell, Midgley, Barrett, Carter and Small, 2013).

A study suggested that WBV training can be an alternative to resistance training (Lorenzen, Maschette, Koh, and Wilson, 2009). This was further proven by researches which established the fact that a vertically oscillating platform (frequency [hz] x amplitude [mm]) elicits reflexive muscle contractions, increasing skeletal muscle activity, and improving strength (Bissonnette, Weir, Leigh, and Kenno, 2010; Cardinale and Wakeling, 2005; Roelants, Delecluse, and Verschueren, 2004). Signorile (2006) suggests that WBV training provides both a musculoskeletal and neural overload that stimulates adaptation within these respective systems. Studies using the vibration platform have reported increases in the muscular strength in the legs, it was also reported to be associated with flexibility of the body and induces muscular endurance and electromyographical (EMG) activity in the muscles being trained (Bird, Hill, Ball, and Williams, 2009; Hazell, Jakobi, and Kenno, 2007; Hazell, Kenno, & Jakobi, 2010; Machado, Garcia-Lopez, Gonzalez-Gallego, Garatachea, 2010; Signorile, 2006). This research has been consistent with not only young amateur and athletic participants, but also with older adults as well (Bissonnette et al., 2010) and (Rees, Murphy, and Watsford, 2007).

Furthermore, the practical appeal of WBV training is that research reports that WBV is as effective as conventional resistance training, and more advantageously takes less time (Bissonnette et al., 2010, Signorile, 2006). For example, using a randomized sample of 43 seniors (66-85 years), Rees, Murphy and Watsford (2007) investigated the extent to which WBV training enhanced standard resistance training outcomes and muscle performance. After training 3 times a week for 2 months, they reported significant improvements in the sit-to-stand (12.4%, 10.2%), the knee- extension strength (8.1%, 7.2%), and the 5-meter walk (3.0%, 2.7%) tests in both WBV and resistance training groups, respectively. However, no significant differences were found when comparing WBV and resistance training. There has been a direct link with the use of WVB to enhance on all the health component variables.

The mechanical vibration produced in online video platforms (OVP) is a physical agent with an oscillatory motion about an equilibrium point (Rauch, Siavanen, Boonen, Cardinale, Degens, Felsenberg, Roth, Scholnan, Verschueren and Rittweger, 2010) and can be determined by biomechanical parameters: frequency, amplitude, peak-to-peak displacement and peak acceleration. Besides them, some other parameters must also be considered, as types of OVP (synchronous, alternated or tri-planar (Rittweger, 2010; Signorile, 2011), duration (working time), time of rest between bouts, periodicity of the sessions and position adopted by subject on the OVP (Rauch et al., 2010). Football coaches, managers and team physiotherapists should see the use of the Whole Body Vibration as alternative use as against the conventional workout for their clubs.

2. Statement of the Problem

Football players need muscular endurance to be able to cope with long hours of training and matches. They also need muscular strength to kick the ball, quickly burst into movements, agility or to leap above opponents to head the ball. It is important that every football player must be flexible to be able to maneuver and in performing tasks like agility efficiently and to receive passes or evade opponents. They also need speed for breakaways, flank runs or defense recovery which possession of muscular strength will permit. Football coaches dedicate a lot of time for drills and training programmes to enhance the fitness level of their players which in addition to tasking nature of competitive games may lead to incidence of muscle damage, symptoms of overreaching and lower limb injuries. It is for this reason that Rowsell, Coutts, Reaburn, and Hill-Haas, (2009) advised that coaches should implement effective recovery strategies to enhance performance. Recovery refers to restoring physiological and psychological processes so that footballers can compete or train again at an appropriate level.

Many studies have attempted to identify and improve on adequate recovery strategies for athletes. Barnett (2006) investigated using recovery modalities between training sessions in elite athletes Cheung, Hume, and Maxwell (2003) also worked on stretching, ultrasound, homeopathy, compression, moderate-intensity exercise (active recovery) and anti-inflammatory drugs. They then reported that anti-inflammatory drugs have potential negative health outcomes and may negatively affect muscle repair and adaptation to training. Scarcely were there studies that have dwelt on assessing the long term effects of whole-body vibration (WBV) as a recovery technique on selected health related components among amateur players in Nigeria. This study particularly dwelt on using the WBV training as a technique towards before, during and after performance therapy to enhance muscular endurance, muscular strength and flexibility of football players as against the conventional methods adopted by Nigerian coaches It is in the light of this that this study investigated the effects of whole body vibration training on selected health related components among amateur players in the polytechnic, Ibadan football team, Ibadan, Nigeria.

2.1 Research Questions

The study provided answers to the following questions:

1) Will the amateur players in the Polytechnic, Ibadan football team possess adequate muscular endurance?
2) Will the amateur players in the Polytechnic, Ibadan football team possess adequate muscular strength?
3) Will the amateur players in the Polytechnic, Ibadan football team possess adequate flexibility?

2.2 Hypotheses

The following hypotheses were tested in the study

1) There will be no significant whole body vibration training effect on muscular endurance among amateur players in the Polytechnic, Ibadan football team.
2) There will be no significant whole body vibration training effect on muscular strength among amateur players in the Polytechnic, Ibadan football team.

3) There will be no significant whole body vibration training effect on flexibility among amateur players in the Polytechnic, Ibadan football team.

3. Methodology

The pretest posttest/control group experimental research design was employed for this study. The population for this study included male players in the Polytechnic, Ibadan football team. There are thirty (30) registered players in the Polytechnic, Ibadan football team but only twenty (20) of these players were available for this study. These players were randomly selected into two groups (experimental and control group) of ten players each. Players were subjected to a series of muscular endurance, muscular strength and flexibility tests to determine pre-test measures. The experimental group were placed on eight weeks of whole body vibration training (three sessions a week) while the control group was placed on placebo (30 minutes of football tactical lesson every two weeks). Post-test assessment was done after intervention had been concluded.

The following research instruments were used for data collection;

1) **Whole Body Vibration Machine:** the Bodytrain vibration plate was used. This machine functions in a one directional, oscillating pattern which stimulates muscles at frequencies of up to 50 Hz which in turn makes the muscles to contract and relax by natural reflex about 50 times per second.
2) **Weighing Scale:** A portable weighing scale was used to measure total body weight in kilograms.
3) **Stadiometer:** This was used to measure the height of participants.
4) **Stopwatch:** This was used in taking accurate measurement of time when necessary.
5) **Measuring tape:** A tape calibrated in metres was used to take all necessary distance measurements.

3.1 Tests Protocols

3.1.1 Muscular Endurance Test

McGill Core Endurance Test. (McGill Torso Test)

Purpose/Objective: to assess muscle endurance of the torso stabliliser muscles.

Trunk flexor test (TFT). The TFT is used to assess the endurance of the anterior musculature of the core (rectus abdominis) (Brumitt, 2010).

Test procedure: The flexor endurance test begins with the person in a sit-up position with the back resting against a jig angled at 60 degrees from the floor. Both knees and hips are flexed 90 degrees, the arms are folded across the chest with the hands placed on the opposite shoulder, and the feet are secured. To begin, the jig is pulled back 10 cm, and the person holds the isometric posture as long as possible. Failure is determined when any part of the person's back touches the jig.

Scoring: Record how long in seconds the client is able to maintain the position.

3.1.2 Muscular Strength Test

RM Bench Press Test

This is a specific repetition maximum (RM) test for the upper body, using the bench press exercise. The one repetition maximum tests (1-RM) is a popular method of measuring isotonic muscle strength. It is a measure of the maximal weight a subject can lift with one repetition. You might want to pair this test with the squat or deadlift lower body max test. See the general description of 1RM fitness tests.

Purpose/Objective: to measure maximum strength of the chest muscle groups.

Equipment required: Bench with safety, bar and various free weights.

Pre-test: Explain the test procedures to the participants. Perform screening of health risks and obtain informed consent. Prepare forms and record basic information such name, age, height, body weight, gender, test conditions. Check equipment for safety and calibrate if required. See more details of pre-test procedures.

Procedure: The subject should perform an adequate warm up. An example would be to warm up with 5-10 reps of a light-to-moderate weight, then after a minute rest perform two heavier warm-up sets of 2-5 reps, with a two-minute rest between sets. The subject should then rest two to four minutes, then, perform the one-rep-max attempt with proper technique. If the lift is successful, rest for another two to four minutes and increase the load 5-10%, and attempt another lift. If the subject fails to perform the lift with correct technique, rest two to four minutes and attempt a weight 2.5-5% lower. Keep increasing and decreasing the weight until a maximum left is performed. Selection of the starting weight is crucial so that the maximum lift is completed within approximately five attempts after the warm-up sets.

Scoring: the maximum weight lifted is recorded. To standardize the score, it may be useful to calculate a score proportional to the person's bodyweight. The sequence of lifts should also be recorded as these can be used in subsequent tests to help in determining the starting lifts. See the table for general guidelines for interpreting the results. These ratings are for both males and females - as females are generally a smaller frame, there are expected to lift a lower actual weight to score an average rating etc. These scores are based on my personal experiences. There are also some athlete results for this test and a calculator to estimate 1RM.

3.1.3 Flexibility Test

Sit and Reach Test

This test measures the flexibility of the lower back and hamstring muscles. This following describes the procedures as used in the President's Challenge Fitness Awards. There are several other versions of the sit and reach test.

Equipment required: sit and reach box (or alternatively a ruler can be used, held between the feet).

Pre-test: Explain the test procedures to the subject. Perform screening of health risks and obtain informed consent. Prepare forms and record basic information such as age, height, body weight, gender, test conditions. Perform an appropriate warm-up.

Procedure: This test involves sitting on the floor with legs out straight ahead. Feet (shoes off) are placed with the soles flat against the box, shoulder-width apart. Both knees are held flat against the floor by the tester, if required. With hands on top of each other and palms facing down, the subject reaches forward along the measuring line as far as possible. After three practice reaches, the fourth reach is held for at least two seconds while the distance is recorded. Make sure there are no jerky movements, and that the fingertips remain level and the legs flat.

Scoring: The score is recorded to the nearest centimeter or half inch as the distance reached by the tip of the fingers. The usual scale used for the Presidents Challenge testing has the zero mark at 9 inches (23 cm) before the feet, therefore if the subject can reach their toes, their score is 9 inches.

4. Result and Discussion of Findings

This study investigated the effects of whole body vibration training on some selected health related fitness components among amateur players in The Polytechnic, Ibadan football team, Ibadan, Nigeria. Inferential statistics of analysis of covariance was used for the study. All hypotheses were tested 0.05 level of significance. The summary of analysis of covariance is then presented in the tables under the corresponding hypothesis with the result of the study discussed under each table.

4.1 Demographic Variables

Table 4.1: Frequency distribution of Participant's Height characteristics

Height	Frequency	Cumulative Frequency	Percentage	Cumulative Percentage
1.7m	12	12	60	60
1.8m	7	19	35	95
1.9m	1	20	5	100
Total	20		100	

Table 4.1 above is showing the height characteristics of participants which had the height of majority within the bracket of 1.7 (60%) and 1.8 (35%) respectively.

Table 4.2: Frequency distribution of Participant's Weight characteristics

Weight	Frequency	Cumulative Frequency	Percentage	Cumulative Percentage
60-64kg	2	2	10	10
65-69kg	8	10	40	50
70-74kg	7	17	35	85
75-79kg	3	20	15	100
Total	20		100	

Table 4.2 above shows the weight characteristics of the participant which had the weight of majority within the bracket of 65-69kg (40%) and 70-74kg (35%) respectively.

4.2 Answers to the research questions

Question 1: Will the amateur players in the Polytechnic, Ibadan football team possess adequate muscular endurance?

Table 4.3: Muscular endurance fitness level of players in the Polytechnic, Ibadan football team

Status	Frequency	Cumulative Frequency	Percentage	Cumulative Percentage
Average	15	15	75	75
Below Average	2	17	15	90
Poor	3	20	10	100
Total	20		100	

Table 4.3 shows that muscular endurance fitness level of players in the Polytechnic, Ibadan, football team when compared with the muscular endurance test norm values, It was observed that majority of the players (75%) had average muscular endurance values of 41-55secs at the entry point of the study. 25% (5) of the players had below average (31-40sec) or poor (below 30sec) muscular endurance values.

Question 2: Will the amateur players in the Polytechnic, Ibadan football team possess adequate muscular strength?

Table 4.4: Muscular strength fitness level of players in the Polytechnic, Ibadan football team

Status	Frequency	Cumulative Frequency	Percentage	Cumulative Percentage
Excellent	20	20	100	100

Table 4.4 shows muscular strength fitness level of players in Polytechnic, Ibadan football team when compared with the muscular strength test norm values, it was observed that all 20 (100%) players had excellent muscular strength values.

Question 3: Will the amateur players in the Polytechnic, Ibadan football team possess adequate flexibility?

Table 4.5: Flexibility fitness level of players in the Polytechnic, Ibadan football team

Status	Frequency	Cumulative Frequency	Percentage	Cumulative Percentage
Excellent	4	4	20	20
Good	11	15	55	75
Average	2	17	10	85
Fair	3	20	15	100
Total	20		100	

Table 4.5 shows the speed fitness level of players in the Polytechnic, Ibadan football team when compared with 30m flexibility test norm values. It was observed that 85% (17) of the players had average (5.10-5.29cm) or better than average (4.89-5.09cm) and below flexibility value at the entry point while the remaining 15% (3) had fair flexibility values of 5.30-5.60cm.

4.3 Hypotheses testing

Hypothesis 1: There will be no significant whole body vibration training effect on muscular endurance among amateur players in the Polytechnic, Ibadan football team.

Table 4.9a: McGill Core Endurance Test Results (Muscular Strength)

	N	Pretest $\overline{X}$ Score	Posttest $\overline{X}$ Score
Experimental Group	10	45.73sec	47.53sec
Control Group	10	42.15sec	42.17sec

Table 4.9a above shows that the experimental group had a pretest mean score of 45.73sec. and a posttest mean score of 47.53sec while the control group had a pretest mean score of 42.15sec and a posttest mean score of 42.17sec When compared with the control group, the experimental group gained 1.80cm after treatment while the control group also had an increase of just 0.02cm.

Table 4.9b: ANCOVA showing main effect of whole vibration training on muscular endurance

Source	Type II Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	32.431[a]	13	2.495	10.217	.000	.139
Intercept	87.916	1	87.916	22.164	.000	.171
Treatment	12.811	1	12.811	10.047	.000	.137
Error	7.946	18	.467			
Total	141.104	20				
Corrected Total	32.000	19				
a. R Squared = .342 (Adjusted R Squared = .331)						

Table 4.9b shows that the main effect of treatment (whole vibration training) is significant on muscular endurance of players of the Polytechnic, Ibadan football team ($F_{(1, 18)}$ =10.047; $p<0.05$; η^2=.137). Therefore, the null hypothesis was rejected. The partial eta squared of 0.137 implies that treatment accounted for 13.7% of the observed variance on muscular endurance of players of the Polytechnic, Ibadan football team.

Table 4.9c: Adjusted Marginal Mean showing the direction of difference in muscular endurance between the treatment groups

Dependent Variable	Treatment Groups	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Muscular endurance	Experimental	49.280cm	.792	30.718	55.841
	Control	46.142cm	.781	26.3	53.682

Table 4.9c showed that participants in experimental group obtained a higher mean score ($\bar{x}$=49.280) while control had a mean score of ($\bar{x}$=46.142). This shows that participants in experimental group had better leg power ability than the control group. It then means that the treatment had better effect on leg power of the participants in experimental group than the participants in the control group.

Hypothesis 2: Will the amateur players in the Polytechnic, Ibadan football team players possess adequate muscular strength?

Table 5a: 1-RM Bench Press Test (muscular strength)

	N	Pretest $\overline{X}$ Score	Posttest $\overline{X}$ Score
Experimental Group	10	45	46
Control Group	10	40	40

Table 5a above shows that the experimental group had a pretest mean score of 45 and a posttest mean score of 46 while the control group had a pretest mean score of 40 and a posttest mean score of 40 WBV training had a better impact on the experimental group as they gained 0.5 after treatment compared to the control group that had an increase of just 0.06.

Table 5.1b: ANCOVA showing main effect of whole vibration training on muscular strength of the amateur players in the Polytechnic, Ibadan football team

Source	Type II Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	38.833[a]	6	6.472	19.907	.000	.329
Intercept	87.916	1	87.916	22.117	.000	.361
Treatment	33.333	1	33.333	19.317	.000	.327
Error	34.119	18	1.900			
Total	194.201	20				
Corrected Total	32.000	19				
a. R Squared = .437 (Adjusted R Squared = .442)						

Table 5.2b shows that the main effect of treatment (whole vibration training) is significant on muscular strength of amateur players of the Polytechnic, Ibadan football team ($F_{(1, 18)}$ =19.317; p<0.05; η^2=.327). Therefore, the null hypothesis was rejected. The partial eta squared of 0.327 implies that treatment accounted for 32.7% of the observed variance on the muscular strength of the amateur players of the Polytechnic, Ibadan football team.

Hypothesis 3. Will the amateur players in the Polytechnic, Ibadan football team possess adequate flexibility?

Table 5.3a: Flexibility Test Results

	N	Pretest $\overline{X}$ Score	Posttest $\overline{X}$ Score
Experimental Group	10	4.877cm	4.761cm
Control Group	10	5.076cm	5.021cm

Table 5.3a above shows that the experimental group had a pretest mean score of 4.877cm and a posttest mean score of 4.761cm while the control group had a pretest mean score of 5.076cm and a posttest mean score of 5.021cm When compared with the control group, the experimental group had 0.116cm control group also had 0.055cm.

Table 5.3b: ANCOVA showing main effect of whole vibration training on flexibility

Source	Type II Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	8.729[a]	1	8.729	1.201	.124	.081
Intercept	87.916	1	87.916	1.320	.110	.075
Treatment	18.261	1	18.261	1.006	.126	.062
Error	17.004	18	.945			
Total	131.91	20				
Corrected Total	32.000	19				
a. R Squared = .017 (Adjusted R Squared = .019)						

Table 5.3b shows that the main effect of treatment (whole vibration training) is not significant on the flexibility of amateur players of the Polytechnic, Ibadan football team ($F_{(1, 18)}$ =1.006; p>0.05; η^2=.062). Therefore, the null hypothesis was not rejected. The partial eta squared of 0.062 implies that treatment accounted for 6.2% of the observed variance on flexibility of amateur players of the Polytechnic, Ibadan football team.

Table 5.3c: Adjusted Marginal Mean showing the direction of difference in flexibility between the treatment groups

Dependent Variable	Treatment Groups	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Flexibility	Experimental	4.321secs	.817	4.551	5.332
	Control	4.281secs	.678	4.344	5.961

Table 5.1c showed that participants in experimental group obtained a higher mean score ($\bar{x}$=4.321) while control had a mean score of ($\bar{x}$=4.281). This shows that participants in experimental group had better flexibility than the control group. It then means that the treatment had better effect on flexibility of the participants in experimental group than the participants in the control group.

5. Discussion of Findings

The average height of the participants was 1.76m and an average weight of around 69kg. It was also revealed that 15 (75%) of the players had average leg power values at the entry point of the study when compared with muscular endurance norm values. 5 (25%) of the players had below average or poor muscular endurance values. Further breakdown shows that none of the players had excellent muscular endurance values with 2 (10%) of the players in the below average category and 3 (15%) having poor muscular endurance values.

All the 20 players had excellent muscular strength values prior to the training programme when compared with muscular strength norm values. But only 4 (20%) of the players had excellent flexibility values when compared with flexibility norm values with 11 (55%) of the players being in the good category. 2 (10%) of the players having average flexibility values and just 3 (15%) were in the fair category. This meant that 17 (85%) of the players had average or better flexibility values when compared with the flexibility norm values prior to the training programme.

Findings from the analysis in this study revealed that there was significant effect of treatment on muscular endurance of participants under study. This is in line with the position of Rittweger (2002); Delecluse, Roelants and Verschueren, (2003), that indications exist that better results may be achieved with whole body vibration in the area of muscular endurance.

It was also discovered that the treatment had a significant effect on muscular strength of participants under study as participants in experimental group obtained a higher mean score ($\bar{x}$=48.414) while control had a mean score of ($\bar{x}$=43.789). This is in line with the study carried out by Despina et al (2014) whose measurements revealed a 7% increase ($p < 0.05$) in rhythmic gymnasts' flexibility ability.

Whole body vibration training also had no significant effect on the flexibility of participants under the study which is not in agreement with a previous study carried out by Nina and Ewald (2012) which found out that there was improved hand coordination in healthy sports among tertiary students immediately after a bout of WBV treatment. However, this may be an indication that whole body vibration training only has as an acute effect on flexibility performance but not a chronic one.

6. Conclusion

This study was conducted to investigate the effect of whole body vibration training on selected health related components among amateur players in the polytechnic, Ibadan football team, Ibadan, Nigeria. Three hypotheses were tested. Pretest-posttest experimental research design was used. The participants were subjected to muscular endurance, muscular strength and flexibility tests to determine pre-test/posttest measures. The experimental group undertook eight weeks of whole body vibration training (three sessions a week) while the control group was placed on placebo (30 minutes of tactical lesson every two weeks). Descriptive statistics of mean, percentages, chats and inferential statistics of analysis of covariance (ANCOVA) were used to test all hypotheses at 0.05 alpha levels of significance. The ANCOVA results showed a significant difference in the pretest and posttest scores of players in muscular endurance and muscular strength but no significant difference in flexibility. Hence, two hypotheses were rejected and one hypothesis was not rejected.

Based on the findings of this study, it was concluded that whole body vibration training improved the muscular endurance and muscular strength of participants and that WBV training improved balance of participants. But WBV training did not significantly improve the flexibility of the participants.

6.1 Recommendations

Based on the findings of this study, the following recommendations were made:

1. Whole body vibration training should be adopted as a viable alternative to other conventional recovery methods to improve muscular endurance and muscular strength as recovery regimen for football players.
2. Football coaches should incorporate whole body vibration training into their training programmes as muscular endurance and muscular strength are essential fitness components needed to play the game of football. More so, as whole body vibration training is time economical and places minimal stress on the body, this may lead to lower rate of injury occurrence.

Conflict of Interest Statement

There is no conflict of interest in any way in this study.

About the Authors

Festus A. Adegoju graduated with BSc. (Hons) Zoology and preceded to study PGDE in Teacher Education (Biological Sciences). He further changed discipline because of his thirst for Sport Science to study Human Kinetics and Health Education where he bagged B.Ed. Hons. (First Class). He proceeded to study Masters of Exercise Physiology (Sport Medicine) in the same department where he graduated M.Ed. with Distinction. This author holds a Confederation of African Football "A" License. He has coached a lot of clubs including the University of Ibadan Football Team. He is the current Chairman of the Nigeria Football Coaches Association (Oyo State Chapter), Nigeria. He has authored several articles in various journals. He is presently a Doctoral Research Scholar in the Exercise Physiology Unit of the Department of Human Kinetics, Faculty of Education, University of Ibadan, Ibadan, Nigeria.

Joseph Kolawole Abon

Joseph Kowole Abon is a research associate at the Ohio University, Athens at the Patton College of Education at Leadership and Coaching Departments. Correspondence in respect of this article should be addressed to Festus Adegoju, University of Ibadan, Ibadan, Nigeria as stated above.

References

Barnett, A. 2006. Using Recovery Modalities between Training Sessions in Elite Athletes: Does It Help? Sports Medicine, 36: 781-796.

Bird, M.L., Hill, K., Ball, M., & Williams, A.D. 2009. Effects of resistance- and flexibility-exercise interventions on balance and related measures in older adults. Journal of Aging and Physical Activity, 17, 444–454.

Bissonnette, D.R., Weir, P.L., Leigh, L., & Kenno, K. 2010. The effects of a whole-body advanced vibration exercise program on flexibility, balance, and strength in seniors. Physical and Occupational Therapy in Geriatrics, 28, 225–234.

Bullock, N., Martin, D. T., Ross, A., Rosemond, C. D., Jordan, M. J., & Marino, F. E. 2008. Acute effect of whole-body vibration on sprint and jumping performance in elite skeleton athletes. J Strength Cond Res, 22(4), 1371-1374.

Cheung, K., Hume, P., & Maxwell, L. 2003. Delayed Onset Muscle Soreness: Treatment strategies and performance factors. Sports Medicine, 33: 145-164.

Cochrane D. J. 2011. Vibration Exercise: the potential benefits. International Journal of Sports Medicine. 32:75–99.

Cochrane, D.J., Legg, S.J. & Hooker, M.J. 2004. The Short-term Effect of Whole Body Vibration Training on Vertical Jump, Sprint and Agility Performance – randomized controlled trial. Journal of Strength and Conditioning Research, 18(4): 82-32.

Cochrane, D. J., & Stannard, S. R. (2005). Acute whole body vibration training increases vertical jump and flexibility performance in elite female field hockey players. Br J Sports Med, 39(11), 860-865.

Despina, T., George, D., George, T., Sotiris, P., Alessandra, D. C., George, K. 2014. Short-term effect of whole-body vibration training on balance, flexibility and lower limb explosive strength in elite rhythmic gymnasts. Hum Mov Sci, 33, 149-158.

Fahey, T.D., Insel, P.M. & Roth, W.T. 2010. Fit & Well: core concepts and labs in physical fitness and wellness. 9th Edition. Boston, Mass: McGraw-Hill.

Grabowski, G.J. and Derrickson, B.H. 2011. Principles of Anatomy and Physiology. 13th Edition. Hoboken, NJ: John Wiley & Sons

Hazell, T., Jakobi, J. & Kenno, K. 2007. The Effects of Whole-Body Vibration on Upper- and Lower-Body EMG During Static and Dynamic Contractions. Applied Physiology, Nutrition and Metabolism. 32(6):1156–1163. doi: 10.1139/H07-116.

Hazell, T.J., Kenno, K.A & Jakobi, J.M. 2010. Evaluation of Muscle Activity for Loaded and Unloaded Dynamic Squats During Vertical Whole Body Vibration – randomized controlled trial. Journal of Strength and Conditioning Research. Jul; 24(7): 1860-5.

Henderson, G., Barnes, C.A & Portas, M.D. 2010. Factors Associated with Increased Propensity for Hamstring Injury in English Premier League Soccer Players. Journal of Science and Medicine in Sport. Jul; 13(4)397-402.

Kurt, C. and Pekunlu, E. 2015. Acute Effect of Whole Body Vibration on Isometric Strength, Squat Jump, and Flexibility in Well-Trained Combat Athletes. Biology of Sport. 32:115–122.

Lorenzen, C., Maschette, W., Koh, M. & Wilson C. 2009. Inconsistent Use of Terminology in Whole Body Vibration Exercise Research. Journal of Science and Medicine in Sport 12:676–678.

Lovell, R., Midgley, A., Barrett, S., Carter, D., & Small, K. 2013. Effects of different half-time strategies on second half soccer-specific speed, power and dynamic strength. Scand J Med Sci Sports, 23(1), 105-113.

Nina, V. & Ewald, H. 2012. Whole Body Vibration Improves the Accuracy of Motor Performance. Journal of Sports Medicine and Doping Studies, S7: 001 doi: 10.4172/2161-0673. S7-001.

Nougier, V., Ripoll, H. & Stein, J.F. 1989. Orienting of Attention with Highly Skilled Athletes. International Journal of Sport Psychology. 20(3): 205-223.

Osawa, Y., & Oguma, Y. 2013. Effects of vibration on flexibility: a meta-analysis. Journal of Musculoskeletal and Neuronal Interactions. 13:442–453.

Quinn, E. 2014. Strength Definition. sport medicine.about.com

Rauch, F., Sievanen, H., Boonen, S., Cardinale, M., Degens, H., Felsenberg, D., Roth, J., Scholnan, E., Verschueren, S. & Rittweger, J. 2010. Reporting whole-body vibration intervention studies: recommendations of the International Society of Musculoskeletal and Neuronal Interactions. Journal of Musculoskeletal and Neuronal Interactions. 10:193–198.

Rittweger, J. 2010. Vibration as an Exercise Modality: how it may work, and what its potential might be. European Journal of Applied Physiology. 108:877–904.

Roelants, M., Delecluse, C., & Verschueren, S.M. 2004. Whole-body-vibration training increases knee-extension strength and speed of movement in older women. Journal of the American Geriatrics Society, 52, 901–908.

Rowsell, G.J., Coutts, A.J., Reaburn, P., & Hill-Haas, S. 2009. Effects of Cold Water Immersion on Physical Performance between Successive Matches in High-Performance Junior Male Soccer Players. Journal of Sports Sciences, 27: 565-573.

Ruiz-Ruiz, J., Mesa, J.L.M, Gutierrez, A. & Castillo, M.J. 2002. Hand Size Influences Optimal Grip Span in Women but not in Men. Journal of Hand Surgery, 27A: 897-901.

Signorile, J. 2010. Whole Body Vibration, part one: what´s shakin' now? Journal of Aging and Physical Activity. 9.

Signorile, J.F. 2006. Whole Body Vibration Training: A new wave in exercise intervention for older adults? Journal on Active Aging, 5, 30–37.

Wang, H. H., Chen, W. H., Liu, C., Yang, W. W., Huang, M. Y., and Shiang, T. Y. (2014). Whole-Body Vibration Combined with Extra-Load Training for Enhancing the Strength and Speed of Track and Field Athletes. J Strength Cond Res, 28, 2470-2477.

Welford, A.T. 1980. Choice Reaction Time: Basic Concepts. Academic Press: New York.

Wyon M, Guinan D, Hawkey A. 2010. Whole-body vibration training increases vertical jump height in a dance population. Journal Strength Condition Research. 24:866–870

Tremblay, M.S., Colley, R.C., Saunders, T.J., Healy, G.N., Owen, N. 2010. "Physiological and health implications of a sedentary lifestyle". Applied Physiology, Nutrition, and Metabolism. 35 (6): 725–40. doi:10.1139/H10-079. PMID 21164543.

Fagerström, L. 2011. Older adults' motivating factors and barriers to exercise to prevent falls. Scandinavian Journal of Occupational Therapy. 18 (2): 153–60. doi:10.3109/11038128.2010.487113. PMID 20545467.

Malina, R. 2010. Physical activity and health of youth. Constanta: Ovidius University Annals, Series Physical Education and Sport/Science, Movement and Health.

President's Council on Physical Fitness and Sports Definitions for Health, Fitness, and Physical Activity, 2012. fitness.gov. Archived from the original on 12 July 2012.

Williams, Lara. 2020. MSEd, ASCM-CEP Medically reviewed by Richard Fogoros, MD Updated on April 03, 2020

The (CDC) Center for Disease Control and Prevention, 2020. Physical Activity Basics. Needs, Benefits, and Resources. Resource and Publications Reports, Recommendations and fact sheets. Active people, Healthy Nation.

Jitendra, Sharma. 2015. Health, Wellness, Fitness and Healthy Lifestyles. Horizon Books. A Division of Ignited Minds. Edutech P. Ltd. Amazon.com.

Barnett, A. 2006. Using Recovery modalities between Training Sessions in Elite Athletes: Does it Help? Sports Medicine. 36:781-796.

Brumitt, Jason. 2010. Core Assessment and Training. Human Kinetics (Organization). Medical. Pg. 154. Amazon.com.

Cole, Mathew A. and Neumayer, Eric. 2006. The impact of poor health on factor productivity: an empirical investigation. Journal of development studies, 42(6).pp.918-938.ISSN 0022-0388 DOI:10.1080/00220380600774681.