

ORIGINAL ARTICLE



The Effect of Using Vibratory Training on Some Physical and Skill Variables for Basketball Players at (K F U)

^{1,2}Ahmed K. Hassan *, ^{1,2}Khaled M. Zahran, ²Mahmoud A. Ahmed

¹Department of Physical Education, College of Education, King Faisal University, KSA. ²Department of Team Sports and Racket Games, Faculty of Physical Education, Minia University, Egypt.

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ABSTRACT

Background. The objective of this research was to identify the effects of vibration training on certain physical and skill variables of basketball players at King Faisal University. **Methods.** The researchers used the experimental method on a sample of 20 basketball players from King Faisal University. All of them were male volunteers. They were randomly divided into two groups, one experimental and the other controlling, consisting of 12 players. In the research variables, the proposed vibration training program was applied for ten weeks at the rate of three weekly training units for 30 - 45 minutes in each training unit of the group experimental, excluding the control. Group, who trained traditionally. The follow-up measurement was performed in the control and experimental groups in the same type of cardiac measurement. **Results.** The most important results were that the proposed training program positively influenced the physical variables and ability examined, and the differences in improvement rates of all physical and skill variables were in favor of the experimental group. **Conclusion.** The researchers concluded from the findings that vibratory training should be included in the players' training program components as a basis for developing fitness and basketball skills, as it has positive effects on fitness and performance.

KEYWORDS: *Vibration Training; Basketball; Physical & Skill Variables*

INTRODUCTION

Basketball has grown over the years to become one of the most popular sports in the world. One can find a basketball hoop in the backyards of homes and schools in every continent and every corner of the world. History was made on a cold early December day in 1891, when Canadian James Naismith, a physical education professor at the (YMCA) Training School. Over the years, basketball has emerged as one of the most demanding team sports regarding the variable skills involved and physical demands (1). Basketball is an intermittent team sport with frequent transitions between activities performed at low, moderate, and high intensities. Movements completed during basketball

gameplay differ for the structure, intensity, distance, frequency, and duration at which they are performed. In particular, pronounced changes in movements occur when transitioning between defense and offence. Furthermore, the given movement patterns during basketball gameplay are punctuated with multidirectional running and shuffling bouts, intertwined with frequent jumps occurring almost every minute, which is more frequent than most other team sports (2).

The use of vibrating training dates back to the second half of the last century, the Russians used it in spacecraft as a desire to maintain muscle strength and reduce the side effects of being in spacecraft by exposing the whole body to

*. Corresponding Author:

Ahmed K. Hassan

E-mail: amohhamed@kfu.edu.sa

mechanical vibration during exercise in static or dynamic conditions, as an alternative way to improve the physical performance of healthy individuals. It has been observed that there is a development in strength and the ability to jump and sprint, in addition to improving balance and motor stability in healthy individuals (3). This type of training has become popular in many sports and rehabilitation fields to obtain adaptation, rehabilitation, and general health. A study by Mahieu, N.; Witvrouw, E.; Van de Voorde, D.; Michilsens, D.; Arbyn, V.; Van den Broecke, W. (2006) that vibratory training is a guide to resistance training to develop muscular strength of skeletal muscles (4), while the results of Cochrane; D.J. (2010) study indicates forces subjected to relatively little vibration do not show any physiological changes from muscle stimulation (5). These studies (4, 6, 7) suggest that vibrating training (energy board) stimulates sensory muscle receptors, increasing muscle contraction strength and the stability of tendons, improving balance and dynamic muscle work between the working muscles and the corresponding muscles. While mentioning Taiar R. et al. (2019) that Vibrational training has an effective effect on both the blood circulation and the lymphatic cells because the vibration includes the processes of contraction and relaxation within the muscle fibers, which helps to increase the blood supply within the muscles, which ensures positive effects on the nerve endings located in the muscles (8). While the results of studies (3, 4, 9-11) indicate, that vibration training works to develop the ability to run, jump power, and perform agility exercises, in addition to many functional improvements, especially in the locomotor system of athletes in football, basketball, Ice skating, and volleyball, which leads to more effective motor transfer when performing motor skills in these various sports. Annino et al. (2007) confirm that vibration training had positive effects on ballet dancers' explosive strength of the knee extensor muscles (3). Through the analysis of basketball matches, it becomes clear that it is a sport that requires many physical and skill capabilities that a basketball player must possess. These components include aerobic endurance, anaerobic endurance, muscular endurance, the ability to jump and jump, and rapid runs with the ability to change directions (6, 12). Colson S. et al. (2010) confirm, that the new rules of basketball have necessitated

the player to perform more explosive actions represented in jumping to the top with the ability to change direction, which means optimal exploitation of the work of the extensor and opposite muscles during the extension of the joints of the lower extremity. (13, 14). The results of several studies, such as (11, 15, 16) also proved that the development of isometric explosive force for players of sports that require explosive power, mainly weighted by volleyball and basketball, has been confirmed after four weeks of electrical stimulation. The use of vibration training increases the ability to The deep jump, which is an essential requirement for basketball players during the shooting of all kinds, as well as follow-up skills, and from the previous and through the experience of researchers in the field of sports training and preparing the basketball player, they decided to conduct this study by integrating vibration training within the training program for the players of the research sample to identify its effect on some of the physical and skill variables of basketball players, the research sample what extent would the proposed program vibration training in developing some of the material and skill variables under study for basketball players?

Research Objectives. The current study aims to: identify the effect of vibration training in developing some of the physical and skill variables under investigation for basketball players. Accordingly, the present study attempts to answer the following question: "To what extent would the proposed program vibration training develop some of the physical and skill variables under investigation for basketball players.

Research hypotheses. 1. There are statistically significant differences between the mean of the pre-and post-measurements of the experimental group in the physical and skill variables under study and the percentage of improvement in favor of the post-measurement of the research sample.

2. There are statistically significant differences between the mean of the pre and post-measurements of the control group in the physical and skill variables under study and the percentage of improvement in favor of the dimensional measurement of the research sample.

3. There are statistically significant differences between the mean of the dimensional measurements of the experimental and control groups, and the control group in the physical and skill variables under study and the percentage of

improvement in favor of the dimensional measurement of the experimental group.

MATERIALS AND METHODS

Experimental Approach to the Problem.

The researchers used the practical method with two groups, one experimental and the other controlling. The program proposed by the researchers was used for a period of (10 weeks) to improve some of the physical and skill components, as the details of vibration training were included in the training program. This program was implemented on the experimental sample consisting of 12 basketball players participating in the training of the King University team Faisal, who is preparing to participate in the Saudi Universities League for the academic year (2019-2020). Their ages ranged from (18.92 ± 0.58). The research experience included a control group consisting of 12 players who train in the traditional method that does not include vibration training to identify the

effect of vibration training by comparing the results between the experimental and control groups. The experiment was carried out during the pre-preparation period for the competitive season, which amounts to 12 weeks, where ten weeks were determined, starting from the third week, where the first two weeks were a general preparation for all sample members and measurements were made for the research (tribal size) (integrated preparation period), Where all the players trained their traditional basketball training under the supervision of their coaches (5 times a week), three of them were allocated to vibration training only for the members of the experimental group for a period of (30-45) minutes.

Subjects. Twenty KFU basketball players agreed to participate in this study. They were randomly distributed into two groups, one of the experimental, and their specifications were according to Table 1.

Table 1. Specifications of the Research Sample n=24

Measure	Mean	Skewness
Age (y)	18.92	0,58
Height (cm)	177.17	1,17
Weight	71.63	1,53

Table 2. Training Protocol

Week	Set Numbers	Capacity	Effect Period	Intensity	Rest
1	3	1/2	30 sec	30 hz.	30 sec
2	3	1/2	30 sec	35 hz	30 sec
3	4	2/3	30 sec	35 hz	30 sec
4	3	2/3	45 sec	40 hz	30 sec
5	4	2/3	45 sec	45 hz	30 sec
6	3	2/3	45 sec	40 hz	30 sec
7	4	3/4	45 sec	35 hz	30 sec
8	4	3/4	60 sec	50 hz	30 sec
9	4	3/4	60 sec	55 hz	30 sec
10	4	3/4	60 sec	50 hz	30 sec

All players have been in regular basketball training during the last four years and have competed regularly in local basketball competitions (in the Eastern Province) for at least three years. None of them has undergone training programs for muscle strength or vibration training during the last three months. All instructions related to the experiment and the program in question were explained, and all volunteers in the sample agreed to participate in the program.

Procedures. The training program consisted of 30 units distributed over (5) weeks, and the unit time ranged between (30 - 45) minutes. All exercises were carried out on the vibration-

training platform that was used in the study of Schuhfried, O et al., whole-body vibration at low frequency (2.0_/4.4 Hz oscillations at 3-mm amplitude) in five series of 1 min each with a 1-min break between the series (17) and Pérez-Turpin, J.A. et al., 20-minute bursts of very-low-magnitude, high-frequency vibration (18)

1. The training intensity is fixed for the first four weeks

2. Changed again during the 5th and 6th weeks

3. The last four weeks have been changed, with the training days fixed in a way that does not contradict the basketball training, as it was on the following days (Sunday - Tuesday - Thursday).

4. The training style was (1:1) throughout the training sessions for the first four weeks (30-sec rocking - 30-sec rest)

5. The total duration of the shaking was 15 minutes.

6. Week 5 and 6 (40 shakes - 30 breaks)

7. Duty cycle: 60%: 40% and total duration of exposure to vibration: 17.5 minutes.

8. Duty cycle: 70% 30%, and the total duration of vibration was 20 minutes

9. For The first two weeks, the program consisted of alternating between two fixed positions:

- High squat (knee angle 110; 180 corresponds to the full extension of the knee)

- Same high squat position while standing on toes (same knee angle; ankle angle constant at 90) for the total time of exposure.

10. During the fifth and sixth weeks, follow the same method as before, with the knee angle changed to (90 degrees).

11. The knee angle was continuously monitored using the knee joint goniometer during the training sessions.

12. During exposure to vibration, the center position was taken with the torso slightly tilted forward at an angle of 13 degrees.

Testing Procedures. Before starting the program, a pre-measurement was conducted for all the research variables in the two groups as follows:

1. Uniform warm-up for ten minutes • Walking - running - jumping - running short distances - jumping. All exercises were done individually and without getting tired.

2. The tests were carried out in a random way to avoid fatigue from one test to another

3. Verbal encouragement was given to motivate the research sample to perform each test optimally.

Tests of physical abilities (Appendix A):

Isometric Back Strength Test.

Standing Long Jump (Broad Jump).

Isometric Leg Strength Test.

Vertical Jump.

Overhead Medicine Ball Throw (forwards).

Standing Medicine Ball Throw.

Shoulder Static Flexibility Test.

Sit and Reach Flexibility Test.

Skillful tests (Appendix B):

One-Handed Scrolling Test.

Dribbling Ended with Shooting on the Basket.

Shooting for Half a Minute Test.

Free Throwing Test.

Defensive Footwork Test.

(Appendix C)

This supplement contains the distribution of exercises over the days, weeks, and months of the training program, and each training has intensity, volume, frequency, and sets. Each group of these exercises represents a training unit rated according to the style of vibration training.

(Appendix D)

This supplement contains vibration training exercises and modes, which are selected according to the work of the muscles and the physical requirements for performing skills in basketball.

Statistical Analysis. Arithmetic means standard deviation, (T) test, correlation coefficients, coefficient of easiness and distinction, skewness coefficients, and improvement rate.

RESULTS

It is evident from the results in [Table \(3\)](#) that there are statistically significant differences in the average scores of the experimental group members in some physical and skill abilities and the percentage of improvement in the post-measurement when compared to the pre-test.

The researchers attribute this progress in physical and skillful variables (under research) to the sports program is based on physical exercises similar in its work to the muscular and kinetic performance of basketball skills and designed in a way that combines competition, performance and fun, which had a major role in improving physical variables. This is consistent with the study of Rubin et al. (19), Torvinen et al. (20) stated that whole-body vibration is a method of neuromuscular training to improve muscle strength, body balance, and bone mechanical efficiency as these mechanical stimuli are transmitted to the body where they stimulate sensory receptors. This causes the activation of motor neurons and is consistent with the results of Colson, SS et al. (13) that a 4-week full-body vibration training program added to the traditional pre-season basketball training is an effective short-term stimulus to enhance knee extensor strength and squat jump performance and adds Ma Luo et al. (7) indicated that vibrating training has a positive effect in improving balance and muscular strength. It depends on the training method through the intensity and volume of the exercises and the training program in order to

ensure a greater improvement in the balance and strength of the quadriceps muscle groups.

It is shown from Table (4) there are statistically significant differences between

means of the pre – post measurements for the control group in some physical and skillful abilities and improvement percent on behalf of post measurement.

Table 3. Differences Significance between Means of the Pre – Post Measurements for the Experimental Group and Improvement Percent in Variables under Research (n=12)

Variables	Units	Mean Pre	Mean Post	(T) Value	Imp. Percent
Physical Back Strength	kg	32.65	42.87	28.41*	31
Broad Jump	Cm	191.58	201.58	20.83*	5
Leg Strength	kg	38.93	52.08	62.61*	34
Vertical Jump	cm	28.40	35.90	18.76*	26
Overhead M.B. Throw	m	4.62	6.35	43.27*	37
Standing M.B. Throw	m	4.80	6.83	67.67*	42
Shoulder Flexibility	cm	75.69	85.87	72.70*	13
Sit and Reach	cm	24.65	31.53	34.42*	28
Skillful One-Handed Scrolling	score	13.65	18.54	18.11*	36
Dribble End Shooting	Sec.	17.69	13.6	51.08*	23
Shooting 0.5 Minute	numbers	6.69	9.39	19.29*	40
Free Throwing	numbers	3.22	5.83	28.69*	81
Defensive Footwork	Sec.	14.75	11.58	18.60*	21

*Statistically significant; Imp. Percent= Improvement Percent; M.B.= Medicine Ball
Tabulated (T) value at freedom degree (11) and significance level (0.05) = 1.796

Table 4. Differences Significance between Means of the Pre – Post Measurements for the Control Group and Improvement Percent in Variables under Research (n=12)

Variables	Units	Mean Pre	Mean Post	(T) Value	Imp. Percent
Physical Back Strength	kg	32.53	39.55	21.94*	22
Broad Jump	Cm	191	194.88	13.84*	2
Leg Strength	kg	38.84	47.13	12.42*	21
Vertical Jump	cm	26.28	28.41	12.50*	8
Overhead M.B. Throw	m	4.59	5.40	26.83*	28
Standing M.B. Throw	m	4.78	5.50	35.92*	15
Shoulder Flexibility	cm	75.53	80.29	6.71*	6
Sit and Reach	cm	24.49	27.89	24.28*	14
Skillful One-Handed Scrolling	score	13.48	16.20	11.34*	20
Dribble End Shooting	Sec.	17.60	15.38	12.31*	13
Shooting 0.5 Minute	numbers	6.56	8.27	9.53*	26
Free Throwing	numbers	3.12	4.53	14.13*	45
Defensive Footwork	Sec.	14.62	12.88	21.76*	12

*Statistically significant; Imp. Percent= Improvement Percent; M.B.= Medicine Ball.
Tabulated (T) value at freedom degree (21) and significance level (0.05) = 1.796

The researchers attribute this progress in physical and skillful variables (under research) to control group members attendance in study, as well as implementing their training program involving drills used in learning and training skills.

The researchers also attribute this progress to control group member’s competency since attendance and continuity in practice, in addition to continuous competition between athletes to offer the best physical and skillful performance

has a great influence in raising the level of physical abilities in which its effect was reflected in developing skill performance.

The results of Table (5) indicate that there are statistically significant differences between the members of the experimental and control groups in some physical and skill abilities and the percentage of improvement in favor of the experimental group. Also, changing the method in training creates a kind of enthusiasm and enthusiasm for training. In addition to gaining the

advantages of vibration training and its ability to improve muscle strength, body balance and mechanical efficiency of the bones, as these

mechanical stimuli are transferred to the body, where they excite sensory receptors, and this causes the activation of motor neurons.

Table 5. Differences Significance between Means of Two Post Measurements for the Experimental and Control Groups and Improvement Percent in Variables under Research (n=24)

Variables	Unit	Experimental Group		Control Group		(T)value	Differences in Improvement Percent %
		Mean	SD	Mean	SD		
Physical Back Strength	kg	42.87	1.08	39.55	0.73	845*	9
Broad Jump	Cm	201.58	1.08	194.88	0.61	17.92*	3
Leg Strength	kg	52.08	0.45	47.13	0.91	16.17*	13
Vertical Jump	cm	35.90	1.54	28.41	0.46	15.46*	18
Overhead M.B. Throw	m	6.35	0.11	5.40	0.04	26.92*	9
Standing M.B. Throw	m	6.83	0.04	5.50	0.05	68.89*	27
Shoulder Flexibility	cm	85.87	0.49	80.29	2.46	7.38*	7
Sit and Reach	cm	31.53	0.50	27.89	0.34	19.97*	14
Skillful One-Handed Scrolling	score	18.54	0.32	16.20	0.33	16.88*	16
Dribble End Shooting	Sec.	13.6	0.19	15.38	0.62	9.10*	10
Shooting 0.5 Minute	numbers	9.39	0.38	8.27	0.36	7.10*	14
Free Throwing	numbers	5.83	0.39	4.53	0.09	10.77*	36
Defensive Footwork	Sec.	11.58	0.46	12.88	0.16	8.85*	9

*Statistically significant; M.B.= Medicine Ball.

Tabulated (T) value at freedom degree (1) and significance level (0.05) = 2.074

These results are consistent with the results of the study of Albasini, A et al. (2010) (9) that the vibration training showed an improvement and an increase in strength in the upper and lower extremities, where the maximum strength increased by 8.1% to 16.1% for the experimental group after 10 weeks of training, which confirms the positive effects of vibration training. It agrees with what was indicated by Bosco et al. (22) and Luo et al. (2005). (7) Vibrational training on the Power Plate sends excess vibrations to the body and muscles to stimulate sensory receptors to activate the largest number of muscle fibers and increase muscle contraction to develop balance and strength for the muscles. Mahieu, N et al. (2006) (4) mentioned that vibration the whole body constitutes an exciting complementary form of training within the scope of strength training and also the results of the study of Paradisis, G.; Zacharogiannis, E. (2007) (23) of the improvement in the running speed of the experimental group at a distance of 0-10m significantly by 4.9%, and it improved in the distance From 50-60 m significantly by 2.2% after six weeks of training and an improvement in explosive power is better than the control group.

CONCLUSION

The sports program used in this study has a significant positive effect on an improvement in the physical and skill variables under study for the experimental group, where the percentage ranged between (5% to 42%) and an improvement in the skill variables under study, where the percentage ranged between (21% to 81%). In the percentage of improvement between the experimental and control group in the physical and skill variables under study, where the differences in the percentage of improvement of the physical variables ranged between (3% to 27%) and improvement in the skill variables under research, where the percentage ranged between (9% to 36%) in favor of the experimental group. This is due to the vibration training program using the Power Plate device.

Recommendations

In light of these research results, the researchers recommend the following:

1. Using vibrating exercises and linking them to different parts of the body in light of the nature and requirements of each specialized sport because of their effective impact on performance..

2. Doing other research to identify the effect of vibration training using the Power Plate device to rehabilitate sports injuries for players.

3. Conducting various researches to identify the effect of vibration training for different sports and to identify its effect on performance during competition.

4. Using modern scientific methods in preparing training programs for players in proportion to their abilities and preparations.

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