Journal of Applied Sports Science
March 2021, Volume 11, No. 1
www.jass.alexu.edu.eg

The impact of vibration training on the development of some physical abilities of basketball juniors.

Researcher / Aliaa Jassem Bo-sakhra [(1)], Prof. Dr/ Mohammed Abdul Hameed Bilal [(2)], Dr/ Mansoor Abdul Hameed Atallah [(3)]

(1) Researcher at the doctorate level, Department of Sports games, Faculty of Physical Education for men, Alexandria University.
(2) Professor of Basketball Training, Department of Sports games -Faculty of Physical Education for men - Alexandria University.
(3) Assistant Professor, Department of Fundamentals of Physical Education, Faculty of sport Education for men, Alexandria University.

Abstract

Learning about the Effect of vibration training on some physical Own (muscular power - measure speed - measure dribble speed - Agility - balance) for Junior Basketball, the study based on an experimental approach for groups (experimental - control) using measurement before and after the program. The study targeted a sample from the Yarmouk Sports Club, and the total number (20) Player they were deliberately chosen, 2020/2021 season. The size of the experimental group was (10) players, and the size of the control group was (10) players.

The results are reached There are statistically significant differences between the results of the experimental group and the control group in the after measurement in the level of physical abilities (muscular power - measure dribble speed - agility - balance) and the benefit of the experimental group. There are statistically significant differences between the results of the experimental group and the control group in the after measurement in the level of EMG and the benefit of the experimental group.

Keywords : *(vibration; training; physical)*

Introduction:

Although there is a lack of strictly controlled studies on the vibration training effect, current findings in this area suggest that vibration may have a beneficiary acute and/or chronic training effect on strength and power enhancement. (11), (6)

The effect of vibration on strength and power development appears dependent upon the vibration characteristics (method of application, amplitude, and frequency) and exercise protocols (training type, intensity, and volume) employed. Vibration amplitude and frequency determine the load that vibration imposes on the neuromuscular system. This vibration load should be in an optimal range to elicit strength and power enhancement. (1), (8), (9)

This randomized controlled study was designed to investigate the short-term effects of an 8-wk whole-body vibration protocol on muscle performance and flexibility in female competitive athletes. Whole-body vibration is a suitable training method to improve knee extension maximal strength, counter-movement jump, and flexibility in a young female athlete if it is properly designed. Not only do the optimal frequency, amplitude, and g-forces need to be identified but also the level of muscle activation that would benefit more from vibration stimulation. The improvement of flexibility is important not only for performance but also for the prevention of muscle-tendon injury. (3)

The study was to analyze electromyography (EMG) responses of vastus laterals muscle to different whole-body vibration frequencies. For this purpose, 16 professional women volleyball players voluntarily participated in the study. Vibration treatment was administered while standing on a vibrating platform with knees bent at 100 degrees (Names Bosco-system, Rome, Italy). EMG root means square (rms) and was recorded for 60 seconds while standing on the vibrating plate in the following conditions: no vibrations and 30-, 40-, and 50-Hz vibration frequencies in random order. The position was kept for 60 seconds in each treatment condition. EMG was collected from the vastus laterals muscle of the dominant leg. Statistical analysis showed that, in all vibration conditions, average EMG activity of vastus laterals was higher than in the no-vibration condition. (10)

Through this study, the researcher aims to identify the effect of vibration training in improving the level of ability and speed to improve the training environment in the State of Kuwait, As you can see, the vibration training method is easy to apply and may be interesting for young people to use, Which brings back the effectiveness of the training environment in the State of Kuwait, It is also a method that improves muscle tone, as shown by the results of some studies, and improves muscle capacity for training, Which will benefit this category of juniors in improving their level of strength and muscular capacity, Especially since previous studies showed the effectiveness of vibration training in improving the level of vertical jump, This illustrates the importance of the current study subject to be studied and researched to identify the benefits of vibration training for Junior Basketball.

Objectives:

Learning about the Effect of vibration training on some physical Own (muscular power - measure speed - measure dribble speed - Agility - balance) for Junior Basketball, by achieving the following duties:-

1. Establish a training program Using Vibration Training for Junior Basketball.
2. Learning about the effect training program Using of Vibration Training some physical Own (muscular

power - transition speed - speed motor - Agility - balance) for Junior Basketball.

Hypothesis:

1. There are statistically significant differences between Measure before and after for the experimental and control groups in the level of some physical Capabilities and in favor of measurement after.
2. There are statistically significant differences between Measure after the experimental and control groups in the level of some physical Capabilities and in favor of experimental group.

Methods:

Approach:

The study is based on an experimental approach for groups (experimental - control) using measurement before and after the program.

Sample:

Core sample:

The study targeted a sample from the Yarmouk Sports Club, and the total number (20) Player they were deliberately chosen, 2020/2021 season. The size of the experimental group was (10) players, and the size of the control group was (10) players.

Exploratory sample:

It was selected (16) players from the basketball team under of Arabic Sports Club, to conduct exploratory study.

The researcher also homogeneity of the sample of the research as a whole, (20) players to make sure they fall under the normal curve in the variables (age -length - weight - Old training), as shown in Table (1), The researcher also found a homogeneity of the sample of researcher in the also physical variables of the members of the research sample, as illustrated in Table (1), (2).

Table (1)
Statistical characterization of the sample individuals in the variables "Age – Height - Weight - old training" N=20

Variables	measuring unit	means	Std Deviation	skew
Age	**Year**	**16.395**	**0.217**	**0.024**
Height	**Cm**	**74.650**	**3.798**	**0.216**
weight	**Kg**	**178.100**	**4.426**	**0.047**
Old training	**Year**	**4.250**	**1.089**	**0.455**

Table (1) shows the homogeneity of the individuals in the research sample in the variables " age - height - weight - Old training ", since the values of the torsion coefficients of these variables are limited to (± 3), which means that the distribution of the individuals of the research sample in these variables is moderate.

Table (2)
Statistical characterization of sample in the physical tests N=20

Variables	measuring unit	means	Std Deviation	skew
Vertical jump Using hands test	**cm**	**30.900**	**5.948**	**0.643**
Vertical jump Without using hands test	**cm**	**19.500**	**3.500**	**0.439**
Long jump stability test	**cm**	**199.500**	**9.205**	**0.621**
Throwing medical ball test	**meter**	**9.800**	**0.584**	**0.323**
T drill test	**Sec**	**12.372**	**0.725**	**0.629**
28m sprint test	**Sec**	**4.901**	**0.430**	**0.778**
measure dribble speed test	**Sec**	**5.760**	**0.425**	**1.034**
stork stand test	**point**	**59.500**	**7.228**	**0.189**

Table (2) shows the homogeneity of the research sample in physical tests, as the skew of research sample are between (± 3) in the variables.

Equal sample:-

After confirming the homogeneity of the research sample, the players were divided into two groups in a homogeneous pairs method, according to the basic and physical variables of the research sample, and the level of parity was as shown in Tables (3) and (4):

Table (3)
Equal sample (experimental - control) in the variables "Age – Height - Weight - old training"

Variables	measuring unit	Experimental N=10		Control N=10		T
		means	Std Deviation	means	Std Deviation	
Age	Year	16.420	0.235	16.370	0.195	0.517
Height	Cm	73.400	3.693	75.900	3.477	1.558
weight	Kg	177.600	4.454	178.601	4.340	0.509
Old training	Year	4.300	1.100	4.200	1.077	0.205

The value of "T" Driven at the level (0.05) = (2.101)

It is evident from Table (3) that there are no significant differences in the basic variables of the tribal measurements between the experimental and control group, as the calculated value of "t" ranged between (0.205-1.558), which is less than the tabular value of "t" at the level of 0.05, which indicates the parity of the two groups.

Table (4)
Equal sample (experimental - control) in the physical tests

Variables	measuring unit	Experimental N=10		Control N=10		T
		means	Std Deviation	means	Std Deviation	
Vertical jump Using hands test	cm	30.900	6.122	31.000	5.744	0.037
Vertical jump Without using hands test	cm	19.300	2.758	19.700	4.100	0.255
Long jump stability test	cm	201.500	6.344	197.500	11.011	0.995
Throwing medical ball test	meter	9.850	0.604	9.750	0.559	0.384
T drill test	Sec	12.306	0.605	12.438	0.822	0.408
28m sprint test	Sec	4.952	0.407	4.851	0.446	0.019
measure dribble speed test	Sec	5.795	0.392	5.725	0.453	0.255
stork stand test	point	59.000	8.602	60.000	5.477	0.310

The value of "T" Driven at the level (0.05) = (2.101)

It is evident from Table (4) that there are no significant differences in the variables of special physical abilities of the tribal measurements between the experimental and control group, as the calculated value of "t" ranged between (0.019-0.995), which is less than the tabular value of "t" at the level of 0.05, which indicates Equalize the two groups before applying the research experiment.

Tests used in this study are:

Physical tests:- (2),(4),(5)

1. muscular power (Vertical jump Using hands test - Vertical jump -Without using hands test - Long jump stability test - Throwing medical ball test).
2. 28m sprint test, to measure speed.
3. 28 m sprint dribbling test, to measure dribble speed.
4. T drill test, agility.
5. stork stand test, to Balance

EMG tests:

1. Measurement EMG (The anterior rectus muscle - the posterior muscle).
2. Measurement EMG (The anterior shoulder muscle).

Scientific transactions used for the tests:

Believe physical tests:

The Believe of the physical tests was calculated by calculating the accuracy of the distinction by applying them to two groups of (16) players, From Arabic Sports Club.

Table (5)
Significance of differences between the distinctive and indistinctive groups In physical tests N=16

variables	measuring unit	distinctive group N=4		Indistinctive group N=4		Means difference	Calculated 'T' value
		mean	s.d	mean	s.d		
Vertical jump Using hands test	cm	38.00	2.236	25.250	0.829	12.75	10.693*
Vertical jump Without using hands test	cm	23.500	1.118	16.000	1.224	7.500	9.048*

variables	measuring unit	distinctive group N=4		Indistinctive group N=4		Means difference	Calculated 'T' value
		mean	s.d	mean	s.d		
Long jump stability test	cm	213.750	4.145	186.250	4.145	27.8500	9.382*
Throwing medical ball test	meter	10.562	0.569	8.250	0.176	2.312	7.763*
T drill test	Sec	11.012	0.294	13.342	0.388	2.330	9.572*
28m sprint test	Sec	4.545	0.145	5.410	0.266	0.865	5.710*
measure dribble speed test	Sec	5.075	0.187	5.875	0.092	0.800	7.677*
stork stand test	point	66.250	7.395	55.000	3.535	11.25	2.745*

The value of "T" Driven at the level (0.05) = (2.447)

Seen from the table (5) and statistically significant difference between distinctive and indistinctive groups' differences in physical tests.

The stability of physical tests:-

Has been found stability of tests using test method application and reapply coefficient (test-retest) on a sample (16) players, From Arabic Sports Club, He re-applied the tests under the same conditions and the same instructions after (7) days.

Table (6)
Reliability coefficient of physical tests N=16

variables	measuring unit	Implementation first		Implementation second		Means difference	Pearson's r
		mean	s.d	mean	s.d		
Vertical jump Using hands test	cm	31.625	6.594	31.875	6.527	0.250	0.861
Vertical jump Without using hands test	cm	19.750	3.929	20.000	3.937	0.250	0.807
Long jump stability test	cm	200.00	14.361	201.250	14.523	1.250	0.895
Throwing medical ball test	meter	9.406	1.230	9.500	1.118	0.094	0.922
T drill test	Sec	12.177	1.214	12.125	1.268	0.052	0.910
28m sprint test	Sec	4.977	0.482	4.843	0.378	0.134	0.803
measure dribble speed test	Sec	5.475	0.426	5.462	0.429	0.013	0.916
stork stand test	point	60.625	8.076	61.250	7.806	0.625	0.905

The value of "R" Driven at the level (0.05) = (0.707)

Seen from the table (6) there were no statistically significant differences between the first and second two implementations in physical tests demonstrating the enjoyment of these tests transactions high firming.

Training Program:

The training program is designed beside the rest of the other physical elements of the game of basketball through :

1. The suggested vibration training program has been applied for two months during the preparation period of the training season, i.e. (8) weeks; (3) sessions per week.
2. The training session lasts from 61.15-83 mines. So that the total time of the program would be 1839 mines.
3. The program included (50) exercises for each of the (muscular power - measure speed - speed motor - Agility - balance) (Supplement 1).
4. Application of the training program in Basketball courts has been carried out in Yarmouk club, Kuwait.
5. Training method was used high intensity interval training method, with an intensity ranging between (30Hz – 40Hz).
6. Warming up time was determined as (15 mines) and cool down time as (6 mines).
7. General warm-up exercises to prepare different muscles of the body to activate the blood circulation, Develop flexibility of the body joints with muscle lengthening.
8. Skills required to be developed and improved in the technical preparation were distributed, in addition to what was taught from the tactics (individual – groups-teams) in the tactical preparation fitting with the age stage (17) years.

the formation of the load Degree through the stages of the program:

Table (7)
Dynamic training load used in the training program

Training weeks	Saturday	Monday	Wednesday	Average load intensity in the week
First week	30H	30H	30H	30H
second week	35H	35H	35H	35H
third week	40H	40H	40H	40H
fourth week	35H	30H	40H	35H
fifth week	40H	40H	30H	36.66H
sixth week	35H	40H	35H	36.66H
Seventh week	40H	40H	40H	40H
eighth week	35H	30H	30H	31.66H

The intensity of the training load ranged between (30 Hz - 40 Hz).

Before measurements:
He researcher conducting tribal measurement the variables on Thursday 20-8-2020 to me Sunday 23-8-2020:

- Thursday 20-8-2020, variables "Age – Height - Weight - old training", physical tests. For the experimental group.
- Friday 21-8-2020, variables "Age – Height - Weight - old training", physical tests, for the control group.
- Saturday 22-8-2020, EMG tests, for the experimental group.
- Sunday 23-8-2020, EMG tests, for the control group.

Implementation of the basic experience:
The training program for the experimental group was implemented from Monday 24-8-2020 to Saturday 17-10-2020 days (Saturday - Monday - Wednesday).
The training program for the control group was implemented from Tuesday 25-8-2020 until Sunday 18-10-2020 days (Sunday - Tuesday - Thursday).
The program was implemented for a period of (8) weeks with (24) training units, provided that the time of the training unit ranged between (61.15 s - 83 s) and the average time of the training unit during the implementation of the training program was (76.15 s).

After measurements:
The researcher conducted the after measurements on Monday 19-10-2020, to me Thursday 22-10-2020, under the same conditions that were conducted in the before measurements.

Statistical Analysis:
IBM SPSS (17) version was used to conduct statistical processing for the research:
(Mean- STD Deviation- Skew- Calculated 'T' value- Pearson's r).

Presentation and discussion of the results:

Table (8)
Significance of differences between the mean of two measurements (Before – after) For the experimental group in physical tests N=10

variables	measuring unit	Before		after		Means difference	Improvement Ascriptions %	Calculated 'T' value
		mean	s.d	mean	s.d			
Vertical jump Using hands test	cm	31.000	5.744	49.500	6.103	18.500	59.677	9.730*
Vertical jump Without using hands test	cm	19.700	4.100	33.300	3.729	13.600	69.035	8.694*
Long jump stability test	cm	197.50	11.011	225.500	6.873	28.000	14.177	8.576*
Throwing medical ball test	meter	9.750	0.559	11.250	0.680	1.500	15.384	6.805*
T drill test	Sec	12.438	0.822	11.385	0.414	1.053	8.465	4.439*
28m sprint test		4.851	0.446	4.519	0.359	0.332	6.843	2.499*
measure dribble speed test	Sec	5.725	0.453	5.069	0.517	0.656	11.458	4.224*
storks stand test	point	60.000	5.477	82.500	5.123	22.500	37.500	11.673*

The value of "T" Driven at the level (0.05) = (2.262)
Seen from the table there are significant differences where the value of (t) calculated higher than the values of (T) Driven at the level of significance (0.05).

Table (9)
Significance of differences between the mean of two measurements (Before – after) For the experimental group in EMG tests N=10

variables		measuring unit	Before		after		Means difference	Improvement Ascriptions %	Calculated 'T' value
			mean	s.d	mean	s.d			
Anterior rectus muscle	GVA	Volts	27.500	4.863	36.100	4.392	8.600	31.272	5.911*
	GAT	Sec	0.107	0.016	0.084	0.008	0.023	21.495	5.782*
Posterio r muscle	GVA	Volts	29.800	4.707	36.200	3.709	6.400	21.476	4.497*
	GAT	Sec	0.079	0.016	0.062	0.007	0.017	24.518	4.465*
anterior shoulder muscle	GVA	Volts	22.700	4.405	28.400	3.979	5.700	25.110	4.291*
	GAT	Sec	0.091	0.011	0.067	0.006	0.024	26.373	7.588*

The value of "T" Driven at the level (0.05) = (2.262)
Seen from the table there are significant differences where the value of (t) calculated higher than the values of (T) Driven at the level of significance (0.05).

Table (10)
Significance of differences between the mean of two measurements (Before – after) For the control group in physical tests N=10

variables	measuring unit	Before		after		Means difference	Improvement Ascriptions %	Calculated 'T' value
		mean	s.d	mean	s.d			
Vertical jump Using hands test	cm	30.900	6.122	40.100	7.020	9.200	29.773	4.441*
Vertical jump Without using hands test	cm	19.300	2.758	25.700	2.282	6.400	33.160	7.613*
Long jump stability test	cm	201.500	6.344	214.500	6.873	13.000	6.451	5.957*
Throwing medical ball test	meter	9.850	0.604	10.450	0.640	0.600	6.091	2.918*
T drill test	Sec	12.306	0.605	11.988	0.542	0.318	2.584	2.646*
28m sprint test	Sec	4.952	0.407	4.756	0.390	0.196	3.957	1.721
measure dribble speed test	Sec	5.795	0.392	5.511	0.394	0.284	4.900	2.363*
stork stand test	point	59.000	8.602	66.50	7.088	7.500	12.711	3.204*

The value of "T" Driven at the level (0.05) = (2.262)
Seen from the table there are significant differences where the value of (t) calculated higher than the values of (T) Driven at the level of significance (0.05).

Table (11)
Significance of differences between the mean of two measurements (Before – after)) For the control group in EMG tests N=10

variables		measuring unit	Before		after		Means difference	Improvement Ascriptions %	Calculated 'T' value
			mean	s.d	mean	s.d			
Anterior rectus muscle	GVA	Volts	25.400	4.820	28.300	4.796	2.900	11.417	2.351*
	GAT	Sec	0.114	0.018	0.107	0.013	0.007	6.140	2.459*
Posterio r muscle	GVA	Volts	27.900	3.884	30.900	4.459	3.000	10.752	2.562*
	GAT	Sec	0.080	0.017	0.079	0.015	0.001	1.250	0.451
anterior shoulder muscle	GVA	Volts	20.600	2.835	23.000	2.607	2.400	11.650	2.918*
	GAT	Sec	0.095	0.012	0.084	0.015	0.011	11.578	3.162*

The value of "T" Driven at the level (0.05) = (2.262)

Seen from the table there are significant differences where the value of (t) calculated higher than the values of (T) Driven at the level of significance (0.05).

Table (12)
Significance of differences between the mean of two measurements after for the experimental and control groups in physical tests

variables	measuring unit	Experimental N=10		Control N=10		Means differenc e	Difference ratio %	Calculate d 'T' value
		mean	s.d	mean	s.d			
Vertical jump Using hands test	cm	49.500	6.103	40.100	7.020	9.400	23.441	3.195*
Vertical jump Without using hands test	cm	33.300	3.729	25.700	2.282	7.600	29.571	5.497*
Long jump stability test	cm	225.500	6.873	214.500	6.873	11.000	5.128	3.578*
Throwing medical ball test	meter	11.250	0.680	10.450	0.640	0.800	7.655	2.709*
T drill test	Sec	11.385	0.414	11.988	0.542	0.603	5.030	2.795*
28m sprint test		4.519	0.359	4.756	0.390	0.237	4.983	1.413
measure dribble speed test	Sec	5.069	0.517	5.511	0.394	0.442	8.020	2.150*
stork stand test	point	82.500	5.123	66.500	7.088	16.000	24.060	5.785*

The value of "T" Driven at the level (0.05) = (2.101)

Table (12) for special physical abilities tests in the after measurement of the experimental and control groups shows that there are significant differences at the level of (0.05) in all special physical tests except for the 28-meter running test, and the calculated T value ranged between (2.150 - 5.785) and was in favor of the experimental group. The difference percentage ranged between (4.983% - 24.060%), and it was in favor of the experimental group in all special physical tests.

Table (13)
Significance of differences between the mean of two measurements after for the experimental and control groups in EMG tests

variables		measuring unit	Experimental N=10		Control N=10		Means difference	Difference ratio %	Calculated 'T' value
			mean	s.d	mean	s.d			
Anterior rectus muscle	GVA	Volts	36.100	4.392	28.300	4.796	7.800	27.561	3.792*
	GAT	Sec	0.084	0.008	0.107	0.013	0.032	21.495	4.764*
Posterior muscle	GVA	Volts	36.200	3.709	30.900	4.459	5.300	17.152	2.889*
	GAT	Sec	0.062	0.007	0.079	0.015	0.017	21.518	3.247*
anterior shoulder muscle	GVA	Volts	28.400	3.979	23.00	2.607	5.500	23.913	3.656*
	GAT	Sec	0.067	0.006	0.084	0.015	0.017	20.238	3.327*

The value of "T" Driven at the level (0.05) = (2.101)

It is evident from Table (13) for EMG for muscles working in shooting by jumping in the post measurement of the experimental and control groups that there are significant differences at the level of (0.05) in all measurements, and the calculated t value ranged between (2.889 - 4.764) and was in favor of the experimental group, and the difference between (17.152% to 27.561%) and was in favor of the experimental group.

The results of the study are consistent with the results of Study No]7[,]12[,]13 [In that vibration training has an effective effect in improving the level (muscular power - measure speed - measure dribble speed - Agility - balance).

The conclusion:

In light of the nature of this study and the sample and the methodology used and the results of the statistical analysis in the scope of this research researcher reached the following conclusions:

1. There are statistically significant differences between the results of the Before - after measurement of the experimental group in the level of special physical abilities (muscular power - measure speed - measure

dribble speed - Agility - balance) and in favor of the after measurement.

2. There are statistically significant differences between the results of the Before - after measurement of the Control group in the level of special physical abilities (muscular power - measure speed - measure dribble speed - Agility - balance) and in favor of the after measurement.
3. There are statistically significant differences between the results of the experimental group and the control group in the after measurement in the level of physical abilities (muscular power - measure dribble speed - agility - balance) and the benefit of the experimental group.
4. There are statistically significant differences between the results of the experimental group and the control group in the after measurement in the level of EMG and the benefit of the experimental group.

Recommendations:

The researcher was able to identify recommendations that benefit the work in the field of training for basketball players is as follows:

1. The use of vibration training in developing the level of special physical abilities (muscular power - speed - agility - balance) for basketball Players.
2. Limit vibratory training programs for juniors with a intensity of 30-40 Hz in performing exercises.
3. Conducting vibration exercises 3 times a week during the basketball Players training programs.
4. Reliance on pair vibration pads during junior training programs for ease of use and ensuring that both parties operate under the same training conditions.

References:

Arabic references:

1. **Christophe Delecluse , Machteld Roelants, Rudi Diels,Erwin Koninckx, Sabine Verschueren(2006):** Effects of Whole Body Vibration Training on Muscle Strength and Sprint Performance in Sprint-trained Athletes, Faculty of Physical Education and Physiotherapy Tervuursevest.
2. **Ekaterina Tankisheva, An Bogaerts, Steven Boonen(2014) :** Effects of Intensive Whole-Body Vibration Training on Muscle Strength and Balance in Adults With Chronic Stroke: A Randomized Controlled Pilot Study, American Congress of Rehabilitation Medicine.
3. **Fagnani F, Giombini A, Di Cesare A, Pigozzi F, Di Salvo(2006) :** The effects of a whole-body vibration program on muscle performance and flexibility in female athletes, Am J Phys Med Rehabil. Dec;85(12):956-962.www.ncbi.nlm.nih.gov.
4. **Günseli Usgu (2016):** The Effects of Whole Body Vibration With Plyometric Training on Physical Performance in Basketball Players, Hasan Kalyoncu University, gov Identifier: NCT03291483.
5. **G. Tsitskaris ,A. Theoharopoulos, A. Garefis(2003) :** Speed, speed dribble and agility of male basketball players playing in different positions, Journal of Human Movement Studies 45(1):21-30 · January.
6. **Harvey W., Wallmann, PT, David L. Bell, Brandon L (2019):** The Effects of Whole Body Vibration on Vertical Jump , Power , Balance , and Agility in Untrained Adults, The International Journal of Sports Physical Therapy , Volume 14, Number 1 , February.
7. **Hsing-Kuo Wang,Chi-Pang Un,Kwan-Hwa Lin,En-Chung Chang(2014) :** Effect of a Combination of Whole-body Vibration and Low Resistance Jump Training on Neural Adaptation, Pages 161-171 , Received 26 Jun 2013, Accepted 24 Sep 2013, Published online: 21 Mar.
8. **J. Skoglund, B. Rehn, J. Lidstro¨m, B. Lindstro¨m(2007) :** Effects on leg muscular performance from whole-body vibration exercise: a systematic review, Med Sci Sports: 17: 2–11.
9. **Karel H. Madou, John B. Cronin(2008):** The Effects of Whole Body Vibration on Physical and Physiological Capability in Special Populations, Hong Kong Physiother J;26:24–38.
10. **MARCO CARDINALE, JON LIM (2003):** Electromyography Activity of Vastus Lateralis Muscle During Whole-Body Vibrations of, Journal of Strength and Conditioning Research, , 17(3), 621–624q 2003 National Strength & Conditioning Association Different Frequencies.
11. **Moran K. , Luo J, McNamara B,(2005) :** The useof vibration training to enhance musclestrength and power. Sports Med:35: 23–41.
12. **NICOLA BULLOCK, DAVID T. MARTIN, ANGUS ROSS, C. DOUG ROSEMOND, MATTHEW J. JORDAN, (2008):** Acute Effect of Whole-Body Vibration on Sprint and Jumping Performance in Elite Skeleton Athletes, Address correspondence to Nicola Bullock, nicola.bullock@ausport. gov.au 22(4)/1371–1374Journal of Strength and Conditioning Research _ National Strength and Conditioning Association**.**
13. **WILLIAM E. AMONETTE, CHARLES S. LAYNE, MARTHA R.(2007):** Vibration Exposure and Biodynamic Responses during Whole-Body Vibration Training, Medicine & Science in Sports & Exercise. 39(10):1794-1800, OCT.