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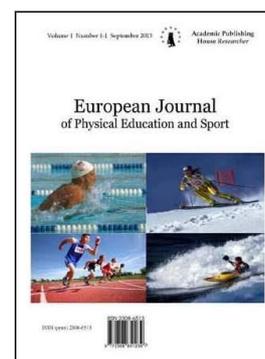
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The Effect of the Contrastive Training Using Weights and Plyometrics on the Development of the Vertical Jump Ability to Improve the Performance of the Smash for Volleyball Players

Zabchi Noredine ^{a,*}, Mokrani Djamel ^a, Benzidane Houcine ^a, Sebbane Mohammed ^a

^a Physical Education and Sports Institute, University of Mostganem, Algeria

Abstract

Considering training as a purposeful educational process that implies scientific planning for the sake of preparing the players, with their different physical, psychological and skill levels, to achieve the highest possible levels, it acquired a special character and was implemented into different important domains to achieve athletic goals at various levels for the development of motor performance. Many methods are used commonly by most of the trainers, and this led us, as researchers, to suggest a training programme that is based on the use of a contrastive training method using weights and plyometrics to achieve the highest degrees of efficiency, through using strength in different and opposite ways within the training unit or within a set of exercises, while trying to contribute to the clarification of this way for all types, in general, and applying it with the volleyball students as a sample representing the research community.

The research process is meant to be conducted through pre and post tests on two groups; one as the control group and the other pilot. The first sample group underwent a programme established under the supervision of the professor of the subject, while the second underwent the suggested programme.

Ultimately we found out through the statistical analysis of the results the existence of significant statistical differences between the pre and post tests in favour of the pilot group on the account of the control one. Researchers attribute these results to the impact of the suggested contrastive training using weights and plyometrics, which leads to the improvement of the ability to jump through bridging the gap between strength training and speed, using the so-called reactive prolongation which facilitates and adapts the additional kinetic units in the muscles during the performance, and gains muscle elasticity, and thus the development of vertical jumping ability, which contributes to the improvement of the smash skill in Volleyball.

Keywords: contrastive training, vertical jump, smash skill, volleyball.

1. Introduction and problematic of the research

Planning for training in different sport activities became a crucial means for the improvement of the training state of players, as the great scientific development in the training methods and preparation of players, having implemented the scientific truths presented by the

* Corresponding author

E-mail addresses: norzabchi7@yahoo.fr (Zabchi Noredine)

different other sciences including biology, psychology, sociology or technology, led to the improvement of the training process.

Sport training has crossed huge distances in the way of science, as it moved to the implementation of different sciences to build its processes and plans. It relies on different training methods and means, while every method targets specific goals. Mohamed Hassen Allawi (1992) points out to the training methods as being the different means through which we can develop the training state of the sport individual to the maximum possible degree.

Volleyball, as one of those mass games that were developed, was also touched by development through targeting the improvement of its skills which are considered as its characterising aspects. These skills seem for us characterized by dynamism and excitement, mainly during the defence and attack phases. It is one of those rich games in terms of technical skills, as we find that they include scrolling and transmission skills, beating, blocking and reception of the transmission and reception of balls, and in all of these the movements of the feet play an important role.

The blyometric tarining is known as a training system designed to dvelop the elastic strength of the muscles, as the muscular sets start to lengthen first under the impact of a given weight before it starts then to contract to the maximum possible degree. Training with wieghts has an important role in the developement of the muscular strength of the palyer, as the nature of the skill performance in this sport requires strength characterized by speed, thence training with weights is essential among the contents of the training ([Hamdi Abdel Munim, Muhamed Sobhi Hassaneen, 1997](#)).

Essaid Abdelmaksood (1997) mentions that in the contrastive training, there is an attempt of reaching the maximum degree of efficiency through the use of force in contrastive or sense opposing ways with the same training unit or a set of exercises, and it is possible to reach the contrast through the change of weights in an explosive way , or through the change at the level of the weight or the type of contraction and muscle tension, or from weight to plyometrics ([Zaki Muhamed Hosseen, 2004](#)).

Kheyria Essokri and Myhamed Breeaka (2009) mention that the creative trainer designs trainings that have a positive effect on the development of his/her players abilities using various sets of activities within the training unit, and changes in training ways based on individual differences among the sportsmen, and that the adequate planning for the increase of the weight leads to reaching the top of the high levels ([breekaa, 2009, 10-19](#)).

Through dealing with the previous studies, researchers found out that the use of the plyometrics and weight training has a great importance in the development of physical aspects. The previous researchers agreed on the importance of using these two methods to enhance the muscular ability, mainly the lower limbs of the body and the vertical jumping operation.

Many researchers consider the plyometric training as one of the most frequently used methods for the dvelopment of strength which is characterized by speed for many sport activities that require the integration of the maximum force with the maximum speed, as this method helps in overcoming the problems confronted in the development of strength that is characterized by the speed, and this is what Hamid Sofiane (2011) mentions copying from Malisux (2006), as he states that the plyometric training contributes in the improvement of the performance, mainly in activities that use explosive muscle contractions. As for Rahman, he mentioned that plyometric training at short term is effecient for for the dvelopment of the musle strength and high vertical jumping and anerobic abilities, as he adds that on the other hand, that associating plyometrics with trainings using weights is of a considerable effeciency for volleyball players ([Sofiane Hamid, 2011, 01-05](#)).

The problem of research is due to field follow-up in the domain of teaching of volleyball players in the Physical Education and Sports Institutes, as a lack in the variation and mixture in modern methods of training was remarked, and mainly for the developènt of special body characterestics, as though the inclusion of weight training in programmes for some and the appearance of plyometrics for others, we did not remark any coordination of these different methods. And on the basis of the scientific observation of researchers, it was found out that trainers use plyometrics and weightlifting in an absolutely separate way. For this reason this research comes to try the use of plyometrics and weightlifting in a contrastive way and to show its impact on the development of the vertical jumping ability in order to perform the smash skill for the students of volleyball specialty.

Research procedures:**Research Methodology:**

The researcher used the experimental method using two groups, one as experimental and the other as control.

The research sample:

The research sample included 30 students chosen in an intentional way among third-year LMD students at the Institute of Physical Education and sports at the University of Oran. (Exploratory sample (06 students), the control sample group (12 students), the experimental sample group (12 students).

Tools and methods of the research:

- Arabic and foreign sources and references.
- Physical and skill tests.
- The suggested training programme (contrastive training)
- Statistical instruments.

Statistical instruments:

Pearson correlation R was used as the research' statistical instrument to study the scientific basis for the tests used in the research, while the T Student was used to compare the results of the pre and post tests used for the experimental and control groups. The statistical methods are based on the arithmetic average standard deviation, in addition to the equation of the progress ratio to know the output throughout the basic experiment in the research.

Used tests:

- Test (1): vertical jump to the top from stability "Sargent"
- Test (2): vertical jump to the top from movement, "Sargent"
- Test (3): Smash test

The main experiment:

The sessions were conducted in the afternoon parts of days, which is the usual time of training for the samples of this research. Also a training programme was established including a set of plyometric and weight-lifting trainings through the contrastive method for the development of vertical jumping for the smash skill for volleyball players, using necessary instruments and means.

The main experiment was applied in the same field and with the same variables apart from the use of the weight lifting and plyometric trainings in the contrastive way (the independent variable) which was included in the training unit for the experimental group under the supervision of the professor, through suggesting 14 training units in addition to the pre and post tests. Every unit has its own main objective which is the same objective planned by the teacher.

The first phase included 3 weeks and the period of trainings took 16 minutes and the lifting tension was about 40 % to 60 %, as the number of repetitions for the same exercise varied from 6 to 10 in 3 to 4 sets with a rest of 60 to 90 seconds.

As for the second phase, it took 4 weeks, and the period of the suggested trainings 18 minutes, as for the lifting tension it varied from 50 % to 70 %, as for the number of repetitions for each exercise, it ranged from 8 to 12 in 4 to 5 sets with a rest of 60 to 90 seconds.

Comparison of the pre-test sample research results

The Student t-test was used to determine the homogeneity of the two sample groups: experimental and control, in these tests.

Table 1. Homogeneity of the sample control and experimental results in the tribal test

Statistical measurements tests	Experimental sample		Control sample		Calculated T	Tabular T	Significance level	Difference significance
	X1	Y1	X2	Y2				
Sargent test (stability), "m"	0.35	0.04	0.28	0.05	0.001	2.201	0.05	No significance
Sargent test (of the movement), "m"	0.42	0.06	0.35	0.05	0.003			No significance
Smash test	12.41	2.42	7.33	2.42	1.92			No significance

The sample size 24, degree of freedom (2 n-2) = 22

From Table 1, we find that the calculated value of (T) ranged between 0.001 and 1.92, and all of them are smaller than the tabular T that is estimated 2.201 at the degree of freedom 22 and the level of significance 0.05. This means that the difference between the averages is statistically insignificant, i.e. that members of the two samples are homogenous and that the random differences that have emerged are only individual differences among them.

Presentation, analysis and discussion of the pre and post tests

Presentation, analysis and discussion of the "Sargent" test (vertical jump from stability):

Table 2. comparison of the pre and post tests for the experimental and control samples

The sample	Pre test		Post test		Calculated T	Tabular T	Level of Significance	Degree of freedom	Statistical significance	Collection rate
	X1	Y1	X2	Y2						
experimental	0.35	0.04	0.48	0.05	3.26	2.201	0.05	11	Statisticcally significant	%37.14
Control	0.28	0.05	0.34	0.06	2.82					Statisticcally significant

It is remarkable from Table 2 that there are significant differences between the arithmetic averages for the pre and post tests for the experimental sample group which undertook a set of plyometric exercises, as calculated (T) was estimated at 3.26 . While for the control sample group it was estimated at 2.82. These values are bigger than tabular (T) which reached 2.201 at the degree of freedom 11 and the significance level 0.05. This means that there are significant differences between the arithmetic averages for the two tests in favor of the post test for both samples, as the experimental one realized superiority in the arithmetic average of the post test as compared to the control sample group.

Presentation, analysis and discussion of the Sargent test (Vertical jump from movement)

Table 3. Comparison between the results of the pre and post tests for the control and experimental research sample groups

The sample	Pre test		Post test		Calculated T	Tabular T	Level of Significance	Degree of freedom	Statistical significance	Collection rate
	X1	Y1	X2	Y2						
experimental	0.42	0.06	0.57	0.04	4.74	2.201	0.05	11	Statisticcally significant	35.71%
Control	0.35	0.05	0.42	0.06	3.53					Statisticcally significant

It is remarkable from Table 3 that there are statistical significances between the arithmetic averages of the pre and post tests for the experimental sample group, which means that there are significant differences between the tests in favor of the post test for both sample groups, as the experimental group outperformed the control one in the arithmetic average of the post test.

Presentation, analysis and discussion of the smash test

Table 4. Comparison of the results of the pre and post tests for the experimental and control sample groups

The sample	Pre test		Post test		Calculated T	Tabular T	Level of Significance	Degree of freedom	Statistical significance	Collection rate
	X1—	Y1	X2—	Y2						
Experimental	13.18	2.78	19.7	2.74	5.71	2.201	0.05	11	Statisticcally significancant	48.82%
Control	10.75	3.45	12.73	2.67	3.72					

It is remarkable from [Table 4](#) that the value of calculated (T) is 5.71 for the experimental sample group, while it is 3.72 for the control one, and they are bigger than tabular (T) 2.201 at the degree of freedom 11 and significance level 0.05. This means that there is a statistical significance between the arithmetic averages for the pre and post tests, i.e. there are significant differences in favour of the post test for both sample groups.

Comparison of the results of the post test

In order to know the differences in tests between the two samples; experimental and control, the Student (T) was used.

Table 5. Differences between the experimental and control groups in the post test

Statistical measurements Tests	Experimental sample		Control sample		Calculated T	Tabular T	Significance level	Difference significance
	X1—	Y1	X2—	Y2				
Sargent test (from stability), "m"	0.48	0.05	0.34	0.06	3.95	2.201	0.05	significance
Sargent test (from the movement), "m"	0.57	0.04	0.42	0.06	4.63			significance
Smash test	18.5	2.43	9.08	2.67	3.82			significance

[Table 5](#) shows the values of calculated (T) which ranged between 3.82 and 4.63 and all of them are bigger than tabular (T) which estimated at 2.201 at the degree of freedom 22 and the level of significance 0.05. This means that the obtained results are statistically significant, i.e. the individual differences between the members of the two samples become significant.

2. Discussion of the results

Researchers attributed the results of the test of vertical jump from stability to the effect of the suggested contrastive training using weights and plyometrics, as it led to the improvement of the ability of jumping through bridging the gap between strength exercises and speed ones, using the so-called “reaction prolongation” which facilitates and adapts additional movement and muscular units in the muscles during performance. Moreover, it offers the muscle elasticity. Thus, the performed sequenced models of exercises in a medium tension confirmed the positive output and the efficient effect on the muscular system through the development of the relation between the maximum strength and the explosive one of the lower limbs. Thence, the development of the ability of vertical jumping improves the smash skill in volleyball, and this matches the study of Ibrahim Adel (1993) which confirms the importance of the use of muscle strengthening exercises in addition to the plyometric training for the development of a better muscular strength.

The outperformance of the experimental group over the control one which is confirmed by the progress ratios in the Sargent test from movement, as it reached 35.71 % for the experimental group and 20 % for the control one, is attributed by the researcher to the effect of the optimal choice of the suggested exercises to the experimental group in order to develop their ability of vertical jumping. These exercises are a set of different jumps in a medium tension, and that proved their positive effect on the muscular system while developing the explosive strength of the lower

limbs for the sake of developing the ability of vertical jumping in order to improve the smash skill in volleyball.

According to the obtained results we see that the trainings used led to the development of the muscular ability of the legs, and this is what Hamed Sofiane (2011) mentioned reporting from Rahmane (2005), as he mentioned that the plyometric training at short term is efficient for the development of the muscular strength and the vertical jumping and the anaerobic abilities. As he adds, on the other hand, that when the plyometric training is linked to weight lifting trainings, it proves efficiency for volleyball players.

Said Abelmaksood (1997) points out to the fact that contrastive training using weights and plyometrics increases the speed of movement performance through the increase of muscles ability to contract in a faster and more explosive average throughout the movement' term within the articulation and in the fullest movement' speed. In addition to that, the high tension use in these exercises leads to the improvement of the agreement within the muscle and among the sets of muscles and that leads to the improvement of the level of strength without increasing the weight of the muscle.

The percentages of the outperformance in the test of the smash reached 49.07 % for the experimental group, while for the control one it reached 23.87 %. This means that the members of the experimental group realized the best results in the post test as compared to the members of the control group, this is due to the inclusion of exercises targeting the development of the explosive strength of the lower limbs for the experimental group, and thus the development of the jumping ability and the improvement of the smash skill in volleyball. The sequenced samples of the plyometric exercises performed in medium tension, in the form of a set of different plyometric jumping exercises, confirmed the positive output and the efficient effect on the muscular system through the development of the maximal strength and the explosive one of the lower limbs, and thence the development of the vertical jumping ability which contributes to the development of the smash skill in volleyball.

And this goes with the study of Atef Rashad (1995) which insists on the appropriate application of the physical exercises (repetition, density, adequacy and tension). Hamed Sofiane (2011) also pointed to the same idea reporting from Malisoux (2006), stating that plyometric training contributes to the improvement of performance mainly in activities that use explosive muscular contractions. Rahman (2005) pointed to the idea that short term plyometric training is efficient for the development of the muscular strength and vertical jumping and the anaerobic strength.

Researchers consider vertical jumping as crucial in volleyball, and this is obvious throughout the results obtained from the smash test which reflects the interrelation between vertical jumping and performance. Thence, the betterment that took place resulted from the respect of the training scientific basics in dealing with students of the specialty through the adequate increase of the training weights, the period of permanence and continuity of the training and its repetition and period (number of weeks).

3. Conclusion

In the light of the experimental sample group and the instruments and means that were used, in addition to the results that we obtained, we can state the following conclusions:

- The suggested contrastive training programme has a positive effect on the variables that are under research.
- The existence of statistically significant differences between the pre and post measurements of the experimental sample group in favour of the post measurement.
- The existence of statistically significant differences between the experimental and control samples in the post measurement in favour of the experimental one.
- The contrastive training method using weights and plyometrics is one of those efficient methods for the development of the muscular ability and vertical jumping for volleyball players.
- The contrastive training method using weights and plyometrics has an efficient effect and a positive output on the development of the vertical jumping and the smash skill in volleyball.

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