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Effects Of A Plyometric Training Program On The Repeated Sprint Ability RSA For Senior Football Players

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Abstract

This article aims to know the impact of plyometric training on the development of repeated sprint ability. The researcher used the experimental approach using the experimental design of two equivalent groups (control and experimental). The study sample consisted of 18 players who were divided into two groups; a control group consisting of 9 players to whom the traditional program prepared by their coach was applied and an experimental group consisting of 9 players to whom the plyometric training program was applied.

The study sample consisted of players under 19 years old who are active in the Second Professional Division Championship of the Football Middle Group. The 30-meter repeated sprint test was applied where the test enjoyed a great degree of validity and objectivity. After

conducting the pre-tests on the two groups, the training program was carried out in the plyometric training method prepared by the researcher for 06 weeks at a rate of 03 training sessions per week at a pace of one and a half hours per training session. After the implementation of the training modules, the post-tests of the two groups were carried out. In order to analyze the results of the study, the statistical program SPSS 21 was used.
By comparing the post-results that had been statistically significant, the results confirmed that the plyometric training program had yielded good results in the repeated sprint test among the players of the group that had used the researcher's program, with significant differences concerning the control group that had applied the regular program. The results of this research are considered good for coaches, physical preparation specialists, and every player who wants to develop RSA during the competition phase by using plyometric training.

Keywords: Plyometric training, repeated sprint ability, Training program.

Introduction

1. Problem of the study:

The world in the present millennium knows about scientific development in all fields and on a large scale. Among these fields, we find the sports field, which has become based on scientific research in studying its various subjects. It also relies heavily on precisely studied scientific foundations and principles for the development of approaches and training programs. This ensures that we achieve the goals and bring the athlete to the level of good performance, so efforts have been made towards greater understanding and deeper research into the concept and rules of sports training science, as well as its different ways and methodologies. All this requires us to shed light on everything new in the field of training and its applications. The successful trainer in the sports training profession always draws his success and strength from science by looking for all the new training techniques, approaches, and programs that he can benefit from in his work.

Football is a highly popular team sport around the world, leading to the creation of modern methods and ways of training in order to bring athletes to the highest technical, artistic, and physical levels. Sports training is all physical loads, or in other words, all the effort of the body resulting in adaptation of the functional organs of the human body in general and the athlete body in particular, as well as adaptation of the formative aspect of the athlete, affecting positively the internal organs of the individual and increases his level (Nayef Mafdi al-Jabour, 2012, p. 13).

Modern training is a comprehensive process to improve athletic performance achieved through a planned training program for preparation and competitions. It is a process aimed at gaining the player's physical qualities in a comprehensive and balanced manner and at a suitable size for the player that corresponds to his physical abilities (Ahmed Aribi Ouda, 2016, p. 201).

The training plyometric method is one of the most effective methods used in modern training. Djamal Sabri Faraj asserts that plyometric training uses movements that are of little time and explosive, where the activity of the neuromuscular units is higher than that of the usual voluntary contraction (Djamal Sabri Faraj, 2010, p. 12).

One of the qualities that a footballer needs is sprint ability, defined as the ability of an athlete to recover and maintain maximal effort during subsequent sprints. It is important in team sports such as football where the player runs short distances with high intensity from 2 to 3 seconds with a rest period of less than 30 seconds within 10-20 meters.

By following teams at the level of the second professional division of football, the researcher noticed many shortcomings, especially in the inability of players to maintain maximum speed, as well as a clear lack of repeated sprint ability, especially on the side of applying plans to running back to defense and start counterattacking.

In order to address this problem, the researcher prepared a training program that includes a series of training modules prepared scientifically and academically manner that respects the requirements of the plyometric training method according to the sample's physical and moral characteristics and abilities.

Most of these data prompted us to do this study where the general question was as follows:

2. General question:

Does plyometric training affect repeated sprint ability among footballers class U19?

3. Study hypothesis:

Plyometric training effectively affects 30-meter repeated sprint ability among footballers.

4. Study importance:

1. To know the importance of using plyometric training in the development of repeated sprint ability in football.
2. The current research represents a new addition for football teams' coaches where these scientific references are an essential source for improving the coach's cognitive efficiency.

5. Study objectives:

1. To know the impact of plyometric training on repeated sprint ability of footballers class U19.
2. To prepare training modules in the plyometric training style among footballers.

6. Study terminology:

1- Plyometric training: is a form of intense training that involves the use of a stretch and contraction sequence of muscle fibers to generate great strength at a high speed. Physiologically, a muscle that extends before the contraction can contract more strongly and quickly. (Sabri Faraj, 201, p. 5).

2- Repeated sprint ability: Dawson (2012) defines it as an important part of fitness and means to cover a short distance of 30-40 meters within 3-4 seconds with a 10-30 seconds recovery time between repeats. (Dawson, 2012, p. 285)

7. Previous studies:

7.1. Arab Studies:

- **The study by Djodet Satti Hamad Allah**, entitled "The impact of a proposed training program using plyometric training on some of the physical and physiological abilities of the players of the Arab American Football University team." The study aimed to learn about the impact of the proposed training program using plyometric training on some of the physical and physiological abilities of the players of the Arab American Football University team. The researcher adopted the experimental approach by relying on two groups; control and experimental, using the two measurements (pre and post) because it is appropriate to the nature of the research in order to achieve the study's objectives. The sample contained 30 players from the football team of the Arab American

University, chosen intentionally. The training program was subject to eight weeks with three training modules per week. The researcher concluded that there were statistically significant differences between the pre and post-measurements in favor of the post-measurement in the members of the experimental group concerning certain variables (the explosive strength of the feet, the explosive strength of the arms, and the anaerobic power). There were no statistically significant differences in the variables of speed running, enduring strength concerning the muscles of the arms and abdominal muscles.

- **The study by Abid Al-waili (2012),** entitled "The impact of plyometric exercises on the development of the muscle strength of the feet and the accuracy of the player's performance using the head skill in football." The study aimed to determine the impact of plyometric exercises on the development of the muscle strength of the feet and the accuracy of the player's performance using his head in football. The researcher used the experimental approach because it is appropriate to the nature of the research. The sample size (24 players) was intentionally selected. To achieve the study's objectives, the experimental design of two groups was used; the experimental group and the control group based on the pre-post measurements. The researcher found that there is a significant difference in the broad jump from the standing point (30 meters) and the accuracy of the player's performance using the head skill in favor of the experimental group. This is due to the impact of these exercises on the development of the muscle strength of the feet, which results in this development being linked with the accuracy of performance to be more positive for players toward better performance in handling and targeting.
- **The study by Berrah Hamza (2019/2020 – PhD thesis),** entitled "The impact of weight and plyometric training to improve and transform the strength quality according to the requirements of some of the basic skills of footballers." The aim of the study is to know the impact of weight and plyometric training to improve and transform the strength quality according to the requirements of some of the basic skills of footballers. The researcher used the experimental approach because it is appropriate to the nature of the research. The researcher concluded that the experimental group that applied the training program witnessed a remarkable improvement in the all physical and skill characteristics studied in the research, while the control group that applied a regular program, there was a relative improvement in the tests.

7.2. Foreign studies:

- The study by Vincent Viano and Antonio Hestler (2015 – PhD thesis), entitled "Comparison of my method of training for speed development and repeated sprint ability." The study aims to observe the impact of recovery time in maximum speed sessions and the differences between male and female adults. The researcher used the experimental approach at a rate of 06 weeks, two sessions per week. The research sample consisted of two groups; 9 boys under the age of 14 and 07 girls under the age of 15. The researcher observed significant differences between the two methods, especially in the 30 meters race with a significant difference in the ability of repeated sprint with a short time to recover.
- The study by Barbara Johnson, entitled "Evaluation of the optimal duration of the effectiveness of the plyometric training program to improve the motor abilities of young people with cerebral palsy." The research is a PhD Study at the Faculty of Special Education and Rehabilitation, Utah University, Logan, America. The aim of the study is to determine the optimal duration of improving the motor abilities of children with cerebral palsy through a plyometric training program. The research adopted the

experimental approach and the sample consisted of 41 participants from the Shriners Hospital in Utah, which received a 15-week program at a rate of two sessions per week. The results showed that the plyometric training improved the running, throwing, and jumping skills of some young people with cerebral palsy and the optimal duration varied depending on the specificity of each case.

8. Study approach:

The experimental approach is one of the most clearly defined scientific approaches because it does not simply describe the situation or state or history of past events, but rather examines the variables related to a particular phenomenon (Boudaoud Abdelyamin, Atallah Ahmed, 2009, p.136).

The experimental design varies according to the experimental topics. In this study, the researcher relied on the experimental design of the pre and post-tests of the experimental group and control group, which is mainly based on the pre-measurement (before the experiment) and then the post-measurement (after the experiment) of the two groups with the control group not being exposed to the experimental variable. The differences between the pre-measurement and the post-measurement prove or negate the validity of the proposed hypotheses.

9. Research fields:

9.1. Human field:

The experiment was conducted on a sample of 19-year-old footballers from the Wifak M'sila team, which is active in the second division of football for the 2020/2021 sports season.

9.2. Spatial field:

These tests were conducted at the Ouartal Al-Bachir stadium - State of M'sila.

9.3. Temporal field:

The pre-test: 13/01/2021

The post-test: 24/02/2021

The post-test was conducted 6 weeks after the implementation of the pre-test, a period during which the experimental sample was exposed to the researcher's proposed training program.

10. Research community and sample:

If the researcher decides to undertake field research, he must clearly identify the community he will study. The research community includes all the individuals who have the characteristics to be studied. The research participants may consist of individuals, universities, or organizations, and in any event, the research community should not be ambiguous. (Mabrouka Omar Mhiriq, 2008, p. 153)

The research community was intentionally selected, namely football players under the age of 19 in M'sila. Six players were excluded after the pilot study, resulting in (18) players, which were randomly divided into two groups. The first group is the experimental group by (09) players and the second is the control group by (09) players.

11. Sample homogeneity:

The researcher conducted the homogeneity test on the two research groups concerning some variables (age, number of training years, anthropometric measurements, height, and weight).

Table (01): shows the arithmetic means, standard deviations, and the calculated (T) value for the experimental sample and control sample concerning the age, height, weight, and the number of training years' variables.

Variables	Control group		Experimental group		(t) value	(t) value	Significance
	arithmetic means	standard deviation	arithmetic means	standard deviation	Calculated	Tabulated	
Age	17.77	0.50	18.01	0.34	1.67	2.14	Statistically insignificant
Height	1.78	0.46	1.79	0.35	1.30	2.14	Statistically insignificant
Weight	71.66	0.33	71.33	0.34	1,50	2.14	Statistically insignificant
Years of training	9.86	0.66	10,01	0.66	0.65	2.14	Statistically insignificant

The value of tabulated (t) is at the level of significance 0.05 and degree of freedom 18 = 2.14

Table 01 shows that the value of the calculated (t) with regard to the age variable was 1.67. Concerning the height and the weight variables, they reached 1.30 and 1.50, respectively. For the number of training years, it reached 0.66. All values are smaller than the tabulated (t) value (2.14) at the level of significance (0.05) and degree of freedom (18).

12. Test used:

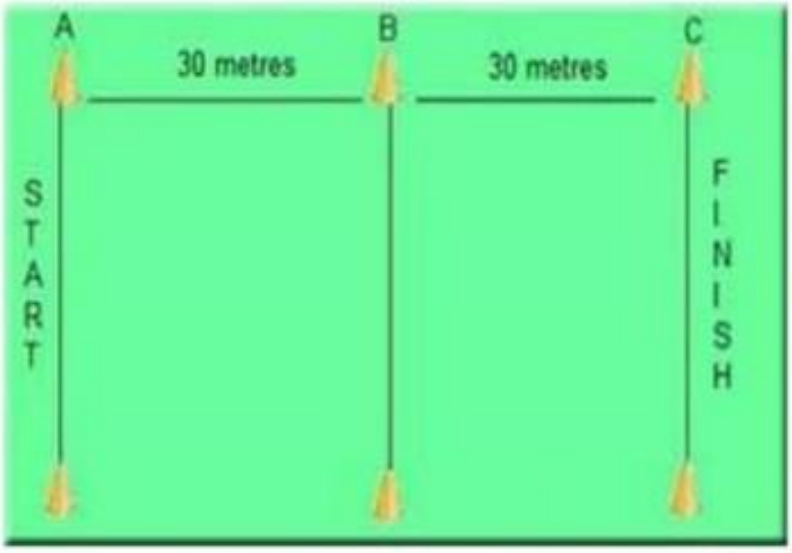
12.1. Repeated sprint ability test:

The objective of the test is to measure the maximum speed.

Performance specifications:

Two cones (A & B) are placed 30 meters away. The player from the first cone goes at full speed from anaerobic A towards B, then from B to C as a distance recovery for 10 seconds after each attempt. The player runs the distance eight times and each time the rest time is 10 seconds (Dawson, 2012 p. 12)

Record: Total time and access rate are calculated in the time passed within eight attempts (see figure).



12.2. Scientific conditions of the tool:

Reliability coefficient:

✓ **Test reliability:**

The Reliability Coefficient is a way of confirming how accurate a test is by giving it to the same subject more than once and determining if there's a correlation which is the strength of the relationship and similarity between the two scores. The results showed that the scores obtained by the player the first time applying the test are the same as the scores obtained the second time, which means the stability of a particular phenomenon of different causes (Vandelin, 1985, p. 313).

The researcher found the reliability coefficient of physical tests and (repeated sprint ability) using the method of applying and reapplying the test. The test was applied to 06 players from the research community and outside the basic research sample (pilot sample). Five days later, the test was reapplied in the same terms as the first procedure. We got the results using Spearman's correlation coefficient to find out the reliability of the test. The results obtained were as follows:

- ✓ The result and reliability of the repeated sprint ability test was 0.97.
- ✓ This indicates high reliability in tests:
- ✓ Square of the differences between the first and second results.
- ✓ Sample Number
- ✓ Spearman correlation coefficient.

$$\frac{6\sum {}^{2}S}{(1-{}^{2}S)S} - 1 = C$$

Table (02): represents the calculation of the reliability coefficient of the repeated sprint ability test

	Tests	correlation coefficient	Validity coefficient
01	**Repeated sprint ability test**	**0.97**	**0.98**

Table (02) shows that all the values of the correlation coefficients calculated for the variables under study are close to 01 and therefore the correlation coefficient is strong. Thus, we can say that the repeated sprint ability test is reliable to a high degree.

Validity coefficient:

Validity is one of the most important requirements for study tools0 Lindcost (1995) defines it as "the accuracy by which the test measures what it was designed to measure".

To reach the test validity, we calculated the coefficient of validity:

Test validity $=\sqrt{\text{Test reliabilty}}$

The results obtained were:

The result of the repeated sprint ability test was 0.99

Test objectivity:

Since, in our study, we relied on measurements tools in measuring a physical test, these tests do not need arbitrators to record results, and therefore the objectivity of the test is equal to one.

12.3. Determination of the training load in the training session:

The proposed training program included several plyometric exercises, where these exercises vary in intensity, size, and density, so the researcher relied on the following:

Concerning intensity, the researcher relied on gradual exercise performance (easy, medium, and hard).

Concerning size, the researcher relied on the number of groups and the number of repeats. The researcher identified 03 groups and 5 to 10 repeats. With regard to the rest time, the researcher relied on 45-90 seconds between totals and 3 minutes between exercises.

Concerning density, the load cycle was divided into one and a half months at a rate of 06 weeks. Three training sessions were programmed each week based on gradual load intensity from the medium upward to reaching the highest possible intensity.

13. Presentation, analysis, and discussion of results:

Sample test results	Number	Arithmetic mean 1	Standard deviation 1	Arithmetic mean 1	Standard deviation 2	Calculated (t)	Tabulated (t)	Significance
Control group	09	60.21	0.78	60.16	0.88	1.89	2.26	Statistically significant
Experimental group	09	61.03	0.89	59.89	0.87	2.88	2.26	Statistically significant

According to table (02), we note the following concerning the control group:

In the pre-test, it received an arithmetic mean of 60.21 and a standard deviation of 0.78. In the post-test, it obtained an arithmetic mean of 61.03 and a standard deviation of 0.89. The calculated (t) reached 1.89, which is less than the tabulated (t) of 2.26 at the freedom degree 06 and significance level of 0.05. Hence, there is no statistical significance of differences, and thus the Regular Program did not affect the quality of repeated sprint ability among the members of the control group.

Concerning the experimental group in the pre-test, it obtained an arithmetic mean of 61.03 and a standard deviation of 0.89. In the post-test, it obtained an arithmetic mean of 59.89 and a standard deviation of 0.87. The calculated (t) reached 2.88, which is greater than the tabulated (t) of 2.26 at the freedom degree 06 and significance level of 0.05. Hence, there are statistically significant differences, and accordingly, the proposed program has positively affected the repeated sprint ability of this group.

Post-test results between the two groups:

Table (04): Post-test results between the two groups

Sample test results	Number	Arithmetic mean	Standard deviation	Calculated (t)	Tabulated (t)	Significance
Control group	09	60.16	0.88	**2.97**	**2.1**	

Experimental group	09	59.89	0.87			Statistically significant

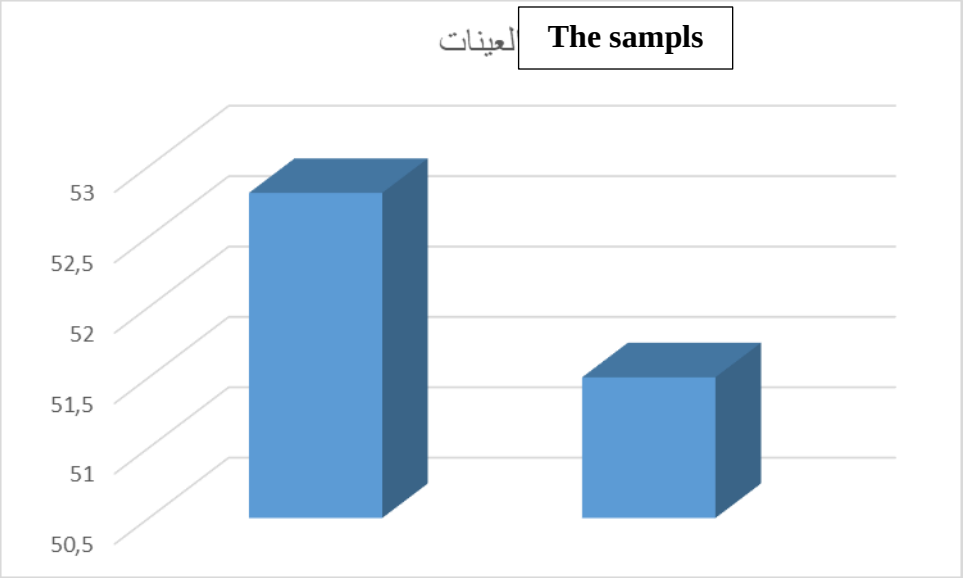


Chart No. (02):

According to the results of Table (03) and Figure (02), which illustrate the differences in the calculated (t) for the post-test between the control and experimental groups, we note that the arithmetic mean in the post-test of the control group was 60.16 and 59.89 for the experimental group. Each group's standard deviation was 0.88 and 0.87, respectively.

The calculated (t) value between the two groups was 2.97 and by comparing it to the tabulated (t) value of 2.14 at the significance level of 0.05, we find that it is statistically significant in favor of the experimental group that worked according to the planned program. This indicates the effectiveness of the proposed training program in the plyometric training method.

14. Conclusion:

Through the findings obtained, we have reached the following conclusions:

- Through the results of the control group that practiced the regular training program with the team coach, we noted that this group did not give relatively positive results because there are no statistically significant differences indicating that the regular training program leads to a relative development in the repeated sprint ability through the RSA Test.
- The experimental group that practiced the proposed plyometric training program obtained very clear results with clear significant differences as well, as reflected in the results of the RSA TEST.
- The results show that the research hypotheses have been achieved, stating that the proposed plyometric training program effectively affects the quality of the repeated sprint ability among footballers.

Accordingly, plyometric training at a rate of three sessions per week for six weeks contributes to the development of muscle power and repeated sprint ability among senior footballers.

These results are important for all coaches, players, physical preparation specialists, and anyone who wants to develop his muscle power during certain stages of competition or training taking into account the rest factor between the training modules which should be more than 48 hours especially if the sessions contain high training loads.

15. Recommendations:

1. The use of plyometric training for the development of repeated sprint ability among footballers during the competition period.
2. Plyometric training should be largely focused on performance-like performance in terms of temporal and motor course.
3. The Plyometric training should be done with lower repetitions and faster frequency than 6-10 repetitions in each group, preferably anaerobic action.
4. The beginner performs from 2 to 3 groups, advanced from 3 to 5 groups, and athletes with a high level from 6 to 10 groups. The rest time between groups is 2 minutes.
5. Preventive preparatory measures should be taken for the plyometric training of players in order to protect them and prevent them from injuries.
6. It is preferable to use at least two to three directions or add other duties during the plyometric training.
7. Conduct a similar study while extending the duration of the training program for more than six weeks to obtain additional results.
8. Conduct similar studies in order to know the right time to rest between training modules in plyometric training.

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