

*Field : Coaching*

*Type : Research Article*

*Received: 05.07.2016 – Corrected: 03.09.2016 – Accepted: 23.09.2016*

## **What Child Game Improve? The Benefits of Plyometric Training**

**Mohammed ZERF, Ali BENGOUA, Noureddine ATOUTI, Moulay Idris MOKKEDES**

Physical and Sports Education Institute Mostaganem, Sports Training department laboratory OPAPS,  
University Abdel Hamid Ibn Badis Mostaganem, 2700, ALGERIA

**Email:** [biomeca.zerf@outlook.com](mailto:biomeca.zerf@outlook.com)

### **Abstract**

There are many misconceptions about what “plyometric” training for athletics, and how it relates to children. Although One of the most frequently used methods of building power is Plyometrics (plyometric exercise) to perform effectively jumps, sprints and prevent injuries games (Benítez Sillero, J.D.; Da Silva-Grigoletto, M.E.; Muñoz Herrera, E.; Morente Montero, A. yGuillén del Castillo, M, 2015). Whereas Verkhoshanski' advocated the shock method of training when he introduced the concept of plyometrics in Russia (William D. Bandy, Barbara Sanders, 2007).where (Bram Swinnen, 2016) confirms that the Plyometric training enhance the muscle activation and stiffness of the muscle–tendon. However, little research has been done to investigate injury risk with plyometric training considerations. Where some authors suggest that plyometric exercises should not be performed by children (Jason Brumitt, Human Kinetics, 2010) or an individual who has not attained puberty (Edward McNeely, David Sandler, 2006). From the propose, our study focus on the impact of the Plyometric training on the performance case primary school who have not reached their puberty. Where our results confirm the benefits of Plyometric training to improve the explosive strength among primary school students where the experimental group is accrual performance than the control group.

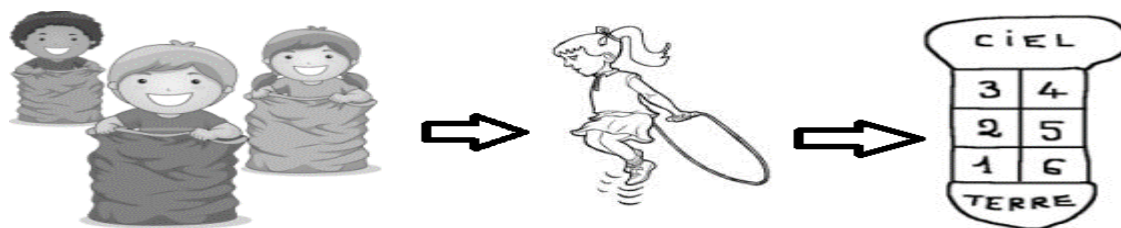
**Keywords:** Plyometric Training, Child Game, primary school students

## Introduction

Plyometrics training was introduced to differences disciplines sports to improve speed and strength and produce power (National Soccer Coaches Associatin of America, 2004). Where The primary goal of plyometrics training is to improve jump ability by using the stretch reflex to facilitate recruitment of additional muscle motor units (Aquatic Exercise Association, 2010). Whereas the benefits of plyometrics training are well accepted, if the stress of repeated jumps or ballistic movements do not increase the risk for soreness or injury according to (Hoffman, Jay, 2014). From the proof that Plyometrics is a method of training muscle elastic strength and explosiveness to enhance athletic performance (Wenjiang Du, 2012). Our goals in this study come to test the hypothesis reports by the recent research which described the use of low-, medium-, and high- intensity Plyometric to develop various jumping, sprint speed, agility, and endurance (Duncan MacDougall, Digby Sale, 2014). where Some suggest that plyometric exercises should not be performed by children who do not have reached puberty (Laurel T. Mackinnon, 2003). For propose, our experimental protocol was integrating as Childish games (Modern Games and Old Games) for 10 minutes of recess in elementary school for a period of 2 weeks in the benefit of the two group. Where the experimental group practice (the potato sack games, the tide pools, games rope) see fig 1, while the Control group use (the balance and turned singing) see fig 2. Whether our assuming was based on Klatt composed of two tests Test squat-jump (SJ) and Balance and Stability (MACKENZIE, B. , 2004).

## Materials and Method

The researcher used the experimental method using two groups, one as experimental and the other as control. As program we use the exercises mention in fig 1 for experimental group while the control group uses exercised shows Fig2. Whereas assuming was based on Test squat-jump (SJ) and Flamingo Balance Test as safe test.



**Figure 1.** The basic games as program for the experimental group



**Figure 2.** The basic games as program for the control group

### **The research sample**

The research sample included (32) thirty-two Final class in primary school zagee bachir Hassi Mamèche Mostaganem their average age 11 Years their Baseline characteristics are listed in table 1. Dived in two groups (experimental group and Control group) The protocol of the current study was integrating as entertainment games (Modern Games as the balance and turned singing and Old Games as the potato sack games, the tide pools, games rope) for 10 minutes of recess in elementary school for a period of 2 weeks in the benefit of the two group. The study was approved by laboratory OPAPS “Institute of Physical Education of our University”.

### **Outcome assessment**

The objective of the Klatt tests (1988) is to assess an athlete's balance, stability and jumping as a prerequisite to undertaking a program of Plyometrics. it is suitable for pubescent male and female athletes.

Test (1): vertical jump to the top from stability "Sargent"

Description / procedure: the athlete stands side on to a wall and reaches up with the hand closest to the wall. Keeping the feet flat on the ground, the point of the fingertips is marked or recorded. The athlete then stands away from the wall, and jumps vertically as high as possible using both arms and legs to assist in projecting the body upwards. Attempt to touch the wall at the highest point of the jump. The difference in distance between the reach height and the jump height is the score. The best of three attempts is recorded. (Hamzoui hakima, missaliti lakdarb, Zerf Mohammed, 2016)

Test (2): Flamingo Balance Test is total body balance test, and forms part of the Eurofit Testing Battery. This single leg balance test assesses the strength of the leg, pelvic, and trunk muscle as well as dynamic balance. The total number of falls or loss of balance in 60 seconds is recorded. Scoring tables are available in the Eurofit Manual (Zerf Mohammed, Bengoua Ali, 2015) (Evert Verhagen, Willem van Mechelen , 2010).

### **Statistical Analyses**

We chose Levene's Test for Equality of Variances to calculate the homogeneity and the correlation coefficient and r-squared ( $r^2$ ) values to depict the relationship between two data as prediction model proposed by Klatt Test ‘prerequisite to undertaking a program of Plyometrics’. whereas 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. (Zabchi Noredine, Mokrani Djamel , Benzidane Houcine , Sebbane Mohammed, 2016)

### **Findings**

The Student t-test and Levene’s Test was used to determine the homogeneity of the two sample groups: experimental and control, in these tests.

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

Variables	Groups	Mean±SD	T	P≤0,05	Levene's Test for Equality of Variances	
					F	P≤0,05
Age (years)	Experimental	11.16±0.93	0.15	0.76	0.46	0.73
	Control	11.45±0.65				
Weight (kg)	Experimental	35.33±4.11	0.36	0,67	0.76	0.85
	Control	35.54±4.15				
Height (cm)	Experimental	131±6.47	1.02	0.67	0.89	0.83
	Control	133±6.28				
S-J (cm)	Experimental	19.81±0.42	0.73	0.47	0.36	0.55
	Control	19. ± 0.45 69				
Balance	Experimental	21.82±2.76	0.45	0.63	0.25	0.62
	Control	21.05±2.99				

From Table 1, we find that the calculated value of (T) ranged between 0.47 and 0.76, and all of them are smaller than  $P \leq 0,05$ . This means that the difference between the averages is statistically insignificant, i.e. that members of the two samples are homogenous confirmed by Levene's Test which is greater than  $P \leq 0,05$  from that the random differences that have emerged are only individual differences among them.

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

Variables	Groups	Mean±SD	T	P≤0,05	R	R <sup>2</sup>
S-J (cm)	Experimental	21.23±0.43	3.29	0.00	0.95**	0.90**
	Control	20.71.± 0.45				
Balance (seconds)	Experimental	22.94±1.22	2.25	0.03		
	Control	20.85±1.02				

From Table 2 All T test are significant in the post tests in the benefit of Experimental group whereas r-squared ( $r^2$ ) value confirm the accuracy of our data where our results line with Klatt tests (1988) that the two tests balance, stability and jumping are prerequisite to undertaking the program of Plyometrics (MACKENZIE, B. , 2004). Where Vern Gambetta confirms that this test is the best way to determine if an athlete is strong enough to handle Plyometrics (Vern Gambetta, 1998). From the proof, we agree hypotheses that children are familiar with Plyometrics training case the potato sack games, the tide pools, games rope games which Improves the benefits of plyometric training. Thing confirms by (Melinda S. Sothern, 2014) developing strength training programs for youth It is recommended that school-age children should to including weightlifting and plyometric training, which has a low risk of injury, no more than any other sport.

## Discussion

Based on the statistical applied and objectives designed for testing of Klatt. Our results confirm:

- The plyometric exercises can be performed by children where our results line with (Houglum, Peggy A, 2016) that the most children use plyometric activities every day—activities such as running, jumping, hopping, and skipping. From the prof we agree the suggests that plyometric training is safe for children when parents provide consent, children agree to participate (Johnson BA, Salzberg CL, Stevenson DA., 2011)
- The plyometric training develops explosive strength where our results line with (James Crossley, Naomi Wilkinson, 2014) to improve the muscles to reach maximum force in the shortest possible time, it is possible on the basis of Plyometrics training according to (Zen Martinoli, 2015)

In addition, the similar studies according to (Benítez Sillero, J.D.; Da Silva-Grigoletto, M.E.; Muñoz Herrera, E.; Morente Montero, A. y Guillén del Castillo, M, 2015) confirm that the players displayed a significant increase of height in SJ and in CMJ with age where (Nedeljkovic, A., Mirkov, D. M., Kukulj, M., Ugarkovic, D. & Jaric, S, 2007) confirm that the performance in these tests increase with age in both tests. In the case of balance, we refer with (Chaouachi A, Othman AB, Hammami R, Drinkwater EJ, Behm DG., 2014) the important of plyometric training is considerate in the reducing the high velocity where This reduction in stretch-shortening cycle stress on neuromuscular system with the replacement of balance and landing exercises might help to alleviate the overtraining effects of excessive repetitive high load activities.

## Conclusion

Children have traditionally been advised against performing plyometric training (Jonathan C. Reeser, Roald Bahr , 2008) whereas (Joan Pagano, 2013) indicate that we watched kids when they are engaged in active outdoor play, we dusting that they are familiar with plyometrics. From the above we agree that Exercise physiologists have shown that power is related to bone development in children and teens and offers health (Nick Draper, Helen Marshall , 2014). However, recent evidence suggests that when performed properly and progressively with good supervision, plyometrics can be safe (Corbin, Chuck B., Le Masurier, Guy, 2014) thing confirmed by the American College of Sports Medicine (ACSM) supports the efficacy and

safety of plyometric training for children (David J. Magee, William S. Quillen, James E. Zachazewski, 2015) where (Solomon Sr. Abrahames , 2013) confirms that Plyometric training programmes have been shown to be effective during puberty for improving running speed and jumps. In summary, as our results the pubescent Children can engage in low- to medium-intensity plyometrics, although it is critical that they have strength and the coordination to tolerate these drills safely without increasing injuries (James Rheuben Andrews, Gary L. Harrelson, Kevin E. Wilk, 2012). Where the similar studies confirm that Plyometrics can provide similar or greater performance adaptations for children (Chaouachi A, Hammami R, Kaabi S, Chamari K, Drinkwater EJ, Behm DG., 2014). From that recommended the familiar old physical games chosen in the current study as modalities training progressions to enhance Plyometrics training adaptations for children who have not reached their puberty.

### **Conflict of Interest**

The authors have not declared any conflicts of interest.

### **REFERENCES**

Aquatic Exercise Association (2010). *Aquatic Fitness Professional Manual-6th Edition*. US: Human Kinetics.

Benítez Sillero, J.D.; Da Silva-Grigoletto, M.E.; Muñoz Herrera, E.; Morente Montero, A. y Guillén del Castillo, M. (2015). PHYSICAL ABILITY OF THE YOUTH FOOTBALLPLAYERS OF A PROFESSIONAL CLUB. *Rev.int.med.cienc.act.fis.deporte*, 15(58), 289-307. Retrieved from [Http://cdeporte.rediris.es/revista/revista58/artcapacidades557.htm](http://cdeporte.rediris.es/revista/revista58/artcapacidades557.htm)

Bram S (2016). *Strength Training for Soccer*. UK: Routledge.

Chaouachi A, Hammami R, Kaabi S, Chamari K, Drinkwater EJ, Behm DG (2014). Olympic weightlifting and plyometric training with children provides similar or greater performance improvements than traditional resistance training. *J Strength Cond Res.*, 28(6), 1483-96. doi:10.1519/JSC.0000000000000305

Chaouachi A, Othman AB, Hammami R, Drinkwater EJ, Behm DG (2014). The combination of plyometric and balance training improves sprint and shuttle run performances more often than plyometric-only training with children. *J Strength Cond Res.*, 28(2), 401-12. doi:10.1519/JSC.0b013e3182987059

Corbin CB, Le Masurier G (2014). *Fitness for Life, 6E*. US: Human Kinetics.

David JM, William SQ, James EZ (2015). *Pathology and Intervention in Musculoskeletal Rehabilitation*. US: Elsevier Health Sciences.

Duncan MacD, Digby S (2014). *The Physiology of Training for High Performance*. UK: Oxford University Press.

Edward McN, David S (2006). *Power Plyometrics: The Complete Program*. UK: Meyer & Meyer Verlag.

Evert V, Willem van Mechelen (2010). *Sports Injury Research*. UK: Oxford University Press.



- Hamzoui H, Missaliti L, Zerf M (2016). Which relationship estimate outcome shooting skill. *The Swedish Journal of Scientific Research*, 3(4), 44-49.
- Hoffman J (2014). *Physiological Aspects of Sport Training and Performance-2nd Edition*. US: Human Kinetics.
- Houglum PA (2016). *Therapeutic Exercise for Musculoskeletal Injuries 4th Edition*. US: Human Kinetics.
- James C, Naomi W (2014). *Personal Training: Theory and Practice*. UK: Routledge.
- James RA, Gary LH, Kevin EW (2012). *Physical Rehabilitation of the Injured Athlete*. US: Saunders.
- Jason B (2010). *Core Assessment and Training*. US: Human Kinetics.
- Jeffrey CP, Xavier De B (2013). Reliability of Countermovement Jump Performance on Chrono Jump-Boscosystem in Male and Female Athletes, *Sport SPA*, 10(2), 5-8.
- Joan P (2013). *Strength Training Exercises for Women*. US: Human Kinetics.
- Johnson BA, Salzberg CL, Stevenson DA. (2011). A systematic review: plyometric training programs for young children. *J Strength Cond Res.*, 25(9), 2623-33. doi:10.1519/JSC.0b013e318204caa0.
- Jonathan C. Reeser, Roald Bahr . (2008). *Handbook of Sports Medicine and Science, Volleyball*. US: Wiley.com.
- Laurel TM (2003). *Exercise Management: Concepts and Professional Practice*. US: Human Kinetics.
- Mackenzie B (2004). *Klatt Tests*, Retrieved from Sports Coach Blog: [www.brianmac.co.uk/klatt\\_tests.htm](http://www.brianmac.co.uk/klatt_tests.htm)
- Melinda SS (2014). *Safe and Effective Exercise for Overweight Youth*. US: CRC Press.
- National Soccer Coaches Associatin of America (2004). *Soccer Coaching Bible*. US: Human Kinetics.
- Nedeljkovic A, Mirkov DM, Kukolj M, Ugarkovic D, Jaric S (2007). Effect of maturation on the relationship between physical performance andbody size. *Journal of Strength and Conditioning Research*, 21(1), 245-250.
- Nick D, Helen M (2014). *Exercise Physiology: For Health and Sports Performance* . UK: Routledge.
- Solomon Sr.A (2013). *Sports Injuries in Children and Adolescents: An Essential Guide for Diagnosis, Treatment and Management*. US: Xlibris.
- Vern G (1998). *The Gambetta method*. US: Gambetta Sports Training System.
- Wenjiang Du (2012). *Informatics and Management Science III*. UK: Springer Shop.
- William DB, Barbara S (2007). *Therapeutic Exercise for Physical Therapist Assistants*. US: Wolters Kluwer Health.

Zabchi N, Mokrani D, Benzidane H, Sebbane M (2016). The Effect of the Contrastive Training Using Weights and Plyometrics on the Development of the Vertical Jump Ability to Improve the Performance. *European Journal of Physical Education and Sport*, 11(1), 24-30. doi:DOI: 10.13187/ejpe.2016.11.24

Zen M (2015). *Rapid Fitness - Elevate Your Fitness to New Heights in Minutes*. US: John Blake.

Zerf M, Bengoua A (2015). Effect Dimensional of Delimiters on Implementation of Speed, Balance, and the Agility in Dribbling among Soccer (Under 15 Years), *International Journal of Educational Science and Research (IJESR)*, 67- 72