International Journal of Applied Research 2016; 2(8): 91-95

ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2016; 2(8): 91-95
www.allresearchjournal.com
Received: 14-06-2016
Accepted: 15-07-2016

C.Senthil Kumar
Ph.D. Scholar, Department of Physical Education, Alagappa University, Karaikudi, Tamil Nadu, India

Dr. K Murali Rajan
Associate Professor, Alagappa University College of Physical Education, Karaikudi, Tamil Nadu, India

Dr. S Nagarajan
Associate Professor, Alagappa University College of Physical Education, Karaikudi, Tamil Nadu, India

Correspondence
Dr. K Murali Rajan
Associate Professor, Alagappa University College of Physical Education, Karaikudi, Tamil Nadu, India

Comparative effect of plyometric training and aquatic plyometric training on sprinting speed and long jump performance of college students

C Senthil Kumar, Dr. K Murali Rajan and Dr. S Nagarajan

Abstract
Objective: Aquatic training offers efficiency, comfort, safety, and training at any level of intensity. Aquatic plyometric training can provide comparable training gains with reduced risk of injury, coaches and strength specialists would have a more viable training option for conditioning that would enhance performance while reducing the risk of injury. And decrease joint compression forces via the benefits of buoyancy.
Design: Randomly divided into three equal groups. Independent variables were the training program (Aquatic plyometric, plyometric and control group). The two dependent variables were speed and long jump performance.
Subjects: Ninety subjects were randomly selected from Alagappa Govt Arts College, Karaikudi, Tamil Nadu, the subject's age was ranged between 18-25 years only.
Measurements: Each participant completed a pre-test and post-test protocol for speed and long jump. Speed was measured by using 50mts run test. The measurement was recorded in seconds. Jumping performance was measured by Long jump test. The measurement was recorded in meters.
Results: Plyometric training group and aquatic plyometric training group significantly improved speed of the college students when it was compared to control group. In this study the Aquatic plyometric training was improved better then the compared plyometric training group on speed. Plyometric training group and aquatic plyometric training group significantly improved long jump of the college students compared to control group. However there was significant improvement between the Plyometric training group and aquatic plyometric training group on the long jump performance.
Conclusion: The implications of this study are that aquatics plyometric may be as good or better for improving speed and long jump performance as a land plyometric training.

Keywords: Speed, long jump, aquatic plyometric and Ancova

Introduction
Plyometrics has been a very popular training technique used by many coaches and training experts to improve speed, explosive power output, explosive reactivity and eccentric muscle control during dynamic movements (Coetzee, 2007) [4]. It is considered a high-intensity, physical training method, consisting of explosive exercises that require muscles to adapt rapidly from eccentric to concentric contractions (Chu, 1992) [3]. Plyometric training has widely been used to enhance muscular power output, force production, velocity, and aid in injury prevention (Robinson *et al.*, 2004) [17].
Plyometric training can enhance an individual's athletic performance, and the use of plyometrics as a training modality to reduce injuries and to enhance performance has increased. However, there could be a major drawback involved with plyometric exercises, specifically, an increased risk of injuries caused by external forces acting upon a joint that momentarily surpass the structural integrity of the muscles, bones, and connective tissue Brzycki, M. 1986 [2]. Aquatic training offers efficiency, comfort, safety, and training at any level of intensity. Performing exercises in the vertical plane (axis) maximizes resistance and increases turbulence and drag, which helps to strengthen the active muscle. It can also be expected that injury rate would be lower in water due to the buoyancy that water provides. Exercising or training in an aquatic environment has several advantages. First, the buoyancy provided by the water can be used to decrease an athlete's weight status and joint loading, allowing for an earlier, safer, and more comfortable return to land-based training. Irion JM (2001) [8]. Second, the fluid dynamic properties of water, such as surface drag, profile drag, and wave drag, provide resistance that can be incorporated into the progression of the

plyometric-training program. Thus, water enables an athlete to strengthen the muscles by providing resistance on the segments that are submerged as each is brought forward and upward through the water. The buoyant force of the water, although decreasing the amount of force and joint compression on landing, does not reduce the amount of force that must be produced to control and stop the eccentric phase of the movement, nor does it reduce the amount of force needed to overcome the resistance of the water during the concentric phase of the movement. Although the popularity and benefits of plyometrics and aquatic training have increased over the years, relatively few training programs have explored the benefits of combining the two. Therefore, the purpose of this study was to compare the effect of plyometric training and aquatic plyometric training on sprinting speed and long jump performance.

Objectives of the Study

1. To find out the effectiveness of plyometric training and aquatic plyometric training on speed of the college men students.
2. To find out the effectiveness of plyometric training and aquatic plyometric training on long jump performance of the college men students.

Hypotheses

1. It was hypothesized that there was significant improvement on speed and long jump performance on twelve weeks Plyometric and aquatic plyometric Training.
2. It was hypothesized that there was significant difference on speed and long jump performance in response to twelve weeks of Plyometric and aquatic plyometric Training.

Materials and Methods

Selection of Subjects

The purpose of this study was to comparative effect of the plyometric training and aquatic plyometric training on sprinting speed and long jump performance among College men Students. In this study ninety subjects were randomly selected from Alagappa Govt. Arts College, Karaikudi, Tamil Nadu, the subject's age was ranged between 18-25 years only. They were randomly divided into three qual groups. Plyometric training group, Aquatic plyometric training group were considered as two experimental groups and the other group was taken as control group. All the subjects were healthy and physically fit. The nature and importance of the study was explained to the subjects and subjects expressed their willingness to serve as subjects in this study.

Selection of Variables

Independent variables

Control group - No any training.
Experimental group I -Plyometric training group.
Experimental group II -Aquatic plyometric training group.

Dependent variable

Speed
Long jump Performance.

Criterion Measures

Speed was measured by using 50mts run test (Philips, D. Allen and James, E. Honak 1998) [15]. The measurement was recorded in seconds. Jumping performance was measured by Long jump test. The measurement was recorded in meters.

Plyometric Training Programme

A 12-week plyometric-training program was developed that included weekly three days training sessions. And the same training was performed in the water belt for the aquatic training groups the duration of the training period was 90 minutes. Rest Interval between Repetition-60 Sec, Rest Interval between Set-2 to 3 minutes. Observations were made for 12 weeks and then post test data were taken. Swimming pool with a depth of approximately hip level and temperature of 26 °C to 28 °C.

Table 1: Plyometric and Aquatic Plyometric Training Programme Details

Exercises	Set×Rep 1 &2 Weeks	Set×Rep 3 &4 Weeks	Set×Rep 5 &6 Weeks	Set×Rep 7 &8 Weeks	Set×Rep 9 &10 Weeks	Set×Rep 11 &12 Weeks
1. Squat Jump	1×8	2×8	3×8	3×10	4×10	4×10
2. Split squat Jump	1×8	2×8	3×8	3×10	4×10	4×10
3. Two foot ankle Hop	1×8	2×8	3×8	3×10	4×10	4×10
4. Standing long jump	1×8	2×8	3×8	3×10	4×10	4×10
5. Power Skipping	1×8	2×8	3×8	3×10	4×10	4×10

Statistical Technique

Statistical analysis was done by using Microsoft windows (version SPSS 20.0). The data were analyzed statistically through analysis of covariance (ANCOVA) to find out the significant difference, if any among the groups whenever they obtained 'F' ratio was found to be significant, the scheffe's was applied as post hoc test to find out the paired mean difference. The level of significance was set at 0.05 level.

Results and Discussion

Table 2: Computation Of Analysis of Covariance on Speed among College Men Students (Scores in seconds)

	Control Group	Plyometric Group	Aquatic Plyometric Group	Source of Variance	Sum of Squares	df	Mean Squares	F Ratio
Pre test mean	7.07	7.27	7.07	Between	0.800	2	0.400	2.56
				Within	13.600	87	0.156	
Post test mean	7.10	6.87	6.47	Between	6.156	2	3.078	17.13*
				Within	15.633	87	0.180	
Adjust post test mean	7.12	6.81	6.49	Between	6.019	2	3.009	18.69*
				Within	13.844	86	0.161	

*Significant at 0.05 level. Table value for degrees of freedom 2 and 87, 86 =3.10.

Table -2 shows the analyzed data on speed performance of accessed through 50 meters run test. Pre test means of speed for control group, plyometric training group and aquatic plyometric training group were 7.07, 7.27 and 7.07 respectively. The obtained F ratio 2.56 was less than the required table value of 3.10. Hence the pre test was not significant. The post test means for control group, plyometric training group and aquatic plyometric training group were, 7.10, 6.87 and 6.47 respectively. The obtained F ratio was 17.13 was greater than the required table value of 3.10. Hence the post test was significant at 0.05 level of confidence for the degrees of freedom 2 and 87.

The adjusted post test means for control group, plyometric training group and aquatic plyometric training group were 7.12, 6.81, and 6.49 respectively. The obtained F ratio was 18.69, which were greater than the required table value of 3.10. Hence it was significant at 0.05 level of confidence for the degrees of freedom 2 and 86.

Table3: Computation of Analysis of Covariance on Long Jump Performance among College Men Students (Scores in meters)

	Control Group	Plyometric Group	Aquatic Plyometric Group	Source of Variance	Sum of Squares	df	Mean Squares	F Ratio
Pre test mean	4.10	4.07	4.03	Between	0.067	2	0.033	0.385
				Within	7.533	87	0.087	
Post test mean	4.07	4.50	4.77	Between	7.489	2	3.744	22.111*
				Within	14.733	87	0.169	
Adjust post test mean	4.04	4.50	4.78	Between	8.186	2	4.093	27.996*
				Within	12.574	86	0.146	

*Significant at 0.05 level. *Significant at 0.05 level. Table value for degrees of freedom 2 and 87, 86 =3.10.

Table 3 shows the analyzed data on long jump performance of Pre test means for control group, plyometric training group and aquatic plyometric training group were 4.10, 4.07 and 4.03 respectively. The obtained F ratio 0.385 was less than the required table value of 3.10. Hence the pre test was not significant. The post test means for control group, plyometric training group and aquatic plyometric training group were, 4.07, 4.50 and 4.77 respectively. The obtained F ratio was 22.11 which were greater than the required Table value of 3.10. Hence the post test was significant at 0.05 level of confidence for the degrees of freedom 2 and 87.The adjusted post test means for control group, plyometric training group and aquatic plyometric training group were 4.04, 4.50, and 4.78 respectively. The obtained F ratio was 27.996 which were greater than the required table value of 3.10. Hence it was significant at 0.05 level of confidence for the degrees of freedom 2 and 86.

Table4: Scheffe's Confidence Interval Test Scores on Speed and Long Jump Performance

variables	Control group	Plyometric group	Aquatic plyometric group	Mean difference	CI value
Speed	7.12	6.81		0.30*	0.24
	7.12		6.49	0.63*	
		6.81	6.49	0.32*	
Long jump	4.04	4.50		0.45*	0.24
	4.04		4.78	0.75*	
		4.50	4.78	0.28*	

***** Significant

Table - 4 shows the mean difference of speed between plyometric training group and control group 0.30, aquatic plyometric group and control group 0.63 and plyometric training group and aquatic plyometric group 0.32 which was greater than the required CI value of 0.24 and hence it was significant at 0.05 level of confidence. The mean difference long jump performance between plyometric training group and control group 0.45, aquatic plyometric group and control group 0.75 and plyometric training group and aquatic plyometric group 0.28 which was greater than the required CI value of 0.24 and hence it was significant at 0.05 level of confidence.

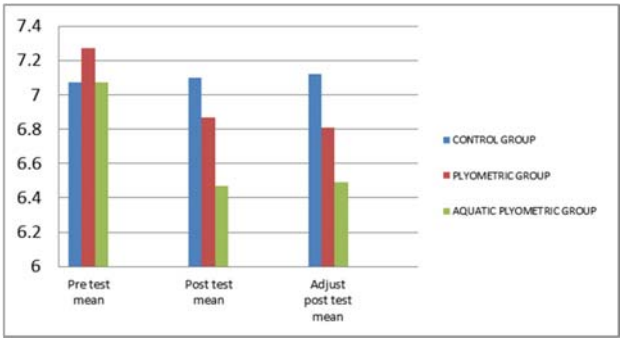

Fig 1: Bar diagram on sprinting speed.

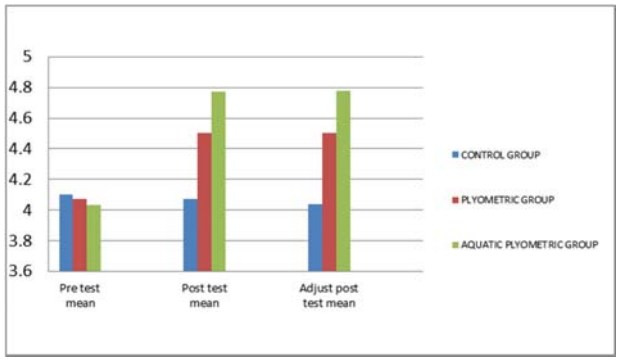

Fig 2: Bar diagram on long Jump Performance

Discussion on Findings

The result of the study on speed indicates that all the experimental groups namely plyometric training group and aquatic plyometric training group brought about significant improvement after the training programme. The analysis of the data indicates that there was no significant difference on speed between control groups. Several studies have suggested that plyometric training may enhance speed, because the use of stretch shortening cycles during plyometrics performance has been shown to have a significant relationship to speed. The many studies proved that plyometric training had positive effect to improve the speed Sethu. S (2014) [18], Impellizzeri FM *et al.* (2008) [7]. The many studies proved that aquatic plyometrics had positive effect to improve the speed Ramesh kumar. S And K. Mohan (2013) [16], Kamaraj. p *et al*. (2013) [11] Kamalakkannan. K *et al.* (2010) [10]. But there were limited studies compare with aquatic and plyometrics on speed performance. Many of those studies proved that aquatic plyometrics as effective as the land plyometrics on speed performance and some of those were opposite. Hamid Arazi *et al.* (2012) [6] Fox, Brian J (2012) [5] Ozhan Bavli (2012) [14] pointed that there wasn't significant differences between land and aquatic plyometrics on speed performance. Recent study found similar result too but Nisith K. Datta and Rakesh Bharti (2015) [13] kamalakkannan. K., *et al.* (2011) [9] noticed that land plyometrics more effective method than the aquatic plyometrics on speed performance. Present research has also showed that for significant difference on speed aquatic plyometric training is greater than plyometric training group to be. Previous studious did not found in particularly long jump performance. Numerous studies have reported that plyometric can improve horizontal/standing long jump performance Abbas Asadi (2013) [1]. Merely one study could be found that compared the effects of aquatic plyometric training group and control group on the standing horizontal (long) jump better performance vlatka wertheimer (2014) [19] Performance of aquatic plyometric training could lead to similar benefits, but with reduced risk of injury and due to the buoyancy of water.

Conclusions

Plyometric training group and aquatic plyometric training group significantly improved speed when compared to control group. Aquatic plyometric training has significant difference better than the plyometric training group on speed. Plyometric training group and aquatic plyometric training group significantly improved long jump performance of the college students when compared to control group. Aquatic plyometric training has significant difference better than the plyometric training group on long jump performance.

References

1. Abbas Asadi. Effects of in-season short-term plyometric training program on power and agility performance in young male basketball players. Journal of Sport Sci Health. 2013; 9:133-137.
2. Brzycki M. Plyometrics: a giant step backwards. Athletic J. 1986; 66:22-23.
3. Chu DA. Jumping Into Plyometrics. Champaign, Ill: Leisure Press, 1992.
4. Coetzee B. An overview of plyometrics as an exercise technique. South African Journal for Research in Sport, Physical Education and Recreation. 2007; 29(1):61-82.
5. Fox Brian J, Hauser Joe, Krings Benjamin, O'Keefe, Chase. Comparing Aquatic Plyometric and Land Plyometric Training on Power and Agility Performance. Journal of springer. 2012; 1:27-33.
6. Hamid arazi, Ben Coetzee, Abbas asadi. The effect of land- and aquatic-based plyometric training on jumping ability and agility of young basketball players. South african journal for research in sport, physical education and recreation. 2012; 34(2):1-14.
7. Impellizzeri FM, Rampinini E, Castagna C, Martino F, Fiorini S, Wisloff U.Effect of plyometric training on sand versus grass on muscle soreness and jumping and sprinting ability in soccer players. British Journal of Sports Medicine. 2008; 42(1):42-46.
8. Irion JM. Aquatic therapy. In: Bandy WD, Sanders B, eds. Therapeutic Exercise: Techniques for Intervention. Baltimore, Md: Lippincott Williams & Wilkins, 2001, 295-332.
9. Kamalakkannan K, Azeem K, Arumugam C. The effect of aquatic plyometric training with and without resistance on selected physical fitness variables among volleyball players. Journal of Physical Education and Sport. 2011; 11(2):205-210.
10. Kamalakkannan K, Vijayaragunathan N, Kalidasan R. Analysis of aquatic and land training on selected physical fitness variables among volleyball players. Journal of Recent Research in Science and Technology. 2010; 2(4):69-73.
11. Kamaraj P, Domnic A, Rameshkumar S. Impact of aquatic based plyometric training on selected skill related motor fitness components namely agility, coordination, power and speed among male Handball players. Star Physical Education journal. 2013, 04.
12. Leah Elizabeth Robinson, BS. Effects of land Unpublished aquatic plyometrics on power, force,and velocity. Unpublished M.A theses. The Ohio State University, 2002.
13. Nisith K Datta, Rakesh Bharti. Effects of Aquatic and Land plyometric training on selected physical variables in intercollegiate male handball players. International Journal of Medical, Health, and Biomedical, Bioengineering and Pharmaceutical Engineering. 2015; 9:5.
14. Ozhan bavli. Comparison the effect of water plyometrics and land plyometrics on body mass index and biomotorical variables of adolescent basketball players. International journal of sport and exercise science. 2012; 4(1):11-14.

15. Philips, D. Allen and James, E. Honak. Measurements and evaluation in physical education. 1998, 280.
16. Ramesh kumar S, Mohan K. Influence of aquatic based plyometric training on selected physical fitness components namely speed, muscular strength, explosive strength, endurance among male Handball players. Journal of International Academic Research for Multidisciplinary. 2013; 1(6):2320-5083.
17. Robinson LE, Devor ST, Merrick MA, Buckworth J. The effects of land vs aquatic plyometrics on power, torque, velocity, and muscle soreness in women. Journal of Strength and Conditioning Research. 2004; 18(1):84-91.
18. Sethu S. the effects of the 8 week plyometric training and ladder training on speed, power and agility of collegiate football players**.** International Journal of Recent Research and Applied Studies. 2014; 1(1):15.
19. Vlatka Wertheimer. The Effect of Aquatic Plyometric Training on Physical Performance. 7th International Scientific Conference on Kinesiology, Opatija, Croatia, 2014.