



The impact of plyometric training method on the high parties' power distinguished with speed in the 50m freestyle competition for the physically disabled

Benzidane Houcine¹, Mokrani Djamel², Hadjar kharfane Mohamed³, Fateh zereg⁴

¹⁻³Laboratory of Programs optimization in APS, Institute of Physical Education & sports, University of Mostaganem, Algeria

⁴Russian State university of Physical Education, Sport, Youth & Tourism, Russia

Abstract

Aim: To determine the impact of plyometric training use on the high parties muscle power and the digital achievement in the 50m freestyle for the physically handicapped (lower parties).

Material and Methods: The experimental method was adopted due to its adequate relation with the research problem. The sample was selected in intended manner including 08 specialized athletes. A training program was applied by using plyometric exercises under researchers' supervision where a measurement test for the power characterized by speed and digital achievement test in 50m freestyle were used.

Results: After the results treatment statistically, it was clear that plyometric training method led to the development of the power characterized by speed for the high parties for physically disabled swimmers (calculated $T = 12.08 >$ tabulated $T = 2.36$), and the existence of improvement in the digital achievement (calculated $T = 7.40 >$ tabulated $T = 2.36$). This means that the development of the force characterized by speed for principle working muscles in freestyle swimming by the use of plyometric training took part in the improvement of digital accomplishment in the 50m competition.

Conclusions: As a conclusion, plyometric training does effect the development of the power characterized by speed for high parties in freestyle swimming for physically disabled and to improve the digital achievement in 50m race.

Keywords: plyometric training, muscle strength, digital achievement, freestyle, physically handicapped

Introduction

Swimming has been adopted as a rehabilitation sport and water treatment for disabled people. This sport proved its worth and impact on the various kinds of handicaps; especially for sever ones things which gave a new hope for the future. It's useful in restoring the sense for people suffering of lower parties' paralysis.

Practicing swimming for disabled people reduces the opportunities of having heart diseases, general weakness and high blood pressure. It helps in the development of physical elements fitness thing which has a positive impact on the functional efficiency for certain muscles groups and respiratory system. (Mekkaoui, 2007).

Little Pralay Majumdar and Sri Srividhya JD (2010) [15], quoting Chatard JC & al. (1968) said Performance in swimming is governed by the maximal energy output, which is obtained by the well-designed training program.

The force or power is among the most important physical fitness elements for its great importance in the training sport field, especially in swimming which calls the necessity of having a link between strength and motor speed for the main working muscle like the explosive strength, force characterized by speed and maximum strength in different competitive races; particularly in short competitions which depend on this special feature.

Plyometric exercise refers to movements that allow the muscle to reach maximal force generation in the shortest amount of

time. These movements typically use a pre-stretch, or countermovement, that allows the muscle to store elastic energy. The countermovement serves to increase explosive reactive power throughout the entire range of motion of the subsequent movement. After the countermovement, the stored elastic energy is used to increase force generation of the following movement. Research has shown that the addition of plyometric to strength and conditioning program allows the athlete to enhance force generation potential of explosive-reactive movements. (Baechle, 2008) [2].

Plyometric training is most frequently completed using body weight rather than a mechanical load to provide the resistance, although weights can be attached to the athlete to increase the resistance. (Polhemus, 1981) [13]

The effectiveness of a plyometric program depends on sport-specific movements and the appropriate intensity and frequency of the plyometric program. Sport-specific movements enhance neuromuscular development, which allows the athlete to perform a specific movement with a greater amount of available muscle mass. The increased use of muscle mass allows for greater force generation during the movement. (Smith, 2009) [5].

As well as this kind of training increases the motor performance, since the earned power leads to a better motor performance in the sport activity practiced so as to increase the muscle amount in contraction at faster rate and more explosive through the motion speed range and improves the

relationship between the maximum power, explosive power and the strength characterized by speed by the optimal use of the rubbery energy or by what is known as the prolongation and default cycle.

Literature review has shown that in the world has made a lot of researches for plyometric method effectiveness and a little bit less researches about plyometric method efficiency for athletes. Most researches main point was to improve and investigate plyometric training effect for the legs. In this research we include also plyometric training effect for the arms. And Pramjeet Singh Ghuman, Harbans Lal Godara (2013) [16] suggests quoting Jalak (2008) has defined speed force subsequently, Speed force represents nerve - muscle machine's ability to move the maximum speed of the whole body, body parts (hands, feet, etc.) or equipment (ball, disc, etc.) (Pramjeet, 2013) [16].

There are various studies dealt with such kind of training as the study of Sylva Suhak (2004) which emphasized that Plyometric exercises are one of the best methods in terms of training relying on the strength and speed in prolonging and extending muscles then shortened by contraction to develop explosive power. For that it's advised to use such exercises at the preparation stage and before the competitions.

For Aramand (1982), he finds that the essential concept of plyometric training is to exploit the falling body motor energy before the extension leading to lengthen first the muscle far from its center then rapid default towards this center. He also mentions that the extension rate or lengthen has a great importance due to the physiology truth; more muscle lengthening speed is increased more the contraction amount and forces are increased. (Aramand, 1982).

Eric McGinnis to say Plyometrics are important for all athletes because speed is always a key component to sport. For swimmers, a faster start and turn is an obvious reason for training lower body explosiveness. Plyometrics are not just for sprinters, however. Speed may not be as crucial to a distance swimmer as it is to a 50 freestyler, but even distance swimmers gain an advantage if they can get more distance than their competitors off of each wall. If you look at the best distance swimmers in the world, most of them have incredibly efficient turns as well as distance per stroke. Both of these qualities are an example of explosiveness, just displayed over a much longer period of time than a sprinter.

And Robin Reichert, he finds Swimmers who want to increase their power and speed can improve their performance by doing plyometric exercises. Plyometric exercises consist of explosive, powerful movements, such as jumping, leaping, throwing a heavy medicine ball and skipping. Plyometric exercises also improve endurance, which is essential for distance swimmers. You could also increase your speed by doing plyometric exercises that increase the power of your start and push-off when turning.

Swimming, especially in short distances, reserved for physically disabled category relies mainly on an important element which is muscle strength in order to improve digital achievements in such championships. According to what has been said, researchers are applying this kind of training for physically disabled category to develop muscle strength in form of proposed training modules according to logical classifying of fundamental working muscles for high parties in

swimming for digital achievements improvement in short races in freestyle.

Research goals

- Identifying to what extent the plyometric training does effect the development of the power characterized by speed for high parties in freestyle swimming for physically disabled.
- Identifying the relationship between development of the power characterized by speed for the fundamental working muscles in freestyle swimming by using plyometric training in order to improve the digital achievement in 50m race.

Methods

Participants

The original community of the research was composed of physically disabled swimmers (males), between the ages of 19-30 (mean \pm : age 24.5 \pm), including fifteen (15) persons eleven (11) of them take part in national official competitions. Eight of them were chosen intentionally as a sample for the research which represents 72% of the global number forming the same experimental and controlled sample ($n = 08$) in Association team Enasre for swimming in the city of Mostaganem (Algeria).

Protocol of tests

Test (01): Measuring the power characterized by speed for a distance of 15m

Performance method

The examiner stands near the launch platform. Once the race of 15m starts, the chronometer starts until the line end ends. One attempt is taken.

Test (02): 50m freestyle

Performance method

Getting ready for the 50 m race, the examiner stands near the launch platform. Once the 50 m race starts, the chronometer starts until the end of the line end race. One attempt is taken in account.

The main experience

The proposed training sessions were held between December, 18th 2014 until the end of March, 12th 2015 during evening training sessions. The training program was formed of set of plyometric exercises designed to develop the strength characterized by speed and digital achievements for the 50 m race freestyle for physically handicapped persons to prepare them to take part in different events and championships for short distances.

The proposed training program

14 training modules were proposed. Each module had its own main objective to develop muscle ability (the strength characterized by speed) according to the logical fundamental working muscles classification for high parties in freestyle in shorten distances at an average of 02 session weekly.

Statistical Analysis

Data is presented as mean \pm standard deviation. Changes in

performance between post-test and pre-test, Within-group analysis was also done using a dependent t-test. A value of $p < 0.05$ was used to determine the significance of the results

within the experiment.

Results

Displaying, analyzing and discussing the results

Displaying, analyzing and discussing the results of the test “the muscle ability measurement for 15 m race”

Table 1: Illustrates the comparison of the experimental sample pre and post results test

Statistical measurements	Post- test		Pre –test		T Calculated	Significant level	proportion of Progress
	X1	Y1	X2	Y2			
Research Sample	14.19	2.88	12.23	2.95	12.08	Significant	13.81%

Statistical signification 0.05, T Tabulated = 2.36

We do notice from the table (01) the existence of significant differences between calculated averages of pre and post measurement of the sample on which the set of plyometric exercises were applied aiming to develop the strength characterized by speed for high parties muscles

where calculated T was estimated to 12.08 which is higher to tabulated T that reached 2.36 in the freedom degree of 07 and significant level of 0.05. Which means that there were significant differences in favor of post test concerning the research sample.

Displaying, analyzing and discussing 50 m freestyle swimming race test

Table 2: Illustrates the results comparison between pre and post sample test

Statistical measurements	Post- test		Pre-test		T Calculated	Significant level	Proportion of Progress
	X1	Y1	X2	Y2			
Research Sample	51.92	11.19	48.32	11.0	7.40	Significant	6.93%

Statistical signification 0.05, T Tabulated = 2.36

Checking table (02) , it’s obvious that there exist significant differences between calculated averages for both pre and post sample measurements on whom set of plyometric exercises were applied aiming to develop the power characterized by speed for high parties muscles, where calculated T was estimated to 7.40 which is greater than tabulated T with 2.36 to a degree of freedom 07 and significant level of 0.05 which means that there exist a statistically significant difference in favor of the sample post measurement.

emphasized on the importance of plyometric training use to improve athletes muscle ability in sport activities which focus with a great degree on high parties. He also noted Mallory S. Kobak & al (2015), quoting Baechle TR, Earle RW (2008) [2] that Plyometric training enables a muscle to reach maximal force in the shortest time possible, therefore being a beneficial method of training for those activities that require explosive and powerful movements in a short duration of time. Plyometric exercise is defined as a quick, powerful movement using a prestretch, or countermovement, that incorporates the stretch-shortening cycle (Mallory, 2015).

Discussion

In results of the test the muscle ability measurement for 15 m race; Researchers explain the significant differences between pre and post measurements (calculated $T = 12.08 >$ tabulated $T = 2.36$), and with proportion of Progress 13.81%, that were in favor of post measurements to the impact of plyometric training use in training modules form proposed as 02 weekly sessions during the period of the research to develop the strength characterized by speed for high parties’ muscles. Thanks to this the explosive power and power characterized by speed have been improved. As a result, the sample members were able to cross the distance of 15 m in a very short time thing which enable them to take part in different events and tournaments programmed for the short distances in freestyle swimming. This, what was mentioned by Hamed Sofian (2011) [9], quoting Rahimi (2005) who pointed out that the use of plyometric training in short term is very effective to develop the muscle strength and increase the anaerobic capacities.

The types of plyometric exercises serial performed strongly that contained a set of linked exercises according to the logical fundamental working muscles classification for high parties, proved their effective influence on crossing the 15 m freestyle swimming in so brief time. This result due to the muscle ability development and relationship progress between explosive power and the power characterized by speed for high parties which led to race achievement in a short timing.

And in 50 m freestyle swimming race test; Researchers explain the significant differences between pre and post measurements (calculated $T = 7.40 >$ tabulated $T = 2.36$), and with proportion of Progress 6.93% which were in favor of post measurements due to ongoing trainings effect for the sample during the research period, especially where proposed plyometric exercises were used to develop muscle ability for high parties’ muscles. This shows the significant correlation between muscle ability and 50 m race achievement. This has been confirmed by Martin A, F’Guyer S & al (2004), François potdevin and al (2011), D.C. Smith & al (2009) [5], Ryszard

François potdevin & al (2011), J. MCossor & al (1999), D.C. Smith & al (2009) [5]. Jeffery F.Vossen & al (2000)

Zarzeczny and al (2011) study where the closest relationship between training using plyometric exercises and their effectiveness in improving muscle ability and so did Sylva (2000) concerning development of muscle ability for high parties. And Potdevin FJ & al study indicates that plyometric training could be relevant to improve swimming performances by enhancing performances in starting and turning phases. It appears that an appropriate short-term plyometric training program can enhance leg performances in as little as six weeks.

Therefore, we may say that the proposed program by using plyometric exercises strongly elevated linked and classified sequentially according to fundamental working muscles logical classification for high parties emphasized on the positive role to achieve 50 m freestyle swimming race in a brief timing. Through developing muscle ability for high parties contributing in the progress of the relationship between explosive power and type strength characterized by speed. There by improving 50 m freestyle swimming digital achievement race for physically disabled.

Conclusions

- Plyometric training has an effective influence in muscle ability development to achieve 50m freestyle swimming race for physically disabled people.
- Plyometric exercises contribute in developing strength characterized by speed for high parties' muscles concerning swimmers in freestyle short distance.
- The existence of significant differences between pre and post measurements for the sample in favor of post measurements.

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References

1. Anna Ogonowska , Elżbieta Hübner-Woźniak , Andrzej Kosmol, Wilhelm Gromisz. Anaerobic capacity of upper extremity muscles of male and female swimmers. *Biomedical Human Kinetics*. 2000; 1:P79-82.
2. Baechle TR, Earle RW. *Essentials of strength training and conditioning* (3rd ed.). Champaign, IL: Human Kinetics, 2008.
3. Birute stqtkevicene, Tomas venckunas. Athletes' anthropometrical measurements and physical capacity influence on learning competitive swimming techniques. *Acta Medica Litunnica*, 15(4), 229-234.
4. Claudin Sherrill. *Sport disabled athletes, humane kinetics publishers*, 1986.
5. Aniel Bishop C, Russell Smith, Mark Smith, Hannah E Rigby. Effect of Plyometric Training on Swimming Block Start Performance in Adolescents. *The Journal of Strength and Conditioning Research*. 2009; (7):37-43.
6. François Potdevin, Morgan Alberty, Alain Chevutschi, Patrick Pelayo, Michel Sidney. Effects of a 6-week plyometric training program on performances in pubescent swimmers. *The Journal of Strength and Conditioning Research*. 2011; 25(1):80-86.
7. Cossor JM, Blanksby BA, Elliott BC. The influence of plyometric training on the freestyle tumble turn. *J Sci Med Sport*. 1999; 2(2):106-116.
8. Jeffery Vossen F, John Kramer f, DarrenBurke G, Deborah Vossen P. Comparison of Dynamic Push-Up Training and Plyometric Push-Up Training on Upper-Body Power and Strength. *Journal of Strength and Conditioning Research*. 2000; 14(3):248-253.
9. Hamdi Sofiane. Effect of two méthodes entrainement, plyométric and musculation, on Explosive by players of Soccer. Canada, Université du Québec à Montréal ,2011, 02.
10. Hawley JA, Williams MM. Relationship between upper body anaerobic power and freestyle swimming performance. *Int. J. Sports Med*. 1991; 12:1-5.
11. Małgorzata Stachowicz, Katarzyna Milde, Marcin Janik. Anaerobic endurance of young swimmers aged 12 years. *Biomedical Human Kinetics*. 2011; 3:87-90.
12. Mallory Kobak S, Michael Rebold J, Renee Desalvo, Ronald Otterstetter. A Comparison of Aquatic- vs. Land-Based Plyometrics on Various Performance Variables. *International Journal of Exercise Science*. 2015; 8(2):134-144.
13. Polhemus R. Plyometric training for the improvement of athletic ability. *Scholastic Coach*. 1981; 51:68-69.
14. Potdevin FJ, Alberty ME, Chevutschi A, Pelayo P, Sidney MC. Effect of 6 week plyometric training program on performances in pubescent swimmers. *Social Sport Research Team (EA 4110), University North of France, Laboratory of Human Movement Studies (EA 3606), University North of France*.
15. Pralay Majumdar, Sri Srividhya JD. Monitoring training load in Indian male swimmers. *International Journal of Exercise Science*. 2010; 3(3):102-107.
16. Pramjeet Singh Ghuman, Harbans Lal Godara. The Analysis of Plyometric Training Program on University Handball Players. *IOSR Journal of Sports and Physical Education*. 2013; 1(2):37-41.
17. Rahimi R, Behpur N. The effect of plyometric, weight and plyometric-weight training on anaerobic power and muscular strength. *University of Physical Education & Sport*. 2005; 3(1):81-91.
18. Rimmer JH, Braddock D, Pitetti KH. Research on physical activity and disability: an emerging national priority. *Med Science Sports Exercise*. 1996; 28(11):66-72.
19. Ryszard Zarzeczny, Mariusz Kuberski, Agnieszka Deska, Dorota Zarzeczna, Katarzyna Rydz, et al. Effects of 8-week training on aerobic capacity and swimming performance of boys aged 12 years. *Biomedical Human Kinetics*. 2011; 3:49-52.
20. Selfa Souhak. The impact of using plyometric exercises in developing overwhelming beating skill for volleyball athletes, Thesis of MA, Baghdad, Sport Education Faculty, 2004.
21. Strzała M, Tyka A. Physical endurance, somatic indices and swimming technique parameters as determinants of front crawl swimming speed at short distances in young swimmers. *Medicina Sportiva*. 2009; 13:99-107.