Available online at www.scholarsresearchlibrary.com

Scholars Research Library

Annals of Biological Research, 2012, 3 (3):1505-1509
(http://scholarsresearchlibrary.com/archive.html)

ISSN 0976-1233
CODEN (USA): ABRNBW

Comparison of land and aquatic based plyometric training on swimming block start

Ehsan Hassannezhad[1], M.R Bahadoran[2], M.R ramezanpour[1], S.R Attarzade Hosseini[3]

[1]Department of Physical Education, Islamic Azad University, Mashhad, Iran[1, 3]
[2]Department of Physical Education, Islamic Azad University, Zanjan, Iran[2]
[3]Department of Sport Physiology, Ferdowsi University of Mashhad, Iran[4]

ABSTRACT

The purpose of this study was to compare the effect of land- and aquatic- based plyometric training on block start of lifesavers. For this reason 21 lifesavers were selected voluntary and divided to two experimental groups (Land plyometric training (n=7) Aquatic plyometric training (n=7)) and control group (n=7) randomly. Experimental groups trained four main skills of plyometric training including depth, star, rocket and squat jumps for 6 weeks and 3 times per week and 45 to 60 min in per session and control group had their routine training. For determination the effect of plyometric training were measured block time (BT), start time (ST),diving Length (DL) and 33-meter record of head-up crawl swimming (33m RHC). Before practices implementation, for each one of the dependent variables, a protest was taken from the participants and after practice period the whole subjects were tested with post tests. The analyzing of the date by ANOVA and T-test showed: there was no significant difference between 2 models of plyometric training (Aquatic and Land) on block start. But aquatic plyometric provided the same performance enhancement benefits as land plyometric with less muscle soreness.

Key Words: Aquatic plyometric training, Land plyometric training, Start block, Life saver.

INTRODUCTION

Unfortunately dryland exercises and weight-training programs in the sport of swimming frequently focus their attention on the development of upper body strength. In accordance with the concept of specificity, much time and effort has been spent on the development of specific exercises or weight training procedures that closely mimic swimming movements. Because of this it has been suggested that swimmers, in general, lack the dynamic lower body strength needed to maximise performance in the swimming start and turns. This may also be because the benefits of developing explosive strength have not been properly investigated. n competitive swimming, the fundamental goal is to cover a set distance in the least amount of time. The swimming start has been defined as including those events that take place between the command[2].

Start times account for approximately 25% of the total time spent swimming 25 yards, 10% of the time in 50-yard races and 5% of the time for 100-yard races.Although the time that a swimmer spends starting in an event is invariably less than they spend stroking or turning, the differences between winning and losing a race are often so small that this can be decisive [4]. It can also be said that the technical success of the start, as with many other sports, sets the athlete up for the race too follow.

The main aim of the swimming start is to propel the swimmer away from the starting block as quickly as possible and with the greatest momentum that can be developed. Due to this the swimming block start can be seen as an explosive event with a movement pattern which requires high force production over a short period of time. There have been many starting styles used in past years. The circular backswing method has now been replaced by the grab start. Shin &Groppel reported that in the early 1970's the conventional arm swing start lost its popularity to the grab start. The grab start technique is performed by gripping the front edge of the starting block with the hands while in the set position. Hanauer introduced this start in the late 1960's and although there has been some dispute, over which starting technique is most effective, the grab start is and widely used method of starting at all levels of competition [1].

In the 1960s, researchers developed a new type of exercises that was initially called shock exercises and was later renamed to plyometric exercises. These exercises cause great changes in fitness through stretch-reflex mechanism (a forceful contraction after the muscle stretches), so that most experts of exercise science view them as the highly efficient component of exercises to induce functional changes [4]. In the majority of sports maximum speed, that are the principles of fitness, may be increased using plyometric. Traditional plyometric training uses the acceleration and deceleration of body weight as the overload in dynamic activities such as depth jumps and bounds. These activities eliminate the deceleration phase seen in traditional weight training activities or training methods.This is due to the body not having to achieve zero velocity at the end of the concentric movement. Therefore plyometrics involve the production of high forces and accelerations throughout the entire range of motion, which is again specific to most athletic movements like the swimming block start. Another advantage is that plyometrics are also performed at higher velocities than traditional weight training methods, increasingtheir specificity to competitive performance [6].

However, these exercises can cause injury in various parts like vertebra and osteoarticular units as well as acute muscular soreness. This has led researchers to change the format and structure of plyometric. Some have investigated the effect of different surfaces like sand and wood or use of special footwear in reducing injuries[2]. Others have recommended that these exercises be done on safer environment like pool. Water may reduce the pressure put on the musculoskeletal system because of the resistance it shows at the time of entry and rapid changes of direction [5]. Different studies that have compared the complications of aquatic and land plyometric show that aquatic plyometric exercises are fewer complications and similar functional changes [7].

On the basis of these considerations, the aim of this study was to compare the effect of aquatic and land plyometric training on swimming start.

MATERIALS AND METHODS

This was a semi-experimental study to compare aquatic and land plyometric. Subjects were male lifesavers with a minimum 4 years of swimming experience. Importantly, the subjects were competent and well practiced in the swimming "grab" start technique. In other words, be able to demonstrate consistent performances in a standard two-foot starting technique. Twenty one volunteer lifesavers were randomly assigend to three of aquatic plyometric training (AP), land plyometric training (LP) and control groups(C) who continued their normal training patterns. The training program included 4 type of plyometric exercises that are excutable in water and land. There were depth jump, star jump, squat jump and reocket jump.the intensity and content of each training session was determined by calculatting a combination of the four mentioned jumps and applied with agradual increment in each session. The intensity of training was variable and determined according to the Table 1. The total training scheduale consisted of 18 sessions (3 times weekly) and each session lasted 60 min. Every sessions strated with a 10-min warm up and finished with 5 min of stretch movments to cool down. Exercises were done in sets of 30– 45 sec of repetitions with 30 rest between the sets and 2 min rest between each jump.

Table1: The intensity of training in different training session

Sessions	*Intensity of training (%)*
1-3	75
4-7	80
8 -11	85
12-14	90
15-18	100

Testing was conducted both pre and post training using high-speed video analysis of subjects' swim start characteristics.

33-meter record of head-up crawl swimming (33m RHC) performance was also measured both pre and post training. In order to ensure validity of results the control group was monitored with respect to start practice, to ensure control.

***Starting Procedure*:** Starting procedures followed competition protocol. The subject was instructed whilst on the block to "take your marks". Once the subject was observed to be stationary the starting signal was activated. On activation of the starting signal the subject executed a race start swimming through a 5-meter mark.

High-Speed Video Analysis: A high-speed video camera was positioned above, and 5-meters, from the subject and the pool end. Subjects performed three trial race starts that were filmed at a rate of 200Hz. The most consistent of these trial starts were averaged and analysed. The kinematic parameters measured from the video data include: Block time (BT) - the time from starting stimulus until take-off from the block, Start time (ST) - the time from starting stimulus until the first contact of the lifesavers with the water, and Diving Length (DL) - the length of the block start to the first place contact of the lifesavers with water.

After practice period the whole subjects were tested with post tests. Descriptive statistics was used to measure the averages and the standard deviation, Kolmogrov-Smyrnov test for normality and T-test and one-way ANOVA to review the effects and the significance level was assumed 0.05

RESULTS

Subjects were male lifesavers with an average (standard deviation) age of 24.4 (2.3), height 175.5 (6.7) and weight 69(6.4). Table 2 shows the mean results of the subjects in the aquatic and land group in pre and post test phase. Diving length increased and the time of 33 m head up crawl decreased in the land and aquatic groups significantly(P<0.05). But other variables did not have any significantly changes in both groups in compression to control group.

Table 2: The Means of Variables of Subjects in the Aquatic and Land Gruop in Pre and Post Test Phase

Variable	*Group*	*Pre*	*Post*	*Difference of Means*	*P value*
Block time (sec)	Aquatic training	0.882	0.879	-0.004	0.3
	Land training	0.952	0.949	-0.003	0.8
Start time (sec)	Aquatic training	1.743	1.729	- 0.014	0.345
	Land training	1.632	1.626	-0.006	0.762
Diving length (m)	Aquatic training	3.36	3.57	0.21	0.003
	Land training	3.18	3.31	0.13	0,00144
33 m record of head-up crawl (sec)	Aquatic training	24.29	22.01	- 2.27	0.002
	Land training	25.69	23.47	-2.21	0.00472

The means of changes in variables of the subjects in the aquatic and land group (pre and post test phase) showed that training method had no meaningful difference on the BT, ST, DL and 33m RHC between the experimental groups.

DISCUSSION

Improvment in 33m record of head-up head up crawl swimming and diving length was observed in both groups in the post test phase. This significant increase shows that the plyometric training helped develop lower body explosive strength and it seems aquatic and land plyometric cause a tangible increase in the recruitment of motor units of agonist muscle and hence, improve the strength of the subjects.

This may point to the greater effect of plyometric on strength males. However, there was no significant difference between 2 groups. These finding are similar to those reported by Miyama and Nosaka and Robinson et al [4, 5].

There were no significant differences in block time and start time in comparison to control group. Subjects in both experimental groups were not required to practice race starts over the 6-week period, which could suggest a lack of transfer to skill performance [7].

It shold be noted that aquatic plyometric were efficient in reducing the pressure exerted on the musculoskeletal system; as also reported by Martel et al, Robinson et al and Miyama and Nosaka[5,4].

CONCLUSION

In conclusion, there was not any significant different between aquatic and landing plyometric training performance, but there are some points that suggest aquatic plyometric training such as no equipment needed for implementation of the practices, pool availability for lifesavers and swimmers and aquatic plyometric is practical training option to enhance performance in athletes while reducing muscle soreness.

REFERENCES

[1] Burgess, KE. Connic,, MJ., Graham-Smith, P. (**2007**). *Journal of Strength Cond Res*. 2007 Aug; 21 (3):986-9.
[2] Cossor, J.M., Blanksby, B.A. (**1999**). *Journal of Science and Medicine in Sport*, vol.2, no.2, pp.106-116
[3] Grantham. (**2006**). Plyometric and sports injuries-spinal shrinkage, patellar tendinitis, lower limb injuries, heel-pad bruising, shin splints and fractures. http://www.sportsinjurybulleting.com.archive/1022-plyometric-injuries.htm
[4] Masamoto, N., Larson, R., Gates, T. (**2003**). *J of Strength Cond Res*.2003 Feb; 17(1):68-71.
[5] Robinson, LE. DEvor, ST. (**2004***). J of Strength Cond Res*.2004 Feb; 18(1)
[6] Stemm, JD., Jacobson, BH. (**2007**). *J of Strength Cond Res*.2007 May;21(2):568-71.
[7] Spurrs, RW. Murphy, AJ. (**2003**) . *Eur J Apply physiol*.2003 Mar; 89(1):1-7.