EFFECT OF PLYOMETRIC TRAINING ON AQUA SURFACE

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Abstracts

The purpose of the study was to know the plyometric training effect on aqua surface. Physical improvements have important implications on team sports, as players perform numerous explosive movements like kicking, tackling, jumping, turning, sprinting, and changing pace and directions during the match (Chaouachi et al., 2009; Duncan et al., 2006; Gabbett, 2000; Ostojic et al., 2006; Stolen et al., 2005), thus, plyometric drills usually involve stopping, starting and changing directions in an explosive manner (Gabbett, 2000). Plyometrics are training methods used by sportspersons in all types of sports to improve strength and explosiveness. Plyometrics consists of a rapid stretching of a muscle (eccentric action) proximately followed by a concentric or shortening action of the same muscle and connective tissue. The stored elastic energy within the muscle is used to produce more force than can be provided by a concentric action alone. Researchers have shown that plyometric training, when used with a periodized strength-training program, can contribute to increases in vertical jump performance, acceleration, leg strength, muscular power, increased joint awareness, and overall proprioception (Miller, et. al., 2006). Fifteen volunteered high school students (N=15) were selected randomly and purposive sample was taken. Subjects underwent 12 weeks progressive plyometric training on aqua surface. Pre and post-test were obtained for fourteen variables. Paired sample correlations and paired't' test was computed to interpret the treatment effect. Results revealed that twelve weeks plyometric training the aqua plyometric training group had remarkably showed improvement in twelve of the fourteen variables of investigation. The waist girth (0.08) and sit & reach test (0.25) did not show significant difference between pre and post test results. It is concluded that plyometric training on aqua surface can help in improving one's physical fitness components.

Keywords*: physical fitness, sports training, plyometrics, aqua surface.*

1. Introduction:

Sports offer much opportunity for people to make the best use of their abilities, to become part of a cooperative team effort, to experience the joy, and sometimes the misery, of winning and losing. In ancient times, our ancestors exhibited extraordinary talents in terms of physical activity. Accompanied by fierce competition, the arena of sports and games has evolved to assume professional dimension. Somehow or other, irrespective of age, the human race is involved in different kinds of sports either for recreation or for competition. To any sport that needs powerful, propulsive movements, such as football, volleyball, sprinting, high jump, long jump, and basketball, the application of plyometric or explosive jump training is applicable (McArdle, Katch & Katch, 2001). The benefits of aquatic training originate from the helpful nature of the water environment, muscular strengthening, and toning of muscles which result from the resistive properties of water as a dense liquid. The buoyancy experienced in water reduces body weight and makes many exercises possible while reducing stress on joints. Buoyancy is the force that water applies in an upward direction against gravity. The buoyant force provided by water decreases the player's weight in relation to the

degree of submersion and decreases the amount of force and joint compression during landing. The buoyancy effect of water makes aquatic training an optimal exercise environment for the players and individuals as impact and stress on joints are reduced. Water has several properties that make it an ideal situation for exercise. The buoyancy of water supports the submerged body from the downward pull of gravity, providing up to a 90% reduction in body weight. Benefits of this buoyant effect include less stress and pressure on the bone, muscle, and connective tissue, while the viscosity and drag force of water provides a resistance proportional to the exerted effort. When the velocity of movement doubles, the drag force produced by water quadruples, providing a resistance training stimulus. As the density of water is approximately 800 times than that of air, the buoyant properties of water reduce forces on the musculoskeletal system, thereby decreasing the risk of overuse injuries such as tendonitis and stress fractures (Kamalakkannan et al., 2010). Plyometric training involves of quick, explosive movements designed to increase speed and power. This can be attained through performing various exercises that focus on training our bodies and brains to activate more muscle fibers, more quickly, in order to increase the efficiency and speed of our muscle contractions. Plyometric trainings usually involve stopping, starting, and changing directions in an explosive manner. These actions are components that can assist in developing agility (Craig, 2004; Miller et al., 2001). Plyometrics are training methods used by sportspersons in all types of sports to improve strength and explosiveness. Plyometrics consists of a rapid stretching of a muscle (eccentric action) proximately followed by a concentric or shortening action of the same muscle and connective tissue. The stored elastic energy within the muscle is used to produce more force than can be provided by a concentric action alone. Researchers have shown that plyometric training, when used with a periodized strength-training program, can contribute to increases in vertical jump performance, acceleration, leg strength, muscular power, increased joint awareness, and overall proprioception (Miller, et. al., 2006). Recommendations have been made to achieve plyometric training on different surfaces that are neither too hard nor soft, since these different surfaces are thought to increase injury potential or prolong the amortization phase, respectively. In an attempt to evaluate the effects of surface type on plyometrics training, studies have associated Plyometrics training in water versus a control group, plyometric training on land and in water, and training on grass versus sand surfaces (Ebben, et. al., 2012).

2. Methodology

Fifteen (N=15) secondary school students were selected randomly into aqua surface plyometric training. The age group of subjects between 14 to 16 years. Purposive random sampling will be observed in order to ascertain minimum levels of fitness of the students.

2.1.Selection of Test Items and Method of data collection

In order to examine the efficacy of aqua based plyometric training following tests were conducted on all the subjects under the study. The subjects were undergo these tests twice during the course of this study i.e. pre-test and post-test. Prior to the administration of the test the investigator will have a meeting with the subjects. The objectives and importance of the test will be made clear to the subjects at the outset. Demonstration of the test will be done by the researcher if there are any ambiguities in terms of understanding of the test by subjects. A Pre-test and a Post-test will be conducted on the same subjects with a time gap of 12 weeks. Data will be collected by the researcher with the help of an assistant. List of tests and variables measured are given in table 1.

Table1. DETAILS ON TESTING PROTOCOL AND VARIABLES SELECTED FOR STUDY

Sl. No.	Variables Measured	Testing Protocol
1.	Body Composition	Body Mass Index (BMI)
2.	Resting Heart Rate	Radial Pulse
3.	Calf girth	Measuring tape
4.	Thigh Girth	Measuring tape
5.	Waist Girth	Measuring tape
6.	Back Flexibility	Sit-Reach Test
7.	Coordinative Abilities	Shuttle Run
8.	Speed	30 meters Sprint
9.	Strength Endurance	Pull Ups (maximum)
10.	Dynamic Strength	Sit Ups (1 minute)
11.	Lower body explosiveness	3 Hop test
12.	Vertical Jump Capacity	Sargent Vertical Jump
13.	Upper body Explosiveness	Medicine ball put
14.	Static Strength	Grip Dynamometer

3. Results and Discussion

The purpose of the study was to find out the significance difference on aqua based plyometric training in respect of anthropometric metric measurements physical fitness variables. In order to explore the training effects 12 weeks progressive training programme was scheduled and pre and post test results were obtained. The training results were subjected to descriptive statistics 't' test to know the training effect between pre and post test data analysis. Later the post test results were subjected to one way ANOVA to explore the training effects of aqua based plyometric training by using SPSS 21 version. The results are presented and discussed in the following pages by sequence as they appear.

3.1.Analysis of Aqua Surface Training

The descriptive statistics of aqua surface training are given in table 2. The perusal of table one reveals that the data is normally distributed and skewness or kurtosis was observed as regard to data. The aqua surface plyometric training data appears to be normal. The aqua surface plyometric training statistics appears to be standard. All the fourteen variables of study explain greater average values than the standard deviations. The minimum values were always lesser than maximum values. The paired sample statistics are given in table 2 also reveal that the allocation is normal and paired sample correlations presented in table 3 reveals that major correlation was observed in respect of twelve variables out of fourteen and the variables which did not show significant correlations were medicine ball put and hand grip strength. Aqua surface paired sample 't' test values are showed in table 4. The 't' values differed significantly with regard to pre and post treatment groups. The value obtained was greater than the table value (2.02). with all the variables. The plyometric training group had remarkably showed improvement in twelve of the fourteen variables of investigation. The waist girth (0.08) and sit & reach test (0.25) did not show significant difference between pre and post test results.

TABLE 2. DESCRIPTIVE STATISTICS OF AQUA SURFACE

Variables		N	Minimum	Maximum	Mean	Std. Deviation
Body Composition	pretest	15	16.57	24.75	20.7560	2.62002
	posttest	15	17.33	26.37	21.6653	2.61380
Resting Heart Rate	Pre-test	15	63.00	78.00	71.3333	4.08248
	Post-test	15	65.00	78.00	72.8667	3.64234
Calf girth	Pre-test	15	28.00	38.00	33.4000	2.61315
	Post-test	15	27.00	36.00	31.5333	2.44560
Thigh Girth	Pre-test	15	39.00	50.00	44.8667	3.18179
	Post-test	15	40.00	49.00	43.8000	2.88345
Waist Girth	Pre-test	15	67.00	81.00	73.2667	4.09646
	Post-test	15	67.00	77.00	72.0000	2.82843
Back Flexibility	Pre-test	15	1.00	12.00	5.4000	2.55790
	Post-test	15	2.00	11.00	5.8000	2.56905
Coordinative Abilities	Pre-test	15	17.45	23.28	20.0473	1.77369
	Post-test	15	17.30	21.45	18.9447	1.08168
Speed	Pre-test	15	4.89	6.76	5.7653	.51557
	Post-test	15	4.41	5.80	5.0133	.35247
Strength Endurance	Pre-test	15	.00	6.00	3.4000	2.16465
	Post-test	15	1.00	20.00	10.7333	5.07749
Dynamic Strength	Pre-test	15	8.00	21.00	13.8667	3.58303
	Post-test	15	18.00	38.00	25.7333	5.20256
Lower body explosiveness	pretest	15	3.24	6.29	4.4593	.91438
	posttest	15	3.60	6.88	4.9000	.99226
Vertical Jump Capacity	pretest	15	9.00	39.00	17.8000	7.02241
	posttest	15	22.00	41.00	33.4667	5.51448
Upper body Explosiveness	pretest	15	1.75	2.76	2.0893	.29001
	posttest	15	2.08	2.97	2.4780	.32161
Static Strength	pretest	15	14.00	21.00	17.4667	1.88478
	posttest	15	19.00	28.00	24.6667	2.60951

Table.3. PAIRED SAMPLES STATISTICS OF PRE SND POST TREATMENT GROUPS

			Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Body Composition	pretest	20.76	15	2.62	0.68
		posttest	21.67	15	2.61	0.67
Pair 2	Resting Heart Rate	pretest	71.33	15	4.08	1.05
		posttest	72.87	15	3.64	0.94
Pair 3	Calf girth	pretest	33.40	15	2.61	0.67
		posttest	31.53	15	2.45	0.63
Pair 4	Thigh Girth	pretest	44.87	15	3.18	0.82
		posttest	43.80	15	2.89	0.74
Pair 5	Waist Girth	pretest	73.27	15	4.10	1.06
		posttest	72.00	15	2.83	0.73
Pair 6	Back Flexibility	pretest	5.40	15	2.56	0.66
		posttest	5.80	15	2.57	0.66
Pair 7	Coordinative Abilities	pretest	20.05	15	1.77	0.46
		posttest	18.94	15	1.08	0.28
Pair 8	Speed	pretest	5.77	15	0.51	0.13
		posttest	5.01	15	0.35	0.09
Pair 9	Strength Endurance	pretest	3.40	15	2.16	0.56
		posttest	10.73	15	5.08	1.31
Pair 10	Dynamic Strength	pretest	13.86	15	3.58	0.93
		posttest	25.73	15	5.20	1.34

Pair 11	Lower body explosiveness	pretest	4.46	15	0.91	0.24
		posttest	4.90	15	0.99	0.26
Pair 12	Lower body explosiveness	pretest	17.80	15	7.02	1.81
		posttest	33.47	15	5.51	1.42
Pair 13	Vertical Jump Capacity	pretest	2.09	15	0.29	0.07
		posttest	2.48	15	0.32	0.08
Pair 14	Upper body Explosiveness	pretest	17.47	15	1.88	0.49
		posttest	24.67	15	2.61	0.67

The 't' values differed significantly with regard to pre and post treatment groups. The value obtained was greater than the table value (2.02). with all the variables. The aqua based plyometric training group had remarkably showed improvement in twelve of the fourteen variables of investigation. The waist girth (0.08) and sit & reach test (0.25) did not show significant difference between pre and post test results.

Table 4. LAND SURFACE TRAINING PAIRED SAMPLE 'T' TEST

			Mean	Std. Deviation	Std. Error Mean	t	**df**	**Sig. (2-tailed)**
Pair 1	Body Composition	pretest	-0.91	1.03	0.27	-3.41	14	0.00
		posttest	-1.53	1.51	0.39	-3.94	14	0.00
Pair 2	Resting Heart Rate	pretest	1.87	1.73	0.45	4.19	14	0.00
		posttest	1.07	1.67	0.43	2.48	14	0.03
Pair 3	Calf girth	pretest	1.27	2.63	0.68	1.86	14	0.08
		posttest	-0.40	1.30	0.34	-1.19	14	0.25
Pair 4	Thigh Girth	pretest	1.10	1.40	0.36	3.06	14	0.01
		posttest	0.75	0.37	0.10	7.95	14	0.00
Pair 5	Waist Girth	pretest	-7.33	3.29	0.85	-8.64	14	0.00
		posttest	-11.87	3.62	0.94	-12.69	14	0.00
Pair 6	Back Flexibility	pretest	-0.44	0.16	0.04	-10.36	14	0.00
		posttest	-15.67	6.07	1.57	-10.00	14	0.00
Pair 7	Coordinative Abilities	pretest	-0.39	0.38	0.09	-3.96	14	0.00
		posttest	-7.20	2.68	0.69	-10.41	14	0.00
Pair 8	Speed	pretest	-0.91	1.03	0.27	-3.41	14	0.00
		posttest	-1.53	1.51	0.39	-3.94	14	0.00
Pair 9	Strength Endurance	pretest	1.87	1.73	0.45	4.19	14	0.00
		posttest	1.07	1.67	0.43	2.48	14	0.03
Pair 10	Dynamic Strength	pretest	1.27	2.63	0.68	1.86	14	0.08
		posttest	-0.40	1.30	0.34	-1.19	14	0.25
Pair 11	Lower body explosiveness	pretest	1.10	1.40	0.36	3.06	14	0.01
		posttest	0.75	0.37	0.10	7.95	14	0.00
Pair 12	Vertical Jump Capacity	pretest	-7.33	3.29	0.85	-8.64	14	0.00
		posttest	-11.87	3.62	0.94	-12.69	14	0.00
Pair 13	Upper body Explosiveness	pretest	-0.44	0.16	0.04	-10.36	14	0.00
		posttest	-15.67	6.07	1.57	-10.00	14	0.00
Pair 14	Static Strength	pretest	-0.39	0.38	0.09	-3.96	14	0.00
		posttest	-7.20	2.68	0.69	-10.41	14	0.00

4. Conclusions

Within the limitations of the present investigation it is concluded that the revealed that Aqua surface paired sample 't' test values are showed in table 4. The 't' values differed significantly with regard to pre and post treatment groups. The value obtained was greater than the table value (2.02) with all the variables. The aqua plyometric training group had remarkably showed improvement in twelve of the fourteen variables of investigation. The waist girth (0.08) and sit & reach test (0.25) did not show significant difference between pre and post test results.

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