A Comparative Study between Effectiveness of Aquatic Exercises Versus Dry-Land Concentric-Eccentric Exercises on Swimmer's Shoulder

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ABSTRACT

The purpose of this study was to find out the significant differences of effectiveness of aquatic exercises versus dry-land concentric-eccentric exercises on swimmer's shoulder. The researcher collected the data on twenty (N=40), Male subjects with swimmer's shoulder between the age group of 18-26 years (Mean ± SD: age 21.43±2.38 years, height 173.86±3.91 m, body mass 68.46±3.75 kg) having a history of injury due to joint instability, ligament and capsule laxity, shoulder impingement due to swimming were selected. The subjects were purposively assigned into two groups 20 in each group, with respective set of concentric-eccentric exercises. Group A (Dry-land) and Group B (aquatic) were given concentric-eccentric exercises for 3times/week for a period of 6 weeks. To compare the mean differences between the two groups, mean, S.D and t-tests were computed by means of Statistical Software. To test the hypotheses, the level of significance was set at 0.05. It is concluded from the above findings that significant differences were found Swimmers with dry-land exercises have higher mean values as compared to swimmers with aquatic exercises showing statistically significant differences.

Keywords: *Aquatic exercises, concentric-eccentric exercises, swimmer's shoulder*

1. INTRODUCTION

In India, swimming has become a highly competitive sport and, as a result, shoulder overuse injuries are a growing concern. Swimming or water polo increases the risk of shoulder tendinitis and tenosynovitis. The term swimmer's shoulder is indicative of the extent to which shoulder pain is identified with competitive swimming (Ciullo & Stevens 1989; McMaster 1986). Swimmer's shoulder is an inflammatory condition caused by the repetitive overhead arm motion of the freestyle stroke. Swimmers may have shoulder pain for many reasons. Poor swimming technique is a major factor in shoulder pain; as well as overtraining. A good dry-land program should help swimmers develop muscular symmetry and that can be accomplished by training opposite muscle groups. Movements in water are easier to perform than their counterparts on land, thus enabling people with disabilities, who are unable to achieve optimal function capabilities on land treatment, to be able to succeed. A Visual Analogue Scale (VAS) is a measurement instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured. For example, the amount of pain that a patient feels ranges across a continuum from none to an extreme amount of pain. VAS is usually a horizontal line, 100 mm in length, anchored by word descriptors at each end. The patient marks on the line the point that they feel represents their perception of their current state. The VAS score is determined by measuring in millimeters from the left hand end of the line to the point that the patient marks (Gould et al., 2001). The Shoulder Pain and Disability Index (SPADI) is a self-administered questionnaire that consists of two dimensions, one for pain and the other for functional activities. The pain dimension consists of five questions regarding the severity of an individual's pain. Functional activities are assessed with eight questions designed to measure the degree of difficulty an individual has with various activities of daily living that require upper-extremity use.Physical therapy is highly effective in one who has acquired swimmer's shoulder. Various modes of resistance training are typically used and include free weights, isokinetic machines, surgical tubing and even swimming against resistance. An 8 week exercise program to correct posture and strength muscles result in a decrease in pain and dysfunction in elite swimmers (Lynch et al., 2010).

2. METHOD AND PROCEDURE

2.1 Selection of Subjects

The researcher collected the data on twenty (N=40), Male subjects with swimmer's shoulder between the age group of 18-26 years (Mean ± SD: age 21.43±2.38 years, height 173.86±3.91 m, body mass 68.46±3.75 kg) having a history of injury due to joint instability, ligament and capsule laxity, shoulder impingement due to swimming were selected were

selected. The subjects were purposively assigned into two groups 20 in each group, with respective set of concentric-eccentric exercises. Group A (Dry-land) and Group B (aquatic) were given concentric-eccentric exercises for 3 times/week for a period of 6 weeks.

2.2 Tools:

- Theraband and Theraband loop for the dry-land exercises.
- Noodle, connector, nose plug, snorkel, hand paddles, ball, kickboard for aquatic exercises.
- Stretch cord for stretching exercises.

2.3 Outcome measures:

- Visual Analog Scale (VAS scoring)
- 50m performance in freestyle with respect to time.
- SPADI scoring (Shoulder Pain and Disability Index)

2.4 Warm up: mild stretching for the entire body with a hold of 20-30 seconds for 5-3 counts respectively.

- Dry-land exercises: either one of them – Marching or elliptical.
- Aquatic exercises: either one of them - walking, running, hopping, marching or cycling in deep water.

Concentric-eccentric exercises: progression from 6 sets of 5 counts then 5 sets of 9 counts to 3 sets of 10 counts then 3 sets of 15 counts for a total count of 30-45*.

- Theraband exercises: Standing- shoulder flexors, abductors, adductors, extensors, internal and external rotators; pectorals minor; upper, middle and lower fibres of trapezius; scapular clocks, serratus anterior.
- Exercises with noodle, connectors, snorkel, hand paddles, pull and push device, ball and kickboard in water*: Shoulder- flexors, abductors, adductors, extensors, internal and external rotators; rotator cuff muscles; serratus anterior; pectorals major; rhomboids and trapezius.

2.5 Cool down: mild stretching for the entire body with a hold of 20-30 seconds for 5-3 counts respectively.

- Dry-land exercises: cool pack or cryotherapy at the site of pain for a period of 10 minutes.
- Aquatic exercises: immersing in pool till the neck level for a period of 10 minutes.

2 3. DATA ANALYSIS

Data was analysed using SPSS (Statistical Package for Social Science) version 17.0. Student's t-test for independent data was used to assess the between-group differences. The level of $p \leq 0.05$ was considered significant.

4. RESULTS

Table 1:Descriptive statistics of swimmers with aquatic exercises & dry-land exercises.

VARIABLES	AQUATIC EXERCISE		DRY LAND EXERCISE		t-value	P-value
	MEAN	SD	MEAN	SD		
VAS 0	5.00	1.41	4.95	1.23	0.111	0.921
VAS 3	3.40	1.45	4.15	1.46	1.506	0.142
VAS 6	1.53	1.46	3.15	1.31	3.445	0.002
VAS 9	0.60	0.84	2.15	1.26	3.484	0.002
VAS 12	0.00	0.00	1.26	1.10	2.260	0.035
BEFORE 50 m SPRINT	29.94	3.46	31.97	4.55	1.441	0.159
AFTER 50 m SPRINT	28.96	3.30	30.29	4.33	0.990	0.329
BEFORE SPADI	29.47	8.10	35.80	10.33	1.962	0.058
AFTER SPADI	4.73	5.38	14.35	5.70	5.056	0.001

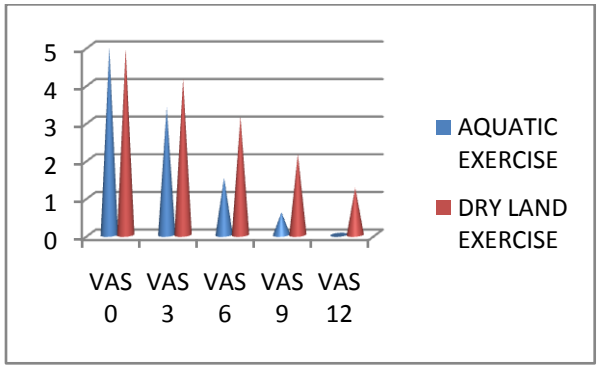

Figure 1: descriptive statistics of swimmers with aquatic exercises versus dry land for VAS 0 sessions to the 12th session.

In figure 1, descriptive statistics of swimmers with aquatic exercises v/s dry-land exercises for VAS 0 sessions to the 12th session was analysed. Swimmers with dry-land exercises have higher mean values as compared to swimmers with aquatic exercises showing statistically significant differences ($p \leq 0.05$-0.001).

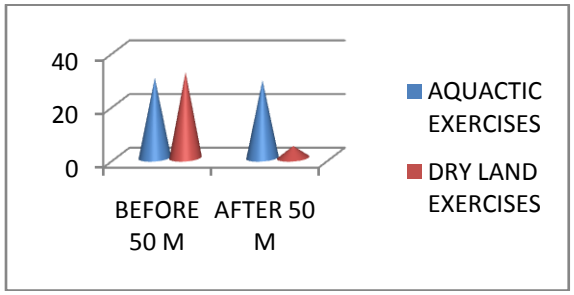

Figure 2: Descriptive statistics of swimmers with aquatic exercises v/s dry-land exercises for 50metre freestyle sprint before starting & after ending the treatment.

Figure 2 showed the descriptive statistics of swimmers with aquatic exercises v/s dry-land exercises for 50metre freestyle sprint before starting & after ending the treatment. No significant differences were there between these two sets of populations.

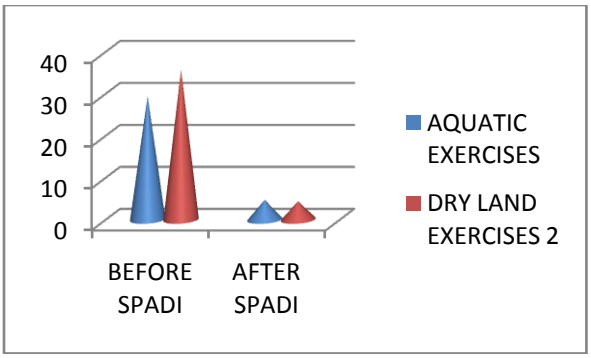

Figure 3: Descriptive statistics of swimmers with aquatic exercises v/s dry-land exercises in case of SPADI scoring before starting & after ending the treatment.

In figure 3, descriptive statistics of swimmers with aquatic exercises v/s dry-land exercises in case of SPADI scoring before starting & after ending the treatment was analysed. Swimmers with aquatic exercises had the lower mean values than the swimmers with dry-land exercises showing statistically significant differences ($p \leq 0.05$-0.001).

5. Discussion

Swimmers are recognizable by the shape of their broad shoulders and tapper to narrow waists and hips. The length of events varies from 164ft (50m) to 4,921ft (1,500m). The objective of any swimming race is to complete the race in shortest possible period of time. There are a surprisingly high number of shoulder injuries occurring in youth swimming. The fastest, most popular and most widely used stroke for training is the freestyle stroke (McMaster, 1999). Dry-land exercises can help swimmers with both their swim technique as well as their overall endurance. In addition, dry-land exercises can relieve the monotony of endless lap swimming and help keeping motivated to improve and engaged with swimming. The pool can be used to rehabilitate a number of upper extremity impairments, as well as to restore functional movement patterns in a resistive medium. Specifically, water resistance training is more efficient than dry-land training in swimmers (Girold et al., 2007).

This study will be beneficial for the athletes with swimmer shoulder to get an idea of quicker and better rehabilitation programme which can prevent them from the reoccurrence of swimmer shoulder. In this study we found that the swimmers with dry-land exercises have higher mean values as compared to swimmers with aquatic exercises showing statistically significant differences ($p \leq 0.05$-0.001) for Visual Analog Scoring 0 sessions to the 12th session and SPADI scoring whereas no significant differences were there between these two sets of exercises swimmers in respect to 50metre freestyle sprint. the concentric-eccentric exercises performed in the water increased the strength of the scapular and shoulder girdle muscles in less time as compared to the dry-land exercises, thus these exercises decreased the instability and pain, therefore making the swimmer's shoulder athletes more fit for a longer duration of time thus reducing the reoccurrence in the athletes with swimmer shoulder.

6. ACKNOWLEDGEMENTS

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