



## THE EFFECT OF AQUATIC EXERCISE ON PAIN AND POSTURAL CONTROL IN WOMEN WITH LOW BACK PAIN

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**ABSTARCT:** Low back pain is the most common cause of referral to a physical therapist and is one of the leading causes of disability. Water exercise takes advantage of the unique properties of water that serve to decrease pain while working out. However, Although therapeutic aquatic exercise is mentioned in a number of recent low back pain guidelines, there is no systematic review available looking at the effects of this treatment form . Therefore, this study examined the acute effects of aquatic exercise on pain, and postural control in women with low back pain. The subjects of this study were 28 female patients who had low back pain aged  $47 \pm 6.9$  years old. Using Oswestry questionnaire, the quantity of back pain was evaluated. Their balance control was evaluated by Romberg test. Then the subjects were divided into Experimental and Control groups randomly. The aquatic exercise program was performed by Experimental group three times per week, for 12 weeks; each session was 60 min long. The evaluations were performed before and after the treatment sessions. The control groups did not participate in any training program. Descriptive analysis, independent t-test and paired T-test were used for statistical analysis. After water exercise program the ability of patients in controlling of balance on one leg open eyes (right  $P= 0.004$ , left  $p= 0.001$ ), one leg close eyes (right  $P=0.02$ ) were significantly improved. Although controlling of balance on one leg (left) close eyes was improved, it was not significantly ( $p=0.2$ ). Pain was reduced ( $P=0.001$ ). Aquatic exercise appears to be a safe and effective treatment modality for patients who are suffering from low back pain. It allows those with low back pain to participate in this crucial way of staying healthy.

**Key words:** low back pain, postural control, aquatic exercise

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### INTRODUCTION

Low back pain is the most common cause of referral to a physical therapist and is one of the leading causes of disability. Between 75% and 85% of the population will experience some form of low back pain during their lifetime (Hayden et al 2005). Aquatic therapy has been used for

many years in the management of musculoskeletal problems including low back pain. Water immersion decreases axial loading of the spine and, through the effects of buoyancy, allows the performance of movements that are normally difficult or impossible on land (Cole, Becker 2004). Although therapeutic

aquatic exercise is mentioned in a number of recent low back pain guidelines, there is no systematic review available looking at the effects of this treatment form and the quality of the available literature (Airaksinen et al 2007, Bekkering et al

2001). Therefore the objective of the present study is to investigate the effect of a period of selected water exercise on postural control of women with low back pain

## **MATERIALS AND METHODS**

### **Subject sample**

The participants of this study were 28 female patients with low back pain (age:  $47 \pm 6.9$ , height:  $158.85 \pm 11.7$ , weight:  $70 \pm 8.3$ ). Subjects had to meet the following inclusion criteria to participate in the study: (1) suffering from chronic and idiopathic low back pain (2) no terminal disease or progressive deterioration of health, (3) no visual deficiency and severe auditive deficiency. The patients underwent an eight weeks of special training (3 times per week). The evaluations were performed before and after the treatment sessions.

### **Assessments**

Static balance (postural control) was evaluated using a One-Leg Balance with Eyes Open or Closed Test (Romberg test). The participant stands on the preferred foot while resting the hands at waist level and then raises the other foot approximately 10 cm off the floor. Balance is scored by the number of seconds for which the foot is kept raised or until balance is lost. Each leg can be tested with each condition. Timing is terminated when the subject touches the free foot to the floor, removes the hands from the hips, moves the supporting foot from the original starting position, hooks the free leg behind the support leg, or (for the eyes closed trial) opens the eyes (5). Using Oswestry questionnaire, the quantify of back pain was evaluated (6).

### **Intervention**

The Water Exercise Program consisted of 1 hour of exercises realized three session per week underwent an eight weeks. The aquatic exercises described in some studies were used (Douris et al 2003, Lord et al 2006, Simmons et al 1996).

Each session was divided into three phases: basic warm-up and stretching exercises phase and

Aquatic environment adaptation phase, and cool down phase.

Basic warm-up and stretching exercises

Prior to training, the patients participated in 15 min of warm-up and stretching exercises, consisting of head rotation, shoulder rotation and stretching of the upper and lower limbs. Walking was performed for 15 min under supervision.

Water exercise

About 13 to 15 exercises were done in each session. The intensity was low to moderate, with constant intensity, frequency and speed, for 8 weeks. Each series was performed continuously and between each one there was a one-minute rest.

### **Data Analysis**

Data are presented as mean  $\pm$  SD. Within group comparisons was carried out by paired t-tests, where between group comparisons was performed by t test for independent samples. Statistical significance was set at an alpha of  $p < 0.05$ . The data were analyzed using the statistical package SPSS, PC program, version 15.0 (SPSS Inc, USA).

## **RESULTS**

According to the obtained results, the hydrotherapy program promoted significant increases in patients' postural control, as observed in the time of completing the functional balance tests Romberg before and after training (Table 1).

Results revealed that the ability of patients in controlling of balance on one leg open eyes (right:  $p= 0.004$ , left:  $p= 0.001$ ), one leg close eyes (right  $p=0.02$ ) were significantly improved after water exercise program. Although controlling of balance on one leg (left) close eyes was improved, it was not significantly ( $p=0.2$ ).

Table1 . Data in pre test and post test of the study for: postural control (One-Leg stance)

Experimental Variables	Pre test (Mean $\pm$ SD)	Post test (Mean $\pm$ SD)	P value
Right one-Leg open eyes	20.59 $\pm$ 26.54	50.82 $\pm$ 19.54	0.004
Right one-Leg close eyes	5.15 $\pm$ 5	11.91 $\pm$ 8.31	0.02
Left one-Leg open eyes	20.71 $\pm$ 24.2	69.4 $\pm$ 47.56	0.001
Left one-Leg close eyes	5.56 $\pm$ 5	8.26 $\pm$ 5.07	0.2

Parallel to these improvements in functional and static balance evaluation, a reduction in the quantify of back pain was observed after water exercise program in experimental group significantly ( $48 \pm 3$  vs.  $32.42 \pm 11$ ,  $p<0.001$ ).

The table 2 shows the data in pre and post test of the study in control group. there was no significant difference between variables in pre and post tests.

Table 2. Data in pre and post test of the study in control group.

Experimental Variables	Pre test (Mean $\pm$ SD)	Post test (Mean $\pm$ SD)	P value
Right one-Leg open eyes	21.13 $\pm$ 19.35	19.98 $\pm$ 17.13	0.6
Right one-Leg close eyes	5.09 $\pm$ 5.8	4.92 $\pm$ 3.78	0.8
Left one-Leg open eyes	19.86 $\pm$ 21.36	20.4 $\pm$ 19.34	0.9
Left one-Leg close eyes	6.21 $\pm$ 5.14	4.53 $\pm$ 3	0.2
Oswestry	47.21 $\pm$ 5	41.26 $\pm$ 4.74	0.3

After exercise in the water, the differences in variables between two groups were shown in table 3.

Table 3. Data in post test of the study in Experimental Group and Control.

Groups	Experimental (Mean $\pm$ SD)	Control (Mean $\pm$ SD)	P value
Variables			

<b>Right one-Leg open eyes</b>	50.82 ± 19.54	19.98 ± 17.13	0.001
<b>Right one-Leg close eyes</b>	11.91 ± 8.31	4.92 ± 3.78	0.02
<b>Left one-Leg open eyes</b>	69.4 ± 47.56	20.4 ± 19.34	0.001
<b>Left one-Leg close eyes</b>	8.26 ± 5.07	4.53 ± 3	0.02
<b>Oswestry</b>	32.42 ± 11	41.26 ± 4.74	0.01

## DISCUSSION AND CONCLUSION

According to the obtained results, balance increased significantly after conducting the hydrotherapy program, according to the Romberg test. This was similar to the results obtained by many other authors (Booth 2004, Simmons & Hansen 1996, Lord et al 1993, Douris et al 2003, Devereux et al 2005) in which the application of a hydrotherapy program increased balance among elderly people and patients with low back pain (Devereux et al 2002, Zaringhalam et al 2010, Pittler et al 2006). In the present study, the low back pain among female patients, evaluated quantitatively, underwent a significant reduction after the treatment. The Oswestry questionnaire and reduction in pain scores, suggest that the water environment is possibly as effective for patients with low back pain. The results are similar with study by (Yozbatiran et al 2004). Water immersion decreases axial loading of the spine and, through the

effects of buoyancy, allows the performance of movements that are normally difficult or impossible on land. By utilizing the unique properties of water (buoyancy, resistance, flow and turbulence) a graded exercise program from assisted to resisted movements can be created to suit the patients' needs and function (Cole, Becker 2004). The result of this study indicates that water exercise appears to be a safe and effective treatment modality for patients who are suffering from chronic low back pain. However, water exercise program used in the research, helped the participant to somehow overcome the general trend of decline in balance function. Our study showed that water exercise improved postural control and reduced the quantify of pain in patients with low back pain. This method is recommended for low back pain rehabilitation.

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