

## **The effects of water-based exercises on depressive symptoms and non-specific low back pain in retired professional athletes: a randomized controlled trial**

**Morteza Taheri\* (Ph.D), Khadijeh Irandoust (Ph.D)**

Imam Khomeini International University, Qazvin, Iran

*\*Corresponding author, Email: [taheri\\_morteza@yahoo.com](mailto:taheri_morteza@yahoo.com)*

### **Abstract**

**Purpose:** The purpose of this study was to investigate the effects of water-based exercises on non-specific low back pain and Depressive Symptoms in retired athletes.

**Methods:** 60 retired male patients were selected through accessible sampling method. By randomization, half of these patients were placed in the experimental group and the rest were chosen as the control group. After completing the written consent form, pre-tests (Beck Depression Inventory and low back pain tests) were performed. After the primary tests, the participants in the intervention group underwent exercise therapy in water for 24 sessions; three times in a week and each time lasted about 40 - 60 minutes, then post-test was performed. Independent Student's t-tests were used to compare the differences between the experimental and control groups.

**Results:** the results suggested that WHR, PBF of intervention group were decreased significantly (respectively,  $p=0.04$ ,  $p=0.05$ ). Trunk muscle mass of intervention subjects was also increased significantly ( $p=0.04$ ). On the other hand, the depression and low back pain of subjects were decreased after intervention (respectively,  $p=0.001$ ,  $p=0.01$ ).

**Conclusion:** The results suggested that exercises in water may be one of the most useful modes of exercise for retired athletes with low-back pain and depression.

**Key words:** retirement, strength sports, Beck Depression Inventory, the Keele STarT Back Screening Tool

### **Introduction**

Over the last decade, retirement in sport has received considerable attention from researchers. From studies it has been found that the termination of a sporting career induces changes in athlete's personal, social, and physical characteristics (Thomas et al., 2007). Professional athletes train for many years to reach their best physical condition and when this starts to deteriorate it can affect an athlete in many ways. Bodily changes such as weight gain, loss of muscular mass and bodily pain all become worries for an athlete which can cause psychological problems after retirement (Tudor et al., 2010). Physical symptoms caused by detraining including joint pain, limb pain, back pain, overweight, muscular weakness, fatigue may be found after retirement, and all these may lead to depression. One hypothesis worth further exploration is that the high level of physical inactivity in retired athletes causes them to gain more weight especially abdominal fat, thus predisposing them to an increased risk of low back pain [LBP] (Urquhart et al., 2011) and depression (Almeida et al., 2009). Thomas, et.al suggested that Retired professional football players experience depressive symptoms and physical pain at a rate that is similar to that found in the general population.

Obesity contributes substantially to chronic medical conditions such as low back pain and depression and these medical conditions place a high economic burden on the health care systems (Almeida et al., 2009; Shiri et

al., 2010; Björck et al., 2008). There is evidence that the prevalence and costs of non-specific LBP are rising among retired athletes (Thomas et al., 2007). Exercise therapy is a commonly used strategy to treat non-specific LBP and is one of several interventions which are highly effective (Granhed et al., 1988). Numerous exercise approaches have been designed with the intention of controlling weight, improving strength, mood and increasing flexibility for retired athletes (Björck et al., 2008). If these exercises are done in water, the properties of water that cause resistance result in relaxation and reducing the pressure on the affected joint and induces the feeling of exhilarating. It was reported in a study that water-based exercises produced better improvement in disability and quality of life of the patients with Chronic Low Back Pain (Dundar et al., 2009). The interesting and distinguishing point of differences between previous researches and the presented study is the sort of exercise therapy. It was hypothesized that water-based exercises would significantly decrease abdominal and overall obesity, increase muscular strength and consequently decrease low back Symptoms and depression in the retired professional athletes. Although depression and low-back pain (LBP) are common health problems, we know of no studies in which the impact of water-based exercises on non-specific low back pain and depression in a more structured way among retired professional athletes.

### **Materials and Methods**

The research method was semi experimental. All retired athletes in Qazvin Province (strength sports; wrestling, weight lifting, martial arts) were informed for screening at dr irandoost's sport-medicine counseling center. 60 retired male athletes were selected through accessible sampling method. By randomization, half of these patients were placed in the experimental group and the rest were chosen as the control group. All the subjects reported non-specific low back pain within the last two month with no medicine intervention. Their regular physical activity have been less than 4 hours in a week after retirement and a twelve-year period has been passed since these athletes left their sport career. After completing the written consent form, pre-tests were performed. It should also be noted that the participants were healthy and fairly well-rested prior to the test. Counseling was standardized and performed by a trained dietitian and physiologist, and took place twice monthly during a 2-month period from start of experiment.

#### **Low Back Pain Test:**

A simple 9-item patient questionnaire (the Keele STarT Back Screening Tool), was used to categorize back pain patients in terms of the complexity of their problem. The tool evaluates not only physical factors, such as pain radiation, severity, and related dysfunction, but also psychosocial factors that can influence outcomes, such as anxiety, depression, and pessimism. The predictive validity and external validity of the STarT Back Tool has been reported, as well as the SBT's reliability, with a Kappa of 0.79 (Jonathan et al., 2009). Visual Analogue Scale (VAS), a Pain Scale with two ends, One is labeled "no pain at all" and the other "unbearable, was used. Subjects were asked to point to a spot on the line that best represents the pain intensity they are experiencing (Ong et al., 2004). After the primary tests, the participates in the intervention group underwent exercise therapy in water for 24 sessions; three times in a week and each time lasted about 40 - 60 minutes. In response to the principle of overload, the process of aquatic exercise therapy was planned by increasing the time and quality of the exercise for each session. Before planning the exercise therapy in water, a pulse meter was used to control heartbeat of the subjects (50-70% of maximal heart rate reserve) during the time of exercise. The sessions consisted of three sections including Warm up, Main plan and Cool down (Kargarfard et al., 2013). Throughout the study, those in the control groups did not experience any regular exercise. After 8 weeks of exercise therapy in water, the post-tests were again performed.

#### **Depression Test:**

We have used the 21-item Beck Depression Inventory (BDI) as a measure of the characteristic attitudes and symptoms of depression in retired athletes. The BDI was completed in a self-reported, written manner. It has been validated and used in different ethnic groups, subjects with coexistent medical conditions, and obese subjects (Beck and Steer, 1988). The study design can be seen in table 1.

**Table 1: Study Design**

Phase	Pre-test			Intervention (8 weeks)		Post-test	
Group	Depression	Low Back Pain	Obesity Variables	Water based Exercises	Depression	Low Back Pain	Obesity Variables
<b>Experimental N=30</b>	✓	✓	✓	✓	✓	✓	✓
<b>Control N=30</b>	✓	✓	✓	-	✓	✓	✓

**Statistical analyses:**

All values are presented as mean values ± SD. Independent Student's t-tests was used to compare the differences between the experimental and control groups.

**Results**

Subjects were evaluated before and after the onset of water-based exercises (pre and post-treatment), establishing comparative data to understand the effects that the activities provided for low back pain and depression and possible effective factors (Table 2, 3). As shown in Table 1, WHR, PBF of intervention group have been decreased significantly (respectively, p=0.04, p=0.05). Trunk muscle mass of intervention subjects was also increased significantly (p=0.04). On the other hand, the depression and low back pain of subjects were decreased after intervention (respectively, p=0.001, p=0.01).

**Table 2: Physical characteristics of participants before and after intervention**

Variable	Group	Intervention		Control		p
		Pre-test	Post-test	Pre-test	Post-test	
<b>Age (yr.)</b>		41.4±2.98	-	40.8±3.1	-	-
<b>Height (cm)</b>		172.4±1.03	-	173.2±1.05	-	-
<b>Weight (kg)</b>		85.52±2.1	82.25±1.4	86.40±1.2	85.95±1.4	0.04*
<b>BMI (kg/m<sup>2</sup>)</b>		28.98±0.8	27.69±0.7	28.89±0.6	28.74±0.5	0.04*
<b>WHR</b>		.92±0.01	.88±0.01	.91±0.01	.90±0.01	0.04*
<b>Percent body Fat (%)</b>		29.8±0.1	27.2±0.2	29.7±0.2	29.2±0.1	0.05*
<b>Trunk Muscles mass (kg)</b>		30.4±0.7	32.1±0.5	30.3±0.6	30.2±0.7	0.03*

Abbreviations: [BMI: body mass index (calculated as weight in kilograms divided by the square of height in meters); WHR: waist/hip ratio)].

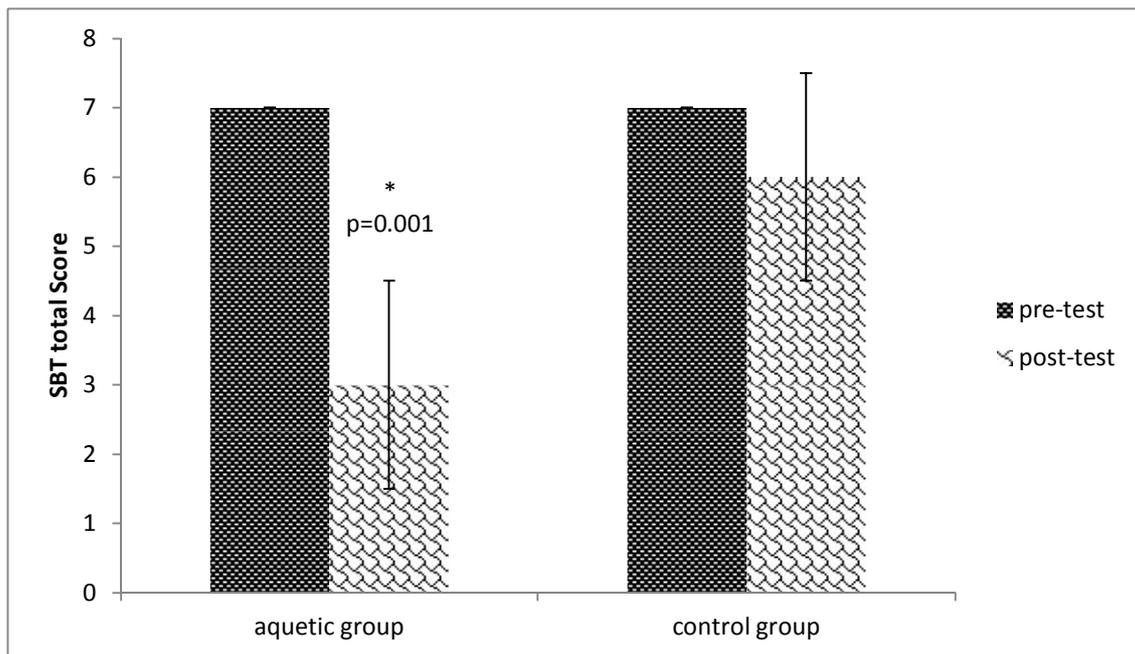
\* Significant difference between Intervention and control group at p≤0.05.

**Table 2: Summary of the effects of water-based exercises on depression and low back pain variables**

Variable	Group	Intervention		Control		p
		Pre-test	Post-test	Pre-test	Post-test	
<b>Low back pain</b>	Total score (SBT)	7	3	7	6	0.001*
	Sub score (SBT)	3	0	3	3	0.0001*
	VAS	7	2	7	6	0.001*
<b>depression</b>	(BDI score)	18	9	16	14	0.01*

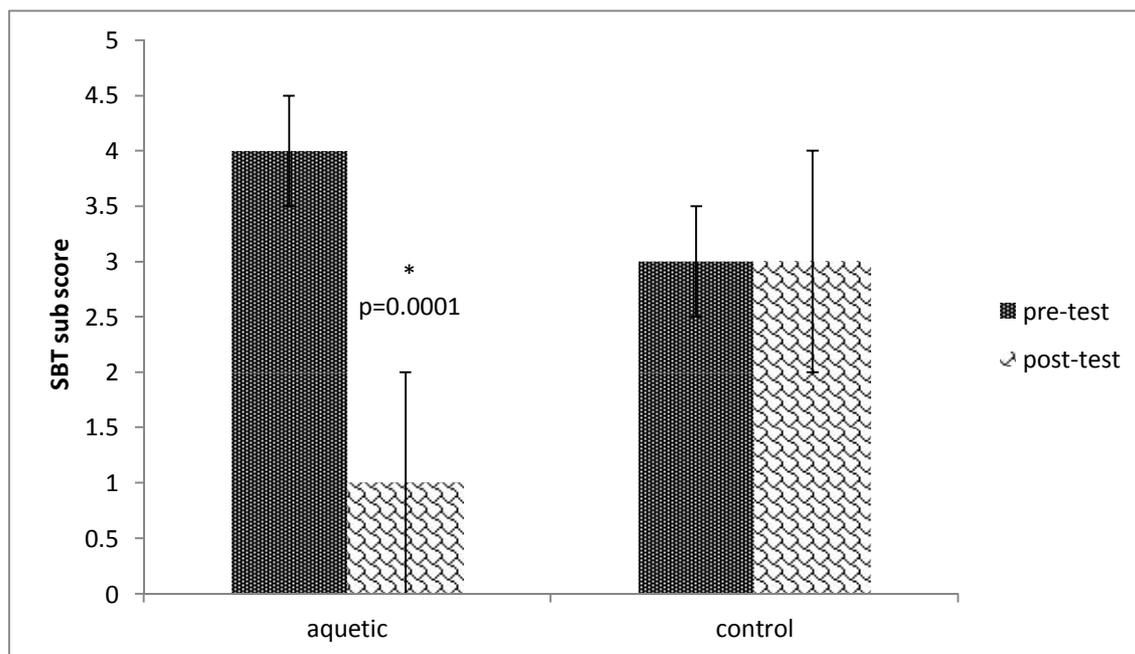
Abbreviations: SBT: the Start Back Screening Tool; VAS: Visual analogue Scale; BDI: Beck Depression Inventory.

\* Significant difference between Intervention and control group at  $p \leq 0.05$ .



**Fig 1: The effect of water-based exercise on low back pain (physical symptoms)**

\* Significant differences between control and intervention group at  $P < 0.05$ .



**Fig 2: The effect of water-based exercise on low back pain (psychological symptoms)**

\* Significant differences between control and intervention group at  $P < 0.05$ .

### Discussion and Conclusion

The aim of this study was to assess the influence of water-based exercises on low back pain and depression in retired professional athletes. It was suggested that eight-week adherence to water-based exercises led to improve low back pain and depression symptoms. Based on our findings, WHR, PBF, BMI, trunk muscle mass were significantly improved after intervention. Therefore, one reason for low back pain and depression improvement in our study may be related to body composition change of subjects. It has been well established that obesity/overweight has side effects on low back pain and depression (Shiri et al., 2010). Therefore, any exercise intervention leading to decreased abdominal fat could improve low back pain and depression. Then, exercise therapy that consists of individually designed programs; including stretching or strengthening may improve pain and function in chronic nonspecific low back pain (Hayden, et al., 2005). Consistent with findings from other studies (Urquhart et al., 2011; Dundar et al., 2009; Maher, 2004) we found the improvement in low back pain after aquatic exercises. Ajediran et al. compared the efficacy of hydrotherapy and land-based exercises in the management of chronic low back pain. They showed hydrotherapy group scoring significantly was higher than land group. It seems hydrotherapy to be better for spinal flexibility and to keep joints as free as possible (Ajediran et al., 2010). Low abdominal muscular strength is considered to be a reason for low back pain, stabilization and powerful of them may be an effective treatment strategy (Verna et al., 2002; Andersen et al., 2006). Our results indicated that trunk muscle was improved up to 6.5 % after 8 weeks hydrotherapy, this May lead to a better neuromuscular control, which occurs due to an improvement in postural stability and then lower pain (Clark, 2002). On contrary, based on the results of the two studies, hydrotherapy seems to be an ineffective treatment for chronic LBP (McIlveen et al., 1998; Sjogren et al., 1997). A possible reason for controversial results may be due to the different exercise protocols (including intensity, duration). (Galper et al., 2006) An advantage of aquatic exercise is that it can involve the upper and lower extremities through optimal ranges of motion while minimizing joint stress. Haukkala et al. showed that with gain of central fat, depressive symptoms also can increase. Our findings were consistent with other studies that found a decrease of abdominal fat mass can effect on depressive symptoms (Forman et al., 2007; Haukkala 2001). Results from investigations are supportive of the anti-depressant and mood enhancing effects of aquatic exercise (Felipe et al., 2013). The evidence point out that physical activity is the best way to reduce stress in people with disabilities, with a tendency for improvements in social and emotional aspects for those who practice it regularly (Carod et al., 2006). Retired athletes with LBP and depression are presented with many different treatment options, and the unique properties of water in aquatic exercises have the potential in a best perfect manner to do so. Additional studies involving more subjects, a more controlled environment, and/or a different variety of psychological and physical tests are required in order to make conclusive assumptions about a larger population.

The results obtained suggested that exercises in water may be one of the most useful modes of exercise for retired athletes with low-back pain and depression.

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