Advances in Bioresearch
Adv. Biores., Vol 9 (4) July 2018: 19-22

Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
DOI: 10.15515/abr.0976-4585.9.4.1922

Advances in Bioresearch

ORIGINAL ARTICLE

The effect of Water Exercise on Postural Control in Patients with Muscle Dystrophy

Aliakbar Najafvand Derikvandi[1], Homa Bamshad[1] Rezvan Kaviyaniniya[1]
[1] M.Sc. Sports Pathology, Islamic Azad University, Boroojerd Branch, Boroojerd, Iran
Email: akbarnajafvand2015@gmail.com

ABSTRACT
One of the problems of patients with muscular dystrophy decreases physical performance because of muscle weakness. The aim of this study is to investigate the effect of an eight-week particular swimming exercise on postural control in patients with masculine dystrophy. A quasi-experimental method was used in this study. Eleven patients with muscular dystrophy were selected through purposive sampling and were randomly divided into two groups randomly including selective swimming exercises (n=6) and control group (n=5). The study was conducted under the supervision of researcher for eight weeks, three sessions per week and the time allocated was between 60-45 minutes. Moreover, a t–test was used for statistical analysis and the significance level was set at p<.05.A significant decrease (p <.05) was observed in the anterior-posterior and lateral-internal displacement in the practice group. However, no significant difference was observed in the control group (p < .05). Comparison of changes made during eight weeks (between pre-test and post-test) a significant difference was observed between the two particularly intervention corrective swimming exercises and control groups (p<.05).According to the obtained findings in this research, particular swimming exercises play a positive role in maintaining postural control and improving counterbalance in patients with muscular dystrophy.
***Key words**: muscular dystrophy, postural control, corrective swimming exercises.*

Received 25.02.2018 Revised 18.04.2018 Accepted 27.05.2018

How to cite this article
A N Derikvandi, H Bamshad, R Kaviyaniniya. The effect of Water Exercise on Postural Control in Patients with Muscle Dystrophy. Adv. Biores., Vol 9 [4] July 2018.19-22.

INTRODUCTION

A wide range of diseases include those with hereditary neuromuscular deficiencies. Their main features are muscle weakness and muscle assimilates.

Duchene, Becker dystrophinopaty and congenital muscular dystrophies are common types of these diseases. Muscular dystrophies are caused by cell membrane defect. Defect appears clearly in the sarcolemma. Cells are connected to each other through a set of (complex) massive protein in muscle tissue and defects in any component of this complex leads to a kind of dystrophy [1, 2].

Inherited progressive muscle disorders created by defects in the number of genes, which is necessary for muscular function. Major disruption in dystrophin gene occurs in muscle weakness [3]. Muscular dystrophy includes a wide range of disabilities and medical problems in adults that need duly diagnosis and management. Weight control and orthosis use can make some things practicable as much as possible for patients. Taking into account the severity and progression of the disease, the patient may require surgery. Patients' main issues such as employment, personal relationships, sex, parents, chronic disability need clear analysis and thoughtful management. After that, respiratory failure is of considerable reservations [4, 5].

Due to progressive muscle wasting and structural changes in the skeleton of patients, muscle weakness can influence the movement and sensory systems to control balance while standing and walking [6,7]. Researchers have shown that children with muscular dystrophy are less able to maintain the gravity and balance than healthy children [8]. Balance disorders are known as a complication of this disease because of muscle weakness and lack of coordination between opposing muscles as well as structural changes in the spine that is the result of disease [6, 9]. Stability Control system is a complex and mixed mechanism in

which the coordination of the three equilibrium system including sophisticated visual system, vestibular system and somato-sensory system plays a significant role [4].

Balance disorders can cause problems in patients with muscular dystrophy since they cause difficulty in moving from one situation to another and disrupt maintaining the standing position or performance functions such as walking or cycling. All of these are likely to increase the balance disorder and fall down possibility [11]. Damage caused by falling down in patients with muscular dystrophy can lead to fractures, increased disability, injury and even death [11, 12].

Muscular dystrophy treatment goals include improving long-term outcomes, longevity, and quality of life in these patients [4].

Regardless muscle weakness and problems in patients with dystrophy in physical activities, the role of muscle strength, endurance in their function, and improvement the quality of their life, there is a need for medical intervention in order to improve physical function in these patients [10].

Since improving balance plays a significant role in reducing the risk of falling down and physical damage in patients with dystrophy [11, 12],the application of intervention methods is important to improve their quality of life and their everyday tasks is important [11].

Considering the state of patients with muscular dystrophy, they may have problems in the exercise on land.

Due to physical disability in patients with muscular dystrophy, it is recommended that exercise training should be designed in anti-gravity conditions [13].

Due to dynamic characteristics of water, it seems that water exercise is effective for these patients. This study was designed to investigate the effect of in water eight-week training on postural control in patients with muscular dystrophy.

MATERIAL AND METHODS

A quasi-experimental design was conducted to evaluate the effect of an eight-week in water selective exercises on muscle strength in patients with muscular dystrophy. Eleven volunteered patients with muscle dystrophy were selected. They signed the consent form and were randomly assigned into two in water selective exercises (n=6) and control groups (n=5). Moreover, the control group received no intervention.

Measurements:

After measuring the patients 'anthropometrics indices including standing and sitting height, the participants' weight, body mass index and muscle strength were measured. Before performing measurements necessary explanations were given to all participants about how to do it, being comfortable in standing position, looking straight forward, feeling comfortable in standing and equal distribution of weight on both feet.

Force platform device was used to measure the postural control.To measure pre- and post-test, the patients were placed on the surface plate. They were just in standing and relaxation position.

Hands were hanging beside the body and patient were looking forward. Time to put the patient on the platform to record the data was 30 seconds. The frequency sample of the device for testing was set to 100 Hz.This test was done with open eyes.To eliminate the effect of fatigue inpatients, between the tests 5 minutes rest was considered.

The test was performed three times and an average was calculated for each individual.

Exercise:

To do it, the treatment groups underwent 24 exercise sessions over eight weeks, in alterative days, 3 days a week. The exercise group in this research received necessary explanation about the sport and its benefits. They were under corrective swimming exercises according to their physical status and muscle weakness.

Warm up:

In the present study, the warm-up excercises including walking forward, backward, backward and sideways across the pool and body stretching was about 10 minutes in the shallow part of the pool at the beginning of each session.

Special enhancing moves:

Enhancing excercises include 15-10 minutes of resistance training exercises were done in the pool.

Swimming preliminary exercises:

Preliminary exercises in this study were done under the supervision of a swimming coach in the pool for 15-10 minutes. Preliminary exercises and training were performed with the help of another person and

aid to maintain buoyancy of subjects because subjects were not familiar with swimming. The swimming training was conducted for 30 periodic seconds and the rest time between periodic rotations was about a minute, but in the case of fatigue more relaxing time was considered.

Recovery:

Recovery exercise was performed by subjects for 5minutes.

Control group:

A group who underwent no treatment by the researcher, while the subjects continued their previous life style.

Statistical Methods

Descriptive statistics including mean and standard deviation were used in this study. A paired t-test (t-affiliated) was used to compare the difference between pre-test and post-test variables of the study and an independent t-test was used to compare the mean differences created between experimental and control groups. All statistical analyses were performed at the significant ($p<0.05$).

RESULTS AND DISCUSSION

As Table 1shows, descriptive statistics indices of anthropometric variables including standing and sitting height, weight, body mass index, and the age of subjects are expressed separately in both experimental and control groups.

Table 1. Anthropometric indices in studied groups

variables	Age (y)	Height (cm)	Weight (kg)	BMI (kg/m^2)
Exercise group	11.83 ± 1.94	142.10 ± 9.78	33.07 ± 5.75	16.26 ± 1.09
Control group	11.60 ± 1.67	138.04 ± 8.20	31.96 ± 5.42	16.68 ± 1.32

In examining changes within groups (Table 2) after eight weeks of selective exercises in water training, the amount of displacement in the anterior-posterior (P=0.023)and medial - lateral direction (P=0.040)was observed significantly in the experimental group. However, no significant difference was observed in the control group (p<.05).

Table 2. Paired sample t-test for pre-intervention and Post-intervention Values of (Displacement of pressure concentration)

variables	group	Pre- test	Post- test	t	P
Displacement of pressure concentration (domestic - lateral)	Exercise group	0.83 ± 0.57	0.49 ± 0.38	2.756	0.040
	Control group	1.28 ± 1.14	1.30 ± 1.11	-1.238	0.284
Displacement of pressure concentration (anterior- posterior commissure)	Exercise group	0.81 ± 0.39	0.61 ± 0.31	3.233	0.023
	Control group	0.94 ± 0.32	0.99 ± 0.28	-2.713	0.053

In examining changes between groups, results showed that there is a significant difference between the amount of displacement in the anterior-posterior direction (P=0.007)and medial - lateral direction (P=0.031) in both experimental and control groups.

Table 3. Independent t-test for Comparison of Mean differences of investigated variables between exercise and control groups

variables	group	Post- test - Pre- test	t	P
Displacement of pressure concentration (domestic - lateral)	Exercise group	-0.34 ± 0.29	-2.916	0.031
	Control group	0.02 ± 0.04		
Displacement of pressure concentration (anterior-posterior commissure)	Exercise group	-0.20 ± 0.15	-3.930	0.007
	Control group	0.06 ± 0.05		

Results of the current study showed that eight-week in water selective exercises led to a significant decrease in the displacement in the anterior-posterior and medial - lateral directions significantly in the experimental group. However, no significant difference was observed in the control group. In examining

changes within groups, results showed that there is a significant difference between displacement in the anterior-posterior and medial - lateral directions.

Berthelsen *et al* [10]reported in a study that [4] antigravity treadmill aerobic and resistance exercise improve dynamic postural control in patients with muscular dystrophy [13] that is in line with the current findings Busse *et al* also reported the improvement in the balance of patients with myotonic dystrophy after the balance training intervention [14] that is in line with the current findings. Muscle strength plays an important role in balance maintaining, and muscle weakness leads the imbalance and fall down in patients with dystrophy[15].Exercises may improve muscle strength in people with muscular dystrophy. In Berthelsen *et al* [10]research; Anti-gravity exercises improve muscle strength in people with muscular dystrophy [13]. Neuromuscular coordination is needed to maintain postural control. In practice, neuromuscular adaptation has been created that is especial for postural adjustments. As a result, postural fluctuations control, anterior-posterior stability and medial - lateral improved in patients with dystrophy. One of the main problems in patients with muscular dystrophy is damage caused by falling down, which cause basic problems in these patients [11, 12].In the pathophysiology of collapse, muscle strength and balance play an important role in reducing crashes [15]. It can be said that regarding the improved balance, water-based exercise can play an important role in the treatment, rehabilitation and finally improve the quality of patient's life.

REFERENCES

1. Akbari MT. (2008). Genetic defects in the diagnosis of muscular dystrophy. Genetics in the 3rd Millennium. ;6(3):1410-.1420
2. Mah JK, Korngut L, Dykeman J, Day L, Pringsheim T, Jette N.(2014). A systematic review and meta-analysis on the epidemiology of Duchenne and Becker muscular dystrophy. Neuromuscular Disorders.;24(6):482-91.
3. Chua K, Tan CY, Chen Z, Wong HK, Lee EH, Tay SK, *et al*. (2016). Long-term Follow-up of Pulmonary Function and Scoliosis in Patients With Duchenne's Muscular Dystrophy and Spinal Muscular Atrophy. Journal of Pediatric Orthopaedics. 36(1):63-9.
4. Edwards RH. (1989). Management of muscular dystrophy in adults. British medical bulletin.45(3):802-18.
5. Bushby K, Finkel R, Birnkrant DJ, Case LE, Clemens PR, Cripe L, *et al*. (2010). Diagnosis and management of Duchenne muscular dystrophy, part 1: diagnosis, and pharmacological and psychosocial management. The Lancet Neurology. 9(1):77-93.
6. Ishikawa Y, Miura T, Ishikawa Y, Aoyagi T, Ogata H, Hamada S, *et al*. (2011). Duchenne muscular dystrophy: survival by cardio-respiratory interventions. Neuromuscular Disorders. 21(1):47-51.
7. Phillips Mf, Quinlivan Rc, Edwards Rh, Calverley Pm. (2001). Changes in spirometry over time as a prognostic marker in patients with Duchenne muscular dystrophy. American journal of respiratory and critical care medicine. 164(12):2191-4.
8. Wagner KR, Lechtzin N, Judge DP. (2007). Current treatment of adult Duchenne muscular dystrophy. Biochimica et Biophysica Acta (BBA)-Molecular Basis of Disease. 1772(2):229-37.
9. Voet N, van der Kooi EL, Riphagen II, Lindeman E, van Engelen BG, Geurts AC. (2010). Strength training and aerobic exercise training for muscle disease. The Cochrane Library.
10. Berthelsen MP, Husu E, Christensen SB, Prahm KP, Vissing J, Jensen BR. (2014). Anti-gravity training improves walking capacity and postural balance in patients with muscular dystrophy. Neuromuscular disorders.;24(6):492-8.
11. Sockolov R, Irwin B, Dressendorfer R, Bernauer E. (1977). Exercise performance in 6-to-11-year-old boys with Duchenne muscular dystrophy. Archives of physical medicine and rehabilitation. 58(5):195-201.
12. Hoeger WW, Hoeger SA. (2016). Lifetime physical fitness and wellness: A personalized program: Cengage Learning.
13. Vignos PJ, Watkins MP. (1966). The effect of exercise in muscular dystrophy. Jama. 1966;197(11):843-8.
14. Busse M E, Pearson O R, Van Deursen R, Wiles C M, (2004). Quantified measurement of activity provides insight into motor function and recovery in neurological disease, J Neurol Neurosurg Psychiatry;75:884-888
15. Sveen ML, Andersen SP, Ingelsrud LH, Blichter S, Olsen NE, Jønck S, *et al*. (2013). Resistance training in patients with limb-girdle and becker muscular dystrophies. Muscle & nerve. 47(2):163-9.