

Physical exercise on the power of axial balance muscles among the patients suffering from a discopathy and a nonspecific backache

Influence of physical exercise on the power of axial balance muscles

Authors: Amidoddin Khatibi Aghda[1], Vahid Sobhani[2], Mahsa Asheghan[3], Mohammadtaghi Hollisaz[2]
[1]Department of Physical Medicine and Rehabilitation, Yazd University of Medical Sciences, Yazd,
[2]Department of Sport Medicine, Baqyatallah University of Medical Sciences, Tehran,
[3]Department of Physical Medicine and Rehabilitation, Baqyatallah University of Medical Sciences, Tehran, Iran

Abstract

Aim: Backache is one of the most common skeletal-muscular disorders experienced at least once by everyone in their life. It is the third cause of people's disablement in the range of 15 to 65 years old in Iran. One of the major causes of the backache is the lumbar disks whose chronic cases are mostly due to swelling. The present research seeks to investigate the effect of axial balance muscles power among those suffering from a discopathy and nonspecific backache. Material and Method: The population of the research included 60 people with a record of at least 4 weeks of backache resorting to the physical medicine department of Baghiyat Allah Hospital who had been advised to undergo Magnetic Resonance Imaging (MRI) based on the clinical symptoms and their status. These people were divided into the nonspecific and discopathic categories. The core muscles power was measured in both groups and compared against one another. After eight weeks of axial balance exercises, the muscular power was once again checked. The resulting data were analyzed using SPSS. Results: The initial results indicated no significant difference between the two groups in terms of factors such as gender, age, job, family background of backache, history of previous diseases, and the average age of backache. As the results indicated after eight weeks of central balancing exercises, the level of pain decreased significantly in both groups and the muscular power distribution also improved. Discussion: Eight weeks of central balancing exercises will result in the significant decrease and improvement of pain and muscular power distribution respectively.

Keywords

Exercise; Muscular Power; Backache; Discopathy; Patient.

DOI: 10.4328/JCAM.5478 Received: 22.03.2017 Accepted: 26.04.2017 Printed: 01.12.2017 J Clin Anal Med 2017;8(suppl 4): 435-8
Corresponding Author: Mahsa Asheghan, Department of Physical Medicine and Rehabilitation, Baghiyatallah University of Medical Sciences, Tehran, Iran.
T.: 00989132505031 F.: 00982182483347 E-Mail: M_asheghan@bmsu.ac.ir

Introduction

Backache is one of the most common skeletal-muscular disorders experienced at least once by everyone during their life [1]. It is the third cause of people's disablement in the range of 15 to 65 years old in Iran [2]. The high cost of backache on the healthcare system has encouraged the researchers to take up new approaches to studying and diagnosing all types of backaches so that they may take the proper measure to treat them [3]. Concerning the diagnosis and treatment of backache, the Pain Association, and the Medical College of the US states that it is impossible to place all those suffering from backache in a homogeneous group, but they must be divided into subgroups so that proper treatments can be recommended for them [4].

One of the major causes of the backache is the lumbar disks whose chronic cases are on the rise. A chronic backache causes discomfort for nearly 80% of the people during their life.

Nearly 7% of the elderly resort to the general practitioners due to those pains and 32% of them are referred to a specialist [5,6].

Spinal disc bulging is one of the major causes of the backache. Due to the extraordinary movement of the lumbar region which is located adjacent to the nearly motionless region of the sacrum, this area is subject to the mechanical pressures which can damage the lower back spinal discs. Lumbar disc bulgings are usually observed between L4-L5 and L5-S1 [7]. The effectiveness of the balancing muscles in the lumbar area is defective in those suffering from disc bulging. As a protective feedback, these muscles will suffer from spasm and shortness [8,9]. Special exercises for the muscles around the spinal column which play a major role in creating dynamic balance and segmental control of the vertebrae have been taken into consideration excessively in rehabilitating those suffering from a chronic backache. This method emphasizes retraining the detailed simultaneous contraction pattern of deep muscles of the torso such as the transverse abdominal muscle and multifidus. The pain reduction mechanism of these specific exercises includes enhancing the stability of lumbar segments [10].

Considering the results of the anatomical and biomechanical investigation of this issue, it is completely accepted that those suffering from backache would experience higher levels of weakness and exhaustion in the muscles of the torso. On the other hand, reduction of the power and bearing stamina of the torso muscles is described to be a potential danger of getting afflicted with a backache. According to the researches and studies conducted in the 1990s, strength and bearing exercises (especially the bearing exercises) are considered to be one of the major principles of treating backache [11]. Spinal column balancing exercises are specific exercises for the muscles around the lumbar vertebrae whose primary role is to create dynamic balance and control the spinal column segments [12]. The primary goal of active balancing exercises for the spinal column is to create the physical capacity to preserve the neutral state of the spinal column during the daily activities of life. This is accomplished by enhancing the bearing and harmony of the balancing muscles of the spinal column [13].

The axial balance muscles are located in the body's center of gravity. If the axial balance muscles are effective enough, the paired force and normal correlation will be formed, and the body will make its moves in a normal biomechanics. If the axial balance muscles of the body are weakened for any reason, this correlation and arthro-kinematics of the joints will be disrupted, and we will observe muscular imbalance. As a result, we will experience chronic pains such as backache and non-natural movements in the spinal column. That is why the recent researches have paid a lot of attention to the role of axial balance muscles in preventing and treating the backache [14].

As a large number of the Iranian people suffer from discopathy or nonspecific backaches, we thought it was a good idea to measure the power of the balancing muscles of the axial spinal column and determine if the muscles are weak or strong. If the muscles are weak, proper exercise can be prescribed to enhance the power of axial balance muscles and improve the patients' backache and their life quality without using medical therapy. Thus, the present research seeks to investigate the power of axial balance muscles in the patients suffering from a discopathy and nonspecific backache.

Material and Method

The population of the research included 60 people with a record of at least 4 weeks of backache resorting to the physical medicine department of Baghiyat Allah Hospital who had been advised to undergo MRI based on the clinical symptoms and their status. All the participants were aged 18 to 65 years old and their formal consent was gained before participating in the research. The following exclusion criteria were also defined: any material or micro-piece in the body which made the MRI impossible, psychological disorders based on examinations, new pain or intensification of pain during the study, lack of cooperation by the patient, impossibility of stretching due to the possible skin problems during stretching, lumbar traction contradictions, cases requiring surgery, lumbar surgery history, other symptoms such as fever and notable weight, and evidences of tumor infection and trauma in discovered in MRI.

Based on the results of MRI, the participants were divided into the normal group, and those with pathology (disc bulging) and the age and gender of the two groups was matched, and the power of the core muscles was measured in both groups and compared against one another. After eight weeks of axial balancing exercise, the power of the muscles was checked again. To measure the power of muscles, the patient was placed in the supine position, and a compressive biofeedback device (Stabilizer 25) was placed under the lumbar vertebrae in the region of L4-L5. The compressive cuff was filled up to 40 mm of HG, and the patient's legs were held in the total extension state, while the pelvis was flexed in an angle. The individual was then asked to perform the drawing maneuver. He was then requested to lower his legs towards the desk while still holding his back straight. When the lumbar curve increased, the cuff pressure was reduced. This indicates a positive result for the test and a weakness for axial balance muscles. Next, the hip angle was measured using a goniometer and scored based on Kendell grading system. If the individual is unable to retain the pressure in an angle of 60° to 90°, the test will be interpreted as positive, and the balancing muscles (rectus abdominus and external oblique) are weak.

SPSS ver. 17 was utilized for data analysis. Kolmogorov-

Smirnov (KS) test was used to investigate the quantitative variables and the normal distribution of them. Based on the distribution of variables, parametric and non-parametric tests were utilized to compare the means of each group. Chi-square, T-test, and One-way ANOVA were used to study qualitative variables. In all statistical analyses, a P-value of less than 0.05 was considered to be significant.

Results

The total number of the participant in this study was 60 with an average age of 46.88 ± 7.60 including 40 male and 20 female participants. The first group (nonspecific) and the second group (discopathy) each had 30 members. The average age in the nonspecific group was 39.38 ± 3.73, while this average for those suffering from discopathy was 36.00 ± 4.63. The gender frequency in these groups was equal for both men and women with 66.6% and 33.4% respectively. No significant difference was observed between the 2 groups in terms of age and gender distribution (p>0.05). The participants were also compared against one another in terms of their jobs (employee or housewife) and family history of backache. No significant difference was observed here either (p>0.05).

Of all the participants, 23 (38.3%) had a history of diseases including 8 cases (34.8%) of blood pressure, 5 cases (21.7%) of diabetes, 4 cases (17.4%) of high blood fat, etc. (Table 1). Four people (17.4%) from the nonspecific group and 4 (17.4%) from the discopathy group had blood pressure. No significant difference was observed between the two groups in terms of the history of various diseases (p=0.81) (Table 1).

As the results indicate, the average length of the pain in the nonspecific group was 2.20 ± 1.34 years, while this value for the group not afflicted with discopathy was 0.95 ± 1.90 years. No significant difference was observed between the length of backache in both groups (p = 0.62).

The average level of backache before and after exercise in both groups can be observed in Table 2. The statistical results indicate that the difference of this variable before and after the exercise is not significant. However, the statistical analysis indicated a significant difference between the level of backache before and after exercise in both groups.

Table 3 represents the distribution of lumbar muscles power in both groups before and after exercise. As the statistical results indicate this difference before and after exercise is not significant in any of the groups. But the statistical analysis represented a significant difference between the level of backache before and after exercise in both groups.

Table 1. Distribution of people based on the history of diseases in both groups.

Groups		History of Disease								P-Value
		BP	Dia	LD	Dia and LD	HP	Dia and BP	BP and LD	Total	0.81
Nonspecific	No.	4	2	1	1	0	0	1	9	
	Percent	17.4	8.7	4.3	4.3	0.0	0.0	4.3	39.1	
Discopathy	No.	4	3	3	0	1	2	1	14	
	Percent	17.4	13.0	13.0	0.0	4.3	8.7	4.3	60.9	
Total	No.	8	5	4	1	1	2	2	23	
	Percent	34.8	21.7	17.4	4.3	4.3	8.7	8.7	100.0	

BP: Blood Pressure; Dia: Diabetes; LD: Lipid Disorder; HP: Hypothyroidism

Table 2. Comparison of backache length in both groups.

	Mean pain	Mid	Mean pain	Mid	
Nonspecific	6.97 ± 0.85	7 (5-9)	3.73 ± 1.26	3 (2-7)	<0.001
Discopathy	7.07 ± 0.83	7 (6-9)	3.57 ± 1.01	3 (2-6)	<0.001
Total	7.02 ± 0.83	7 (5-9)	3.65 ± 1.13	3 (2-7)	<0.001
P-Value	0.69		0.85		

Table 3. Comparison of the distribution of lumbar muscles power in both groups.

Groups		Before			After				P-value
		60	75	Total	30	45	60	Total	
Nonspecific	No.	10	20	30	10	17	3	30	<0.001
	Percent	16.7	33.3	50	16.7	28.3	5.9	50	
Discopathy	No.	5	25	30	5	22	3	30	<0.001
	Percent	8.3	41.7	50	8.3	36.7	5	50	
Total	No.	15	45	60	15	39	6	60	<0.001
	Percent	25	75	100	25	65	10	100	
P-Value		0.13			0.31				

Discussion

The present research seeks to study the effect of exercise on the power of axial balance muscles among patients suffering from discopathy and those suffering from a nonspecific backache. The population was composed of 60 patients composed of 2 groups with a nonspecific and discopathic backache and equal members.

The initial statistical results indicated no significant difference between the two groups in terms of age, gender, job, family history of backache, history of diseases, and the average length of backache. This implies the similarity between these groups in terms of the factors mentioned. The results point to the fact that an eight-week period of central stabilizing exercises will reduce the pain significantly in both groups and increase the muscular power distribution. These results are in line with the previous researches conducted in this field.

Javadian et al. conducted a research to study the effects of stabilizing exercise on the pain, performance disability and muscular stamina among those patients suspected of segmental instability backache. As the results indicate, stabilization exercises are more effective than regular exercise in improving the intensity, performance disability, muscular stamina, and motion domain in patients suspected of segmental instability [15]. Their results are in line with the results achieved in our research.

Momen et al. studied the therapeutic effect of exercise on pain, disability, and stamina of torso muscles among women afflicted with the chronic idiopathic backache. As the results showed, exercise therapy was capable of enhancing the stamina of muscles body in women suffering from chronic idiopathic backache. It can reduce pain and disability in the population [16]. The results of this group are also in line with the results achieved in our research. Furthermore, Lee et al. also studied the level of pain and entropy changes following an 8-week period of stabilizing exercises. In

this study, 60 patients were placed in 2 categories: those suffering from a nonspecific backache and those with discopathy. The two groups were then matched in terms of age and gender, and the CORE muscles power was measured for both groups and compared against one another. After 8 weeks of axial stabilizing exercise, the power of the muscles was studied again. After 8 weeks of intervention, the level of pain in all the participants had witnessed a significant decrease, but no difference was observed between the groups in terms of pain reduction [17].

Concerning this fact that physical exercises need to be a part of the treatment for those suffering from backache, there is a consensus. There are, however, different ideas concerning the type of the exercise, the length of the period and their effectiveness mechanism. Some researchers prescribe only those physical exercises that cover all the muscles of the spinal column so that they can control the whole motion of the spinal column. These researchers believe that the effectiveness of these exercises is due to the enhancement of the general and local muscles of the torso, higher thoracolumbar fascial tension, multifidus hypertrophy, higher local pressure, and facilitation of the simultaneous contraction of the flexors and extensors of the torso. Researchers believe that the goal of the therapeutic exercise of those suffering from backache needs to be the enhancement of the stability of spinal column rather than enhancing the power or hypertrophy of torso. Contrary to power enhancement approach, the present approach seeks to increase the stability of the spinal column, activate balancing muscles especially the multifidus and transverse abdominal muscle separated from other muscles of the spinal column during the initial phases of treatment [18].

Physical exercises and exercise therapy to treat those suffering from backache have been a subject of great attention during the past few years. The influence of balancing exercises on the nervous-muscular performance in the patients with a chronic backache has also been proved [2]. The balancing exercises are mostly focused on the small, deep and the posterior muscles of the spinal column and retain and stabilize the correct body posture through retraining and increasing the stamina of the muscles. Stabilizing the spinal column results in less pain and enhancement of the patient's performance [18]. As the previous researches indicate, stabilizing exercises reduce the pain and enhance the level of performance disability among those suffering from a chronic backache [19]. Hayden et al. conducted a random trial research and concluded that therapeutic exercise is the best type of treatment for a chronic backache which can decrease the pain and enhance the performance disability. Of course, it needs to be designed exclusively based on the individual's abilities and run under the supervision of a physiotherapist [17].

Conclusion

In this study, the stabilizing exercises were conducted under the full supervision of a physiotherapist. One of the causes of the enhancement of the performance disability of the patients in this research was probably the facilitation of the motion sense and reduction of backache. We may also conclude that the stabilizing exercises in our study reinforce the transverse abdominal muscle and prevent belly drooping and result in the greater stability of the spinal column in the lumbar region. As a matter of fact, the transverse abdominal muscle acts like a balloon and press the abdominal organs to the spinal column. This will all result in greater stability of this region in daily activities.

Acknowledgements

None

Conflict of Interest Statement

We declare that we have no conflict of interest.

Funding

Funded by the Baqyatallah University of Medical Sciences (No: 2015-16).

Ethical Standards

All authors obey the rules of Helsinki Declaration, and no ethic problem exists in the manuscript.

References

1. Borkan J, Van TM, Reis S, Schoene ML, Croft P. Advances in the field of low back pain in primary care: a report from the fourth international forum. Spine (Phila Pa 1976). 2002; 27: 128-32.
2. Nezhad RS. The effect of core stability training on pain and performance in women patients with non-specific chronic low back pain. J Res Rehab Sci. 2012; 57-64.
3. Richardson C. The time to move forward in therapeutic exercise for lumbopelvic stabilization. Edinburgh Churchill Livingstone. 2004.
4. Chou R, Huffman LH. Nonpharmacologic therapies for acute and chronic low back pain: a review of the evidence for an American Pain Society/American College of Physicians clinical practice guideline. Annals Int Med. 2007; 14: 492-504.
5. Dixon ASJ. Progress and problems in back pain research. Rheumatology. 1973; 12: 165-75.
6. McCormick A, Fleming D, Charlton J. Morbidity statistics from general practice: fourth national study. OCLC World Cat. 1995; 1991-2.
7. Gard G, Gille KA, Grahn B. Functional activities and psychosocial factors in the rehabilitation of patients with low back pain. Scand J Caring Sci. 2000; 14: 75-81.
8. Bakhtiary AH, Safavi-Farokhi Z, Rezasoltani A. Lumbar stabilizing exercises improve activities of daily living in patients with lumbar disc herniation. J Back Musculoskeletal Rehab. 2005; 18: 55-60.
9. McGill SM. Low back exercises: evidence for improving exercise regimens. Phys Ther. 1998; 78: 754-65.
10. Lee JH, Hoshino Y, Nakamura K, Kariya Y, Saita K. Trunk muscle weakness as a risk factor for low back pain. A 5-year prospective study. Spine (Phila Pa 1976). 1999; 24: 54-7.
11. Varangaonkar VC, Ganesan S, Kumar KV. The relationship between Lumbar range of motion with hamstring flexibility among 6-12 years children from South India: A cross-sectional study. Int J Health Allied Sci. 2015; 4: 23-7.
12. Brumitt J, Matheson J, Meira EP. Core stabilization exercise prescription, part 2 a systematic review of motor control and general (Global) exercise rehabilitation approaches for patients with low back pain. Sports health: a multidisciplinary approach. Sports Health. 2013; 5: 510-3
13. Rainville J, Hartigan C, Martinez E, Limke J, Jouve C. Exercise as a treatment for chronic low back pain. Spine J. 2004; 4: 106-15.
14. Head K. Ultimate back fitness and performance. Physiotherapy Canada 2007; 60: 205-6.
15. Javadian Y, Behtash H, Akbari M, Taghipour-Darzi M, Zekavat H. The effects of stabilizing exercises on pain and disability of patients with lumbar segmental instability. J Back Musculoskelet Rehabil. 2012; 25: 149-55.
16. Momeni S, Moghaddasi F. The effect of exercise therapy on pain, disability, and endurance of trunk flexor-extensor muscles in women with chronic idiopathic low back pain. Behbood J. 2011; 15: 338-46.
17. Lee T, Kim YH, Sung PS. A comparison of pain level and entropy changes following core stability exercise intervention. Med Sci Monitor. 2011; 17: 362-8.
18. Lin HT, Hung WC, Hung JL, Wu PS, Liaw LJ. Effects of pilates on patients with chronic non-specific low back pain: a systematic review. J Phys Ther Sci. 2016; 28: 2961-9.
19. Hemmati SH, Rajabi R, Karimi N, Jahandideh A. Compact core stabilization exercises on pain and disability in women with chronic non- specific low back pain. Koomesh J. 2011; 3: 244-53.

How to cite this article:

Physical exercise on the power of axial balance muscles among the patients suffering from a discopathy and a nonspecific backache. Aghda AK, Sobhani V, Asheghan M, Hollisaz M. J Clin Anal Med 2017;8(suppl 4): 435-8.