Iberian Journal of Social Science
2022 vol2, Issue 2

The effect of Pilates exercises with and without antioxidants on pain, disability and endurance of flexor and extensor muscles in female teachers with non-specific chronic back pain

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***Abstract*— the aim of this study was to investigate the effect of Pilates training with and without consumption of antioxidants on pain, weakness and endurance of flexor and extensor muscles in female teachers with non-specific chronic back pain. The statistical sample of the research included 30 women suffering from non-specific chronic back pain purposefully selected and randomly assigned to three groups: Pilates without antioxidant, Pilates with antioxidant and control (10 people in each group). The intervention groups participated in a course of 8-week program, while the control group received no intervention and had their normal routine activities. The Pilates training protocol included six**

components: warming up, strengthening the abdominal muscles, control and excitability of the spine, lateral stabilization, shoulder stabilization and back strengthening, as well as hip stabilization and thigh endurance. Antioxidant consumption was in the form of daily consumption of one multi-daily capsule with a dose of 1000 micrograms. Before and after the intervention, the level of pain (Quebec Standard Pain Questionnaire), disability (Oswestry Disability Questionnaire) and endurance of flexor muscles (sit-up test) and trunk extensor (Sorenson test) were measured. Compared to the control group, both intervention groups caused a significant decrease in pain and disability and a significant increase in the endurance of trunk flexor and extensor muscles (P=0.001). These changes were significantly higher in the Pilates practice group with multi-daily consumption (P>0.05). Probably, Pilates improves pain and functional disability in teachers with non-specific chronic back pain by increasing trunk muscle endurance. For greater effect, it is better to use an antioxidant supplement (multi-daily) along with exercise.

***Keywords*— Back pain, Pilates, disability, trunk muscle endurance, female teachers**

Introduction

Work-related low back pain is the most common debilitating musculoskeletal injury in the world and can negatively affect working quality. Most of the medical costs are related to patients with chronic pain. This situation ultimately leads to reduced productivity and increased sick leave. Therefore, its economic dimension has drawn the attention of managers. So these people should quickly recover and return to work to prevent further economic loss (1-4).

Low back pain is more common in women than men (5) and is one of the most common reasons for absences from work and using health insurance and health services. According to the research, 70 to 85 percent of people have experienced back pain during their lives, and 80% of them have reported recurrence (6, 7). Because of the complexity of the mechanism of this type of pain, there is no proven method of treatment (8). Recent studies have shown that flexibility, strength, and endurance exercises, referred to as conventional methods of exercise therapy, are used to reduce pain and improve function in patients with chronic low back pain (9-11). The main causes of back pain are not clear yet but it seems that in most cases, back pain is caused by muscle weakness and awkward posture of the body (12). Research has shown changes in the degree of lumbar lordosis, abdominal muscle weakness, posterior lumbar muscle weakness, and loss of muscle endurance of thigh are the main factor contributing to low back pain (13, 14). The decrease in trunk muscle endurance is one of the most common findings in patients with back pain. Trunk flexor-extensor muscles are among postural muscles of body which act against gravity to keep the body in an upright position and control it when bending (15, 16).

According to many researchers, decreased endurance of these muscles leads to early fatigue, increased pressure, force on passive tissues of lumbar spine, damage to these tissues, and finally the incidence of low back pain (15-17). Similarly, the results of EMG tests prove increased muscle fatigue in people with low back pain compared to healthy individuals (18, 19). Farahpour e. al (2005) examined muscle endurance in patients with chronic low back pain and the changes in different modes of therapy and showed that patients with low back pain have significantly less strong trunk flexor-extensor muscles in the pre-test compared to normal individuals (17). Thinness and atrophy of trunk muscles in patients with low back pain compared to healthy individuals could be among the causes of lower muscular endurance in these people. Hides et al. (1994) showed in their study that in patients with low back pain, multifidus muscle cross-sectional area is 31% lower than in healthy individuals (20). Verbunt et al. (2003) also state that back muscles as postural and body maintenance muscles contract more than other muscles and are more prone to atrophy and weakness (21). So, it can be a cause of reduced endurance and fatigue of the muscles and the subsequent incidence of back pain and disability in such patients. Therefore, it can be helpful to enhance muscle endurance and delay the onset of fatigue. So far, several methods for the treatment of patients with chronic low back pain have been considered including using pain medication,

muscle relaxants, therapeutic yoga, stretching and flexibility exercises, stability exercises, massage therapy, and therapeutic exercise (13-22-25). Exercise therapy is a common practice in the treatment of patients with chronic low back pain (24, 26, 27). Hayden et al have found exercise therapy effective in the treatment of back pain (10). The importance of exercise in patients with low back pain is so considerable that different sport programs have been offered by researchers (10). Overall, the results show exercise therapy can reduce pain, increase muscle endurance, and improve the performance of patients with low back pain (28). By reviewing the literature of the studies on low back pain, it seems that in most studies, common exercises that can affect back pain are separately studied. Few studies have focused on a combination of several methods. Physiotherapy exercises have always been used for treatment. On the other hand, one of the methods of exercise therapy which in recent years has been widely paid attention to by exercise and rehabilitation specialists is Pilates (29). In this method, a set of special exercises are used that engage the body and the brain in a way that affect endurance, strength, and flexibility. This is done in static position (lying, sitting, and standing) and without moving, jumping or leaping. The advantage is that these exercises reduce the risk of joint injuries and muscle injuries (30). Many patients with back pain have found that Pilates can reduce their back pain, and prevent the disease recurrence. Despite the positive results of exercise therapy and different methods of it, few studies have been done on the effects of stabilization exercise with Pilates alone and in combination with other methods of treatment on non-specific chronic low back pain.

On the other hand, the consumption of antioxidant supplements has attracted the attention of many athletes and non-athletes with the goal of health. These supplements may also lead to improved pain in patients with low back pain. For this reason, the aim of this study was to investigate the effect of Pilates training with and without antioxidants on pain, weakness and endurance of flexor and extensor muscles in female teachers with non-specific chronic back pain.

Materials and methods

The current research was a clinical trial type.

The statistical sample of the research included 30 women suffering from non-specific chronic back pain purposefully selected and randomly assigned to three groups: Pilates without antioxidant, Pilates with antioxidant and control (10 people in each group). After the aim of the research and all the steps were described in details for the participants, all of them volunteered and completed a written consent form. Criteria for inclusion of patients in the study included being female, suffering from chronic non-specific low back pain, having low back pain of at least 3 months, a reduction in trunk flexor-extensor muscle endurance, and being aged between 20 and 45 years. Exclusion criteria included having acute and subacute low back pain, being pregnant, having a history of diseases, injuries and disorders affecting the underlying back pain such as a herniated disc, arthritis, sciatica, narrowing of vertebral canal, osteoporosis, the existence of bone Spurs in lumbar spine, hip and vertebral fractures, previous surgery, tumor, infection, ponytail syndrome, lumbar, scoliosis, flat back, kyphosis and history of any medication or health measures to remove low back pain. In addition, all the subjects were examined by a specialist, their MRI images were studied, and based on the criteria of inclusion they were homogenized.

The intervention groups participated in a course of 8-week program, while the control group received no intervention and had their normal routine activities. Pilates exercise protocol consisted of six components: warm-up, strengthening abdominal muscles, spine control and irritability, lateral stability, shoulder stability and strengthening the back, and pelvic stability and thigh strength. Before the start of training, the subjects were taught how to correctly inhale and exhale.

The number of times the exercises were repeated ranged between 6 and 10 and the exercises started from easy ones and gradually become more and more challenging, as the subjects become stronger (29).

Warm-up (7 to 10 minutes): sitting cat (6 to 10 reps) - mobilization of hip (6 to 10 reps) - floating foot (6 to 10 reps) - forming shoulder (6 to 10 reps) - raising chest by sit-ups (6 to 10 reps) - raising chest by sit-ups with pause (keep 6-esteem) - sliding two feet together (6 to 10 repeats) – hundred exercise (keeping the position for 6 to 10 breathing)
- Strengthening abdominal muscles: stretching one leg (6 to 10 reps) – diagonal sit-ups (6 to 10 reps) - pulling both feet (6 to 10 reps)
- Control and mobility of spinal cord: lifting hips off the floor (6 to 10 reps) - the mobility of spine (6 to 10 reps) - stretching the spine (6 to 10 reps) –
Lateral stability: lifting leg from the side (6 to 10 repetitions for each side) - lateral Kicking (6 to 10 repetitions for each side)
- Shoulder stability and strengthening back: Swimming in the squat (6 to 10 repetitions for each side) - Bump hips (6 to 10 repeats) - Practicing basic bed (6 to 10 reps) – back extension using hand (6 to 10 reps)
- Pelvic stability and hip endurance: Caterpillar for 5 seconds (6 to 10 repetitions for each side) - shell (6 to 10 reps)
Pilates exercise were a combination of physiotherapy exercises and Pilates as it is explained below. It was tried to keep the volume of interventions balanced, as far as possible.
- Warm-up (7 to 10 minutes): sitting Cat (6 to 10 reps) - mobilization of hip (6 to 10 repetitions) - forming shoulder (6 to 10 reps)
- raising chest by sit-ups with pause (keeping the position for up to 6 breaths)
- strengthening abdominal muscles: diagonal sit-ups (6 to 10 reps)
- Control and mobility of the spine: lifting hips off the floor (6 to 10 reps) - stretching the spine (6 to 10 repetitions)
- Lateral stability: lifting leg from the side (6 to 10 repetitions for each side) –
- Shoulder stability and strengthening back: Swimming in the squat (6 to 10 repetitions for each side) – back extension using hand (6 to 10 reps)
- Pelvic stability and hip endurance: shell (6 to 10 reps)
- pulling knees to the chest: they lying on the back and pulled one knee up into the abdomen, keep for six seconds, and then put the knee on the mattress. Then, the same was done with the other knee.
- Posterior pelvic tilt: they tilted their pelvis to the posterior and applied pressure on back arch for six seconds.
- Bridge: lying on their back, they raised their hips and held for six seconds
- Extension of back: they lied facedown with head and shoulders raised for six seconds on the mattress.
- Extension of the hip: they lied facedown with one leg straight up from the pelvic area and kept there for 7 seconds.
Antioxidant consumption was in the form of daily consumption of one multi-daily capsule with a dose of 1000 micrograms. 48 hours before and 48 hours after the intervention, the level of pain (Quebec Standard Pain Questionnaire), disability (Oswestry Disability Questionnaire) and endurance of flexor muscles (sit-up test) and trunk extensor (Sorenson test) were measured.
Quebec pain questionnaire consists of 25 five-item questions (minimum 0 and maximum 4) which scores the pain perceived while doing daily routines between 0 and 100. Scoring 0 implies complete health, 1-25 mild pain, 26-50 moderate pain, 51-75 strong pain, and 75-100 severe pain causing trouble for the patient (31). Oswestry questionnaire measures functional ability of patients by ten 6-option sections in the field of tolerance and coping with pain, personal care, lifting objects, walking, sitting, standing, sleeping, social life, travel, and change in the degree of pain. At worst disability conditions, score 5 is given to each section and the total score of the ten sections is 50. Total disability is obtained by multiplying the score in each section by 2. In fact, the range of scores is between 0 and 100. Thus, a score of zero indicates perfect health and a pain-free functionality, 1-25 mild disability, 26-50 moderate disability, 51-75 high disability, and 75-100 severe disability causing trouble for the patient (32). It should be noted that in this study, samples were selected among those who scored over 25 for pain and disability. Previous studies have approved and confirmed the validity and reliability of Quebec and Oswestry questionnaires to assess pain

and disability in daily activities and the reliability of them has been reported 84% (33). Sorenson test was used to assess the endurance of trunk extensor muscles. The subjects were asked to lie prostrate on the floor. Lower body was fixed by patches on the test bed while upper body was out of bed with hands in front of chest. Then, the subject was asked to keep the trunk without support horizontally until the signs of fatigue appeared. The time recorded was considered as the endurance of extensor muscles (34). The reliability and validity of this test have been verified to measure the endurance of extensor muscles and the reliability of it has been reported 88% in patients with nonspecific low back pain (88%) (35). In addition, in order to test trunk flexor muscle endurance sit-up test was used. The subjects lay on the back with the soles of the feet on the floor knees bent 90 degrees, and hands beside ears. The subject's legs were fixed on bed. The number of correct sit-ups done in one minute was recorded. The test is of high reliability. Its reliability has been reported 98% in different studies (36).

To analyze the data, descriptive and inferential statistics were used. In descriptive statistics, mean and standard deviation were used. In inferential statistics, In order to investigate and compare the changes of the variables, the statistical method of mixed variance analysis and Bonferroni post hoc test were used. The significant level was considered $P \leq 0.05$ and the SPSS software (version 16) was used to perform statistical operations.

Results

The results of mixed analysis of variance and Bonferroni post hoc test are presented in Tables 1 and 2, respectively.

Table1. The results of the mixed analysis of variance test

Variables	Groups	pre	post	F	P
Pain	Pilates	37.50 ± 11.77	19.80 ± 11.32	1178.63	0.001 *
	Pilates + Multi-daily	50 ± 7.43	28.10 ± 7.09		
	Control	45.50 ± 11.90	44.90 ± 11.43		
Disability	Pilates	53.10 ± 9.79	34.30 ± 9.83	825.79	0.001 *
	Pilates + Multi-daily	50.20 ± 5.30	28.60 ± 4.97		
	Control	51.90 ± 6.87	51.20 ± 7.71		
Endurance of flexor muscles	Pilates	11.40 ± 3.30	18.30 ± 3.40	904.07	0.001 *
	Pilates + Multi-daily	10.30 ± 3.65	18.80 ± 3.48		
	Control	9.70 ± 4.66	9.50 ± 4.14		
Endurance of extensor muscles	Pilates	19.90 ± 10.48	41.40 ± 12.28	255.72	0.001 *
	Pilates + Multi-daily	28.60 ± 11.67	55.30 ± 11.87		
	Control	27.50 ± 11.80	28.30 ± 12.79		

* Significant at the level of $P \leq 0.05$

Table2. Bonferroni post hoc test results

Variables	Pairwise comparison	P
Pain	Pilates / Pilates + Multi-daily	0.001 *
	Pilates / Control	0.001 *
	Pilates + Multi-daily / Control	0.001 *
Disability	Pilates / Pilates + Multi-daily	0.002 *
	Pilates / Control	0.001 *
	Pilates + Multi-daily / Control	0.001 *
Endurance of flexor muscles	Pilates / Pilates + Multi-daily	0.002 *
	Pilates / Control	0.001 *
	Pilates + Multi-daily / Control	0.001 *
Endurance of extensor muscles	Pilates / Pilates + Multi-daily	0.001 *
	Pilates / Control	0.001 *

	Pilates + Multi-daily / Control	0.001 *

* Significant at the level of P≤0.05

Compared to the control group, both intervention groups caused a significant decrease in pain and disability and a significant increase in the endurance of trunk flexor and extensor muscles (P=0.001). These changes were significantly higher in the Pilates practice group with multi-daily consumption (P>0.05).

Discussion

Based on the present findings, Pilates practice (both without multi-daily consumption and with multi-daily consumption) led to a significant decrease in pain and disability, and a significant increase in the endurance of trunk flexor and extensor muscles in female teachers with non-specific chronic back pain. These changes were significantly greater in the group that consumed multi-daily. Considering the impact of exercise on reducing pain and disability, the results of the present study are in line with the results of Barr (37). Previous research has showed that patients with chronic low back pain have weakness and atrophy of deep and central muscles, especially abdominal and multi-headed lumbar muscles (38). Also, it is aid that in patients with chronic low back pain, muscle dysfunction may be due to deformation and change of one of neuromuscular control mechanisms affecting trunk stability and efficiency in motion. Exercise may reduce pain and increase performance by increasing strength, endurance, flexibility, coordination, static and dynamic stability, neuromuscular control, motor control, correcting movement patterns and relaxation of muscles (37, 39). Pilates exercise probably control and develop sensory-motor trunk muscles and core muscles (40). The development of trunk stability decreases additional forces, which are harmful to the spine, and reduces pain. In addition, this exercise gives patients information about natural alignment of the spine, strengthens deep postural muscles that support this alignment, and reduces harmful pressure of passive spine holders. Mental practices of this method reduce the pressure on the body and increase concentration and muscle function during normal daily activities, so the pressure on the spine is reduced (41). The factors that lead to chronic back pain include reduction of strength, flexibility, and endurance of trunk muscles and excessive pressure imposed to the spine caused by bad body postures while sitting and standing. Pilates exercise strengthens deep back muscles like multifidus and transverse abdominal muscles. They also increase the coordination and development of trunk stability and reduce additional forces to the spine, which leads to lower back pain and physical disability. Pilates is a combination of static and dynamic stretching exercises to increase flexibility. Physiological neural properties of contractile tissues respond to stretching exercises. When performing stretching exercises of Pilates, soft tissues such as skin, tendon, joint capsule, and muscles cause the activation of Golgi tendon organ. These receptors control alpha motor neuron activity and thereby reduce muscle tension and allow sarcomere to be extended. Therefore, it seems that Pilates exercise can be used as a treatment method in patients with low back pain. Motealeh (2005) stated that endurance and coordination exercises and a combination of them improve pain and disability in patients with chronic low back pain and believes using a combination of endurance and coordination exercises is more effective in reducing pain and disability (42). Farahpour et al (2005) also pointed out that a 12-week physical therapy decreased the pain and disability of patients with chronic low back pain with the weakness of the flexor-extensor muscles of the trunk (17). However, the research done by Grifka (2006) reported contrasting results (43). That is probably because the sample and method of measuring the endurance of extensor muscles in work of Grifka is different from the present study as in study of Grifka, the sample consisted of 82 athletes with low back pain and surface electromyography was used to measure the endurance of extensor muscles (43). However, in the present study, the subjects were chosen from a non-athlete sample and Sorenson test was used to measure the endurance of extensor muscles. On the other hand, Rainville et al (2004) pointed out that there is no evidence that exercise therapy increases back pain or disability of patients and suggested that therapeutic exercise and endurance activities reduce the risk of injuries and lower back

pain. They believe these exercises can be used for treating patients as they increase the flexibility of muscles, improve their performance, and reduce pain (24).
Also, it was observed that the reduction of pain and disability and the increase of endurance of trunk flexor and extensor muscles were significantly increased due to the use of multi-daily. More studies should be done in this field, but it seems that one of the causes of pain in patients with back pain is increased oxidative stress and inflammation. For this reason, taking antioxidant supplements can reduce pain in these patients by reducing inflammation and oxidative stress. Reducing pain can lead to reduced disability and increased muscle function. In any case, more studies are needed in this field.

Conclusion

The nature of chronic back pain and the disability associated with it are influenced by several factors and it has been shown they are better perceived by psychosocial factors. Therefore, pain, and disability are the most important factors hindering success of the treatment of chronic low back pain. Studies have shown that movement therapy reduces pain and disability in patients with chronic low back pain follows. Several clinical studies have suggested this kind of treatment for chronic pain control. Based on the present results, we conclude that Pilates exercises (alone and with multi-daily consumption) increase the endurance capacity of the flexor and extensor muscles in creating stability and stability of the trunk and by raising the fatigue threshold of the trunk muscles, Improve pain and functional disability in working women with chronic non-specific low back pain.
Also, it seems that one of the causes of pain in patients with low back pain is increased oxidative stress and inflammation. For this reason, taking antioxidant supplements such as Multi-daily can reduce pain in these patients by reducing inflammation and oxidative stress and lead to reduced disability and increased muscle function. In any case, more studies are needed in this field.

References

1. Stankovic A, Lazovic M, Kocic M, Zlatano D. (2008). Spi-nal segmental stabilization exercises combined with traditional strengthening exercise program in patients with chronic low back pain. Acta Fac Med Naiss, 25(3): 70-165.
2. Bigos SJ (2008). Battie MC. Risk factors for industrial back problems. Arch Phys Med Rehabil, 4: 2-11.
3. Kinkade S. (2007). Evaluation and treatment of acute low back pain. Am Fam Physician, 75: 1181-8.
4. Hides JA, Jull GA, Richardson CA. (2001). Long-term effects of specific stabilization exercise for first episode low back pain. Spine, 26: 243-8.
5. Andersson GB. (1999). Epidemiological features of chron-ic low-back pain. Lancet, 354: 581-5.
6. Vlaeye J W S, De Jong J, Geilen M, Heuts P H,Van Breukelen G. (2000). Graded exposure in vivo in the treatment of Pain related fear a replicated sin-gle case experimental deign in four patients With chronic low back pain. Behav Res Ther, 39: 151-66.
7. Lee GK, Chronister J, Bishop M. (2008). The Effects of psychosocial Factors on Quality of Life among Individuals with chronic Pain. Rehabil Couns Bull, 51: 11-7.
8. Eyigor S, sertpoyraz S. (2008). Comparison of isokinetic exercise versus standard exercise training in pa-tients with chronic low back pain: a randomized controlled study. Clin Rehabil, 23: 238-47.
9. Farrell JP, Koury M, Taylor CD. (2000). Therapeutic exer-cise for back pain. In: Twomey LT, Taylor JR Physical therapy of the low back pain. Philadelph-ia: Churchill Livingstone: 3rd ed, 327-39.
10. Hayden JA, van Tulder MW, Malmivaara AV, Koes BW. (2005). Meta-analysis: exercise therapy for non-specific low back pain. Ann Intern Med, 142: 765-75.
11. Koumantakis GA, Watson PJ, Oldham JA. (2005). Trunk muscle stabilization training plus general exercise versus general exercise only: randomized con-trolled trial of patients with recurrent low for non-specific low back pain. Ann Intern Med, 142: 765-75.
12. Shoja Aldin SSAD, Sadeghi H, Bayat Tork M. (2009). Relationship between the trunk muscles endurance and anthropometric characters with low back pain among athletes with lumbar lordosis (Persian). Journal of Movement Science & Sports, 6(12): 23-33.
13. Descarreaux M, Normand MC, Laurencelle L, Dugas C. (2002). Evaluation of a specific home exercise program for low back pain. J Manipulative Physiol Ther, 25(8):497-503.
14. Kendall FP, McCreary EK, Provance PG. (1993). Muscle testing and function. 4th ed. Philadelphia: lippincott Williams & Wilkins, 15-46.
15. Kim HJ. (2006). Infuences of trunk muscle on lumbar lordosis and sacral angle. Eur Spine J, 15 (4): 409-14.
16. Wilder DG, Aleksive AR. (1996). Muscle response to sudden load: a tool to evaluate fatigue and rehabilitation. Spin, 21(22): 2628-39.
17. Farahpour N, Yazdani S, Bahram A, Farajollahi N. (2005). Interactions between chronic low back pain, isometric muscle force of the trunks flexors and extensors and exercise therapy (Persian). Journal of Movement Science & Sports, 2(4): 106-22.
18. Roy SH, Oddsson LIE. Classification of paraspinal muscle impairments by surface electromyography. Phys Ther, 78 (8): 838-51.
19. Ershad N, Kahrizi S, Firouzabadi M, Faghihzadeh S. (2007). Evaluation electrical activity of trunk muscle in female chronic low back pain patients during holding load (Persian). Kowsar Medical Journal, 12 (1): 59-68.

20. Hides JA, Stokes MJ, Saide M, Jull GA, Cooper DH. (1994). Evidence of lumbarmultifidus wasting ipsilateral to symptom in patients with acute subacute low back pain. Spin, 19 (2): 165-72.
21. Verbunt JA, Seelen HA, Vlaeyen JW. (2003). Disuse and deconditioning in chronic low back pain: concepts and hypothesis on contributing mechanisms. Eur J Pain, 7(1): 9-21.
22. Karimi N, Ebrahimi I, Ezzati K, Kahrizi S, Torkaman G, Arab AM. (2009). The effects of consecutive supervised stability training on postural balance in patients with chronic low back pain. Pak J Med Sci, 25(2):1-5.
23. MacGill S. (2007). Low back disorders: evidence-based prevention and rehabilitation. 2nd ed. Hum Kinetice, 124-58.
24. Rainville J, Hartigan C, Martinez E, Limke J, Jouve C, Finno M. (2004). Exercise as a treatment for chronic low back pain. The Spine Journal, 4(1):106-15.
25. Williams KA, Petronisb J, Smith D, Goodrich D, Wu J, Ravif N, et al. (2005). Effect of Iyengar yoga therapy for chronic low back pain. Pain, 115(1-2):107-17.
26. Koes BW, Bouter LM, Beckerman H, van der Heijden, Knipschild PG. (1991). Physiotherapy exercises and back pain: a blinded review. BMJ, 302(6792):1572-6.
27. Van Tulder MW, Koes BW, Bouter LM. (1997). Conservative treatment of acute and chronic nonspecific low-back pain. Spine, 22 (18): 2128-56.
28. Sung PS. (2003). Multifidi muscles median frequency be-fore and after spinal stabilization exercise. Arch Phys Med Rehabil, 84: 1313-8.
29. Rydeard, R. Leger, A. Smith, D. (2006). Pilates – based therapeutic exercise: effect on subjects with nonspecific chronic low back pain and functional disability. J orthop sports phy ther, 36 (7). 472-84.
30. Muscolino JE, Cipliani, S. (2004). Pilates and the powerhouse. Journal of bodywork and movement therapies, 8(1). 15-24.
31. Kopec JA, Esdaile JM, Abrahamowicz M, Abenhaim L, Williams JI. (1995). The Quebec Back Pain Disability Scale measurement properties. Spin, 20 (3): 341-52.
32. Page SJ, Shawaryn MA, Cernich AN, Linacre JM. (2002). Scaling of the revised oswesry low back pain questionnaire. Arch Phys Med Rehabil, 83(11): 1579-84.
33. Davidson M, Keating JL. (2002). A comparison of five low back disability questionnaires: reliability and responsiveness. Phys Ther, 82(1):8-24.
34. Demoulin C, Vanderthommen M, Duysens C, Crielaard J. (2006). Spinal muscle evaluation using the Sorensen test: a critical appraisal of the literature. Joint Bone Spine, 73(1): 43-50.
35. Latimer J, Maher CG, Refshauge K, Colaco I. (1999). The reliability and validity of the biering-sorenson test in asymptomatic subjects and subjects reporting current or previous nonspecific low back pain. Spin, 24 (20): 2085-9.
36. Diener MH, Golding LA, Diener D. (1995). Validity and reliability of a one-minute half sit-up test of abdominal strength and endurance. Sports Med Train Rehab, 6:105-19.
37. Barr KP, Griggs M, Cadby T. (2005). Lumbar stabilization: core concepts and current literature, Part 1. Am J Phys Med Rehabil, 84: 473-80.
38. Hodges PW, RichardsonCA. (1996). Inefficient muscular stabilization of the lumbar spine associated with low back pain. A motor control evaluation of transversusabdominis. Spine (Phila Pa 1976), 21 (22): 26-50.
39. Frost H, Klaber Moffet JA, Moser JS. (1995). Randomized controlledtrial for evaluation of fitness program for patients with chronic low back pain. BMJ, 31: 4-151.
40. Banigol F, Rajabi R. (2010). Evaluation of effectiveness the pilates exercise on pain and lombopelvic stability in non specific chronic LBP. Journal of movement scienci and sports, 14 (2): 9-21.
41. Gladwell V, Haggarm M. (2006). Dose a program of pilates improve chronic non – specific low back pain? Sport rehabili journal, 15 (4). 338-50.
42. Motealeh, AR. (2005). Comparison of the effects of three types of endurance exercises. Coordination exercises and ther combinations on improvement of pain and disability of chronic low back pain (Persian). Scientific Journal of Hamadan University of Medical Sciences and Health Services, 12 (2): 58-63.
43. Grifka J. (2006). The association of low back pain, neuromuscular, imbalance and trunk extension strength in athletes. Spin, 6(6): 673-83.

Iberian Journals

Iberian Journal of Social Science

2022 vol2, Issue 2

The effect of Pilates training on cardiovascular risk factors in overweight teachers

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***Abstract*— the aim of this study was to investigate the effect of a Pilates training course on cardiovascular risk factors in overweight teachers. Therefore, 20 overweight teachers (body mass index 25 and above 25) with an age range of 30 to 40 years were purposefully selected and randomly assigned to two Pilates training and control groups (10 people in each group). The Pilates training group participated in 8 weeks of Pilates training (three sessions per week). The control group did not participate in any regular physical activity program during this period. Relevant measurements were taken before and after the intervention. Weight, body mass index, and serum levels of triglycerides, cholesterol, LDL, and HDL were measured in two groups. The statistical method of mixed analysis of variance was used to compare and examine the changes of variables between two groups at the level of P≤0.05. Weight, body mass index, cholesterol, triglyceride and LDL in the Pilates group were significantly reduced compared to the control group (P<0.05), but HDL in the Pilates group did not change significantly compared to the control group (P>0.05). It seems that Pilates exercise can reduce the risk factors of heart diseases in overweight teachers.**

***Keywords*— Pilates, cardiovascular risk factors, lipid profile, HDL, overweight**

Introduction

Studies conducted in recent years show that Pilates exercise plays an important role in improving physical fitness, body composition, metabolic disorders and depression (1, 2). These advantages are obtained while Pilates exercises are a low-cost, healthy, safe method without side effects, and it is easy to learn and can be applied even by patients, elderly and disabled people (3). However, while the effects of Pilates exercise on the metabolic and hormonal status of several diseases have been investigated in limited studies (1-4), the effect of this type of exercise on cardiovascular risk factors has been less investigated. Today, cardiovascular diseases are one of the most important causes of death, especially in developed countries, and account for nearly 40% of deaths in the world every year. Due to the inactive lifestyle, cardiovascular diseases have increased in the last few decades (5). Several risk factors such as increased levels of triglycerides (TG), low-density lipoprotein (LDL) and very low (VLDL), cholesterol, and a decrease in high-density lipoprotein (HDL), weight gain and high blood pressure increase the prevalence of heart diseases (5). Research results on the effect of exercise on plasma lipid levels in obese individuals are contradictory (6-11). There is no clear mechanism of the effect of exercise on lipoproteins. It seems that regular aerobic exercise with a relatively high intensity can significantly improve overall lipoprotein profile (12). Fat tissues have numerous capillaries and autonomic nerves. Therefore, all their metabolic actions are controlled by thyroid, sexual and nervous hormone factors. Many of them are affected by obesity, which can be one of the reasons for the increase in cholesterol levels in obesity (13). TG levels are inversely related to HDL levels. Elevated TG and LDL levels are a major risk factor for cardiovascular disease. An overview of research on the effect of exercise on lipid profiles shows that, according to some researchers, exercise rarely affects TC and LDL levels, unless it is associated with weight loss (13). Various studies have investigated the effect of physical activities and exercises on cardiac risk factors. Various findings indicate a significant favorable effect on these factors by physical exercises (14, 15). However, there are also findings that reported no significant effect of physical exercises on cardiac risk factors (16-19). However, previous research has paid less attention to Pilates exercise. These exercises, which focus on and strengthen the mind and body, have recently attracted the attention of many people, and considering that it is done with mild intensity, the researcher thinks that it may have the same effects as aerobic exercises, especially when the training duration is long (for example, 40 minutes or more). The research results show that we need medium intensity and long duration exercises for the desired changes in the lipid profile and these risk factors (20). On the other hand, previous results show that intense exercises do not have a significant favorable effect on lipid profile (21). Therefore, Pilates exercise may be effective in this field.

In this regard, the aim of the present study was to investigate the effect of a Pilates training course on cardiovascular risk factors in overweight teachers.

Materials and methods

20 overweight teachers (body mass index 25 and above 25) with an age range of 30 to 40 years were purposefully selected and randomly assigned to two Pilates training and control groups (10 people in each group). Before starting the research, the nature, goals and risks of this study were explained to the subjects in a face-to-face meeting, and written consent was obtained from them to participate in this study.

After that, all pre-test variables, including blood biochemical factors and general characteristics, were measured. For each blood sample, C-reactive protein was measured by ELISA method using a commercial ELISA kit, Ontario Canada Company with a sensitivity of 10 ng / ml. Cholesterol, triglyceride, LDL and HDL were measured by colorimetric method using Biorox kit. Then the volunteers were randomly assigned to one of the control and Pilates groups. The Pilates training group participated in 8 weeks of Pilates training. During this period, the control group did not participate in any regular

physical activity program and only did their normal daily activities. After the end of the intervention period, the subjects were again measured before the exercises. In order to control the subjects' nutrition, they were given a written recommendation.

Subjects in the exercise group participated in 24 Pilates training sessions (for 45 to 60 minutes) for 8 weeks. In the first session, the basic principles of Pilates exercise were explained and general information about Pilates was provided to them. These basic principles were observed in all sessions. At the beginning of each session, after preparing the preparations for the training session, including: breathing control and how to stand correctly in Pilates class (about 5 minutes), it started with Pilates breathing and stretching exercises that were accompanied by the instructor's explanations (about 10 minutes). The continuation of the session was continued by performing specific moderated exercises (about 40 minutes). At the end of the class, cooling down and returning to the initial state was done (about 5 minutes). The exercises started from a low level and progressed gradually. The protocol used in this research was the selected exercises that were collected by the researcher from different texts and according to the capabilities of the people and were approved by the Pilates instructors. The exercise protocol included six components: warming up, strengthening the abdominal muscles, control and excitability of the spine, lateral stabilization, shoulder stabilization, back strengthening, hip stabilization, and thigh endurance. The intensity of exercises for each subject was controlled based on the tolerance threshold of exercise and pain. As the exercises continued, people did the exercises with more repetitions without feeling pain or fatigue. In this way, the exercises started with 8 repetitions and ended with 16 repetitions.

The statistical method of mixed analysis of variance was used to compare and examine the changes of variables between two groups at the level of $P \leq 0.05$. Also, SPSS version 16 statistical software was used to perform statistical calculations.

Results

The statistical method of mixed analysis of variance was used to compare and examine the changes of variables between two groups at the level of $P \leq 0.05$. Weight, body mass index, cholesterol, triglyceride and LDL in the Pilates group were significantly reduced compared to the control group ($P<0.05$), but HDL in the Pilates group did not change significantly compared to the control group ($P>0.05$).

Table1. The results of the mixed analysis of variance test

Variables	Groups	Pre	post	F	P
Weight (kg)	Pilates	72.30 ± 2.98	71.40 ± 3.02	10.80	0.004 *
	Control	69.80 ± 5.30	70.10 ± 5.50		
BMI (kg/m^2)	Pilates	25.98 ± 0.18	25.64 ± 0.27	7.05	0.016 *
	Control	25.68 ± 0.41	25.81 ± 0.53		
Cholesterol (mg/dl)	Pilates	200.33 ± 20.94	189.45 ± 20.76	12.004	0.003 *
	Control	194.31 ± 26.46	196.81 ± 25.59		
Triglycerides (mg/dl)	Pilates	154.84 ± 30.69	136.06 ± 29.81	9.69	0.006 *
	Control	146.78 ± 19.50	152.81 ± 26.79		
LDL (mg/dL)	Pilates	136.15 ± 20.38	125.72 ± 22.34	10.40	0.005 *
	Control	141.09 ± 15.04	142.34 ± 14.04		
HDL (mg/dL)	Pilates	121.91 ± 17.79	123.49 ± 17.20	0.075	0.78
	Control	144.54 ± 10.79	143.90 ± 11.11		

* Significant at the level of $P \leq 0.05$

Discussion

According to the findings of the present study, weight, body mass index, cholesterol, triglycerides and LDL in the Pilates group were significantly reduced compared to the control group, but HDL in the Pilates group did not change significantly compared to the control group. Many researchers have shown

that all types of exercise and sports activities have an effect on blood fats. Skumas et al. (2003) and Kin Isler et al. (2001) reported a decrease in triglyceride, cholesterol, and LDL, as well as an increase in HDL following physical training (23, 22). Kraus (2002) after some studies stated that high intensity and long distance have the greatest effect on the change of lipids and lipoproteins in blood serum (13). HDL has long been considered as the strongest predictor of coronary artery disease in all ages. It has been shown that its reduced levels are an independent and important risk factor for coronary disease (24). The effect of aerobic exercise on HDL levels has been reported in some researches, especially researches whose intensity is between 70% and 90% of the maximum heart rate (25). Probably, the lack of significant change in HDL in the present study is due to the low intensity of physical activity in Pilates. However, Linder et al. (1983) showed that HDL increases at any intensity of exercise (26). However, a threshold of physical activity intensity is probably required for HDL changes. Various other factors affect the changes in the amount of HDL in the blood of people that among them can mention the sex of the subjects, diet, drug use, and hereditary characteristics of the people. Physiologically, the cause of HDL increase can be attributed to factors such as the increase of lecithin cholesterol acyltransferase (LCAT, LPL) and the decrease of HTGL (hepatic lipase) activity (27). HDL is the main carrier of cholesterol ester hydroperoxide and when oxidized, it has a great capacity to reduce the total amount of lipo peroxide produced in LDL. In other words, the reverse transfer of cholesterol reduces the incidence of cardiovascular diseases. Therefore, increasing it has a great value (28). Different researches have presented different results of the effects of exercises. Donavan and colleagues (2005) have acknowledged the beneficial effects of moderate-intensity and long-distance exercise on reducing LDL and VLDL (28). William and colleagues (2002) have pointed out that LDL is more effective in intense aerobic exercise (29). Considering the consumption of fat as fuel during activity and during the return to the initial state, it seems to be one of the factors of reducing LDL and VLDL. Performing sports activity (exercises) increases the amount of lipoprotein type A and causes an increase in LPL enzyme. LPL also causes the catabolism of the lipid part of LDL. Therefore, LDL in the blood is expected to decrease (30). One of the factors of TG reduction may be the activity of LPL as a result of sports training (30). Total cholesterol has also been mentioned as one of the main cardiovascular risk factors in most researches. The reduction of triglycerides following exercise can be attributed to the response of lipoprotein lipase (LPL) to exercise.

Conclusion

In general, the results of the researches show that sports exercises, if they are within the threshold intensity and duration, can cause favorable changes in the lipid profile and cardiovascular risk factors, and probably Pilates exercise in the present study also has the threshold intensity and duration for teachers with extra The weight has been Therefore, overweight teachers can use this type of exercise to reduce their heart risk factors.

References

1. Na CI, Kim D, Lee H, Jung H, Jung J, Kim H, et al. (2010). Effect of the pilates exercise on the health physical fitness, immunoglobulin and sex hormone in female college students. FASEB JOURNAL, 24: 618-25.
2. Eyigor S, Karapolat H, Yesil H, Uslu R, Durmaz B. (2010). Effects of pilates exercises on functional capacity, flexibility, fatigue, depression and quality of life in female breast cancer patients: a randomized controlled study. Eur J Phys Rehabil Med, 46(4): 481-7.
3. Rogers K, Gibson AL. (2006). Effects of an 8-Week Mat Pilates Training Program on Body Composition, Flexibility, and Muscular Endurance. Medicine & Science in Sports & Exercise, 38(5):S279-S80.
4. Cruz-Ferreira AIC, Pereira CLN, Fernandes JA. (2009). Effects Of Three Months Of Pilates-based Exercise In Women On Body Composition. Medicine & Science in Sports & Exercise, 41(5):16-7.
5. Blake GJ, Ridker PM. (2002). Inflammatory bio-markers and cardiovascular risk prediction. J Intern Med, 252 (4): 283-94.
6. Nayebifar Sh, Afzalpour M, Saghebjoo M, Hedayati M. (2010). Effects of resistance training and aerobic exercise on solution adhesion molecules and the profile intercellular serum lipids in overweight women. Sport and Biomotor Sciences, 2(4): 77-87.
7. Akbarei M,Askarei M, Ahanjan Sh, Akbarei M, Tadibei V. (2007). Effects of an eight-week aerobic training program on blood lipids in hypertensive male employees. Journal of Medical Council of Islamic Republic of Iran, 25(2): 126-131.
8. Sayarei A, Hosynie J, Eydie A, Ferdosei M. (2007). The comparison effect of 8 weeks of submaximal exercise swimming and running on triglyceride, cholesterol, LDL-C and HDL-C of obese high school boys of boroujen city. Jundishapur Scientific Medical Journal, 6(4): 414-422.

9. Thompson PD, Rader DJ. (2001). Does exercise increase HDL cholesterol in those who need it the most?. American Heart Association Journals, 21: 1097-1098.
10. Crouse SF, O'Brien BC, Grandjean PW, Lowe RC, Rohack JJ, Green JS. (1997). Effects of training and a single session of exercise on lipids and apolipoproteins in hyper cholesterolemic men. Journal of Applied Physiology, 83: 2019-2028.
11. Askari A, Askari B, Fallah Z, Kazemi Sh. (2012). Effect of eight weeks aerobic training on serum lipid and lipoprotein levels in women. Golestan University of Medical Sciences, 14(1): 26-32.
12. Yin YE, Xu-Hong HOU, Xiao-Ping PAN, Jun-Xi LU, Wei-Ping JIA. (2009). Serum vaspin level in relation to postprandial plasma glucose concentration in subjects with diabetes. Chinese Medical Journal, 122: 2530-3.
13. Kraus WE, Houmard JA, Duscha BD, Knetzger KJ, Wharton MB, Jennifer S, et al. (2002). Effects of the amount and intensity of exercise on plasma lipoproteins. New England Journal of Medicine, 347(19): 1483-1492.
14. Imamoglu O, Atan T, Kishali NF, Burmaoglu G, Akyol P, Yildirim K. (2005). Comparison of lipid and lipoprotein values in men and women differing in training status. Biol Sport, 22(3): 261-70.
15. Kishali NF, Imamoglu O, Kaldirimci M, Akyol P, Yildirim K. (2005). Comparison of lipid and lipoprotein values in men and women differing in training status. Int J Neurosci, 115(9): 1247-57.
16. Aellen R, Hollmann W, Boutellier U. (1993). Effects of aerobic and anaerobic training on plasma lipoproteins. Int J Sports Med, 14(7):396-400.
17. Cardoso Saldaña GC, Hernández de León S, Zamora González J, Posadas Romero C. (1995). Lipid and lipoprotein levels in athletes in different sports disciplines. Arch Inst Cardiol Mex, 65(3): 229-35.
18. Coutinho MS, da Cunha GP. (1989). Physical exercise and serum lipids. Arq Bras Cardiol, 52(6): 319-22.
19. Taheri L. (2007). The Effects of 8week aerobic exercise on blood lipoprotein of non-athletic middle-aged women of ahvaz. Harakat, 9(1):87-99.
20. Banz WJ, Maher MA, Thompson WG, Bassett DR, Moore W, Ashraf M, et al. (2003). Effects of resistance versus aerobic training on coronary artery disease risk factors. Exp Biol Med (Maywood), 228(4):434-40.
21. Elliott KJ, Sale C, Cable NT. (2002). Effects of resistance training and detraining on muscle strength and blood lipid profiles in postmenopausal women. Br J Sports Med, 36(5): 340-4.
22. Michel L. (2006). Blood lipid responses after continuous and accumulated aerobic exercise. J of Sport Nutr, 16: 245-54.
23. Kin Isler A, Kosar, SN, Korkusuz F. (2001). Effects of step aerobics and anaerobic dancing on serum lipids and lipoprotein. J. sports med Physical fitness, 41(3): 380-5.
24. Gordon DJ. (1977). High density lipoprotein as protective against coronary heart disease. The Framingham study, Am. J Med, 62: 701-714.
25. Gaesser GA, Rich RG. (1984). Effects of high-ad low intensity exercise training on aerobic capacity and blood lipids. Med Sci Sports Exercise, 16: 269-574.
26. Linder, CW, Durant, RH, Mahony, DM. (1983) The effects of physical conditioning on serum lipids and lipoproteins in white male adolescencent. Med Sci Spor Exerc, 15: 232-236.
27. Aki Vniofa, Korperainen RA. (2007). Effects of impact exercise on physical performance and cardio vascular risk factors. J. of Med & Sci, 39(5): 756-763.
28. Donovan GO, Owen, A. (2005). Change in cardiorespiratorty fitness and coronary disease risk factor following 24 week of equal energy cost. J APPL Physiol, 10: 1152-1154.
29. William E, Kraus MD, Joseh A, Houmard B, et al.(2002). Effect of omount and intensity of exercise on plasma lipoproteins. The New England Journal of Medicine, 347: 1483-1492.
30. Saremi A, Asghari M, Ghorbani A. (2010). Effects of aerobic training on serum omentin-1 and cardiometabolic risk factors in overweight and obese men. J Sports Sci, 4:1-6.

Iberian Journal of Social Science

2022 vol2, Issue 2

Investigating the factors affecting the brand equity of sports tourism destination brand (Case study of Bandar Abbas city in Iran)

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***Abstract*— bandar Abbas city is a suitable platform for sports tourism, especially in the cold seasons of the year, as well as water sports due to its geographical location and natural features; but so far it has not been successful in this regard. Having a successful sports tourism brand can be very effective in increasing the competitive advantage of the destination, attracting sports tourists and thus increasing revenues from the sports tourism industry, economic prosperity and preventing migration of residents. By examining the brand equity, the nature of the destination can be identified and a general framework can be provided to the managers and marketing professionals of that destination that can measure the effectiveness of the brand of that destination. Therefore, the purpose of this study was to investigate the factors affecting the special value of the brand of sports tourism destination in Bandar Abbas city. The statistical population of the study included all sports tourists (sports and sports science events) from October to March 2019 in Bandar Abbas city. The sample size was 108 people who were selected by convenience sampling method. The data collection tool was a questionnaire and the data obtained through structural equations and partial least squares method were analyzed using SPSS and smart pls software. Findings from the study show that brand awareness, brand image and perceived quality have a positive and significant effect on brand equity and brand image, perceived value and brand equity have a positive and significant effect on brand loyalty. Brand awareness has the greatest impact on brand equity and brand equity has the greatest impact on brand loyalty but perceived quality has not had a significant effect on brand loyalty.**

***Keywords*— brand equity, sports tourism, tourism destination, brand loyalty, Chabahar**

Introduction

Tourism in tourism destinations has a positive impact on the economic development of the country, especially currency, employment rate, taxes, etc. (1). On the other hand, sport is one of the important

activities of tourists during tourism and tourism and travel are associated with different types of sports. A tourist is a person who travels to a city or country outside his / her place of residence for a period of at least one day and not more than one year, and his / her goal is not to work and earn money in that city or country (2). Also, a sports tourist is a temporary visitor who stays at the venue for at least 24 hours and her main purpose is to participate in a sporting event, but at the same time, there may be secondary attractions (2). Sports tourism is one of the growing fields of tourism (3).

With increasing competition and the emergence of phenomena such as global markets, the domestic industries of each country in order to remain in this field must increase their competitive advantages. One of the strategic tools that lead to commitment and repetition of consumption, increase economic value for shareholders and expand the range of economic activities beyond geographical boundaries, is the brand equity (4). Brand equity is at the core of the concept of brand management and has been viewed from different perspectives. According to Keller (1993), brand equity is the distinctive effect of brand knowledge on consumer response to marketing and strengthens customers' purchasing preferences and intentions (5). Brand equity provides a tool for measuring the effectiveness of past marketing efforts, evaluating the success of current brand positioning, and predicting future brand performance (6). Because destinations are places that people choose to stay and travel for a specific experience based on an understanding of a particular feature of the attraction, it is possible to create a brand for them by using planning methods, so that tourists, when choosing between a destination that has become a brand and its competitors, prefer a branded destination because of the better position the brand has in mind. Thus, today, mere attention to hard infrastructure has disappeared and a significant focus on soft infrastructure, urban planning such as designing a good mental image or building a brand for the city is being formed (7).

In recent years, most research has measured the brand equity of the tourism brand based on the Acker method. Aaker defines brand equity based on the following 5 dimensions:

1- Brand loyalty: The attitude and behavior of the visitor towards a specific destination brand, which shows the unique preference of that destination and the recommendation of that destination to others to visit.

2- Brand Awareness: Refers to consumer awareness and destination reminders.

3- Perceived quality: This refers to the quality of goods and services provided to tourists, the level and degree of satisfaction in the minds of consumers and their feelings.

4- Brand Association: The position of the destination brand in the minds of tourists, including that they deal with the destination brand, the characteristics of the goods and services produced by the destination, their function and level, the relationship of products with consumer interests.

5- Other items include brand assets (other priorities, patterns, the company's relationship with its competitors, etc). Aaker states that from a marketing perspective, brand equity is the same as brand equity of consumer-based (8, 9).

In Qaemi (2012) study in Qeshm Island, the aim was to identify the factors affecting the equity of the destination brand and provide a model for its perceived value. The study sample was 308 tourists who had traveled to Qeshm Island. In this study, four dimensions of Acker brand equity were examined with the

letters of brand awareness, brand image, brand loyalty and perceived quality. According to the findings, all variables directly affected the brand equity, among which, the brand image had the most and the perceived quality of the brand had the least effect on Qeshm destination's value (10). Assessing brand equity, especially in service industries such as sports tourism, is one of the key aspects of destination management. Of course, it is important to note that the complex characteristics of a tourist destination can be a major challenge in determining the branding for that destination. Maybe that's why few studies have been done on the brand of tourism destinations. The first step in creating brand equity is to create awareness in the mind of the consumer. Awareness is only related to the destination brand. Brand awareness plays a key role in choosing a destination. Before seeing any destination, tourists identify the available destination brands in their minds through a set of awareness. In general, the set of knowledge leads to the creation of evaluations that help to select the destination brand (11). There is extensive research on the destination brand image. Nevertheless, there is a deep gap between destination brand research and reliable and global criteria of destination brand image from the point of view of tourists. Berley and Martin (2004) used extensive literature to determine the categories and features used to define a destination brand image. They showed that there are nine categories of destination brand image features, including culture, history and art (e.g. museum), social and natural environment, economic and political factors (e.g. safety), natural resources (e.g. beaches), General infrastructure (for example, airport), tourism infrastructure (for example, hotel and restaurant), leisure and recreation of tourists, and finally the atmosphere of the place (for example, relaxation). Nevertheless, achieving a comprehensive scale of the destination image is difficult. The construction of such a scale depends on the purpose of the assessment as well as the destination attractions (12).

Perceived quality means consumer judgment about the preference and advantage of a product. Assessing the quality of services provided by a destination directly depends on the options and characteristics that a destination has to offer to tourists. In addition, because the destinations have a set of general characteristics and a series of more specific characteristics, it is difficult to establish a general and comprehensive scale to measure the perceived quality of the destination (12). Also, perceived value is considered as a kind of trade consisting of benefits and costs received (12).

Zhang et al. (2014) defined the intention to revisit the destination and recommend it to friends and relatives as loyalty to the brand of the tourist destination. Studies show that the perceived quality of services and destination image play an important role in decision making, destination selection and evaluation of tourists' future travel (13). Some consider brand loyalty to be the ultimate goal of brand equity. Brand loyalty may increase under the influence of other dimensions of brand equity or may be created independently of other dimensions; That is, loyalty, in addition to being affected by other dimensions of brand equity, also affects them.

According to the research literature, in this study, the brand equity approach from the consumer point of view has been considered as a criterion for valuing brand equity. According to research results, the dimensions of brand equity include brand awareness, perceived quality and mental image and brand loyalty. In this study, the framework proposed by Acker (1991) is used to conceptualize the brand equity of a tourist destination. Of course, the relationships between variables have been adapted from research in this area. The model used in this research is selected based on the results of researchers' research and with the opinion of a group of experts (familiar with the destination brand and familiar with the needs of sports and the study area).

The purpose of this study was to investigate the factors affecting the special value of the brand of sports tourism destination in Bandar Abbas city.

Methodology

In terms of purpose and orientation of the applied type and in terms of strategy, the present study is among the quantitative and survey research. The statistical population of the study is the total number of sports tourists (both sports events and scientific sports events) visited Bandar Abbas city from October to March 2019. The sampling method was purposefully available and the sample size was 108 people. In this research, documents (libraries, articles, required books) and computer (Internet) have been used to collect information on the theoretical foundations of the research. Also, in order to collect data and information and to analyze them, a questionnaire with 5-point Likert scale has been used, which has been previously developed by Jafari et al. (1396) (16). According to the research model, 6 indicators were examined, which include brand awareness, brand image, perceived quality of the brand, perceived value of the brand, brand loyalty and brand equity. The questionnaire questions contained 41 questions and it was tried to make the questionnaire questions as understandable as possible. The data obtained through structural equations and partial least squares method were analyzed using SPSS and smart pls software.

Results

Confirmatory factor analysis was used to analyze the internal structure of the questionnaire and discover the factors that make up each hidden structure or variable. The results of confirmatory factor analysis are summarized in Table 1. Some other indicators that exist in the final model and its values should be higher than a certain limit are Cronbach's alpha or CA (above 0.7), internal compatibility or CR (above 0.7) and the mean extraction variance Or AVE (above 0.5) (15) as shown in Table 1.

In the second step (path analysis), model fit and model fit indices were determined. However, to measure the fit of the model obtained by Smart PLS software, they use an indicator called Goodness Fit Index (GOF), but Hensler and Sarstad (2014) considered this indicator to be inefficient for assessing model fit. In this regard, the most valid indicator used to evaluate the fit of the model is the root of the standardized squared mean (SRMR), which experts believe should be below 0.08. The SRMR value in this study is 0.45, which indicates a good fit of the model. The results related to path coefficients along with the level of significance are reported in Table 2. The value of path coefficients is checked by P values (probability values). If the desired value is less than 0.05 the path and the path coefficient are significant, otherwise the path coefficient is not significant (16).

As can be seen brand awareness, brand image and perceived quality have a positive and significant effect on brand equity ($P<0.05$). As can be seen, perceived value, brand image and brand equity have a positive and significant effect on brand loyalty ($P<0.05$).

Table1. Factor loads of research structures

Variables	Structure	Factor load	CA	CR	AVE
Awareness	1 Hearing about destinations before	0.905	0.783	0.821	0.55
	2 Quick come to mind features	0.873			
	3 Know what you have seen and heard	0.800			
	4 Identify the destination with a specific brand	0.903			
the image	1 Beautiful and eye-catching nature	0.918	0.795	0.834	0.614
	2 Quiet environment	0.876			
	3 suitable environment for relaxation	0.554			
	4 Favorable weather	0.669			
	5 interesting local dishes	0.489			
	6 has fascinating historical attractions	0.467			
	7 has attractive cultural attractions	0.868			
	8 Kind and hospitable	0.674			
	9 lakes and mountains	0.871			
	10 unique handicrafts	0.521			
	11 perfect places for adventure	0.760			
	12 available sports and leisure facilities	0.579			
Perceived quality	1 Clean physical environment	0.613	0.855	0.893	0.65
	2 quality road and rail infrastructure	0.802			
	3 quality accommodation centers	0.543			
	4 Security of life	0.558			
	5 reasonable prices	0.427			
	6 Good service quality	0.621			
	7 Clean air	0.811			
	8 Appropriate information	0.589			
	9 Easy access	0.775			
	10 Attention to tourists	0.417			
Perceived value	1 is worth spending money on	0.886	0.850	0.95	0.74
	2 This journey is more of a torture than a holiday	0.818			
	3 is too far from home	0.783			
	4 I spend a lot of money due to the existence of various good facilities and services	0.743			
	5 This trip seems to be a good purchase	0.833			
	6 Compared to other areas, its choice makes sense	0.637			
	7 Given the prices, the costs are reasonable	0.904			
Loyalty	1 Select the destination again	0.905	0.754	0.811	0.711
	2 Introduce to others	0.914			
	3 Preference over similar purposes	0.912			
Brand equity	1 High level of service quality	0.767	0.822	0.881	0.605
	2 destinations with lovely cities	0.889			
	3 Spending to see it is a good deal (decision)	0.876			
	4 difficult imaginations in mind	0.852			
	5 trips to its new locations	0.937			

Table2. Results of path analysis to examine the interaction of variables

Confrontation of variables	Path coefficient β	t-value	p-value
The relationship between brand awareness and brand equity	0.244	4.49	0.001 *
The relationship between brand image and brand equity	0.2	3.11	0.003 *
The relationship between perceived quality and brand equity	0.218	4.01	0.001 *
The relationship between perceived quality and loyalty	0.17	1.01	0.67
The relationship between perceived value and loyalty	0.230	4.31	0.001 *
The relationship between brand image and loyalty	0.224	4.22	0.001 *
The relationship between brand equity and loyalty	0.259	5.13	0.001 *

* Significant at the level of $P \leq 0.05$

Discussion

The results of this study show that the special value of Bandar Abbas brand as a sports tourism destination affected by brand awareness, brand image and perceived quality of the brand. The results show that awareness, the most impact and perceived quality have the least impact on the special value of Bandar Abbas sports tourism destination brand. This research is consistent with the results of Khoshkho and Ayoubi Yazdi (2010). They also concluded in their studies that awareness has the greatest impact on the brand equity of Kish Island (17). However, the results of this study are not in line with the results of Zarei et al. (2016). They reported that perceived quality has the greatest impact on brand equity (18).

Also, based on the present findings, loyalty is influenced by brand equity, perceived value and brand image, which equity has the most impact and perceived value has the least impact on loyalty. However, perceived quality does not affect brand loyalty. In Hemmati and Zahrani's research (2014), the relationship between perceived quality and brand loyalty was rejected (19). The results of Qaemi study (2012) also indicated that brand equity is the most effective factor affecting brand loyalty (10). As a result, the present study is in line with Hemmati and Zahrani (2014) and Qaemi (2012) studies.

According to the results of the questionnaire of this research, knowing about what is seen and heard has the least impact on the brand awareness of the destination. Therefore, it is necessary for the destination management to pay more attention to providing attractive advertisements that fit the tastes of sports tourists and to allocate more capital to them. Also, using cyberspace to facilitate access to information needed to travel to Bandar Abbas and inform sports tourists about things they may encounter during the visit can be effective.

In terms of destination image, interesting local cuisine and unique handicrafts had the least impact on the formation of the desired image. Therefore, by creating and reviving handicraft workshops as well as holding local food festivals, the role of the desired items in shaping the image of the destination can be more colorful.

In terms of perceived quality, attention to sports tourists, reasonable prices and quality accommodation centers have the least impact. The problem of lack of quality accommodation centers can be solved by building different accommodations in the form of hotels and guesthouses at reasonable prices and by constructing eco-lodges and even creating sports camps for sports tourists. Also, according to the potential of the region, by developing maritime tourism, while creating a unique experience for sports tourists, it can create jobs for local people.

In terms of brand equity, the high level of service quality has the least impact, which shows the weakness of Bandar Abbas in providing quality services to sports tourists. Therefore, it is necessary for city managers to try to improve and provide better services by formulating appropriate marketing programs and rational modeling of competitors' performance, which is more in line with the needs of sports tourists.

In terms of perceived value, these items, which make sense compared to other areas and I spend a lot of money on it due to the existence of various facilities and services, have the least impact. Therefore, the destination must identify its powerful attractions, seek the nature that makes these attractions different and attractive to sports tourists, and continuously promote this nature through all communication and marketing behavior. Over time, this process will help to build a lasting reputation based on brand values. In addition, the destination management organization should try to provide ancillary products and services to tourists due to the existence of strong competitors in the region. For example, it can add new products such as amusement parks, which can increase the attractiveness of the destination and create conditions for spending more money in the destination and the possibility of attracting new markets and loyalty to provide the destination.

This study examined the brand equity from the perspective of sports tourists. It is suggested that the opinion of the local community and experts be considered in future research. Considering the development of the brand concept of sports tourism destinations, it is suggested that the relationship between the brand equity of sports venues, hotels, restaurants, attractions and the equity of the destination brand be examined. Also, it seems that the growth stage of the sports tourism region affects the priority of each of the factors affecting the brand equity. It is suggested that the factors affecting the special value of the sports tourism destination brand be examined according to the development stages of the tourism region.

Conclusion

It is concluded that brand awareness, brand image and perceived quality have a positive and significant effect on brand equity and brand image, perceived value and brand equity have a positive and significant effect on brand loyalty. Brand awareness has the greatest impact on brand equity and brand equity has the greatest impact on brand loyalty, but perceived quality does not have a significant direct effect on brand loyalty.

References

1. Richards, G. (2013). Creativity and tourism in the city. Current Issues in Tourism,17(2): 1-26.
2. Mohsin, A. (2005). Tourist attidue and destination marketing. The case of Australia northern territiory and Malaysia. Tourism management, 26: 732-733.
3. Chalip, L., Costa, C. (2006). Building sport event tourism into the destination barnd: foundation for a general theory in H. Gibson (Ed), sport tourism. concept and theories, 86-105.
4. Iranzadeh, S., Ranjbar, A., Sadeghpour, N. (2012). Investigating the effect of marketing mix on brand equity. Journal of Modern Marketing Research, 2 (3): 155-172.
5. Amari, H., Zandedel, A. (1391). Assessing the mediating effect of brand image on the formation of brand equity. Journal Beyond Management, 5 (20): 59-78.
6. Liu, C.H.S., Chou, S.F. (2016). Tourism strategy development and facilitation of integrative processes among brand equity, marketing and motivation. Tourism Management, 54: 298-308.

7. Tabesh, S.S., Nemati Mehr, M. (1393). Explaining tourism brand strategies based on mental image. International Conference on Sustainable Development, Strategies and Challenges focusing on agriculture, natural resources, environment, Tabriz.
8. Aaker, D.A. (1996). Measuring brand equity across products and markets. California Management Review, 38(3): 102-120.
9. Bianchi, C., Pike, S., Lings, I. (2014). Investigating attitudes towards three South American destinations in an emerging long haul market using a model of consumer-based brand equity (CBBE). Tourism Management, 42: 215-223.
10. Qaemi, V. (2012). An empirical survey on perceived value from tourism destination based on brand equity model: A case study of Qeshm Island. Management Science Letters, 2(7): 2347-2354.
11. Kashif, M., Samsi, S.Z.M., Sarifuddin, S. (2015). Brand equity do Forte Lahore como uma marca de destino turístico. RAE-Revista de Administração de Empresas, 55(4): 432-443.
12. Bordea, A. (2014). Destination Brand Equity for European City Destinations. Master thesis, University of Southern Denmark.
13. Zhang, H., Fu, X., Cai, L.A., Lu, L. (2014). Destination image and tourist loyalty: A meta-analysis. Tourism Management, 40: 213-223.
14. Jafari, W., Najarzadeh, M., Kiani Faizabadi, Z. (2017). Investigating the Factors Affecting the Special Value of Tourism Destination Brand (Case Study: Savadkuh County). Journal of Tourism Planning and Development, 6 (20): 75-93.
15. Hair, J.F., Hult, G.T.M., Ringle, C.M., Sarstedt, M. (2016). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM). 2nd Edition. Thousand Oaks: Sage.
16. Danaifard, H., Alwani, S.M., Azar, A. (1389). Quantitative research methodology in management: a comprehensive approach. Tehran, aristocratic, Saffar.
17. Imani Khoshkho, M.H., Ayoubi Yazdi, H. (1389). Factors affecting brand equity in Yazd tourism destination. Quarterly Journal of Tourism Studies, 13: 113-137.
18. Zarei, Q., Bashkooh Ajirloo, M., Mahmoudi Pachal, Zeinab. (2015). Investigating the effect of perceived quality of brand on brand equity of Sarein tourism destination. 2nd International Conference on Accounting, Management and Innovation in Business, Rasht, Lutheran University of California and Rasht Municipality.
19. Hemmati, Reza., Zahrani, Davood. (1393). Investigating the Factors Affecting the Satisfaction and Loyalty of Foreign Tourists to Isfahan as a Tourism Brand. Quarterly Journal of Tourism Planning and Development, 3 (10): 182-204.