Biological Forum – An International Journal **7**(1): 1267-1271(2015)

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

The Impact of 8-week Selected Pilates Exercises on Lordosis Correction and BMI in Female Teens Aged 15-18

Majidi Siahtan Samira* and Behbudi Laleh*
**Department of Physical Education and Sport Science,*
Islamshahr Branch, Islamic Azad University,Tehran, IRAN.

(Corresponding author: Behbudi Laleh)
(Received 22 March, 2015, Accepted 26 April, 2015)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The present study aims at investigating the effects of 8-week selected pilates exercises on lordosis correction and BMI in female teens aged 15-18. In so doing, 24 female students afflicted with lordosis voluntarily participated in the study. Given that participants had the same degree of the lordosis, they were divided into experimental group (N = 12) and control group (N = 12). The former group featured the average age 15.86 ± 0.78, the average height 156 ± 4.91cm, the average weight 54.3 ± 4.27 kg. As for the control group, the average age, height, and weight were 15.9 ± 1.63, 152.2 ± 6.39 and 55.5 ± 7.79respectively. As the first phase of the study, the degree of participants' lordosis was measured and subsequently, recorded in special sheets. Then, the experimental group was exposed to pilates exercises for 8 weeks - 3 sessions of 45 to 60 min per week) while the other group did not take any pilates exercise. After the exercises were totally done, participants' degree of lordosis and Body Mass Index were examined. Data analysis was done through descriptive statistics, correlated t-test, independent t-test, and Pearson Correlation Coefficient (PCC). The study yielded the result that 8-week pilates exercise has a significant result on the degree of lumbar lordosis and BMI in female students aged 15-18. Moreover, there is not any significant relationship between participants' degree of lordosis and BMI.

Key words: Lordosis, Elementary level, Pilates

INTRODUCTION

Enjoying physical health and a desirable physical condition is of high significance in life. However, industrial developments and mechanical life brought about some dramatic changes to human life in the recent years, e.g. lessening the level of physical activities and subsequently, increasing physical abnormalities (Alizadeh,1998). The studies in Iran show that about 8 million Iranian female students suffer physical abnormalities and movement disorders. One of the greatest reasons behind such problems is the fact that schools lack good sports facilities (Mandanmohan *et al.,* 2003). As the empirical report s suggest, physical abnormalities have irreversible effects on the performance of cardio-vascular system, blood circulation system, central nervous system, muscles, as well as psychomotor performance (Karami-e-dehkordi 2007). In this regard, the crucial role of the spinal column should not be overlooked. The spinal column acting as the movement axe of our body can be easily damaged during physical activities due to different reasons (Daneshmandi *et al.,* 2006).

A normal lumbar spine has a curve. The term lumbar lordosis refers to the abnormal inward curvature of the lumbar regions of the spine. People with lordosis cannot walk upright and shift their weight to the heels to prevent falling down ahead (Ramezankhany *et al.,* 2010). Lordosis is a kind of acquired disorder causes of which are inactivity, uncomfortable shoes, non-standard equipments, poor posture, and bad walking habits. BMI can be also regarded as the other possible cause of lumbar lordosis; therefore, postural abnormalities of the spine, especially in females, and the negligence in correcting the existing abnormalities have recently come into sharp focus of experts (Ghaseminezhad and Norbakhsh 2008). In order to correct Non-structural abnormalities different strategies including corrective exercises, surgery, and sport activities, e.g. pilates were applied. Pilates is an exercise for mental and physical health (Johnson *et al.,* 2007). Such an exercise aims at improving muscle control (Pelvic muscle, shoulder girdle muscle and lower limb) and balance, keeping a proper body posture (restoring the proper biomechanics of the body), promoting the stability of the spine, and doing daily exercises in the correct way (Emery *et al.,* 2010).

Pilate's exercises also try to engage central muscles including abdominal, lumbar, diaphragm, pelvic and gluteus muscles which are getting weak since they are not used that much in daily activities. These exercises have dramatic effects on body condition, especially spinal column. Although pilates exercises do not cause any movement, they trigger central stability and stretching of spinal column and pelvis. Improving the performance of central muscles leads the improvement of neuromuscular system (Bernardo 2007). Nowadays, pilates is done in two ways: traditional and modern methods. The traditional pilates includes continuous repetitions and sets which are fixed, i.e. they cannot be changed to fit different people. However, the modern pilates focuses on body and highlights the awareness of certain training essentials such as muscle tightness and weakness (Fatemi and Ghanbarzadeh 2009). Pilates, traditionally known as a training method for human health, is recently known as a rehabilitation strategy (Altan *et al.,* (2009).

Previous studies have proved that pilates exercises have positive effects on musculoskeletal pains and some important factors such as static and dynamic balance. Daneshmandi *et al* (2005) stated that as all the previous studies show, more researches are required for the effects of pilates exercises to be illuminate. Such exercises are not simply a series of ordinary movements like corrective exercises rather due to their diversity of its nature, more people especially females are inclined to do (Kalili and Elkins 2009). In the recent two decades, pilates exercises have provided some new insights into the realm of physical fitness and rehabilitation methods of some diseases, e.g. backache. For instance, the recent studies confirmed that pilates exercises can be used as a therapy for rehabilitating people suffering severe backache (Sperling and Viera 2006).

In some other studies, researchers investigated the effect of 12-week pilates exercises on physical disability of women with multiple lordosis. They came to the result that the average physical disability of the patients in experimental group decreased before and after the exercises. Moreover, a significant difference was seen between the two groups. In another study examined the effect of pilates exercises and Kinesio Tape on pain and functional disabilities of men suffering chronic nonspecific back pain. They stated that pain and functional disabilities sharply decreased after 6 weeks of doing pilates exercises. Regarding chronic nonspecific back pain, Miamoto *et al* (2011) studied the effect of doing pilates exercises along with using a book on lumbar cares (Miyamoto *et al.,* 2011).

Their studies confirmed that pilates exercises can significantly decrease pain and improved patients' performance. Also, Ferreiraa and Caraiho (1009) investigating the effect of pilates on women's body composition came to the conclusion that pilates exercises decrease body fat mass but increases body lean mass and leads to almost no changes in body weight (Ferreira and Carraiho 2009).

Pilates has recently found its way into Iranian sport and a large number of people including athletes are unaware of that or lack enough information about that. Given that more researches are required to illuminate the importance of such exercises and, to the best of the author's knowledge, no studies were conducted to investigate the relationship between lordosis and BMI, it seems quite necessary to explore the reasons as well as therapy of the disorder among high school female students to ameliorate the economic and social losses caused by lordosis. Moreover, investigation of the relationship between the variables can be of great help to improve such abnormalities. As the would-be youths who are going to build the country in the future, Iranian adolescents are mostly exposed to lordosis abnormalities (Olufeyi and Arogundade 2002) which pose serious problems not only for their sport life, but also for their everyday life. Provided that the present study comes to significant results, the training method presented here can be regarded as a good strategy to strengthen muscles and decrease the pressure of spinal column. Therefore, the findings of this study may be to the benefit of officials of the Department of Education and Training, too since they can provide their students, especially female ones, with such helpful trainings in their physical education course and subsequently alleviate their suffering.

Moreover, the findings of the study shed light on how to select the best treatment for lumbar lordosis patients. Thus, physicians can assure their patients with high certainty that how applicable and fruitful the selected treatment would be.

METHODOLOGY

This is a quasi-experimental research which includes experimental group and control group. Pre-test and post-test were also used for the two groups. Statistical population of the study incorporates high school female students aged 15 to 18 in district 1, Tehran.

As the first step, the researcher elaborated on the purpose of the study for the officials of the Department of Education and Training in Tehran, district 1; then two schools were randomly selected as the population of the study. Students' height, weight, and degree of lordosis were measured using a flexible ruler in order to determine the normal range of lumbar lordosis.

Finally, 24 students with lordosis above 50.1, who have not done regular sport activities during the last 6 months were selected as the participants of the study. Participants were supposed to have some specific qualifications as follows: they should be non-athletes who have not done pilates exercises for one year; they should also receive no treatment for lordosis and no surgery for their spinal column should have been done during the last three years. All in all, they must be away from malignancies, rheumatism, systemic and metabolic diseases, and any kind of known disease affecting the variables of the study. Being qualified enough to take part in the study, participants were divided into experimental group (N =12) and control group (N=12). Prior to participants cooperation in the study, they parents were asked to fill in a consent form which confirms their agreement with their children participating in the study. Then, their weight and height were measured to calculate their BMI. Also, subcutaneous fat of different parts of body such as chest, abdomen and thigh was measured to evaluate the percentage of their body fat. The results were recorded in special papers.

The experimental group did pilates exercises for 8 weeks -3 sessions of 45 to 60 min per session. Control group received no treatment. After 8 weeks, the degree of lordosis was measured again. The data description of the study was done using the measure of central tendency (mean), distribution (standard deviation), and statistical data. As for inferential data analysis, correlated t-test and independent t-test were used. The former was applied to compare the probable differences between the means in pre-test and post-test. However, the latter was used for comparison of pre-tests of two groups. Pearson Correlation Coefficient (PCC) was also used for examining the relationship among variables using SPSS 18 at significant level α0/05.

FINDINGS

The study yielded the result that both groups are in the same range regarding age, height, and weight. On the other hand, it was revealed that 8-week pilates exercise has a significant effect on lumbar lordosis of female students aged 15-18 in Tehran, district 1.

Table 1: The Results of Independent T-test Showing Changes in the Degree of Lordosis and BMI of Both Groups.

Groups	Mean	Standard Deviation	Degree of Freedom	Value of T	Value of p
Degree of Lumbar Lordosis in Experimental Group	42.51	0.70	21	9.53	0.000
Degree of Lumbar Lordosis in Control Group	36.65	0.63			
BMI of Experimental Group	19.75	1.24	21	4.12	0.008
BMI of Control Group	23.63	1.47			

Table 2: The Results of Pearson Correlation Coefficient for Variables Relationships.

Statistical		BMI
Lordosis	Correlation Coefficient	0/321
	Level of Significance	0/014
	Number	11

CONCLUSION

To the best of the author's knowledge, this is the first study investigating the effect of pilates exercises on the degree of lordosis and Body Mass Index in female students aged 15 to 18. In this research, a series of pilates exercise during a specific period time significantly improved participants' lordosis, that is to say, the comparison of the pre-test and post-test shows that the degree of their lordosis significantly decreased after doing the exercises. The results of this research are in line with the study done by Youzbashi (2008) investigating the effects of pilates exercises on the correction of lumbar lordosis of women aged 20-30.

Moreover, the results of this study expands upon the works done by Alizadeh (1998), Daneshmandi *et al* (2005) which examined the effect of corrective exercises on the improvement of lumbar lordosis. Based on their findings, the above-mentioned researchers believed that corrective exercises have a great effect on lumbar hyperlordosis. However, Levine *et al* (1997) came to the result that although 8-week strengthening exercises increase the strength of abdominal muscles, it does not change the degree of lumbar lordosis and pelvic tilt (Levine, 2003). The contradiction between the findings of the studies can be resolved considering that the exercises selected by Levine *et al* (1997) were suitable for strengthening abdominal muscles (Jago *et al.*, 2006). but the present study took advantage of pilates exercises which engage all four muscle groups effecting pelvis; also all movements were done according to the 9 basic principles.

In support of this fact, it is worth mentioning that Hoseininfart *et al* (2009) investigating the relationship of the strength of back extensors and hip flexors with degree of lordosis stated that one cannot claim weakness or strength of back extensors and hip flexors is related to the degree of lordosis without considering the mutual function of lumbar-pelvic girdle muscles (Hoseinifar *et al.*, 2007). Highlighting the importance of corrective exercises for lumbar-pelvic area, they stressed that selection of the exercises must be done with precision and not simply based on the level of weakness or strength of some lumbar-pelvic muscles. By the same token, it seems that the effect of pilates exercises on lumbar lordosis is due to its positive influences on the strength, resistance, and positional flexibility of back and waist. In this regard, Kendal *et al* (1996) asserted that the increase in the degree of lumbar lordosis leads to backache and lumbar lordosis in sagittal plane (Kendal *et al.*, 2005). Some reserchers believed that imbalance and lack of muscle strength have dramatic effects on lordotic curve and subsequently leads to backache. In this study, pilates exercises decreased the degree of participants' lumbar lordosis by improving positional strength, flexibility, balance, and muscle strength.

The results of the study confirmed that 8-week pilates exercises decreased participants' BMI, i.e. the level of their BMI in post-test was much lower than their BMI in pre-test. Needless to say that BMI is calculated by one's body mass divided by the square of their height. As it was mentioned earlier, participants' body fat percentage decreased as a result of pilates exercises; the reduction in their body mass percentage was accompanied by a reduction in their weight. Since participants' height was fixed, a reduction in their BMI due to the exercises is quite rational. The probable reason behind this fact is the effect of pilates exercises on the basal metabolism as well as the metabolism of body during the exercise, which decreases participants' weight.

The other finding of the study is that there is a relationship between BMI and lumbar lordosis in female students aged 15-18, which is not in line with the results of the studies done by Saidi and Saneei (2010) but expands upon the findings of Hossainfar *et al* (2007). Differences in the number and sex of participants, type of training exercises, type of measurement device, and the purpose of the study can be referred to as the reason behind the differences in the results of the above-mentioned studies. In addition, body composition or BMI is regarded as one of the factors of physical fitness and health. Indeed, Body Mass Index tells us how much weight our body carries per centimeter of height. The more weight is massed in height, the higher Body Mass Index is.

REFERENCES

Alizadeh MH. (1998). The effect of two exercises programmers on the lumbar spine curvature in asymptomatic subjects. Ph.d. Dissertation. Manchester Univ.

Mandanmohan M, Jatiya L, Udupa K and Bhavanani AB. (2003). Effects of yoga training on handgrip, respiratory pressures and pulmonary function. *Indian J Physical Pharmacol.* **47**(4): 387-392.

Karami-e-dehkordi M. (2007). Comparison of two corrective methods to decrease lumbar lordosis in student aged between 10-11 year. [MA Thesis]. Isfahan: Azad university of Khorasgan, [Persian].

Daneshmandi H, Sardar M and Taghizadeh M. (2006). Effect of a exercise program on lumbar lordosis deformity. *Journal of Research in Sport Science*. (Persian).

Ramezankhany A, Parvaneh N and Hedayati M. (2010). Comparing effects of aerobics, pilates exercises and low calorie diet on leptin levels and lipid profiles in sedentary women. *Iranian Journal of Basic Medical Sciences.* **14**(3): 256-263.

Ghaseminezhad A and Norbakhsh M. (2008). The effect of an eight week aerobic and yoga training on the level of depression in non athlete females age over 40 years in Ahvaz oil industry. *Harakat.* **35**: 5-20.

Johnson EG, Larsen A, Ozawa H, Wilson CA and Kennedy KL. (2007). The effect of Pilates-based exercise on dynamic balance in healthy adults. *J Body and Mov Therapies.* **11**: 238-42.

Emery K, De Serres SJ, McMillan A and Julie N. (2010). The effects of a Pilates training program an arm-trunk posture and movement. *Clinical biomechanics (Bristol, Avon).* **25**(2): 124-130.

Bernardo LM. (2007). Effects of pilates training in healthy adults: an appraisal of the research literature. *Journal of Bodywork and Movement Therapies.* **11**: 106-110.

Fatemi R and Ghanbarzadeh M. (2009). Relationship between airway resistance indices and maximal oxygen uptake in young adults. *Journal of Human Kinetics*. **22**: 29-34.

Altan L, Korkmaz N, Bingol U and Gunay B. (2009). Effect of Pilates training on people with fibromyalgia syndrome: A pilot study. *Archives of physical medicine and rehabilitation*. **90**(12): 1983-1988.

Kalili M and Elkins MR. (2009). Aerobic exercise improves lung function in children with intellectual disability: a randomized trial. *Australian Journal of Physiotherapy.* **55**: 171-175.

Sperling MV and Viera CB. (2006). Who are the people looking for pilates method? *J Body and Mov Ther.* **10**: 328-34.

Miyamoto GC, Costa LO, Galvanin T and Cabral CM. (2011). The efficacy of the addition of the Pilates method over a minimal intervention in the treatment of chronic nonspecific low back pain: a study protocol of a randomized controlled trial. *J Chiropr Med.* **10**(4): 248-54.

Ferreira C and Carraiho A. (2009). Effects of three months of pilates-based exercise in women on body composition. *Medicine and Science in Sports and Exercise*. **41**(5): 61-7.

Olufeyi A and Arogundade O. (2002). The effect of chronic exercise on lung function and basal metabolic rate in some Nigerian athletes. *African Journal of Biomedical*. **5**: 9-11.

Levine D. (2003). The effect of pelvic movement on lumbar lordosis in the standing position. JOSPT. 24: 130-135.

Jago R, Jonker ML, Missaghian M and Baranowski T. (2006). Effet of 4-week of pilates on the body composition of young girls. *Prev Med.* **42**(3): 177-80.

Hoseinifar M, Ghiasi F and Akbari A. (2007). The relationship between lumbar and thoracic curves with body mass index and low back pain in students of Zahedan University of medical sciences. *J Med Sci.* **7**(6): 984-990.

Kendal FP, McCreary EK and Provance P. (2005). Muscles, Testing and function: With Posture and Pain. 5th ed, Baltimore MD: Williams and Wilkins.