

Effects of Pilates and Tai Chi on Pain and Dysfunction in Chronic Lumbago Patients

The purpose of this study was to identify the effects of Pilates and Tai Chi as physical therapy interventions for pain and dysfunction in chronic lumbago patients. A total of 31 females who were at least 20 years old and diagnosed with chronic lumbago were divided into a Pilates group (PG) (n=10), Tai Chi group (TCG) (n=11), and conservative group (CG) (n=10), to measure their pain and dysfunction before and after a six-week intervention. With regard to the changes in the lumbago consciousness scale before and after the six-week intervention, all three groups showed statistical significance ($p < .05$). The intergroup differences were significant between the PG and CG and between the TCG and CG. All three groups also showed statistical significance ($p < .05$) in the Oswestry Disability Index before and after the six-week intervention. Again, the intergroup differences were significant between the PG and CG and between the TCG and CG. Based on these results, the application of Pilates and Tai Chi with conservative treatment may be effective in reducing pain and improving dysfunction in chronic lumbago patients.

Key words: *Tai Chi; Pilates; Chronic Lumbago*

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INTRODUCTION

Lumbago is a painful disorder that should be handled from several angles due to its various, complicated causes, which can be roughly divided into structural factors induced by lesions from backbone posture, psychological factors like stress, and biomechanical factors due to a dynamic malfunction of the musculoskeletal system. Almost 80% of all lumbago cases are caused by weakened soft tissues in the lumbus, rather than structural factors around the lumbus(1). The treatment of lumbago can be limited by weakened lumbosacral muscular strength, reduced endurance, loss of flexibility, and the range of motion of the lumbus and the lower limb joints, regardless of the cause. Thus, it is important to maintain muscular strength and flexibility, to stabilize the abdominal muscles and the joints around the lumbus, and to recover the flexibility of the

trunk and lower limbs in order to reduce or prevent the recurrence of lumbago(2).

Pilates is a type of movement exercise that focuses on each muscle within a relaxed body, while naturally enhancing muscular strength without strain or pain. It intensively trains the power house and moves muscles that are not usually used, through contraction and release to develop and strengthen the whole muscle equally(3). When one relaxes the body and focuses on each muscle while breathing, one can exercise those muscles that are not frequently used(4). Pilates has many positive effects, including increases in flexibility, concentration, and stability in the lumbus, and a reduction in pain(5).

Tai Chi is a martial art that integrates the concentration of the mind, balance, body weight movement, muscular relaxation, and respiratory control, using consistent, graceful, and flowing movements derived from the postures of animals,

like snakes, cranes, dragons, and tigers(6). It has been reported to have positive effects on psychological problems, including depression. The University of Massachusetts Medical School reported that a 16 week Tai Chi program made patients with lumbago feel better, and reduced their negative emotions, including tension, depression, anger, and confusion(7). Other studies have reported that 12 weeks of Tai Chi controlled regular pain during daily life, reduced depression in lumbago patients, and showed positive effects on the psychological problems of patients with chronic lumbago or arthritis(8, 9).

In this study, we identified the effects of physical therapy using Pilates and Tai Chi on pain and dysfunction in chronic lumbago patients.

METHODS

Subjects

The study subjects were selected from among the female outpatient lumbago patients who were treated in a hospital located in Yongin-si, Gyeonggi-do. Those individuals in which three months had passed since their last treatment, and who consented to participation in this study were chosen. Specifically, females who were at least 20 years old, diagnosed with lumbago, had not undergone hospitalization or surgery due to chronic lumbago, had not been treated for pain for longer than one month after their lumbago diagnosis, had not exercised regularly for the previous three months, did not have physical or mental problems with regard to aerobic exercise, and provided written consent to participate in this study were considered to meet the inclusion criteria. In total, 31 chronic lumbago patients were randomly divided into a Pilates group(PG)(n=10), Tai Chi group(TCG)(n=11), and conservative group(CG)(n=10). The contents and purpose of the experiment were fully explained to the subjects before the experiment, and the subjects provided

Table 1. General Features of Research Subjects

Feature	PG	TCG	CG
Age (yr)	32.53±12.51	35.59±13.01	33.59±13.25
Height (cm)	162.27±5.12	165.46±7.51	164.46±5.94
Weight (kg)	61.41±8.21	58.91±10.24	60.91±9.71
BMI (kg/m ²)	16.45±3.65	17.27±5.21	18.27±5.18

PG: Pilates group TCG: Tai Chi group CG: Conservative group

written informed consent? signed a consent form. The Ethics Committee of Namseoul University, South Korea, approved the study.

Experimental Procedures

All three of the groups underwent treatment three times per week, for six weeks, consisting of a hot compress(20 min), interference current therapy(15 min), and deep heat therapy(5 min). The PG group exercised three times per week, for six weeks, with the auxiliary intervention(10, 11).

Table 2. Pilates Program

Program level	Contents
warm-up(10 min)	breathing(2 sets), imprint & release(4 reps x 2 sets), hip release(6 reps x 2 sets), supine spinal(2 reps x 2 sets)
main exercise (40 min)	stage 1 (1-3 weeks) hundred(20 reps x 5 sets), roll-up(6 reps x 3 sets), single leg circles(6 reps x 5 sets), double leg stretch(6 reps x 5 sets)
	stage 2 (4-6 weeks) single straight leg stretch(10 reps x 5 sets), double leg stretch(10 reps x 5 sets), crisscross(10 reps x 5 sets), the corkscrew(6 reps x 3 sets), the saw(8 reps x 4 sets), single leg kicks(10 reps x 5 sets)
cool-down(5 min)	head nods(6 reps x 3 sets), hip rolls(6 reps x 3 sets), shell stretch (1 rep)

The TCG exercised three times per week, for six weeks, with the auxiliary intervention(12).

Table 3. Tai Chi Program

Program level	Contents
warm-up(10 min)	stretching exercise
main exercise(40 min)	commencement form, opening and closing hands, single whip, waving hands in the cloud, opening and closing hands, brush knee twist step, playing the lute, step forward to deflect downwards, parry and punch, apparent closing up, embracing the tiger and pushing the mountain, opening and closing hands, closing movement
cool-down(5 min)	stretching exercise

Measurement method

We used the lumbago consciousness scale to measure the changes in the lumbago symptoms of the three groups after the six week intervention. The lumbago consciousness scale was adjusted so that the participants could subjectively assess their pain on a scale of 1 to 10 points(13). The Oswestry Disability Index was used to measure the changes in the lumbar dysfunction of the three groups after the six week intervention. This index consisted of nine items of assessment, including pain intensity, personal hygiene, lifting, walking, sitting, standing, sleeping, social life, and traveling, on a scale of 0 to 5. The higher the score(between zero and 45), the more severe the lumbago dysfunction(14).

Data Analysis

The SPSS version 18.0 software was used for the data analysis. The Kolmogorov–Smirnov test was used for, and confirmed, normality, and the two-way analysis of variance was used to compare the lumbago consciousness scale and the dysfunction between the groups, based on the intervention. Tukey’s test was used as post hoc analysis, and the paired t–test was used to compare the intra-group changes in lumbago and dysfunction before and after the intervention. The level of statistical significance was set at $\alpha=.05$.

RESULTS

Changes in the Lumbago Consciousness Scale based on the Intervention

Table 4. Changes in the Lumbago Consciousness Scale based on the Intervention (Unit: Index)

Group	Pre	Post	F	p
PG	7,14±1,74	2,32±0,21*		
TCG	8,24±2,46	2,14±1,57*	6,418	0,011 ¹²
CG	7,74±1,57	3,24±1,84*		

*p<.05, *Significant difference between before and after the intervention, ¹Significant difference between the PG and CG, ²Significant difference between the TCG and CG.
 PG: Pilates group
 TCG: Tai Chi group
 CG: Conservative group

The changes in the lumbago consciousness scale before and after the six-week intervention showed statistical significance in all three groups (p<.05). Moreover, the intergroup differences were significant between the PG and CG and between the TCG and CG.

Changes in the Oswestry Disability Index based on the Intervention

A statistical significance was seen in all three groups(p<.05) with regard to the changes in the Oswestry Disability Index before and after the six week intervention. The intergroup differences were significant between the PG and CG and between the TCG and CG.

Table 5. Changes in the Oswestry Disability Index based on the Intervention (Unit: Index)

Group	Pre	Post	F	p
PG	27,57±7,14	14,17±3,84*		
TCG	28,14±8,47	13,94±4,17*	5,813	.021 ¹²
CG	27,94±8,01	16,74±4,85*		

*p<.05, *Significant difference between before and after the intervention, ¹Significant difference between the PG and CG, ²Significant difference between the TCG and CG.
 PG: Pilates group
 TCG: Tai Chi group
 CG: Conservative group

DISCUSSION

The changes in the lumbago consciousness scale before and after the six week intervention showed statistical significance in all three groups(p<.05). In addition, the intergroup differences were significant between the PG and CG and between the TCG and CG.

Obesity and a reduction in muscular strength around the lumbus serve as important reasons for chronic lumbago, and reinforcing lumbar muscular strength plays a key role in reducing the pain(15). Exercise for lumbar stability can minimize the stress imposed on the spine, and help maintain the stability of the spinal column and the trunk by inducing balance with the spinal skeletal or core muscles(15). It has been reported that using elastic bandages, gym balls, and exercise for lumbar stability in middle aged females with chronic lumbago for eight weeks reduced their lumbago(16). Pain reduction was also reported

in research in which chronic lumbago patients underwent gym ball exercises, or female farmers with musculoskeletal disorders underwent Pilates training for 12 weeks(17,18). Pilates training is one type of exercise for strengthening the muscles related to lumbar stability, and it may recover the function of the stabilizers and deep abdominal muscles that contribute to posture control. This is based on the neutral posture of the trunk reducing the delivery of stimulation to the ligaments and the articular capsules, as the pain sensitive tissues, to improve lumbago(19,20). In addition, Pilates training may enhance lumbar stability and improve the function of the trunk stabilizers and deep muscles, thereby reducing the load on the spine, and inducing minimizing stimulation on the pain sensitive ligaments and articular capsules to reduce chronic lumbago(20,21).

Tai Chi has been reported to reduce pain in elderly women with lumbago, patients with spondylosis and spondylolisthesis, and adult patients who underwent back surgery(22,23). These results seem to indicate that the postures with slightly bent knees and the flowing movements of Tai Chi strengthen the muscles around the lumbus and improve joint flexibility to reduce pain(24,25).

The changes in the Oswestry Disability Index before and after the six week intervention also showed statistical significance in all three groups ($p < .05$), and the intergroup differences were significant between the PG and CG and between the TCG and CG.

Lee reported that 23 soldiers with lumbago showed significant increases in flexibility after flexibility exercises with gym balls(26). In addition, Park Mi Aae et al. reported that a four week exercise for stabilizing the lumbus using gym balls enhanced the trunk flexion in lumbago patients(27). Similarly, the PG showed better improvement in the dysfunction scores than the CG in this study, indicating that Pilates, as an exercise for stabilizing the lumbus, promotes cooperative contraction of the core muscles around the lumbus(e.g., the transversus abdominis, diaphragm, and lumbar multifidus muscles) to increase stability in the lumbar segmental movements during trunk exercise(17-19).

Tai Chi is known to show physical effects, such as an increase in muscular strength, joint flexibility, and stamina, and has guaranteed safety; therefore, it can be used in patients with chronic disorders and in the elderly(28). One previous study reported that 12 weeks of Tai Chi improved

the flexibility and mobility of patients with chronic lumbago(29). The Tai Chi intervention improved function in this study, indicating that this type of exercise may increase the muscular strength, endurance, flexibility, and systemic immunity in the lumbus(30).

Overall, the results of this study may be difficult to generalize for all types of chronic lumbago patients, because the lumbago patients treated in this research were outpatients who visited a hospital. Moreover, we did not establish homogeneity in the periods of time that they experienced lumbago.

CONCLUSIONS

This research, we determined the effects of six weeks of Pilates and Tai Chi on the pain and dysfunction of patients with chronic lumbago by analyzing the variables related to the research, and comparing them with existing research.

1. The changes in the lumbago consciousness scale before and after the six week intervention showed statistical significance in all three groups ($p < .05$). Moreover, the intergroup differences were significant between the PG and CG and between the TCG and CG.

2. A statistical significance was seen in all three groups ($p < .05$) with regard to the changes in the Oswestry Disability Index before and after the six week intervention. The intergroup differences were significant between the PG and CG and between the TCG and CG.

Our results showed that the application of Pilates and Tai Chi with conservative treatment may be effective in reducing pain and improving dysfunction in lumbago patients.

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