CHAPTER 3

METHODS

3.1 Research design

This study investigated the effect of Pilates training on lumbopelvic stability, flexibility, pain and stress. Forty chronic low back pain patients were randomly assigned into Pilates and control groups. Pilates group received 45 minutes per session, two sessions per weeks for eight weeks. Control group were asked to remain their normal activities. Four outcome measures were tested at week 0, 4 and 8 and investigator was blinded to the measurement. Four outcome measures were compared to verify the effect of Pilates exercise.

3.2 Subjects

Forty chronic low back pain patients were invited to participate in the study.

Inclusion criteria

Subjects were included in the study if,

1. They were aged between 21-50 years.
2. They experienced low back pain for more than 3 months.
3. They indicated a willingness to participate in 2 times/week exercise program during the intervention period.

Exclusion criteria

Subjects were excluded from the study if,

1. They have been diagnosed as having tumor, infection, inflammatory disease that affecting the spine, vertebral compression fracture, herniated nucleus pulposus.
2. They had history of low back surgery.
3. They were pregnant.
4. They had uncontrolled hypertension, previous myocardial infarction, cerebrovascular disease, peripheral vascular disease or respiratory disease.
5. They received any treatments or participated in an exercise training program during the intervention period.

3.3 Instrumentation

1. A stabilizer pressure biofeedback unit (Chattanooga Group, Inc.) for measuring lumbopelvic stability. (Figure 3.1)

Figure 3.1 A stabilizer pressure biofeedback unit

2. Sit and reach box for measuring low back flexibility. (Figure 3.2)

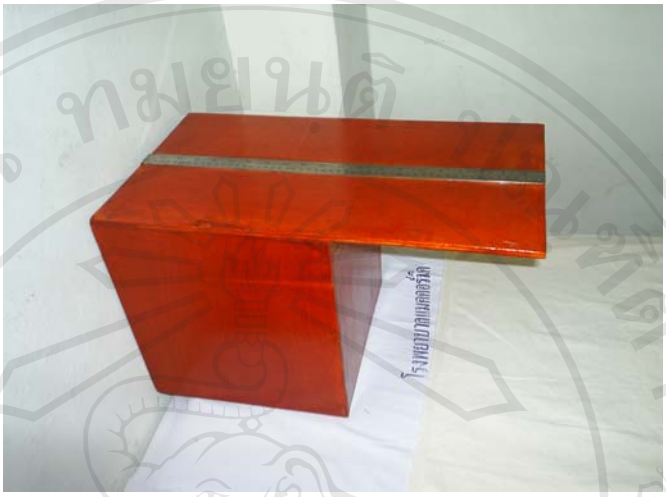

Figure 3.2 Sit and reach box

3. Visual analogue scale for measuring pain. (Appendix A)
4. Stress Inventory questionnaire for measuring psychological status. (Appendix B)

3.4 Procedures

1. All testing and Pilates training were carried out at exercise unit, McCormick Hospital, Chiang Mai.
2. Health screening questionnaire was used for initial screening of chronic cardiovascular, pulmonary, and metabolic diseases to optimize safety for participation in the exercise program.
3. Subjects who met the inclusion criteria and agreed to participate signed an inform consent before participated in the study.
4. The main outcome measurements (lumbopelvic stability, sit and reach test, VAS, Stress Inventory questionnaire) were assessed.

5. Subjects were randomly assigned to Pilates and control groups using concealed envelop.
6. Subjects in Pilates group received exercise program two times per week for 8 weeks as described in Appendix C.
7. For the control group, subjects were asked to maintain their normal activities, not perform any exercises or receive any treatment during the study.
8. All subjects were asked to keep record of any change in their activities throughout the study.
9. Main outcome were reassessed at 4^{th} and 8^{th} weeks.

3.5 Main outcome assessment

3.5.1 The lumbopelvic stability test

1. Subjects were in supine crook lying position, with hip in 70 degrees flexion to place the lumbar spine in mid-position.
2. A barrier was positioned parallel to the level of anterior superior iliac spine to standardize and limit hip movement to 90 degrees flexion.
3. After randomly selecting the initial tested leg, the pressure biofeedback was placed beneath the lumbar spine area between L1 to S1 and inflated to 40 mmHg. The resting leg was placed on weighing scales to ensure that subjects did not push through this leg for stability and counterbalance.
4. Subjects were instructed to breathe inhale and exhale, at the end of exhalation hold the abdominal hollowing action while starting the unilateral heel-lift.

5. A unilateral heel-lift in the sagittal plane was performed requiring flexion of the hip from the starting position (70 degrees of hip flexion) to the barrier (90 degrees of hip flexion), then returning to the starting position. (Figure 3.3)

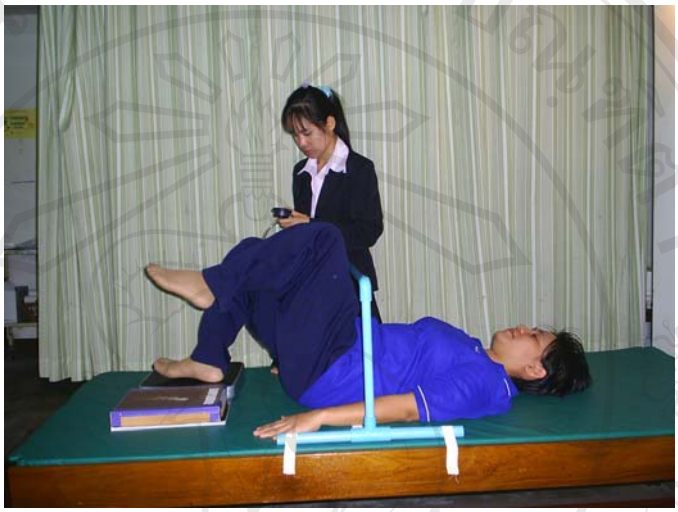

Figure 3.3 Unilateral heel-lift

6. An ability to maintain the registered pressure at 40 mmHg (± 2 mmHg) during this maneuver indicated a successful performance.

3.5.2 Flexibility test

Sit and reach test (YMCA sit and reach test) (71)

1. Subjects were asked to removed their shoes and sit with their legs fully extended with the soles of the feet against the sit and reach box. (Figure 3.4)

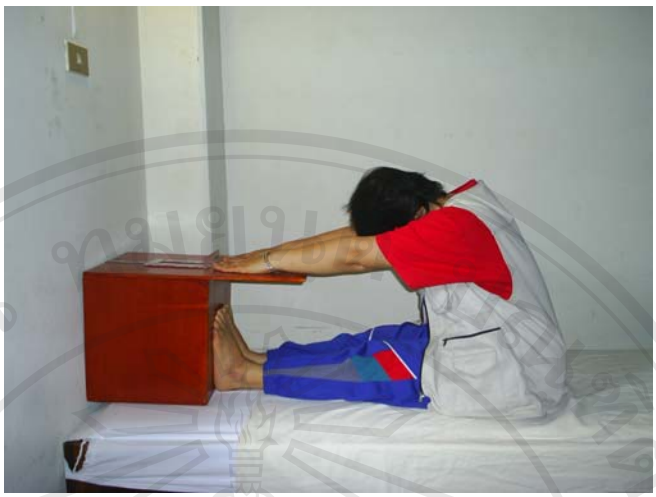

Figure 3.4 Sit and reach test

2. Subjects were asked to slowly reach forward with both hands as far as possible and holding this position momentarily. Subjects were made sure that they kept their hands parallel and did not lead with one hand. Fingertips were in contact with the measuring portion of the sit-and-reach box.
3. The score of the most distant point reached with the fingertips was read. Testing was repeated for two times and the best of two trials were recorded. To assist with the best attempt, subjects were asked to exhale and dropped their head between the arms when reaching. Investigators were ensured that the knees of the subjects stayed extended. Subjects were asked to breathe normally during the test and not to hold their breath at any time.

3.5.3 Pain measurement

Back pain intensity was recorded using the visual analogue scale. The scale consisted of a horizontally orientated 10 centimetre line anchored at opposite ends by the descriptors “No pain” and. “Worst pain”. An average pain experienced over the

previous 24 hours was measured. The subjects imagined the pain level in their low back, and labeled their pain on this tool.

3.5.4 Stress measurement

Stress inventory questionnaire was utilized for stress assessment. This questionnaire consisted of 20 questions. The answer for each question was categorized in four levels of frequency of symptom, ranged from never, sometimes, often and always. The summary of scores was used to classify subjects into groups of psychological stress situation.

3.6 Data analysis

To determine whether a pass/fail in the lumbopelvic stability test was associated with a particular group, a chi-square test was performed. Change in pain and flexibility at baseline, 4 weeks and 8 weeks after training was analysed using repeated measured ANOVA and difference between Pilates and control group was analysed using ANOVA. Friedman statistic was used to determine difference in stress level at baseline, 4 weeks and 8 weeks while Mann-Whitney U test statistic was used to test difference between exercise and control groups. *p*-value of 0.05 or less will be considered as statistically significant.