

CHAPTER 3

METHOD

3.1 Study design

A repeated-measures within-subjects design was used, consisting of baseline measurement, followed by an 8-weeks back school training program, then a posttest and a final test at 4-weeks follow-up. The independent variable was back school program. The dependent variables were pain intensity as measured by NRS, back care knowledge using back care knowledge test, lumbopelvic stability using lumbopelvic stability test, quality of lifting using quality of lifting questionnaire and quality of life using SF-36 questionnaire. Data collection was undertaken at National Weightlifting Camp in Chiangmai during December 2008 to June 2009. This study was approved by the Research Ethics Committee of the Faculty of Associated Medical Sciences, Chiangmai University.

3.2 Participants

Weightlifters from the National Weightlifting Camp in Chiangmai were recruited to participate in this study. Participants were assessed for the appropriate inclusion and exclusion criteria. All of them were over 18 years. They suffered from low back pain that was defined as pain between the lower back and the buttocks area for more than 3 months and pain intensity was between 1- 10 on a NRS. Participants were screened to exclude those with symptom radiating down to any leg, neurologic deficits, acute compression fracture or having had back surgery within 2 years.

Participants were not explicitly blinded to the treatment. All participants received verbal and written information about the study and gave written informed consent prior to assessment.

3.3 Instrumentations

The equipment and assessment tools used in this study were

- ☒ Pressure biofeedback unit
- ☒ Gym ball
- ☒ Theraband
- ☒ Mat
- ☒ Numeric rating scales
- ☒ Back care knowledge test
- ☒ SF-36 questionnaire
- ☒ Quality of lifting questionnaire

3.4 Evaluations

Demographic data of each participant including gender, age, weight, height, years of experience and history of low back pain were recorded. Participants received 3 evaluation sessions: baseline measurement, posttest 1 (immediately following 8 weeks of back school training program) and posttest 2 (4 weeks after back school training program cessation). The evaluations were made within 4 days prior to the start of the back school program, within 4 days of the end of the back school program and within 4 days of the twelfth week. At each evaluation session, five parameters

including pain intensity, back care knowledge, lumbopelvic stability, quality of lifting and quality of life were assessed. One extra evaluation session of the back care knowledge was made immediately after subjects completed the knowledge and pain management session. Details of evaluation methods are described below.

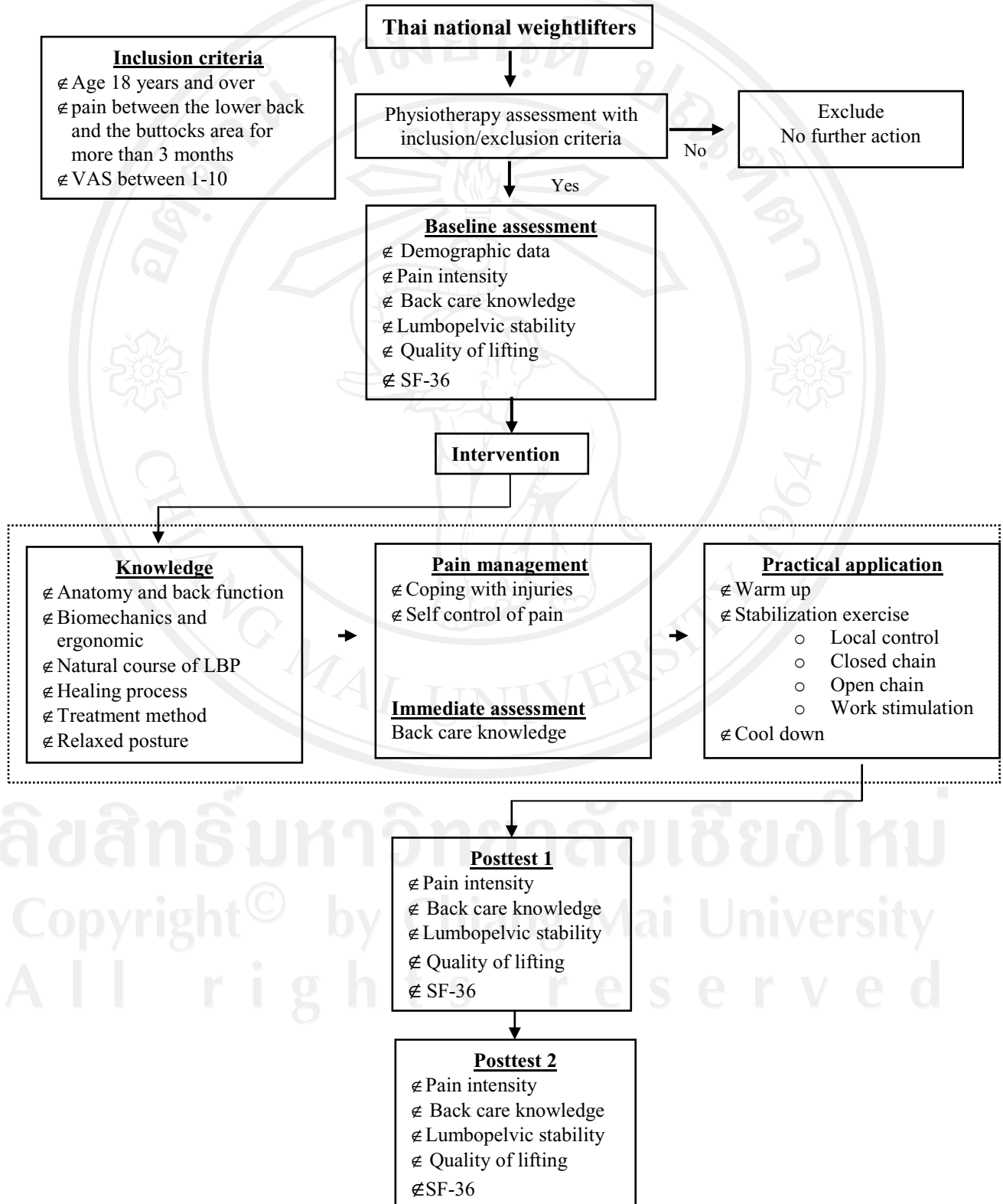
3.4.1 Pain intensity

Participants' perception of pain in the low back area was measured by NRS. Participants were asked to select the number between 0 and 10 that fit best to their pain intensity. Zero represents 'no pain at all' whereas "10" represent 'the worst pain ever possible'. Pain intensity was evaluated at baseline, posttest 1 and posttest 2.

3.4.2 Back care knowledge

Back care knowledge was measured by back care knowledge test. Content of the knowledge test includes anatomy, biomechanics, cause of low back pain, healing process, treatment and pain coping. The test consists of 20 items, a multiple-choice quiz of 10 items and a True or False quiz of 10 items (Appendix B). The test was created by the investigator and the content was proved by three experienced physiotherapists. Back care knowledge was evaluated at baseline, immediately after the knowledge and pain management session, posttest 1 and posttest 2.

System of patient selection and data collection



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3.4.3 Lumbopelvic stability

Lumbopelvic stability is an objective method for assessing the ability of abdominal muscles to actively stabilize the lumbar spine (31) by using a pressure biofeedback unit (PBU, Chatanooga Australia Pty Ltd). Before pretesting, all subjects received three practices and encouraged to perform a correct transversus abdominis contraction, avoid pelvic tilt and rectus abdominis contraction. The first 3 practices were designed to increase abdominal muscle awareness before testing. All subjects started testing with level 1. The subject was assigned to lying on crook position (supine with knees flexed approximately 90° and the feet flat on the floor) and raised the pelvis.

The examiner placed the pressure transducer under the midpoint between the superior aspects of the iliac crests. The subject returned to the starting position and alternated anterior and posterior pelvic tilts to adjust the spine into a relaxed position. During attempted to a neutral position, lumbar lordosis usually presented in a small degree. Consequently, the transducer was pumped up to 40 mmHg. The ability to do abdominal hollowing and maintain the pressure at 50 mm Hg (± 4 mm Hg) for 3 breathing cycles without any compensation indicated that the subjects successfully performed the exercise. The subject was prohibited the compensations: elevate the shoulders from the floor, flexion or extension of the neck, posterior rotation of the pelvis, rectus abdominis protrusion or extension of the lumbar spine.

If a subject failed to pass exercise level 1, he or she was given a grade of 0. In contrast, if the subject passed exercise level 1, he or she was instructed in exercise level 2 and continued the test until failure. For exercise levels 2-7, the subject was first instructed in the necessary leg movement, and then his or her leg(s) was passively moved through the motions required. The details of each level of the test were illustrated in previous section.

3.4.4 Quality of life

Quality of life was measured by the Thai version of the Medical Outcomes Study Short-Form Survey version 2.0 (SF-36v2) as shown in Appendix D. The evaluations were carried at baseline, posttest 1 and posttest 2. All subjects were instructed to complete the questionnaire. Each item of the questions is recoded with a value from 0-100. Consequently, an average value was calculated for the items in each of the eight scales (48-52).

3.4.5 Quality of lifting

Quality of lifting was evaluated by a quality of lifting questionnaire (Appendix C). The questionnaire contains pictures of weightlifters performing snatch and clean and jerk lifting. Snatch lifting is divided into 8 stages while clean and jerk lifting is divided into 12 stages. Participants were asked to rate the intensity of pain at each stage of both lifting techniques. Quality of lifting was evaluated at baseline, posttest 1 and posttest 2.

3.5 Back school program

Back school program consisted of 3 phases: knowledge, pain management and practical application. Three small group sessions were scheduled during a period of 8 weeks. Details of each session are summarized below.

Phase 1

During the first phase, anatomy and function of back were described. The knowledge of biomechanics and ergonomic, particularly in weightlifting were briefly presented. The aggravating factors and the treatment methods were discussed, and healing process was emphasized. Finally, stretching exercises were demonstrated.

Phase 2





During the second phase, awareness, perceptions, skill were assessed by a focus group discussion. This session was presented by a sport psychologist. Coping with injury methods were demonstrated, using mastery rehearsal and coping rehearsal techniques. Self-control of pain was used through relaxation training and introduced on home exercise.


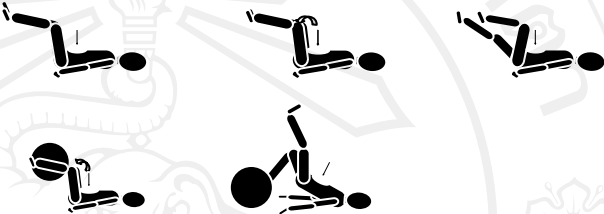


Phase 3

The third phase focused on the stabilization exercises. The exercise was performed specifically to multifidus, TA, internal and external oblique muscles. Briefly, stabilization exercise from back school program was performed at 7 days per week for 6 weeks. Each session lasted approximately 30 minutes including a

standardized warm-up, followed by stabilization exercise and concluded with cool-down. A variety of stabilization exercises were performed during the 6-week-intervention and are outlined in Table 3.1. The intensity of exercises was increased over the time period: first 4-week increased by joint reaction force and stress on the spine and last 2-weeks modified this exercise with training problems. The contents of exercises were divided into 4 phases consisting of local segmental control (2 weeks); closed chain segmental control (one week), open chain segmental control (one week) and work simulating exercise (2 weeks). During the local segmental control, the participants learned intensive proper technique and correct posture. The closed chain segmental control is a combination of local control and weightbearing of trunk, pelvic girdles and limb by using a gym ball. The open kinetic chain aimed to continue to maintain the local segmental control while loads were added through open kinetic chain movement of adjacent segments. Finally, work-simulating exercises consisted of exercises simulating the training activities that the participant experienced. These exercises based on the basic ergonomic principles included keeping the lumbar segments near midposition and using short lever arms by bending the knee and hip joints during functional and course replications of home and training environments. Each exercise consisted of warming up (5 minutes), stabilization exercise (20 minutes) and cooling down (5 minutes). Three bouts of 15 repetitions were applied. The warming up and cool down exercise was focused on stretching of the back and thighs using static technique. All programs were instructed by the physical therapist and started at low resistance level. Furthermore, exercises were provided for weightlifters to perform at home during time of the back school program. Details of back school program were presented in Table 3.1.

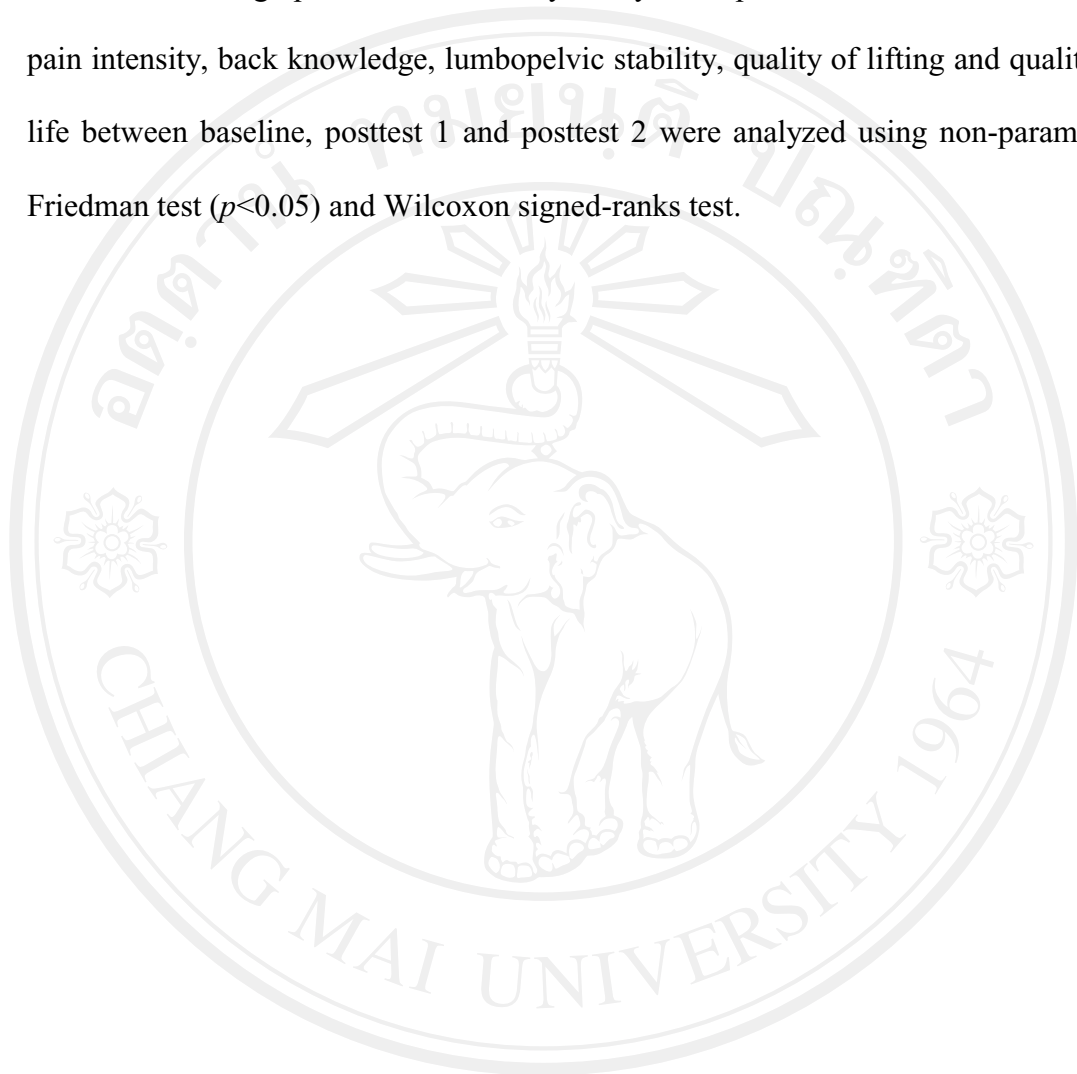
Table 3-1 Details of back school program

| phase | Weeks | Contents |
|------------------------------------|---------|---|
| 1st Knowledge (1 hour) | 1st | Significant of back school, Anatomy and function the back, Biomechanics and ergonomic of weightlifting, Natural course of low back pain, Healing process, Low back pain treatment, Relax posture |
| 2nd Pain management (1 hour) | 2nd | Coping with injuries, Self control of pain, Stress management, Relax training |
| 3rd Exercises | 3rd-4th | <p>Local segmental control Stretching exercise (hold 15 s, 5 repetitions)</p>  <p>Local segmental control (hold 10 s, 10 sets, 3 bouts)</p>  |
| | 5th | <p>Closed chain segmental control Stretching exercise (hold 15 s, 5 repetitions)</p>  <p>Close chain segmental control (3 bouts of 15 repetitions)</p>  |

| | | |
|--|----------------|---|
| | <p>6th</p> | <p>Open chain segmental control Stretching exercise (hold 15 s, 5 repetitions)</p>  <p>Open chain segmental control (3 bouts of 15 repetitions)</p>  |
| | <p>7th-8th</p> | <p>Work simulate Stretching exercise (hold 15 s, 5 repetitions)</p>  <p>Work simulate (3 bouts of 15 repetitions)</p>  |

3.6 Statistical analysis

The demographic data were analyzed by descriptive statistics. Differences in pain intensity, back knowledge, lumbopelvic stability, quality of lifting and quality of life between baseline, posttest 1 and posttest 2 were analyzed using non-parametric Friedman test ($p < 0.05$) and Wilcoxon signed-ranks test.



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