CHAPTER III
RESEARCH METHODOLOGY

Research design

The study was a descriptive research which prospectively monitored of middle-age to elderly Thai joggers for heath. The questionnaire was used for data collection. Data collections were characteristic of subjects, running profile, and running injuries profile. Additionally, the measurement of static lower-limb alignment (Q-angle, leg-length discrepancy, arch type) and follow up running injuries for 16 weeks period were included.

Population

In this study, the target population groups were Thai joggers for health from middle-age to elderly people who were 45 – 75 years old. The samples were recruited according to the following criteria.

Inclusion criteria

1. Thai joggers for health, who jogging at a public park in Bangkok (this study will use Suan Lumpini as a main place), aged from 45-75 years old.

2. Volunteers signed the consent form to become subjects.

3. All participants were healthy and had no injuries before joined the study.

Exclusion criteria

1. The participants were sick or injured.

2. Participants had sign and symptom of medical condition that might caused effect in this study such as heart disease, arthritis, etc. Which may effect their running.

3. The participants had other injuries beside the above such as a broken bone, etc.

Sample

Sample technique

This study used purposive sampling technique.

Sample size determination

In this study, sample size determination was calculated from Roscoe's simple rule of thumb (Roscoe, 1975). In multivariate research (e.g. multiple regression) he suggested sample size should be at least ten times larger than the number of variables being considered. Variables for the study are age, sex, body mass index(BMI), weight, arch type, leg length discrepancy, Q-angle, weekly distance, frequency of running, running experience, shoes, stretching and history of injury, Totally 13 variables. In addition, from the previous pilot study in 16 middle age and elderly people aged from 45 years old. The pilot study was investigated running injuries by using questionnaire in Lumpini park and found that there are 10 joggers (62.5% of all joggers) sustained injury. The calculation of sample size is then

$$n = (10 \times f) / r$$

n = sample size

f = number of factors (variables) for this study = 13

r = incidence of running injury ≈ 62% (from pilot study)

$$n = (10 \times 13) / 0.62$$

$$n = 210$$

n for sample was 210 persons. To account for the expecting drop outs during the investigation and ensure the study confidence, subjects were added for this study. Thus, total subjects were 250 persons for this study.

Instruments

1. Questionnaire was divided into three separate sections:

- *Personal profile* asked for sex, age, weight, height, arch type, Q-angle, leg length discrepancy, medical condition and drug used.

- *Jogging profile* asked for running experience, duration of running, frequency of running, distance of running, stretching exercise, shoe and orthotics used.

- *Injury profile* asked for history of injury and current injuries among 16 weeks of the study.

2. Height measuring board and weight measuring scale (Yamato, DP-6100 GP, Japan)

3. Equipments for foot imprint such as coat paper and clear ink.

4. Plastic full-circle goniometer (TomoFix™ SYNTHES® MATHYS) and nonpermanent pen (demographic pencil) (wiped out after the measurement)

5. Tape measurement (Hokanson®)

6. Camera (digital camera)

Procedure

The researcher divided the process of research into 2 sections as follows;

1. Create questionnaires to collect data.
2. Collect the data.

1. The process of creating questionnaires

The questionnaires were newly created and acted as a tool for research study. The steps of creating questionnaires were as the following:

1. Find out and collect data of which the researcher wanted to study.

2. Set data and measurement from the purpose of the research study. Which in this case, it was to study the risk concerns about the risk factors and incidence of running injuries in middle age and old age people. The main questions would be from the injuries of soft tissue and various factors caused from running.

3. Create the questionnaires. The main subject was about the purpose of the study which is based on the research study such as personal data, running factors, and injuries data etc.

4. Set type and pattern. The questions will be "Schedule" type which the researcher would ask the questions and filled out the answers by oneself.

5. Draft the questionaires by writing all questions according to the main subject and purpose of research.

6. Examine the draft questionnaires by which the experts would see what to improve. They would consider that the questions were right to the main subject, the purpose of the study and able to answer.

7. Pretest. The researcher would test the improved questionnaires to a group of people which had the same type as the target group.

8. Evaluate the questionnaires from the result of the answer before the real test by face validity.

To face validity which was to test the relations of the contents of the questionnaires and the contents of what the researcher wanted to study. Three experts could analyze the questionnaires into an index value which each expert had agreed to the following score:

+ 1 when it was sure that the questions were represented the exact type of the target group.

0 when it was not sure that the content was represented the exact type of the target group.

- 1 when it was sure that the question did not represent the exact type of the target group.

Replace the score into the following formula:

$$IC = \frac{\sum R}{N}$$

When IC meant Index of Congruence

$\sum R$ meant total scores of the whole experts' opinions.

N meant amount of the experts.

If the index was equal to or more than 0.5 that meant the questions represented the exact type of the target group.

If the index was less than 0.5 that meant the questions might be taken out or be improved.

As from the pretest, the researchers found out that IC (Index of Congruence) calculated equals to 0.9 which meant the questionnaires represented the exact types of the groups.

2. Data Collection

1. Measure all the tools used in this research.

2. Contact the volunteers from the people who come to the park for jogging.

3. Explain the purpose and the benefits when participate in this research.

4. Ask the volunteers to fill in the questionnaire.

5. Measure the baseline value such as weight, height, arch type, Q-angel, leg-length discrepancy including the pictures of the shoes to find out wear and tear pattern.

5. Follow the injuries and collect data from the questionnaires for 16 weeks period.

6. Collect the data and statistical analysis.

7. Discussion and Conclusion.

Measurements of baseline characteristics of subjects

- During each measurement session, subjects worn a pair of shorts.
- Took off the socks and shoes, bared foot. Cleaned and dried the feet.
- Measured body weight and height.
- Measured arch type, Q-angle, leg length discrepancy.

Measurement of Arch Type

1. For the static index, the footprint was taken during half body weight stance – each foot supported approximately 50% of the body weight.

2. The footprint was taken with clear ink and coated paper.

3. During footprint acquisition, subjects were asked to stance on the coated paper in a normal upright posture, with their two feet separated a shoulder's width apart. The subjects had no noticeable body motion, e.g., postural swaying.

4. Marking of the footprint starts with a line which was drawn from the center of the heel to the tip of the second toe (in Fig.3.1a). This line was termed the 'foot axis'. Then, two lines perpendicular to the foot axis were drawn tangential to the foot, one on the most posterior aspect of the heel and one on the most anterior aspect of the footprint excluding the toes, in front of the metatarsal heads. The part of the foot axis between these two lines was trisected into equal parts, thus dividing the footprint into rearfoot (A), midfoot (B) and forefoot (C) regions, as shown in Fig 3.1b.

5. Scan the footprints. After that, determined area of the footprints by using **image pro plus program** (version 6.1 for Windows 2000 & XP professional: Copyright, 2006. Media Cybernetics, Inc.) to calculate arch index (AI).

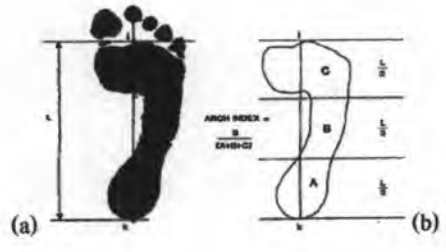

Figure 3.1: (a) the footprint was taken with clear forensic ink and coated paper. The points j and k were identified as described in the text. (b) The outline of the footprint, excluding the toes, was traced using a digitizing tablet. It was then divided into equal thirds by parallel lines which were perpendicular to the line *jk*. The arch index (AI) was calculated as the ratio of the midfoot area (B) to the area of the entire foot excluding the foot (A+B+C). (From Cavanagh and Rodgers, 1987)

Arch index was defined as the area of the midfoot divided by the total area of the footprint, ignoring the toes. The calculation of AI was then

$$\text{Arch index} = \frac{B}{A + B + C}$$

The following divisions were used for the classification of footprints:

High arch $AI \leq 0.21$

Normal arch $0.21 < AI < 0.26$

Flat arch $AI \geq 0.26$

Q-angle measurement (Stand position)

1. The subject was asked to stand barefoot.

2. Q-angle measurement were taken bilaterally with the subject in a standing position with the knees extended and the Quadriceps muscle group relaxed.

3. A transparent, flexible plastic full circle goniometer with two 0.18 m. arms and 2° increments, was used to measure the Q-angle with the anterior superior iliac spine (ASIS), midpoint of the patella, and midpoint of the tibial tubercle as landmarks (Fig 3.3.)

Q-angle measurement (Supine position)

The Q-angle in supine position was measured with the knee in full extension with the subject supine similar as the Q-angle measurement in stand position.

These two measurement (stand and supine position) - the center of the patella and the tibial tubercle were marked with a demographic pencil (non permanent pen), which was wiped out after the measurement.

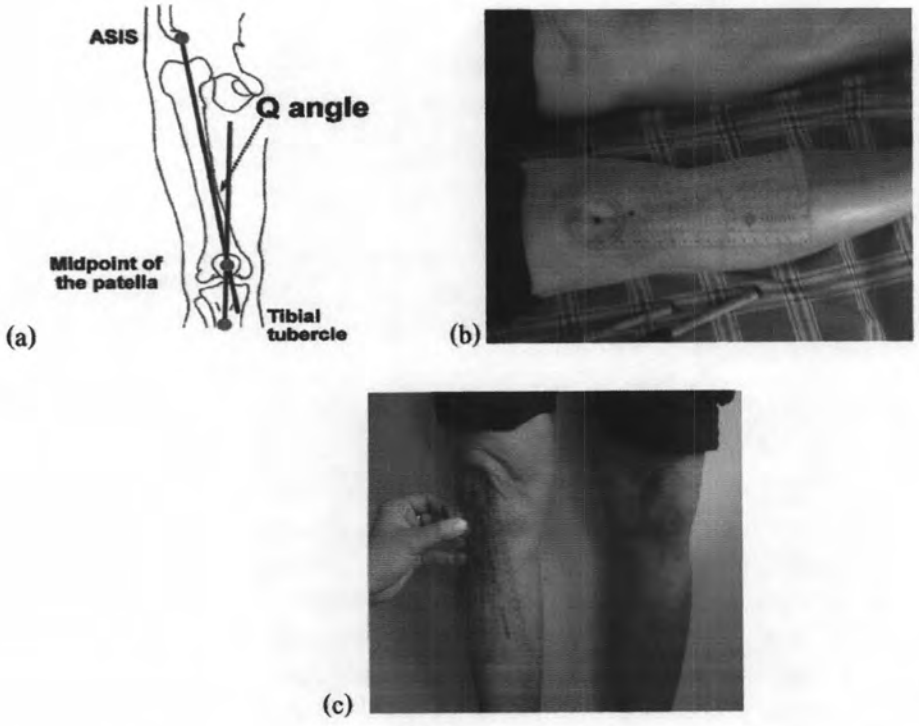

Figure 3.2: (a) Q was angle formed by the intersection of a line, from the anterior superior iliac supine (ASIS) to the midpoint of the patella, with a line from the midpoint of the patella to the midpoint of the tibial tubercle. (From Livingston LA, 1997) (b) Q angle was measured with the subject in a supine position. (c) Q angle was measured with the subject in a standing position.

Leg length measurement

1. Subjects were positioned supine.

2. The subject's hip and knees were, therefore, in a position that closely approximated the anatomical position.

3. Use tape measure to determine the distance from the ASIS to the medial malleoli (true leg length). (Figure 3.4)

4. Leg length discrepancy was the difference between the right and left leg lengths.

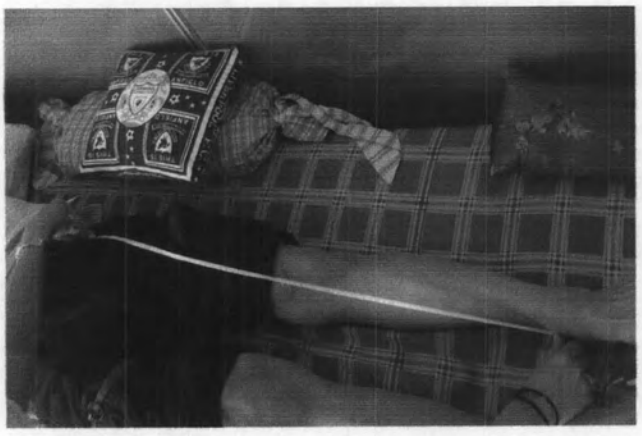

Figure 3.3: True leg length (anterior superior iliac spine to medial malleolus). (From Clinical Symposia by Brody DM, 1987)

Data collection of running injuries

Followed the injuries and collected the data using subject's form (Appendix E) for 16 weeks period. We followed up every week. If could not meet the person face to face, would contact them by phone. Injuries that were unrelated to running, were excluded from the study.

Data analysis

1. Descriptive statistics were used for baseline calculation.

- Means with standard deviation were used for quantitative data.

- Numbers with percentages were used for qualitative data.

2. The univariable analysis was used to contributing variables included in the logistic regression model. This univarate analysis assessed the associate between risk factor in injured and non-injured of running injuries.

- Independent-Sample T Test was used for continuous data.

- Chi-square test was used for categorical data.

3. This multivariate binary logistic regression model was used to assess the relative contribution of the predicted risk factors.

4. $p < 0.05$ was used to enter the model. Statistics were compiled using the Statistical Package for Social Sciences (SPSS version 11.5).

5. Intraclass correlation coefficients (ICC) were used to estimate agreement between two examiners and same examiner determined area of the footprints by using Image pro plus program.