

CHAPTER III

METHODS

1. Participants

Twenty children with CP were participated in the study. Participants were recruited from Srisangwan Chiang Mai School and nearby.

1.1 Inclusion criteria: A participant was included in the study if;

1.1.1 He/she had a diagnosis of cerebral palsy

- Spastic hemiplegia

- Spastic diplegia

- Spastic quadriplegia

1.1.2 He/she aged between 8-18 years.

1.1.3 He/she was able to walk 1 minute, with or without walking aids.

1.1.4 He/she was able to understand verbal commands (such as point and pick target follow from verbal commands).

1.1.5 He/she had muscle tone in lower limbs equal or less than 2 on a

Modified Asworth Scale (APPENDIX A).

1.2 Exclusion criteria: A participant was excluded from the study if;

1.2.1 He/she missed the follow-up appointment 3 times.

1.2.2 He/she obtained medicine before walking training (e.g.

Antihistamine, Anticonvulsant, medicine for muscle relaxation)

1.2.3 He/she had an abnormality in the cardiovascular system or respiratory system (such as heart disease, asthma).

1.2.4 He/she obtained orthopedic surgery in the previous six months.

1.2.5 He/she had a problem of the musculoskeletal system that affected gait pattern (such as pain and inflammation of hip and knee)

1.2.6 He/she had orthopedic deformities which had a negative influence on walking (such as hip subluxation)

2. Equipment

2.1 Treadmill Biodex RTM[®] Model 500 for gait training

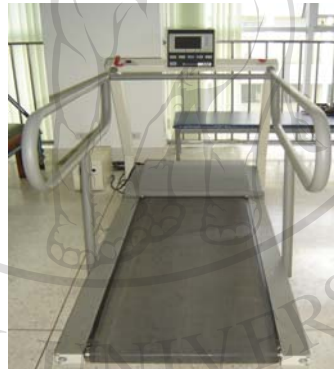


Figure 8 Treadmill Biodex RTM[®] Model 500

2.2 Suspension system 1 unit for partial body support during gait training



Figure 9 Suspension system

2.3 Sony® Handycam DCR-HC 90 E 1 unit for take photographs of hip angle during standing



Figure 10 Sony® Handycam DCR-HC 90 E

2.4 Tripod 1 unit for adjust level of VDO camera.



Figure 11 Tripod

2.5 Silicon COACH 6 Pro report Pak® program for calculate of hip angle

2.6 Timer (ALBA Citizen) 1 unit for reckon time 1 minute during assessment



Figure 12 Timer

2.7 Digital weight 1 unit for adjust weight bearing



Figure 13 Digital weight

2.8 Measuring Tape 1 unit for measure distance after 1 minute walk test



Figure 14 Measuring Tape

2.9 Cone 2 unit for land mark during assessment by 1 minute walk test



Figure 15 Cone

2.10 Chair 1 unit for seat before start walking



Figure 16 Chair

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3. Procedures (Figure 19) were divided into to 2 phase.

Phase I: Pilot study

1. Before data collection, a pilot study was conducted to test intrarater reliability using intraclass correlation ($ICC_{3,1}$).
2. Three participants were recruited from Srisangwan Chiang Mai School in Chiang Mai Province (2 girls and 1 boy). The averaged age and weight of participants were 9 ± 1.0 year and 26.33 ± 8.50 kg, respectively.
3. The participants were measured the physiological cost index (PCI), maximum walking speed (MWS), Dimension D (standing) in gross motor function measure (%GMFM), and hip angle during standing (Hip angle) for 3 times with 2 days apart for each time.

3.1 One minute walk test (36) was used to assess the PCI and MWS.

Procedures of one minute walk test were as follow;

3.1.1 Firstly, each participant rested for a minimum of 5 minutes before starting the test and sat at a starting point. The researcher collected resting HR.

3.1.2 Secondly, each participant was given an instruction to start and keep walking around the track (length 20 meter) as fast as possible for 1 minute.

3.1.3 After one minute walking, the researcher collected the HR suddenly and measured the distance.

3.1.4 Then the researcher calculated for the PCI as formula below:

$$PCI \text{ (beat/m)} = \frac{\text{Walking heart rate (beats/min)} - \text{Resting heart rate (beats/min)}}{\text{Walking Speed (m/min)}}$$

3.1.5 The MWS was obtained from distance during fast walking in one minute walk test.

3.2 %GMFM (37) was used to assess standing ability. This dimension includes 13 items that assess the child's ability to maintain various standing position, to assume standing from various positions, and to perform specific tasks from the standing position (APPENDIX B). The GMFM is a clinical measure designed to evaluate change in gross motor function in children with CP. This test has been found to have a high reliability and validity (38). Scoring is based on a four-point scale for each item using the following key:

- 0 = does not initiate
- 1 = initiates
- 2 = partially completes
- 3 = completes

3.2.1 The scoring key is provided as a general guideline. "Does not initiate" (0) applies to the child who is requested to attempt an item and is unable to commence any part of the activity.

"Initiate" (1) refers to less than 10% task completion. "Partially completes" (2) refers to a child performing from 10% to less than 100% task completion. "Completes" (3) describes 100% task completion.

3.2.2 The participants were allowed maximum of three trials for each item.

3.2.3 After testing, summed all scores and then calculated of percent score. A percent score was calculated by (sum score/total score) x 100

3.3 The Hip angle was measured using the Silicon COACH Digitizer. The researcher was attached the markers to the participants at the mid axillar, greater trochanter, lateral epicondyle of the femur, and the lateral malleolus as shown in Figure 17.



Figure 17 Hip joint angle during standing

The video camera was used to record the participants at pre- and post-training during standing position. The video camera was placed perpendicular to the participant and at a distance of six meters away from him/her.

After that picture from video camera was capture in Silicon COACH 6 Pro report Pak® program for captured and digitized the markers, then calculated for hip angle during standing position.

4. The results showed that the intrarater reliability of PCI, MWS, %GMFM, and Hip angle was excellent ($ICC_{3,1} = 0.98, 0.99, 1.00, \text{ and } 0.98$ respectively).
5. After that, the two participants were performed gait training with PBWS on a treadmill at Department of Physical Therapy for 3 days.

5.1 One participant performed forward gait training alone and one participant performed combination between forward and backward gait training.

5.2 During gait training, the researcher was found that;

5.2.1 The participant walked on tip toe and sat on the suspension,

5.2.2 During gait training, the band of PBWS was grazed with neck of participant, may leading to wound occur,

5.2.3 The level of high weight digital not equal level of high treadmill, leading to weight bearing on treadmill during training not correct.

6. After training 3 days, the researcher was correct problems before real training.

Phase II: Gait training study was divided into 2 sessions;

Session 1: Test session

1. Participants were screened using the inclusion and exclusion criteria and filled in the patient information form (APPENDIX C)

2. All participants signed an inform consent from prior to data collection (APPENDIX D and E). The experimental protocol was

approved by the ethical research committee of the Faculty of Associated Medical Sciences, Chiang Mai University (APPENDIX

F and G).

3. All participants were measured all variable for 2 times at pre- and post-training. All procedures were the same as in pilot study.

4. After measured at pre-training, the participants were randomly divided into 2 groups by drawing with matched pairs in terms of types of CP, gender, level of ability that was obtained from PCI

and %GMFM. Group A performed forward gait training alone and Group B performed a combination of forward and backward gait training.

Session 2: Training session

1. Group A

1.1 Training time was 30 minutes per trial (1 trial had 2 sessions)

1.1.1 Session 1: forward gait training 15 min and rest 5 min

1.1.2 Session 2: Continued of forward gait training 15 min

1.2 Frequency of training was 3 times per week for 8 weeks.

2. Group B

2.1 Training time was 30 minutes per trial (1 trial had 2 sessions)

2.1.1 Session 1: forward gait training 15 min and rest 5 min

2.1.2 Session 2: backward gait training for 15 min

2.2 Frequency of training was 3 times per week for 8 weeks.

3. Both groups were set to trained 6 steps as shown in Figure 18.

4. During the training program, manual guidance was given with verbal cueing.

5. Considering for increasing speed of treadmill and percents of weight bearing that participants are able to walk with constant rhythm of movement and good balance.

6. After training 8 weeks, both groups were remeasured of all variables.

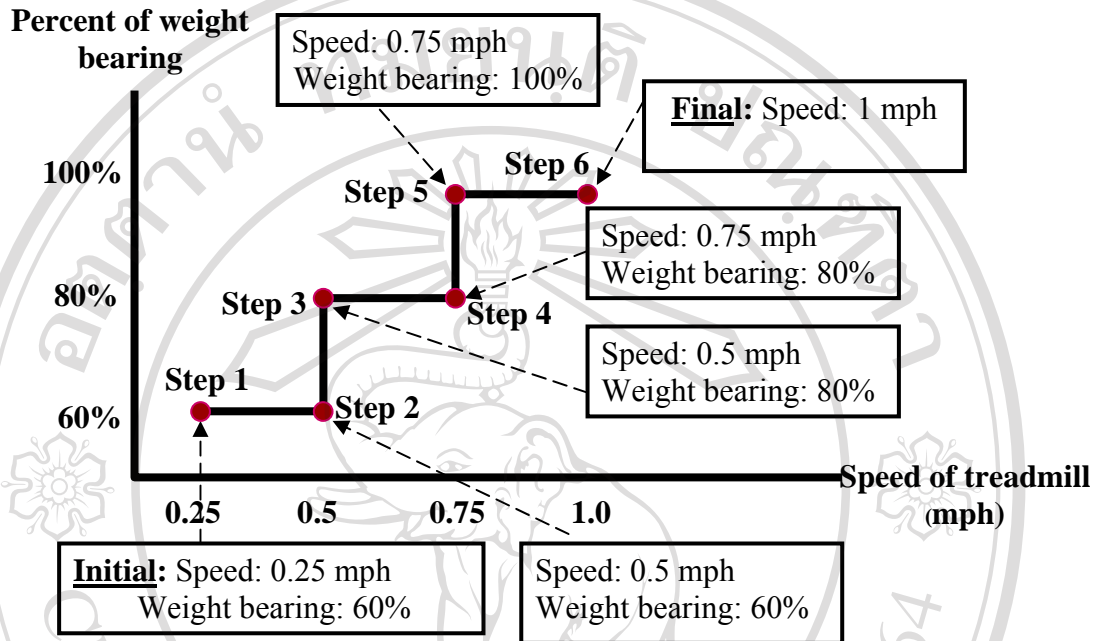


Figure 18 Model of gait training on a treadmill with PBWS

Step 1 Started training velocity at 0.25 mph and 60% of weight bearing,

Step 2 then, changed the training velocity to 0.5 mph and 60% of weight bearing,

Step 3 changed the weight bearing to 80% and velocity at 0.5 mph

Step 4 then, changed the training velocity to 0.75 mph and 80% of weight bearing

Step 5 changed the weight bearing to 100% and velocity 0.75 mph

Step 6 Finally, changed the training velocity to 1 mph and 100% of weight bearing

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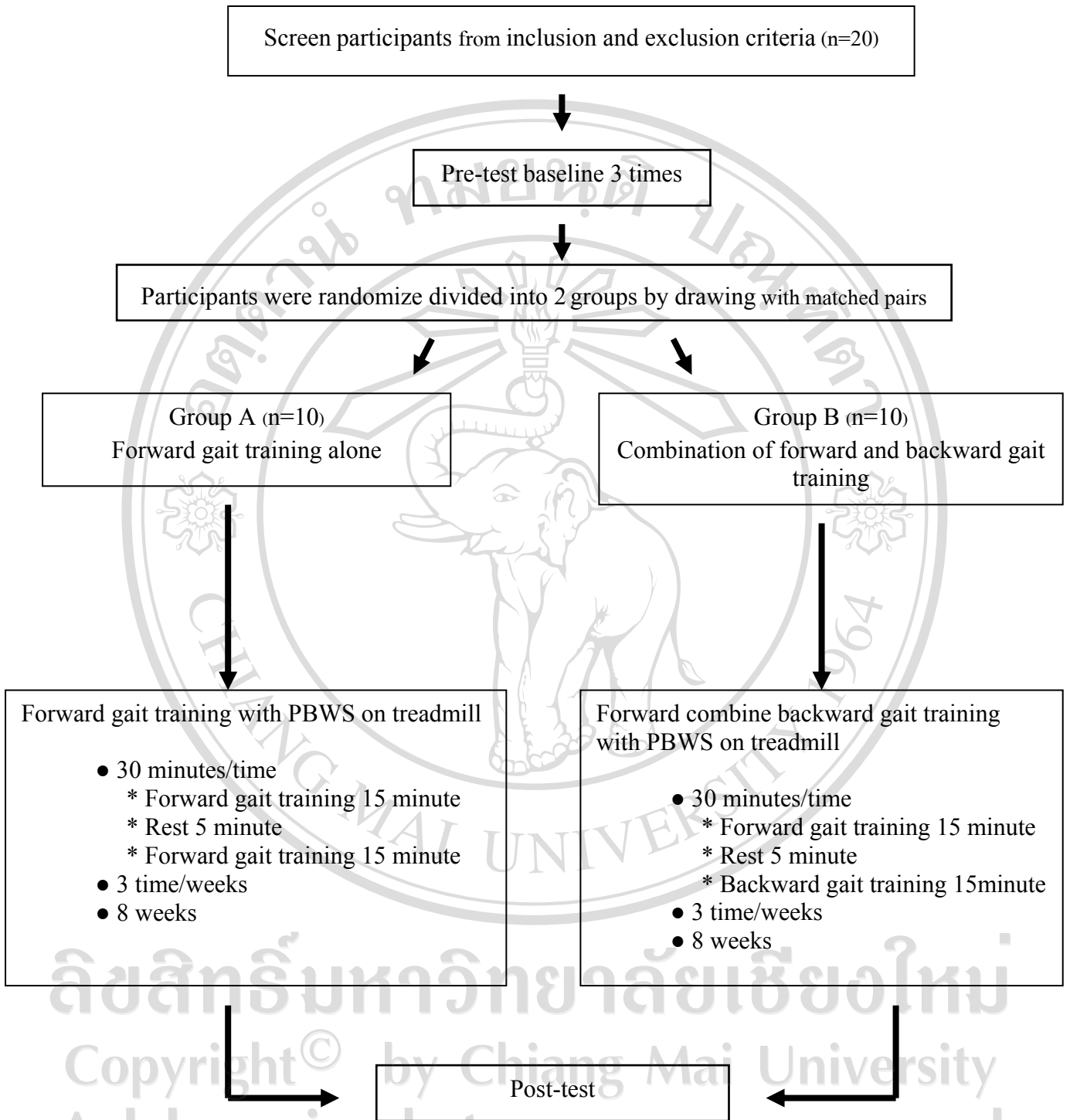


Figure 19 Procedure of the study

4. Data analysis

Analysis was performed using the Statistical Package for the Social Sciences (SPSS) for windows, version 10.0. Descriptive statistics were performed for all variables measured. Data of all variables in each condition were tested for normality, using one sample Kolmogorov-Smirnov test. The paired t-test and unpaired t-test were used to evaluate all variables if the data was normally distributed. Wilcoxon Signed-ranks test and Mann-Whitney U were used to evaluate all variables if the data was not normally distributed. A value of $p < 0.05$ is considered to be significant.

5. Location

The study was conducted at the Department of Physical Therapy, Faculty of Associated Medical Sciences, Chiangmai University and Srisangwan Chiang Mai School, Chiang Mai Province, Thailand.