

CHAPTER IV

RESULTS

1. Demographic characteristics of the participants

Sixteen individuals with spastic diplegia (8 boys and 8 girls) were participated.

Demographic characteristics of the participants in each group are given in Table 3.

Table 3 Characteristics of the participants in the combined group and control group

	Control group (N=8)	Combined group (N=8)
Age (yr)	12.75 ± 3.33	13 ± 4.50
Body weight (kg.)	33.31 ± 10.83	34.38 ± 9.98
Sex (Male: Female)	4 : 4	4 : 4
GMFCS level II : III	3 : 5	5 : 3
Crouch : Genu recurvatum	4 : 4	4 : 4

2. Comparisons of variables between the combined and control group before training

The average age of the combined and control group were 13.0±4.5 and 12.8±3.3 years, respectively. The averaged percent normalized QMVIC at the pre-training in combined and control group were 17.7±8.2 and 17.2±8.5 percent, respectively.

The averaged QL at the pre-training in combined and control group were 10.6 ± 6.5 and 12.3 ± 6.4 degrees, respectively. The average angles of hip, knee and ankle joints during standing at the pre-training of the combined were 70.7 ± 84.6 , 65.0 ± 75.0 , 96.0 ± 9.5 degrees, respectively. In addition, the average angles of hip, knee and ankle joints during standing at the pre-training of the control group were 69.35 ± 81.34 , 63.0 ± 78.3 , and 100.6 ± 12.0 degrees, respectively. The median QMAS and HMAS at the pre-training of combined and control group were 1 and 2, respectively. The age, percent normalized MVIC, angles of hip, knee and ankle joints during standing and QMAS, HMAS between the combined and the control group at the pre-training were not significant differences as shown in Table 4.

Table 4 Comparisons of variables between the combined and control group before training

Group	Age (year)	QMVIC Mean \pm SD	QL Mean \pm SD	Angles joints Mean \pm SD			MAS Median (max-min)	
				hip	knee	ankle	Quad	Ham
Combined	13.0 \pm 4.5	17.7 \pm 8.2	10.6 \pm 6.5	70.7 \pm 84.6	65.0 \pm 75.0	96.0 \pm 9.5	1 (3-0)	0 (1-0)
Control	12.8 \pm 3.3	17.2 \pm 8.5	12.3 \pm 6.4	69.4 \pm 81.3	62.6 \pm 78.3	100.6 \pm 12.0	2 (3-0)	0 (1-0)
<i>p</i> -value	0.86	0.70	0.44	0.96	0.92	0.24	0.67	0.25

3. Attendance rate

All participants safely completed the 7-week strength training and 2-week follow-up, with no reports of any complications or adverse events. During 7-week

period of strength training that consisted of 21 training sessions, all participants strictly adhered to the study protocol. The adherent rate was high and 80.5% to 100 (Table 5).

Table 5 Percentage of attendance during 7-weeks period of strength training program

Number of participants	Number of training sessions	Percentage of attendance
11	21	100.00%
1	20	95.24%
1	19	90.48%
1	18	85.71%
2	17	80.95%
Mean ± SD	20.13 ± 1.50	91.09%

4. Weight training and current amplitude

The ankle weight is shown in Figure 11. The present study found that there was no significant difference between the combined and the control group for ankle weight each the week. The average ankle weight of the combined and control group were 8.91 ± 1.50 lb and 7.4 ± 1.53 lb respectively.

The current amplitude is shown in Figure 12. The present study found that there was no significant difference between the weeks of training for current amplitude. The average current amplitude of the combined was 32.94 ± 7.14 mA.

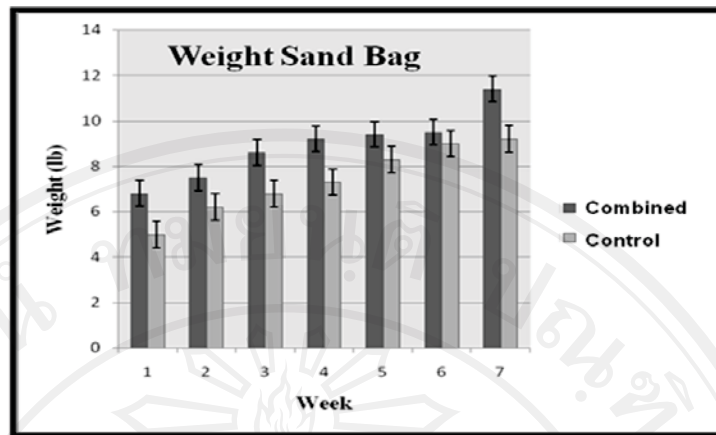


Figure 11 Weights training in the combined group and control group

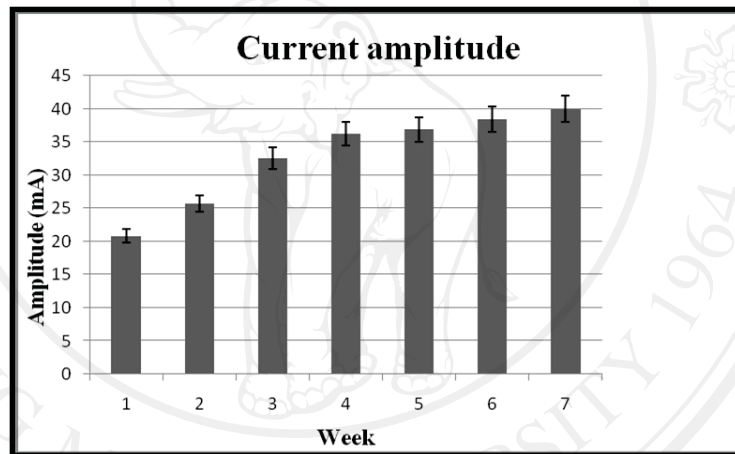


Figure 12 Current amplitude in the combined group

5. Quadriceps Maximum Voluntary Isometric Contraction (QMVIC)

The QMVIC is shown in Table 6. The results found that there was no statistically significant difference for interaction between time x group effect ($F_{(2, 30)} = 2.16, p = 0.41$) and main effect of group ($F_{(2, 30)} = 0.40, p = 0.09$), but there was statistically significant difference for the main effect of time ($F_{(2, 30)} = 45.28, p = 0.01$). In addition, the QMVIC for both groups were statistically significant increased at the post-training as compared to the pre-training and statistically significant

decreased at 2-week the post-training as compared to the post-training ($p < 0.008$). Moreover, only the QMVIC of the combined group after the 2-week training was significantly greater than at the pre-training data ($p < 0.008$).

Table 6 The quadriceps maximum voluntary isometric exercise in combined and control group at the pre training, the post training, and the follow up

Outcome measures	Group	Pre training	Post training	Follow up
QMVIC (%) (MEAN±SD)	Combined	17.74±8.23	24.19±9.66	21.16±8.46
	Control	17.24±8.50	21.97±9.88	18.27±7.13

* Significant differences were found at $p < 0.008$ using the dependent t-test

The percent change in QMVIC is shown in Figure 13. The results found that, after training the percent changes in QMVIC increased 40.43±23.16% (at the end) and 31.07±48.49% (at 2 week post the training) for the combined group and 30.74±19.13% (at the end) and 10.41±14.77% (at 2 week the post training) for the control group from the pre-training. Finally, the percent changes in QMVIC decreased 6.50±28.43% for the combined group and 15.19±7.30% for the control group (at 2 week the post training) from the post training.

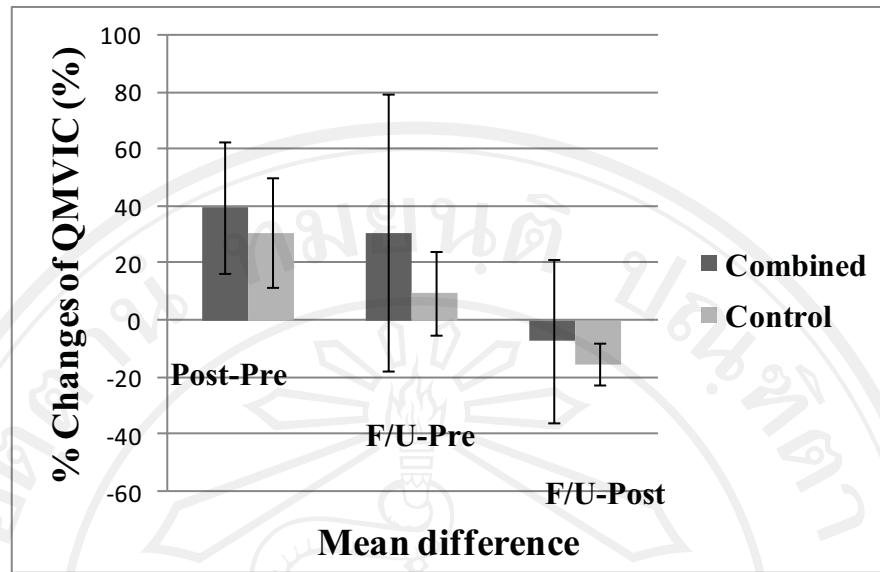


Figure 13 Percent changes in QMVIC of the participants in the combined group and control group

6. Quadriceps lag (QL)

The QL is shown in Table 7. The results showed that there was no statistically significant difference between times of assessment for each group and there was no statistically significant difference between groups among times of assessment ($p \geq 0.05$).

Table 7 The quadriceps lag in the combined and the control group at the pre training, the post training, and the follow up

Outcome measures	Group	Pre training	Post training	Follow up
		Mean±SD	Mean±SD	Mean±SD
Quadriceps lag (degree)	Combined	10.56±6.49	8.81±6.02	9.69±6.89
	Control	12.33±6.41	12.44±5.88	13.38±7.43

The percent change in QL is shown in Figure 14. The results found that, after training the percent changes in QL decreased $12.27 \pm 34.54\%$ (at the post training) and $6.37 \pm 49.82\%$ (at 2 week the post training) for the combined group and increased $12.06 \pm 62.26\%$ (at the post training) and $59.24 \pm 41.59\%$ (at 2 week the post training) for the control group from the pre-training. Finally, the percent changes in QL increased $21.1 \pm 35.89\%$ for the combined group and $49.62 \pm 39.99\%$ for the control group (at 2 week the post training) from the post training.

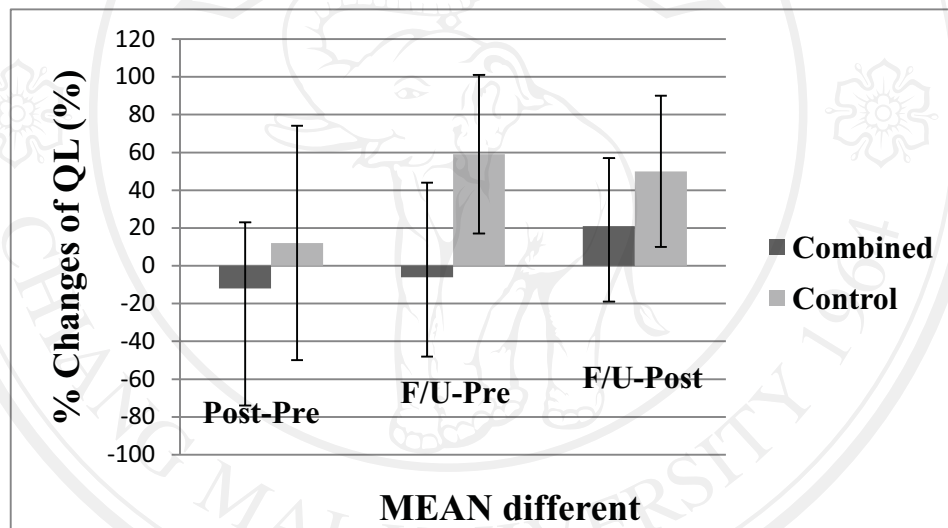


Figure 14 Percent changes in QL of the participants in the combined group and control group

7. QMAS and HMAS

The QMAS and HMAS are shown in Table 8. The results found that there was significant difference at the end of training between the combined and the control group for QMAS ($p = 0.04$). In addition, the combined group showed statistically significant decrease in the QMAS at the post-training ($p = 0.01$) and increase the 2-week after completed training ($p = 0.02$) as compared to the pre-training but there was

no statistically significant difference for HMAS. For control group, there was no statistically significant difference for QMAS and HMAS between times of assessment ($p \geq 0.05$).

Table 8 The quadriceps and hamstrings modified Ashworth Scale in combined and control group at the pre training, the post training, and the follow up

Outcome measures	Group	Baseline	Post-Test	Follow-Up
		Mode(Min-Max)	Mode(Min-Max)	Mode(Min-Max)
QMAS (6 score)	Combined	1(3-0)	0(3-0)	2(3-0)
	Control	2(2-0)	1(3-0)	2(3-0)
HMAS (6 score)	Combined	0(1-0)	0(1-0)	0(1-0)
	Control	0(1-0)	0(0-0)	0(0-0)

†† Significant difference was found at $p < 0.05$ using Mann Whitney-U test

† Significant differences were found at $p < 0.05$ using Wilcoxon Signed Rank test

8. Angles of hip, knee and ankle joints during standing

Angles of hip, knee and ankle joints during standing are shown in Table 9. The results showed that there was no statistically significant difference for all comparisons. ($p \geq 0.05$).

Table 9 The angles of hip, knee and ankle joints during standing the in combined and control group at the pre training, the post training, and the follow up

Outcome measures	Group	Pre training Mean±SD (Min-Max)	Post training Mean±SD (Min-Max)	Follow up Mean±SD (Min-Max)
Hip joints (degree)	Combined	70.29±85.09	73.60±85.10	73.52±83.76
		(-20.00-159.39)	(-15.00-161.89)	(-16.00-161.09)
	Control	69.36±81.34	73.85±83.22	73.54±82.30
		(-16.00-159.34)	(-14.00-164.18)	(-10.00-163.62)
Knee joints (degree)	Combined	65.01±74.95	67.22±76.25	67.73±76.60
		(-13.00-162.05)	(-10.00-162.28)	(-7.00-159.63)
	Control	62.59±78.27	68.42±82.10	68.11±80.62
		(-18.00-150.92)	(-17.00-157.55)	(-15.00-166.62)
Ankle joints (degree)	Combined	96.00±9.48	103.24±11.34	102.83±14.06
		(76.53-110.81)	(80.32-119.15)	(77.49-130.25)
	Control	100.56±11.96	102.05±10.60	103.96±11.52
		(83.31-121.34)	(90.56-123.33)	(86.29-127.05)