

CHAPTER IV

RESULTS

Fifteen patients with stroke volunteered for the study. Two men dropped out after the second pretest and another after 3 training sessions, because of transportation problem. The remaining 12 completed all 24 training sessions within a 6 - 7 weeks period. The average height and weight of subjects were 172.4 ± 6.22 cm (152 - 179 cm) and 76.4 ± 5.3 kg (53 - 92 kg), respectively. Demographic information of the final subject pool was presented in Table 1.

Before intervention, statistical analysis of the clinical measures from 12 subjects was performed using a 1-way repeated-measures ANOVA. All outcome measurements appeared unchanged between pretesting sessions. Since neither showed significant differences, it was concluded that subjects were exhibiting stable motor deficits. (Table 2 - 4 displays the mean values of the outcome measures before training).

After intervention, paired-sample T-test was performed to compare the outcome between pre-training and post-training. The results showed that all of six strength measures for the paretic arm revealed significant difference over the pre-test ($p < 0.05$). The torque maximum showed improvements on the shoulder flexion (Mean maximum torque increased by the end of treatment to +8.5 N significant at $p = 0.001$), the shoulder extension (+14.2 N, $p = 0.001$), the elbow flexion (+10.3 N, $p = 0.001$), the elbow extension (+7.5 N, $p = 0.001$), the wrist flexion (+4.2 N, $p = 0.001$), the wrist extension

(+4.3N, $p = 0.001$). The results of the spastic test remained consistent throughout the study period ($p = 0.06$). Table 5 displayed the mean values of these significant changes in strength and spasticity.

On the AROM measures, it was revealed significant improvements for all of AROM on the post test over the baseline ($p > 0.05$). The results showed improvements on the shoulder flexion (Mean AROM increased by the end of treatment to +25 degree, significant at $p = 0.001$), the shoulder extension (+14.5 degree, $p = 0.001$), the elbow flexion (+26.9 degree, $p = 0.001$), the elbow extension (+17.7 degree, $p = 0.001$), the wrist flexion (+14.6 degree, $p = 0.001$), the wrist extension (+7.1 degree, $p = 0.001$). Table 6 displayed the mean values of these significant changes in AROM.

Table 7 summarizes the clinical assessments of upper extremity functions. The functional ability scores showed that changes in the values were statistically significant ($p = 0.002$). At the end of treatment, functional ability scores of the mWMFT increased on average 4.5 points of pretreatment values. The mean time values showed that the changes in the values were statistically significant ($p = 0.003$). Mean time to perform tasks in the mWMFT decreased at the end of treatment on average to 224.1 s of pretreatment values. The amount of use score (AOU) of the MAL showed statistically significant effects of the treatment ($p = 0.008$). The score improved on average +12.4 points of pretreatment values. The quality of movement scores (QOM) of the MAL showed statistically significant effects of the treatment. The pattern for QOM scores of the MAL increased post treatment on average to 14.4 points ($p = 0.002$) of pretreatment values.

Table 1. Characteristics of subject population

Subject	Age (yr)	Sex	Months Since CVA	Side affect	Side Dom	Etiology	Other medical condition	Other training during study
1	47	M	26	L	R	infarction	none	none
2	41	M	21	L	R	infarction	none	none
3	38	M	19	L	R	hemorrhage	HT	none
4	55	M	72	L	R	hemorrhage	HT	none
5	59	F	7	L	R	hemorrhage	none	none
6	47	F	17	L	R	infarction	none	none
7	33	M	30	R	R	hemorrhage	none	none
8	45	M	59	L	R	infarction	none	none
9	57	F	14	L	R	hemorrhage	Asthma	PT Program for LE
10	48	M	49	L	R	infarction	none	none
11	52	M	12	L	R	infarction	none	US (1session)
12	47	M	8	R	R	infarction	DM	PT Program for LE

M = Male

F = Female

L = Left side

R = Right side

Side Dom = Side dominant

HT = Hypertension

US = Ultrasound

Table 2. Comparison of strength and spasticity at the pretest session (N=12).

Torque Max Measure (N)	PRE-1	PRE-2	PRE-3	df	F	Sig*
Shoulder flexor	22.4±7.3	22.2±6.5	23.6±6.1	2.0	0.620	0.557
Shoulder extensor	21.7±9.6	21.9±8.9	23.7±8.7	2.0	2.432	0.171
Elbow flexor	11.9±5.4	11.4±4.7	12.6±4.6	2.0	1.635	0.243
Elbow extensor	11.4±5.8	11.8±2.7	12.8±2.6	2.0	0.713	0.513
Wrist flexor	3.5±1.2	4.4±2.4	4.7±2.4	2.0	1.744	0.224
Wrist extensor	3.3±1.1	3.4±1.5	3.4±1.2	2.0	0.068	0.934
Elbow spasticity	12.1±1.5	11.8±1.6	11.9±1.3	2.0	0.070	0.933

* p < 0.05

PRE-1, mean torque maximum obtained during 1st pretesting periodPRE-2, mean torque maximum obtained during 2nd pretesting periodPRE-3, mean torque maximum obtained during 3rd pretesting period

Table 3. Comparison of active range of motion at the pretest session (N=12).

AROM (degree)	PRE-1	PRE-2	PRE-3	df	F	Sig*
Shoulder flexion	98.6±41.8	97.8±41.2	99.6±41.0	2.0	2.565	0.180
Shoulder extension	36.3±10.1	36.3±10.4	34.9±10.9	2.0	1.131	0.361
Elbow flexion	98.1±22.4	100.1±21.9	99.7±22.8	2.0	2.665	0.186
Elbow extension	27.7±29.8	28.08±29.1	29.8±30.1	2.0	1.875	0.204
Wrist flexion	23.5±17.6	24.1±15.8	25.0±17.4	2.0	4.308	0.232
Wrist extension	28.6±23.2	28.5±23.3	28.9±22.9	2.0	0.810	0.472

* p < 0.05

PRE-1, mean AROM obtained during 1st pretesting periodPRE-2, mean AROM obtained during 2nd pretesting periodPRE-3, mean AROM obtained during 3rd pretesting period

Table 4. Comparison of functional outcome measures at the pretest session (N=12).

Outcome Measure	PRE-1	PRE-2	PRE-3	df	F	Sig*
ability score of mWMFT	37.7±16.6	37.8±16.8	37.9±16.8	2.0	1.667	0.237
time of mWMFT(s)	771.7±543.6	769.2±543.7	770.3±542.9	2.0	5.984	0.084
AOU of the MAL	16.7±17.7	17.6±18.1	18.3±17.6	2.0	1.267	0.323
QOM of the MAL	27.8±25.4	29.0±25.1	30.0±23.6	2.0	3.632	0.170

* p < 0.05

PRE-1, mean score obtained during 1st pretesting periodPRE-2, mean score obtained during 2nd pretesting periodPRE-3, mean score obtained during 3rd pretesting period

mWMFT = modified Wolf Motor Function Test

AOU = amount of used score of the MAL

MAL = Motor Activity Log

QOM = quality of movement scores of the MAL

Table 5. Comparison of strength and spasticity at the pretest and posttest session (N=12).

Torque Max Measure (N)	\bar{x} Mean PRE	Mean POST	Change	T-value	Sig[*]
Shoulder flexor	22.7±6.2	31.2±7.2	+8.5	-5.473	0.001
Shoulder extensor	22.4±8.8	36.6±10.1	+14.2	-8.886	0.001
Elbow flexor	12.0±4.7	22.2±7.8	+10.2	-5.699	0.001
Elbow extensor	12.0±3.0	19.5±6.7	+7.5	-4.498	0.001
Wrist flexor	4.2±1.8	8.4±3.0	+4.2	-5.975	0.001
Wrist extensor	3.3±1.0	7.7±2.8	+4.4	-6.324	0.001
Elbow spasticity	12.0±1.1	10.9±1.3	-1.1	2.096	0.060

* p < 0.05

\bar{x} Mean PRE, mean torque maximum obtained during pretest, which were computed using the following formula: $[\text{Pre1} + \text{PRE2} + \text{PRE3}]/3$.

Mean POST, mean torque maximum obtained during posttest.

Change, mean change torque maximum, which were computed using the following formula: $\text{POST mean} - \text{Mean PRE}$.

Table 6. Comparison of active range of motion at the pretest and posttest session (N=12).

AROM (degree)	\bar{x} Mean PRE	Mean POST	Change	T-value	Sig[*]
Shoulder flexion	98.6±41.3	123.6±37.0	+25.0	-5.006	0.001
Shoulder extension	35.8±10.3	50.3±9.3	+14.5	-6.433	0.001
Elbow flexion	99.3±22.3	126.2±13.7	+26.9	-4.718	0.001
Elbow extension	28.5±29.6	10.8±11.1	+17.7	-3.103	0.010
Wrist flexion	24.2±16.8	38.7±19.9	+14.6	-4.786	0.001
Wrist extension	28.7±23.2	35.8±20.0	+7.1	-4.268	0.001

* $p < 0.05$

\bar{x} Mean PRE, mean AROM obtained during pretest, which were computed using the following formula: $[\text{Pre1} + \text{PRE2} + \text{PRE3}]/3$.

Mean POST, mean AROM obtained during posttest.

Change, mean change AROM, which were computed using the following formula: $\text{POST mean} - \text{Mean Pre}$.

Table 7. Comparison of functional outcome measures at the pretest and posttest session (N=12).

Outcome Measure	\bar{x} Mean PRE	Mean POST	Change	T-value	Sig [*]
ability score of mWMFT	37.8±16.7	42.3±15.2	+4.5	-3.869	0.002
time of mWMFT(s)	770.4±543.4	547.1±402.3	-223.3	3.848	0.003
AOU of the MAL	17.5±17.7	29.9±27.5	+12.4	-3.221	0.008
QOM of the MAL	28.9±24.6	43.1±31.8	+14.4	-4.093	0.002

* p < 0.05

\bar{x} Mean PRE, mean score obtained during pretest, which were computed using the following formula: [Pre1 + PRE2+ PRE3]/3.

Mean POST, mean score obtained during posttest.

Change, mean change score, which were computed using the following formula:

POST mean – Mean PRE.

mWMFT = modified Wolf Motor Function Test

AOU = amount of used score of the MAL

MAL = Motor Activity Log

QOM = quality of movement scores of the MAL