CHAPTER 4

RESULTS

1. Demographic data

The participants in this study consisted of 16 Thai women national weightlifters (all team members). The mean age and duration of experience were 20.44 ± 3.14 and 6.38 ± 2.31 years, respectively (Table 1).

Table 1 Demographic data of Thai women national weightlifters

	N	Mean	SD	Range
Age (years)	16	20.44	3.14	17-29
Duration of experience (years)	16	6.38	2.31	3-11

2. Pain visual analog scales

Average pain at rest using visual analog scales in the sport massage condition between pre- and post-applications of sport massage were showed in figure 1 and table 2.

This result indicated that average pain visual analog scales significantly decreased after receiving sport massage in day 1, day 2 and day 3. The percent changes of the average pain scales of day 1, 2, and 3 were reduced by 26.04% ($F_{(1,15)}$=23.60 ; $p<0.001$), 26.94% ($F_{(1,15)}$=25.81 ; $p<0.001$), and 35.10% ($F_{(1,15)}$= 43.80 ; $p<0.001$), respectively.

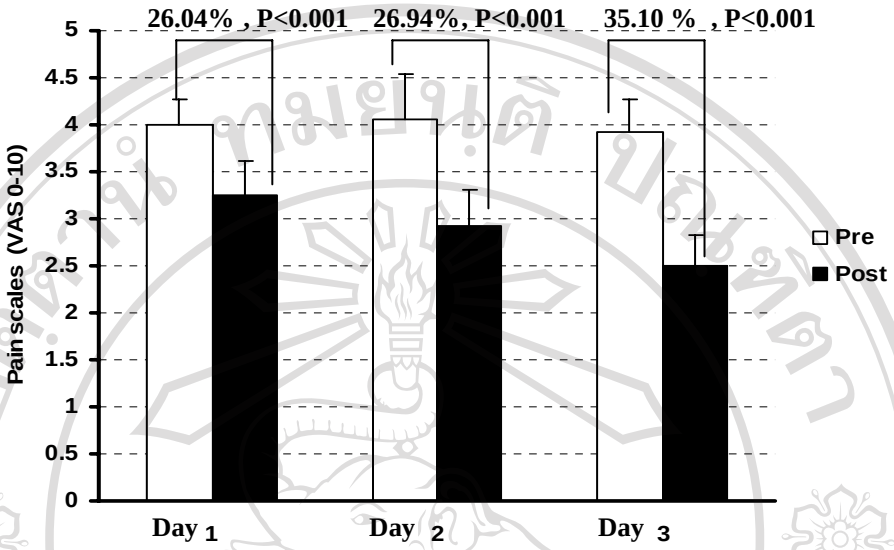

Figure 1 Average pain visual analog scales of the sport massage condition (Mean ± SEM).

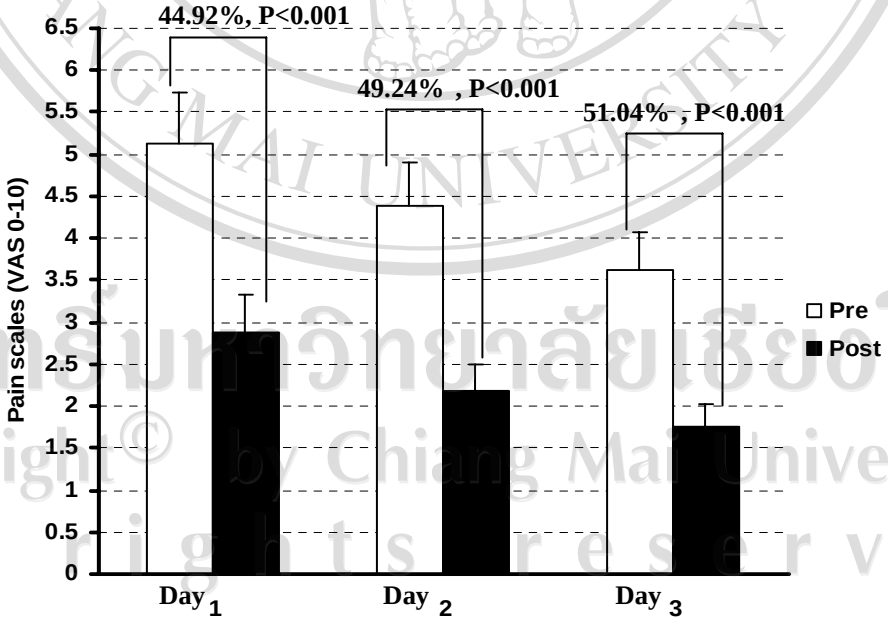

Figure 2 Average pain visual analog scales of sport massage in combination with lumbopelvic stability training (Mean ± SEM).

Table 2 Average pain on visual analog scales following application of therapeutic techniques during day 1, 2, and 3.

		Massage (Mas)	Sport massage with lumbopelvic stability training (Mas & LPS)	Comparisons between techniques
Day 1	Pre (Mean ± SD)	4.00 ± 1.09	5.12 ± 2.47	[a] = (Mas & LPS vs Mas ; p<0.001)
	Post (Mean ± SD)	3.06 ± 1.43	2.87 ± 1.85	
	% Change	26.04	44.92 [a]	
	P-value (Pre-Post)	p<0.001	p<0.001	
Day 2	Pre (Mean ± SD)	4.06 ± 1.09	4.37 ± 2.06	[a] = (Mas & LPS vs Mas ; p<0.001)
	Post (Mean ± SD)	2.93 ± 1.52	2.18±1.27	
	% Change	26.94	49.24 [a]	
	P-value (Pre-Post)	p<0.001	p<0.001	
Day 3	Pre (Mean ± SD)	3.93 ± 1.34	3.62 ± 1.74	[a] = (Mas & LPS vs Mas ; p<0.001)
	Post (Mean ± SD)	2.62 ± 1.31	1.75 ± 1.12	
	% Change	35.10 [c]	51.04 [a]	
	P-value (Pre-Post)	p<0.001	p<0.001	

[a] = Comparisons between techniques (the sport massage with lumbopelvic stability training vs the sport massage technique [p<0.001]).

The figure 2 and table 2 showed average pain visual analog scales of sport massage in combination with lumbopelvic stability training. Following the sport massage in combination with lumbopelvic stability training, the percent changes of the average pain scales at day 1, 2, and 3 were reduced by 44.92% ($F_{(1,15)}$=48.60 ; p<0.001), 49.24% ($F_{(1,15)}$= 46.99 ; p<0.001), and 51.04% ($F_{(1,15)}$=35.52 ; p<0.001), respectively.

Comparing pre-value of VAS scores between conditions demonstrated that there had the similar baseline to start with ($F_{(1,15)}$ = 5.08, p>0.05). A comparison for the mean reduction on pain visual analog scales between techniques demonstrated that sport massage in combination with lumbopelvic stability training significantly demonstrated greater effect in reduction of an average pain than sport massage technique. This effect was also demonstrated on day 1, day 2, and day 3 (Table 2).

3. Pressure pain threshold

Pressure pain thresholds between pre- and post-applications of sport massage condition over upper trapezius muscle and L4-5 were demonstrated in tables 3 and 4 and figures 3 and 4.

The result indicated that pressure pain threshold over upper trapezius muscle increased after receiving sport massage in day 1, day 2 and day 3. The percent changes of the pressure pain threshold of day 1, 2, and 3 increased about 14.15% ($F_{(1,15)}$=19.85 ; p<0.001), 10.91% ($F_{(1,15)}$=50.48 ; p<0.001), and 11.51% ($F_{(1,15)}$= 26.83 ; p<0.001), respectively. Moreover, the pressure pain threshold over L4-5 increased about 19.42% ($F_{(1,15)}$=71.97 ; p<0.001), 12.25% ($F_{(1,15)}$=11.69 ; p<0.001), and 12.88% ($F_{(1,15)}$= 49.57 ; p<0.001), respectively.

Table 3 Pressure pain threshold over upper trapezius muscle following application of therapeutic techniques during day 1, 2, and 3.

		Massage (Mas)	Sport massage with lumbopelvic stability training (Mas & LPS)	Comparisons between techniques
Day 1	Pre (Mean ± SD)	371.31 ± 112.07	377.85 ± 60.58	NS
	Post (Mean ± SD)	423.15 ± 133.41	470.98 ± 69.61	
	% Change	14.15	25.66	
	P-value (Pre-Post)	p<0.001	p<0.001	
Day 2	Pre (Mean ± SD)	415.86 ± 126.96	474.91 ± 74.16	NS
	Post (Mean ± SD)	456.69 ± 130.87	558.42 ± 81.03	
	% Change	10.91	18.11	
	P-value (Pre-Post)	p<0.001	p<0.001	
Day 3	Pre (Mean ± SD)	467.41 ± 147.32	534.61 ± 79.69	NS
	Post (Mean ± SD)	519.31 ± 167.10	631.65 ± 98.61	
	% Change	11.51	18.64	
	P-value (Pre-Post)	p<0.001	p<0.001	

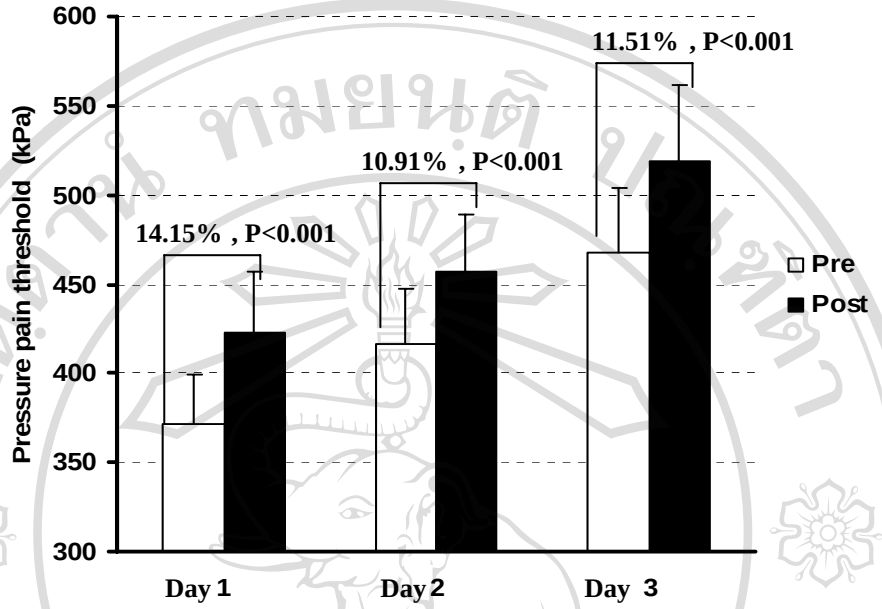

Figure 3 Pressure pain threshold over upper trapezius muscles in the sport massage condition (Mean ± SEM).

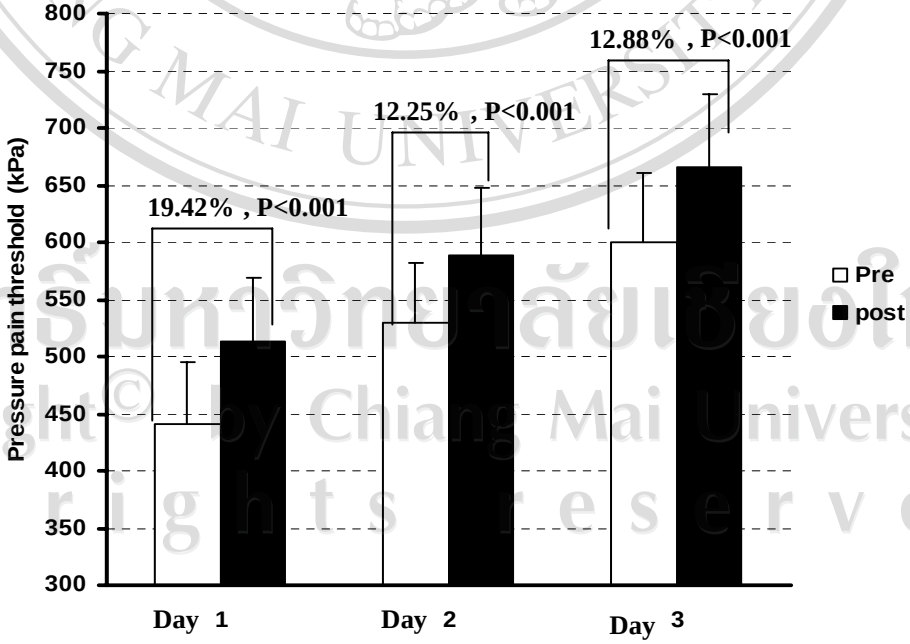

Figure 4 Pressure pain threshold over L4-5 in the sport massage condition (Mean ± SEM).

Table 4 Pressure pain threshold over L4-5 following application of therapeutic techniques during day 1, 2, and 3.

		Massage (Mas)	Sport massage with lumbopelvic stability training (Mas & LPS)	Comparisons between techniques
Day 1	Pre (Mean ± SD)	440.64 ± 215.47	472.28 ± 98.64	NS
	Post (Mean ± SD)	512.65 ± 227.23	560.09 ± 90.10	
	% Change	19.42	19.95	
	P-value (Pre-Post)	p<0.001	p<0.001	
Day 2	Pre (Mean ± SD)	528.76 ± 214.35	565.34 ± 100.50	NS
	Post (Mean ± SD)	587.85 ± 235.06	658.88 ± 110.75	
	% Change	12.25	16.92	
	P-value (Pre-Post)	p<0.001	p<0.001	
Day 3	Pre (Mean ± SD)	598.69 ± 242.74	661.38 ± 124.79	NS
	Post (Mean ± SD)	665.73 ± 255.85	762.08 ± 129.20	
	% Change	12.88	15.68	
	P-value (Pre-Post)	p<0.001	p<0.001	

The pressure pain thresholds under the condition of sport massage in combination with lumbopelvic stability training were showed in table 3 and 4 and figure 5 and 6. The percent changes of pressure pain threshold over upper trapezius muscles in the sport massage in combination with lumbopelvic stability training increased 25.66% ($F_{(1,15)}$=171.81 ; p<0.001), 18.11% ($F_{(1,15)}$=116.04 ; p<0.001), and 18.64% ($F_{(1,15)}$= 86.70 ; p<0.001) at day 1, 2, and 3, respectively. The percent changes of pressure pain threshold over L4-5 at day 1, 2, and 3 were increased about

19.95% ($F_{(1,15)}$=135.27 ; p<0.001), 16.92% ($F_{(1,15)}$=90.11 ; p<0.001), and 15.68% ($F_{(1,15)}$= 201.66 ; p<0.001), respectively.

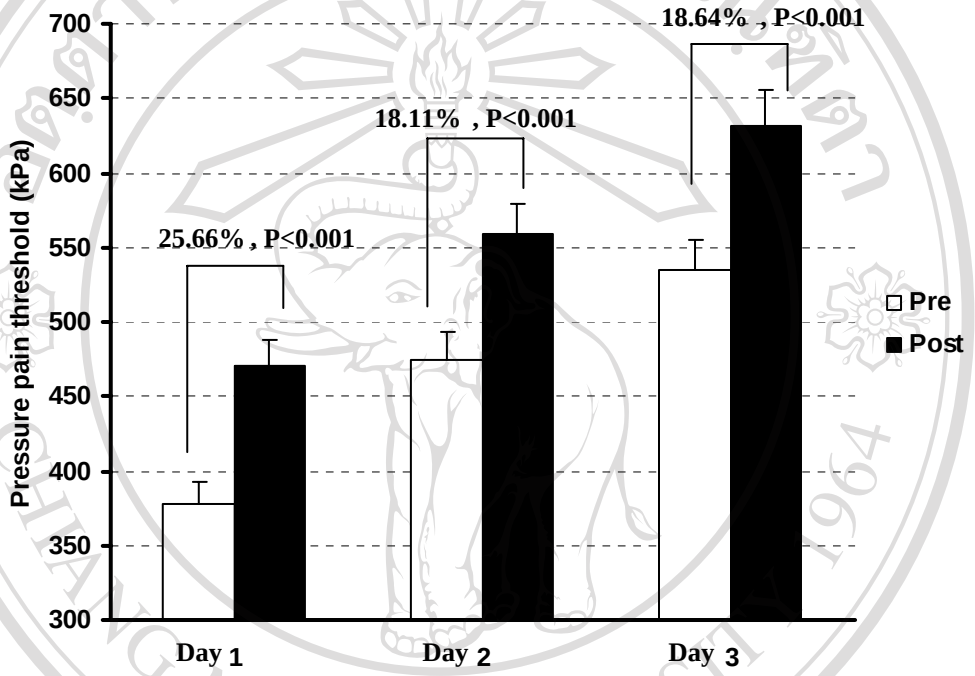

Figure 5 Pressure pain threshold over upper trapezius muscle under the condition of sport massage in combination with lumbopelvic stability training (Mean ± SEM).

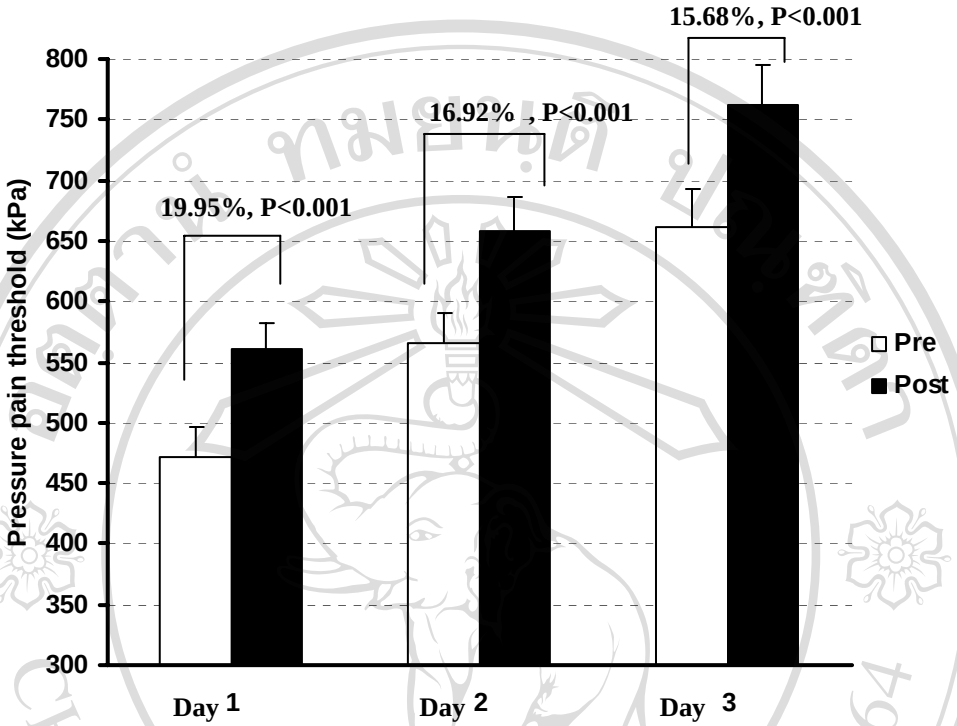

Figure 6 Pressure pain threshold over L4-5 under the condition of sport massage in combination with lumbopelvic stability training (Mean ± SEM).

Comparing pre-value of pressure pain threshold (upper trapeziue and L4-5) between conditions demonstrated that there had the similar baseline to start with ($F_{(1,15)} > 0.14$, $p>0.05$). To compare the effectiveness between techniques, the result showed that the sport massage in combination with lumbopelvic stability training demonstrated a greater effect in reducing pain perception over upper trapezius muscle and L4-5 (Tables 3 and 4) than the sport massage technique. However, its superior effect did not reach statistic significance when comparing to the sport massage.

4. Blood flow

Blood flow of the sport massage condition between pre- and post-applications were demonstrated in table 5 and figure 7. This result showed that blood flow increased after receiving sport massage in day 1, day 2 and day 3. The percent changes of day 1, 2, and 3 increased about 122.94% ($F_{(1,15)}$=23.68 ; p<0.001), 114.00% ($F_{(1,15)}$=69.86 ; p<0.001), and 112.36% ($F_{(1,15)}$=54.20 ; p<0.001), respectively.

Table 5 Blood flow following application of therapeutic techniques during day 1, 2, and 3.

		Massage (Mas)	Sport massage with lumbopelvic stability training (Mas & LPS)	Comparisons between techniques
Day 1	Pre (Mean ± SD)	11.03 ± 2.09	13.78 ± 3.04	NS
	Post (Mean ± SD)	24.92 ± 12.44	30.48 ± 4.91	
	% Change	122.94	131.17	
	P-value (Pre-Post)	p<0.001	p<0.001	
Day 2	Pre (Mean ± SD)	10.96 ± 2.23	13.54 ± 2.71	NS
	Post (Mean ± SD)	23.37 ± 6.95	32.22 ± 5.30	
	% Change	114.00	145.22	
	P-value (Pre-Post)	p<0.001	p<0.001	
Day 3	Pre (Mean ± SD)	11.49 ± 1.59	12.98 ± 2.39	NS
	Post (Mean ± SD)	24.60 ± 7.99	32.20 ± 4.94	
	% Change	112.36	152.21	
	P-value (Pre-Post)	p<0.001	p<0.001	

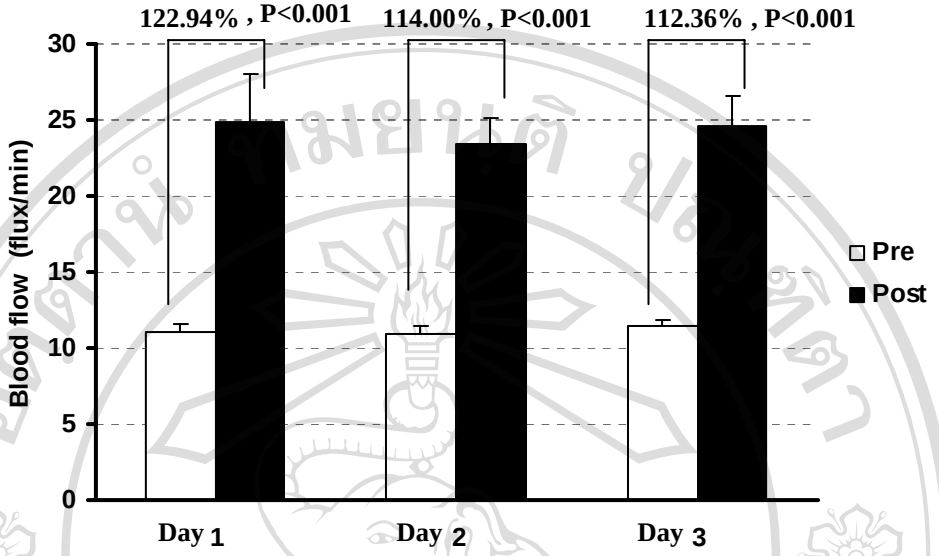

Figure 7 Blood flow of the sport massage condition (Mean ± SEM).

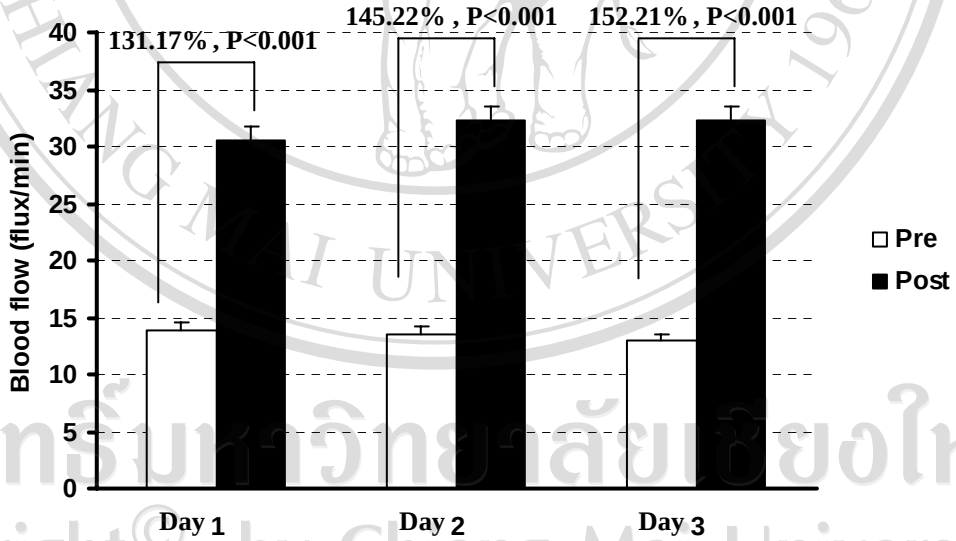

Figure 8 Blood flow of sport massage in combination with lumbopelvic stability training (Mean ± SEM).

Blood flow under the condition of sport massage in combination with lumbopelvic stability training were showed in table 5 and figure 8. The percent changes of blood flow in the sport massage in combination with lumbopelvic stability training, the percent changes of blood flow increased 131.17% ($F_{(1,15)}$=137.96 ; p<0.001), 145.22% ($F_{(1,15)}$=182.34 ; p<0.001), and 152.21% ($F_{(1,15)}$= 353.50 ; p<0.001) at day 1, 2, and 3, respectively.

Comparing pre-value of blood flow between conditions demonstrated that there had the fluctuated pattern of blood flow among the condition ($F_{(1,15)}$ = 8.45, p<0.05), these may be the diurnal effect of the sympathetic tone. In comparison between the techniques, the result indicated that blood flow increased dramatically after receiving the sport massage in combination with lumbopelvic stability training than that of the sport massage technique. However, the statistic significance did not reach when comparing between techniques (Table 5).

5. Lumbopelvic stability levels

Lumbopelvic stability levels under the sport massage condition between pre- and post-applications were demonstrated in figure 9. The result showed that the lumbopelvic stability levels increased minimally after receiving sport massage in day 1, day 2 and day 3. In day 1, the lumbopelvic stability levels at pre-application was ranged from 2 to 5, after receiving sport massage only two subjects increased in lumbopelvic stability levels and fourteen subjects were still not change. However, the range of post-application in this condition was still in the same level of 2 to 5. In day 2, there were five subjects increase and eleven subjects were not change in

lumbopelvic stability levels. Range of lumbopelvic stability levels at pre- application was 2 to 5 and after received sport massage, range of lumbopelvic stability levels was 3 to 5. In day 3, there were five subjects increase in lumbopelvic stability levels and eleven subjects were not change. Range of lumbopelvic stability levels at pre-application was 3 to 4 and post- application was 3 to 6.

Table 6 Lumbopelvic stability levels following application of therapeutic techniques during day 1, 2, and 3.

		Massage (Mas)	Sport massage with lumbopelvic stability training (Mas & LPS)	Comparisons between techniques
Day 1	Pre (Mean ± SD)	2.93 ± 0.68	3.12 ± 0.50	NS
	Post (Mean ± SD)	3.06 ± 0.68	3.25 ± 0.68	
	% Change	5.20	3.64	
	P-value (Pre-Post)	NS	NS	
Day 2	Pre (Mean ± SD)	2.93 ± 0.68	3.25 ± 0.57	NS
	Post (Mean ± SD)	3.25 ± 0.57	3.68 ± 0.70	
	% Change	13.54	14.58	
	P-value (Pre-Post)	$p<0.05$	$p<0.05$	
Day 3	Pre (Mean ± SD)	3.31 ± 0.60	3.68 ± 0.60	NS
	Post (Mean ± SD)	3.62 ± 0.95	3.87 ± 0.80	
	% Change	8.54	4.89	
	P-value (Pre-Post)	$p<0.05$	NS	

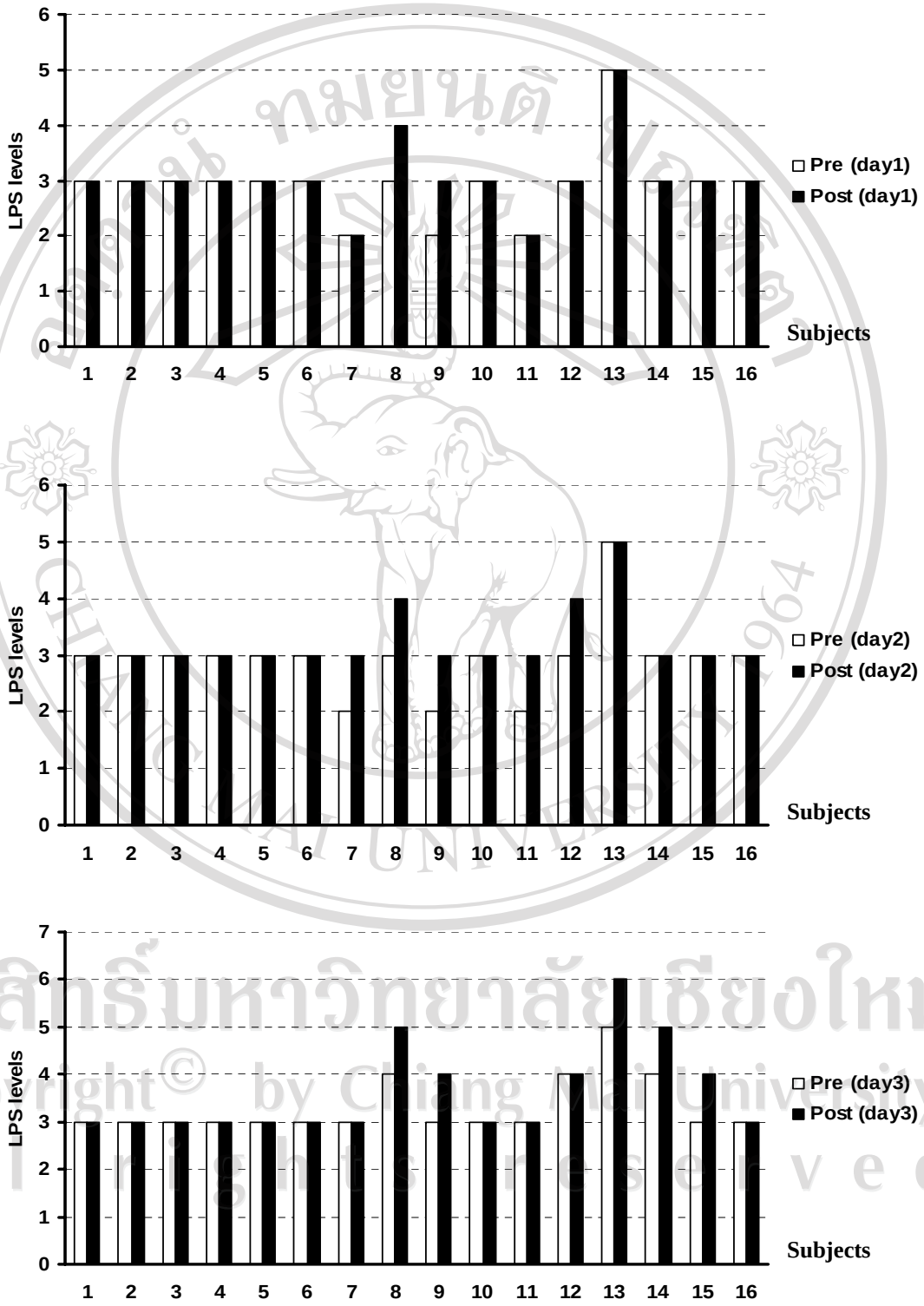

Figure 9 Lumbopelvic stability levels of the sport massage condition in Day 1, 2, 3.

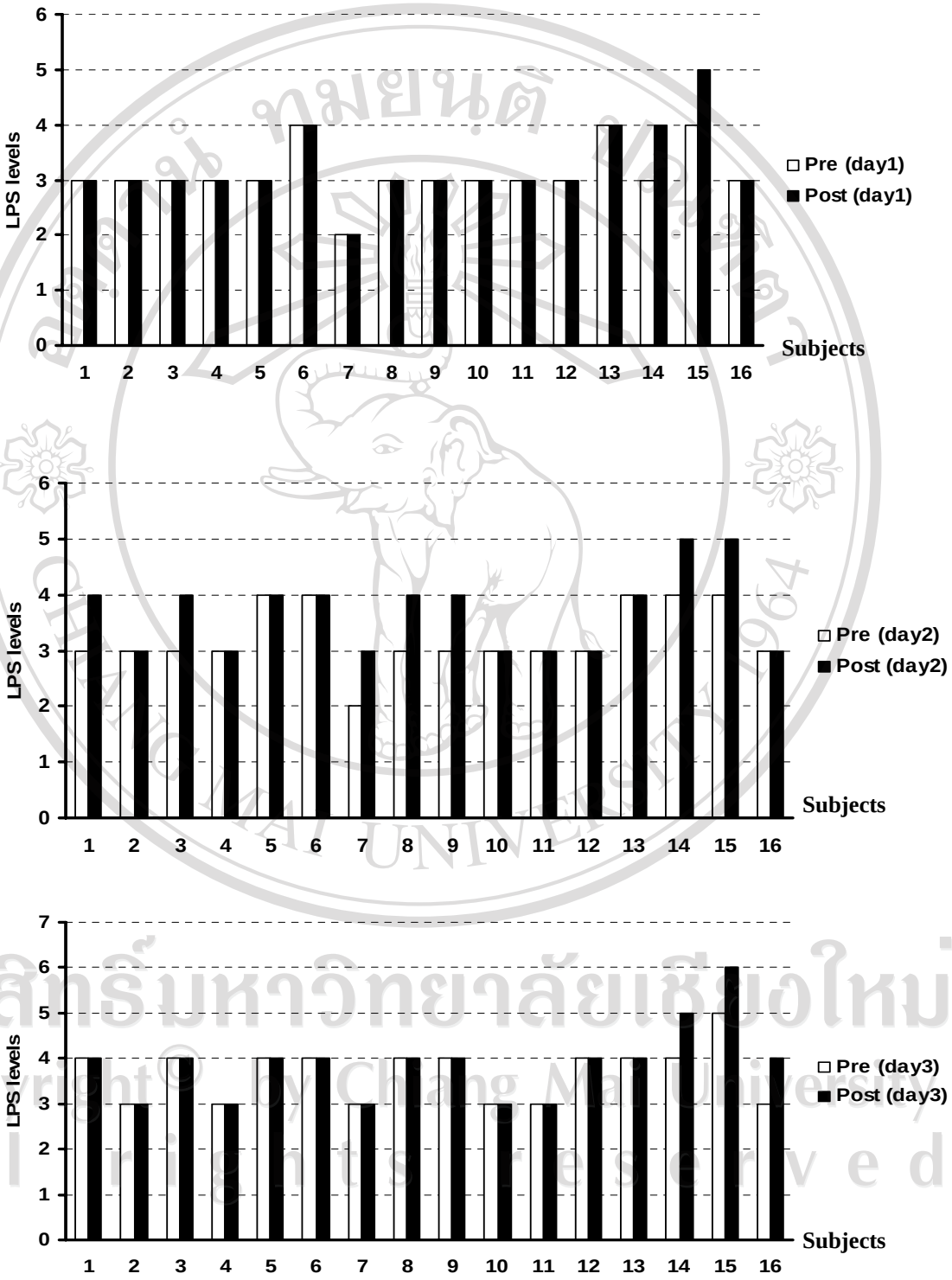

Figure 10 Lumbopelvic stability levels of sport massage in combination with lumbopelvic stability training in Day 1, 2, 3.

Lumbopelvic stability levels under the condition of sport massage in combination with lumbopelvic stability training were showed in figure 10. In day 1, there were two subjects increased in lumbopelvic stability levels and fourteen subjects were not change. Range of lumbopelvic stability levels at pre-application was 2 to 4 and after received sport massage in combination with lumbopelvic stability training, range of lumbopelvic stability levels was 2 to 5. In day 2, range of lumbopelvic stability levels at pre-application was 2 to 4 and post-application was 3 to 5. There were nine subjects increase in lumbopelvic stability levels after received sport massage in combination with lumbopelvic stability training, and seven subjects were not change. In day 3, there were three subjects increased in lumbopelvic stability levels and thirteen subjects were not change in lumbopelvic stability levels. Range of lumbopelvic stability levels at pre-application was 3 to 5, and after received sport massage in combination with lumbopelvic stability training, range of lumbopelvic stability levels was 3 to 6.

Comparing pre-value of in lumbopelvic stability levels between conditions demonstrated that there had the similar baseline to start with ($F_{(1,15)} = 1.90$, $p > 0.05$). To compare the outcome in lumbopelvic stability levels between techniques, the result demonstrated that the lumbopelvic stability levels seemed to be changed minimally under both conditions (Table 6), but the sport massage in combination with lumbopelvic stability training showed the trend of greater effect than the sport massage. Unfortunately, this trend of differences was not statistically significant.