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APPENDICES

APPENDIX A

Table I Physical characteristic of AR group.

AR #	Age (Year)	Weight (kg.)	Height (cm.)	HRrest (bpm)	[LA] rest (mmol/l)	HRmax (bpm)	VO2max (ml/kg/min)
1B	26	78.7	178	56	1.27	172	41.7
2A	26	64.0	167	74	0.44	176	45.7
3R	20	82.0	181	58	0.93	175	45.6
4T	21	65.3	181	58	1.25	172	50.5
5R	21	89.8	175	74	1.13	175	54.3
6S	19	70.0	169	65	0.58	183	40.7
7T	21	56.0	168	64	0.94	188	52.4
8B	21	65.3	176	61	1.12	181	48.5
9F	21	56.6	173	79	1.26	188	44.1
10B	23	69.7	172	64	0.75	183	42.6
11F	18	64.3	176	58	1.60	175	40.4
12F	28	64.0	175	68	1.03	173	46.4
13A	22	68.0	181	50	1.11	178	55.5
14A	21	67.2	170	64	1.44	191	48.5
15B	21	64.0	173	69	0.95	197	52.2
16A	20	55.0	172	58	1.31	178	62.1
17A	18	54.2	173	70	1.91	183	65.3
18A	20	68.0	173	60	1.74	189	54.7
Mean	21.50	66.78	174.06	63.89	1.15	180.94	49.51
SD	2.63	9.32	4.28	7.40	0.38	7.30	7.07

B = BASKETBALL

R = RUGBY

T = TEAKWONDO

F = FOOTBALL

A = ATHLETIC

S = SWIMMING

Table II Physical characteristics of MR group.

MR #	Age (Year)	Weight (kg.)	Height (cm.)	HRrest (bpm)	[LA] rest (mmol/l)	HRmax (bpm)	VO2max (ml/kg/min)
1B	25	75.5	179	64	1.61	175	46.2
2A	26	65.3	166	71	0.83	187	49.3
3R	20	85.0	180	57	0.53	173	44.8
4T	21	65.2	181	77	0.93	172	52.1
5B	22	72.5	190	61	1.13	170	40.7
6B	19	87.0	191	54	0.90	165	40.9
7A	21	71.0	170	65	1.04	192	47.1
8B	21	68.3	178	58	0.79	189	53.6
9S	19	67.2	170	75	1.25	194	50.2
10F	21	56.6	173	78	1.10	186	57.5
11B	23	71.4	172	61	1.16	181	44.7
12F	18	67.3	176	61	1.72	174	44.9
13A	22	65.0	182	52	0.89	179	55.6
14B	19	69.0	177	58	1.43	184	50.3
15B	20	61.4	171	61	1.27	189	48.8
16B	19	71.2	173	57	1.11	179	69.0
17T	21	59.0	171	71	1.52	189	50.5
18A	20	68.0	173	60	0.90	179	64.3
19T	21	57.0	168	69	0.81	194	50.4
20R	21	88.8	175	75	1.51	180	48.4
Mean	20.95	69.59	175.80	64.25	1.12	181.55	50.47
SD	1.99	9.01	6.65	7.93	0.31	8.38	7.05

B = BASKETBALL

R = RUGBY

T = TEAKWONDO

F = FOOTBALL

A = ATHLETIC

S = SWIMMING

Table III Physical characteristics of PR group.

PR #	Age (Year)	Weight (kg.)	Height (cm.)	HRrest (bpm)	[LA] rest (mmol/l)	HRmax (bpm)	VO2max (ml/kg/min)
1B	24	76.0	180	68	1.80	178	48.9
2F	24	75.0	175	83	0.93	194	40.3
3A	26	65.2	166	74	0.64	180	44.4
4F	21	56.6	173	64	1.32	185	49.0
5F	21	60.0	170	72	0.32	198	41.8
6F	25	75.3	176	70	1.19	194	45.1
7F	19	65.0	178	68	0.92	198	48.0
8T	21	56.8	168	59	0.61	189	48.7
9R	20	84.9	180	57	0.71	179	45.4
10B	21	65.0	181	62	1.12	174	53.9
11S	19	65.3	169	67	1.54	189	43.6
12B	23	69.8	172	64	0.94	198	43.3
13F	18	64.1	176	64	1.73	172	44.3
14A	22	70.0	180	51	0.98	180	56.6
15A	21	71.3	170	66	1.15	194	49.5
16P	22	60.2	170	51	0.74	174	53.9
17A	22	53.9	164	72	1.29	195	45.6
18T	21	59.0	171	71	1.89	181	47.6
19A	22	57.2	163	58	1.21	168	63.9
Mean	21.68	65.82	172.74	65.32	1.11	185.26	48.09
SD	2.06	8.18	5.58	7.95	0.43	9.81	5.71

B = BASKETBALL

R = RUGBY

T = TEAKWONDO

F = FOOTBALL

A = ATHLETIC

S = SWIMMING

P = POLO

APPENDIX B

Table I Blood lactate concentration of AR group.

ACTIVE RECOVERY							
#	rest	af.ex.0	5 min.	10 min.	15 min.	20 min	30 min.
1	1.27	7.10	7.98	6.69	6.03	5.12	3.28
2	0.44	10.00	10.26	9.68	9.20	8.33	4.00
3	0.93	10.97	12.45	11.30	10.41	8.55	4.91
4	1.25	9.24	12.16	8.26	7.88	5.82	3.08
5	1.13	10.88	11.53	9.28	7.74	5.43	3.39
6	0.58	6.76	8.51	8.85	7.08	6.39	3.80
7	0.94	8.68	10.11	8.05	7.94	5.68	2.36
8	1.12	9.11	11.97	8.12	7.78	6.55	3.95
9	1.26	9.59	14.31	14.63	12.04	9.76	6.76
10	0.75	8.73	9.30	8.05	5.99	5.10	2.46
11	1.60	6.58	6.50	5.30	3.76	3.17	2.09
12	1.03	9.39	12.19	11.74	9.12	7.09	5.43
13	1.11	8.61	8.67	7.66	6.04	3.89	2.76
14	1.44	9.70	10.62	8.77	8.01	6.43	3.59
15	0.95	9.09	11.98	10.52	8.13	5.65	4.88
16	1.31	13.13	12.24	9.77	7.42	5.24	2.61
17	1.91	10.47	10.52	7.93	6.42	4.49	2.47
18	1.74	10.93	11.87	9.39	5.11	4.46	2.31
<i>mean</i>	1.15	9.39	10.73	9.11	7.56	5.95	3.56
<i>SD</i>	0.38	1.62	1.95	2.07	1.93	1.68	1.26

Table II Blood lactate concentration of PR group.

PASSIVE RECOVERY							
#	rest	af.ex. 0	5 min.	10 min.	15 min.	20 min.	30 min.
1	1.80	7.61	8.47	7.42	7.34	5.67	5.00
2	0.95	9.03	9.39	8.83	8.13	6.53	5.19
3	0.64	9.28	11.07	11.80	9.61	8.12	5.35
4	1.32	10.84	14.01	10.76	9.35	8.03	5.29
5	0.36	9.12	10.21	9.10	8.19	6.59	5.98
6	1.19	8.87	10.91	10.95	10.10	9.65	6.59
7	0.92	7.89	13.60	12.42	10.38	8.58	6.78
8	0.61	9.06	14.82	14.10	8.05	8.01	7.69
9	0.71	9.59	10.65	10.15	9.22	6.98	5.23
10	1.12	10.02	12.57	9.40	7.18	5.73	4.07
11	1.54	10.64	13.34	13.02	11.24	9.95	6.70
12	0.94	8.52	11.12	10.43	8.84	5.91	4.98
13	1.73	11.10	11.70	10.98	8.82	6.94	4.96
14	0.98	12.75	14.41	14.38	12.43	9.51	5.21
15	1.15	9.94	11.84	10.88	10.44	7.54	5.92
16	0.74	8.12	10.70	10.03	8.28	7.07	4.36
17	1.29	8.04	13.73	15.16	13.18	10.45	7.98
18	1.89	11.85	15.29	15.14	14.04	11.59	9.95
19	1.21	11.65	13.48	12.17	10.52	8.84	6.38
<i>mean</i>	1.11	9.68	12.17	11.43	9.75	7.98	5.98
<i>SD</i>	0.42	1.46	1.93	2.18	1.91	1.68	1.42

Table III Blood lactate concentration of MR group.

MASSAGE RECOVERY							
#	rest	af.ex. 0	5 min.	10 min.	15 min.	20 min.	30 min.
1	1.61	7.92	8.50	7.88	6.74	5.70	4.41
2	0.85	9.31	8.40	8.58	6.59	5.26	4.06
3	0.53	9.86	11.25	8.33	6.73	5.94	4.49
4	0.93	8.24	11.25	6.73	5.82	4.44	4.30
5	1.13	8.45	9.27	7.05	6.98	6.64	5.36
6	0.90	8.15	10.32	10.19	9.65	7.51	5.72
7	1.04	10.98	13.95	10.21	9.12	7.54	5.69
8	0.79	8.92	11.05	8.04	7.12	6.54	4.53
9	1.25	10.07	10.96	10.70	9.02	8.61	6.49
10	1.10	7.41	13.41	10.10	9.24	7.34	4.59
11	1.16	8.81	10.20	9.52	8.23	6.27	4.13
12	1.72	8.98	8.81	7.88	5.63	4.82	3.75
13	0.89	12.05	12.50	11.64	9.54	8.31	5.37
14	1.43	10.43	11.18	10.19	8.65	6.97	4.89
15	1.27	11.71	13.27	10.86	9.51	7.34	6.73
16	1.11	9.34	13.18	11.49	8.98	7.01	4.53
17	1.52	9.63	11.93	9.45	8.74	7.05	5.04
18	0.90	8.91	8.82	8.07	7.55	6.11	4.86
19	0.81	10.36	12.06	10.60	9.51	7.06	5.96
20	1.51	9.86	10.21	9.85	7.63	5.99	4.17
<i>mean</i>	1.12	9.47	11.03	9.37	8.05	6.62	4.95
<i>SD</i>	0.31	1.23	1.72	1.45	1.32	1.08	0.83

APPENDIX C

Lactate Analyzer

1. Press **MENU** until the following display appears.

```

RUN-0 RECALL-1
SETUP-2 DIAG-3
  
```

2. Select Run by pressing **ENTER**.

```

SAMPLE-0
CAL-1 PRIME-2
  
```

3. Select the Calibration cycle by pressing 1, then **ENTER**.

```

WAIT
  
```

If there is problem, the display will read

```

INJECT 5 mmol/L
STANDARD
  
```

4. Inject the 5 mmol/L standard. When you remove the injection device, *you should see*

```

RUNNING...
STIR ON
  
```

```

RUNNING...
REF ON
  
```

```

WASHING...
  
```

```

WAIT
  
```

```

INJECT 5 mmol
CALIBRATOR CHECK
  
```

5. Inject the 5 mmol/L standard to verify a successful calibration. *Now you should see*

```

RUNNING...
STIR ON
  
```

```

RUNNING...
REF ON
  
```

WASHING

CAL CHECK
XX.XXmmol

The acceptable range is from 4.90 to 5.10 mmol/L. If the result is outside of this range repeat the calibration process in order to eliminate the possibility of improper injection technique. If the calibration was successful press **MENU**.

SAMPLE -0
CAL -1 PRIME -2

6. Check the linearity of the membrane by injecting a sample of either the YSI 2327 lactate standard

Press **ENTER**, and the display *will read...*

ENTER ID # XXX

No ID # is required so press **ENTER**, the display *will read...*

WAIT

INJECT SAMPLE

7. Inject the sample. When you remove the Syringejet or Injector, *you will see*

RUNNING
STIR ON

RUNNING
REF ON

#XXX.XX.Xxmmol/L
WASHING

MM/DD/YY HH:MM
#XXX.XX.Xxmmol/L

The sample result will be displayed along with the ID# (in this case 000), date, and time.

- 8 If the result is acceptable press **MENU** and the display *will read...*

SAMPLE-0
CAL-1 PRIME-2

You are now ready to measure samples.

Quality control for assay of lactate concentration

The assay of lactate concentration had been done by using automated lactate analyzer (YSI 1500 Sport, Ohio, USA). The standard lactate solution (5 mmol/l) is used as the test agent. Intra- assay variation was done by 20 repeated assay on the same day. Inter-assay variation was done by performing the assay once each day for 20 days. Mean, standard deviation and %CV were calculated and shown below.

$$\%CV = \frac{SD \times 100}{\bar{X}}$$

Intra-assay variation

5.2
5.16
5.86
5.09
5.19
4.96
5.15
5.15
4.86
5.25
4.54
4.7
4.5
4.93
5.22
4.67
4.73
4.73
4.76
4.35
4.95
0.345486
6.97943

\bar{x}

SD

%CV

Inter-assay variation

4.59
4.63
4.56
4.57
5.03
4.92
5.02
4.36
4.95
5.1
5.2
4.54
5.16
4.7
5.86
4.5
5.09
4.93
5.19
5.22
4.906
0.354733
7.23595

APPENDIX D

QMC (Quinton Metabolic Cart)

I. Calibration

1. Power up the QMC and allow it to warm up for at least 30 minutes prior to calibration.
2. From the Main Menu, select [**Calib**], then press [**Enter**].
3. Select **Analyzer Calibrate**, then press [**Enter**].
4. Select **Gas Autocal**, then press [**Enter**].
5. Within one minute, the gas analyzer will calibrate automatically. The screen will display the tolerance limits.
6. Select **Pneumotach Calibrate**, then press [**Enter**].
7. Enter environmental conditions, then press [**F10**]. **Do you want to save Edited Ambient Conditions? (YN) [Y]** appears on the display.
8. Press [**Enter**]. Patient data file update appears and Zero flow valts is highlighted in red in the upper right corner of the screen.
9. Adjust the Pneumotach zero control knob so that the Zero Flow reads $0.000v \pm 0.020v$.
10. Press [**F10**] when the pneumotach zero value is set.
11. Attach the 3-liter syringe to the breathing valve assembly, then follow the prompts on the bottom of the display.
12. Press [**Esc**] to return to the **Calib** submenu.
13. Select **BxB Calibrate**, then press [**Enter**]. **Calibrate BxB Response** appears.
14. Press [**Enter**]. The response and the delay times for the O₂ and CO₂ analyzers appear.
15. Press [**Esc**] twice to return to the **Main Menu**.

II. Patient

Before performing an exercise study you must enter the patient's biographical data.

1. From the Menu, select **Patient**, then press **[Enter]**.
2. Select **Enter New Patient**, then press **[Enter]**. The patient information display appears.
3. Enter all appropriate data, then press **[F10]**. The screen displays **Do you want to Save this**

Patient Data? [YN][Y].

4. Press **[Enter]** to return to Patient submenu, then press **[Esc]** to return to the Main Menu.

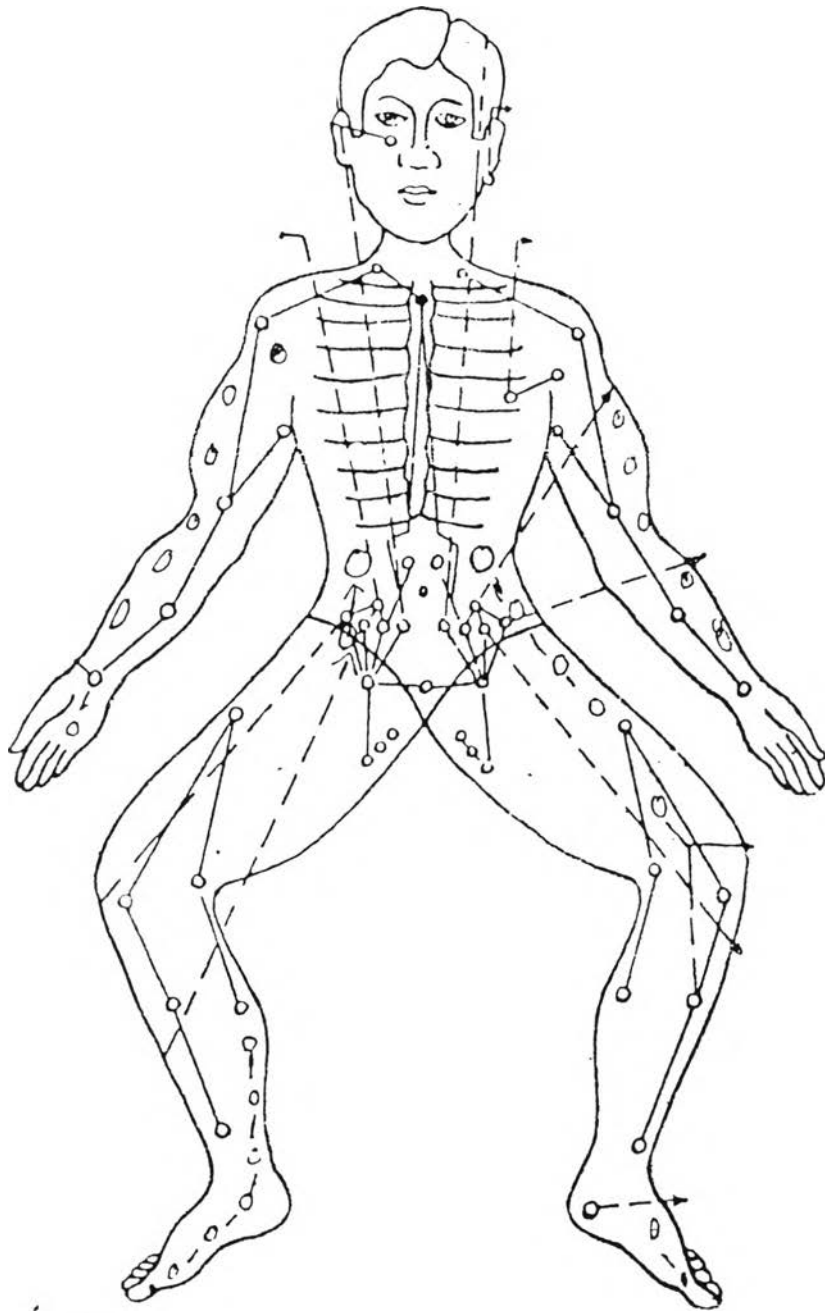
III. Test

Before starting an exercise study, make sure that:

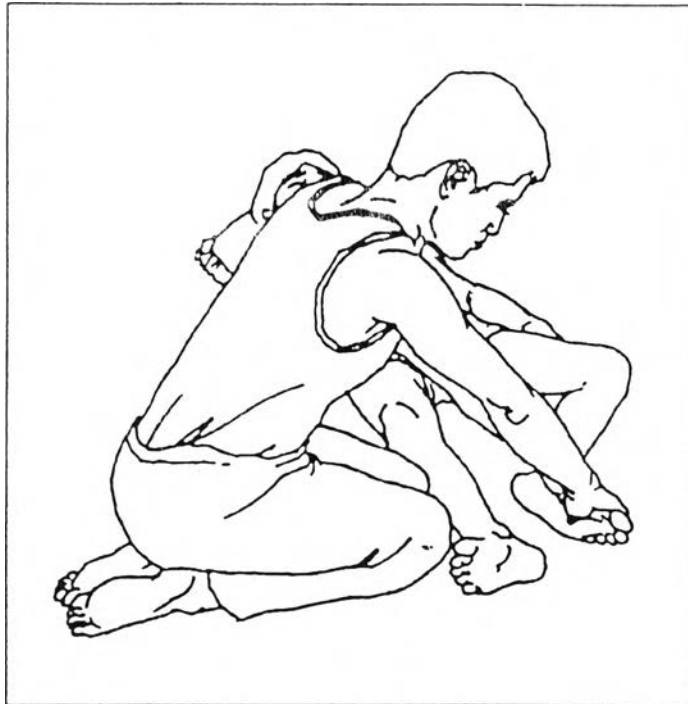
- You have explained the testing procedure to the patient.
- You have entered patient biographical data into the QMC.
- The QMC has been powered up for at least 30 minutes.
- You have calibrated the QMC.
- Headgear, breathing valve and expired hose are in place.
- The BxB line is in place.
- The patient is sitting comfortably on the cycle ergometer.
- The QMC is in the appropriate menu for Exercise Study.

APPENDIX E

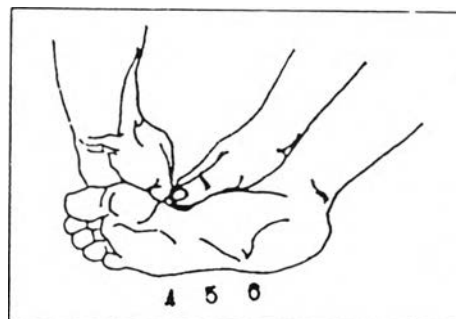
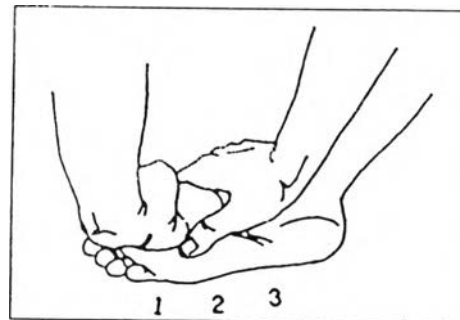
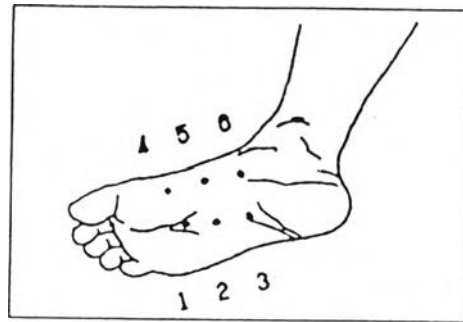
TRADITIONAL THAI MASSAGE



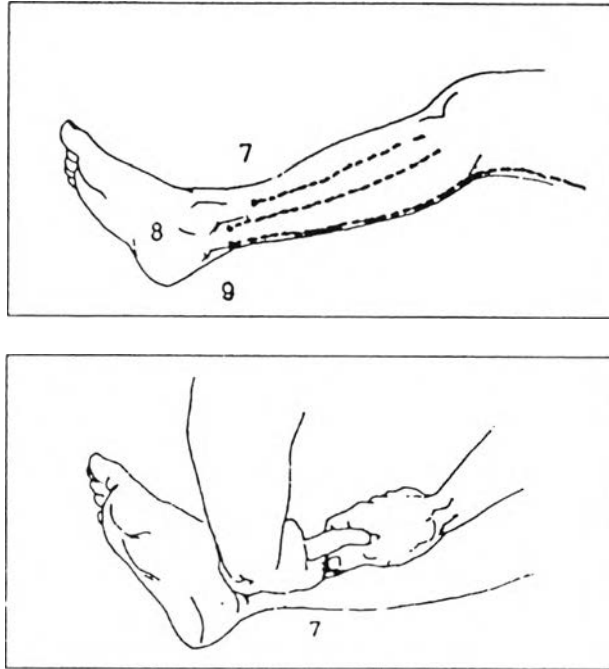
LEG MASSAGE



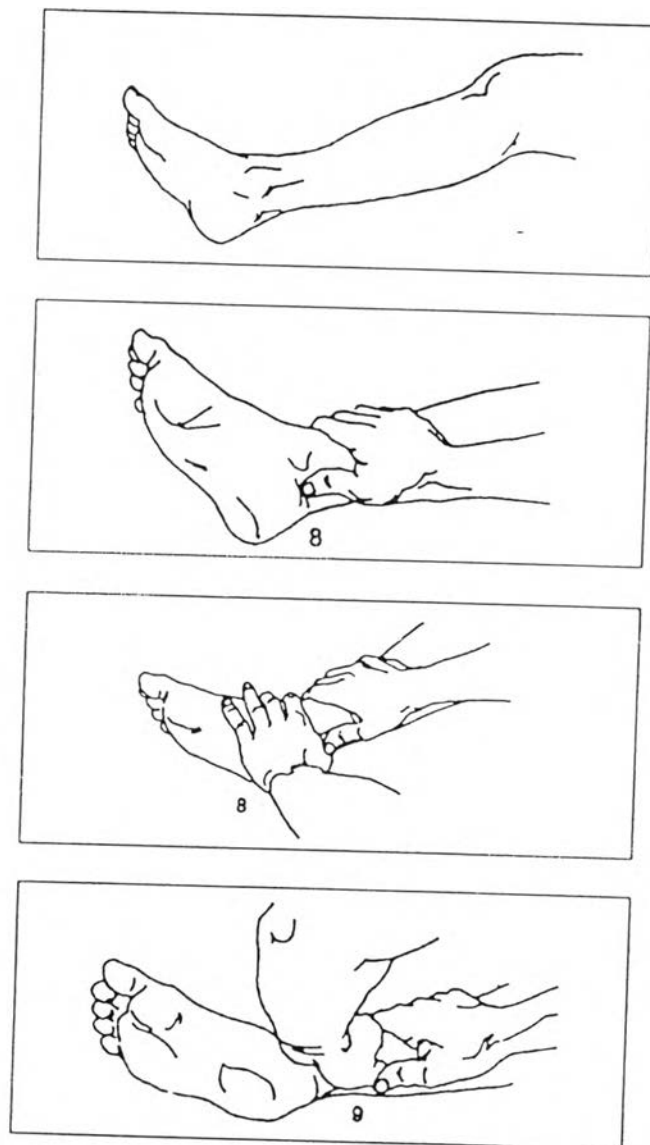
The giver kneels on the left side of the receiver near the feet (this is just to avoid confusion on the part of the reader and for clarity of explanation and illustration : sitting on the right side is also permissible all you have to do is reverse everything in the instructions, that is, changing left to right and vice versa).



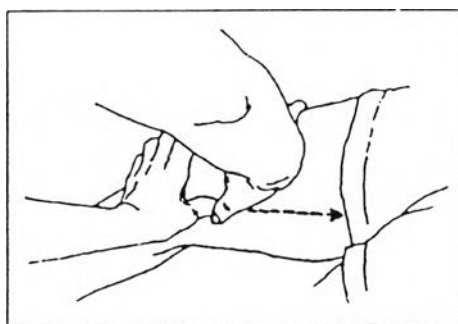
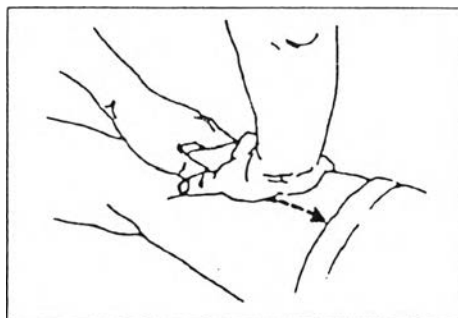
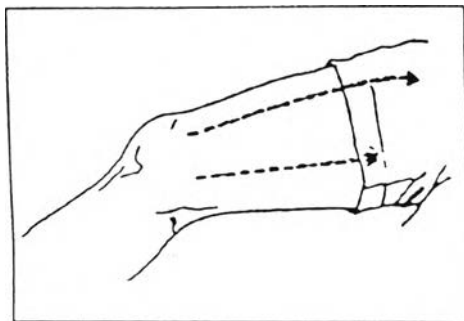
1. Massage begins on the right foot. The giver reaches over and bends the right leg slightly so that the sole of the foot is turned upward. Press on points 1, 2, 3 with two thumbs, one on top of the other, then press on points 4, 5, 6 following the underside of the bone which can be felt along the curve on the side of the foot. (The whole part of the sole could also be pressed in the same manner.)



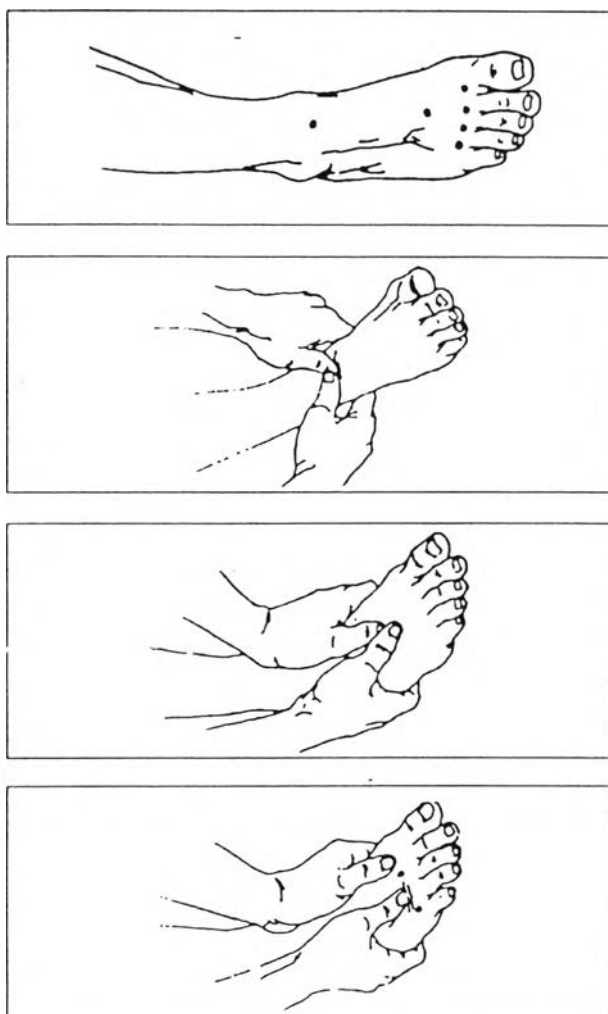
2. Straighten the leg out again and press with two thumbs, directly under the edge of the shin bone. Roll your thumbs slightly as if trying to get under the bone. Press along the line from ankle to knee, starting from point 7 (above the ankle bone).



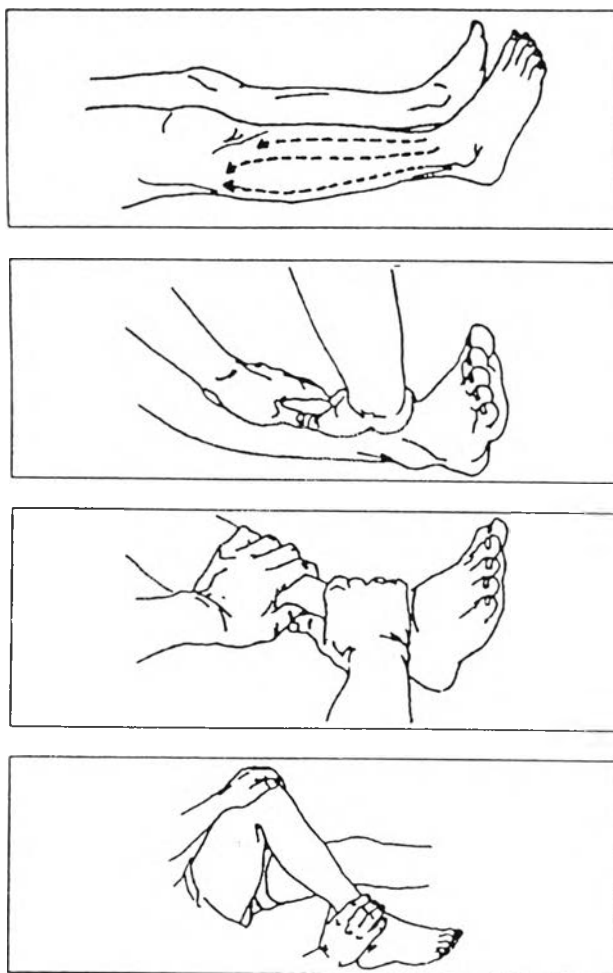
3. Press in the same manner from point 8 along the middle line of the calf muscle from ankle to knee. Then press on point 9 directly on the Achilles tendon and move all the way up to the upper leg on the back of the thigh. Working on the upper leg could become easier if the leg is bent slightly so that the back side of the thigh is more exposed.



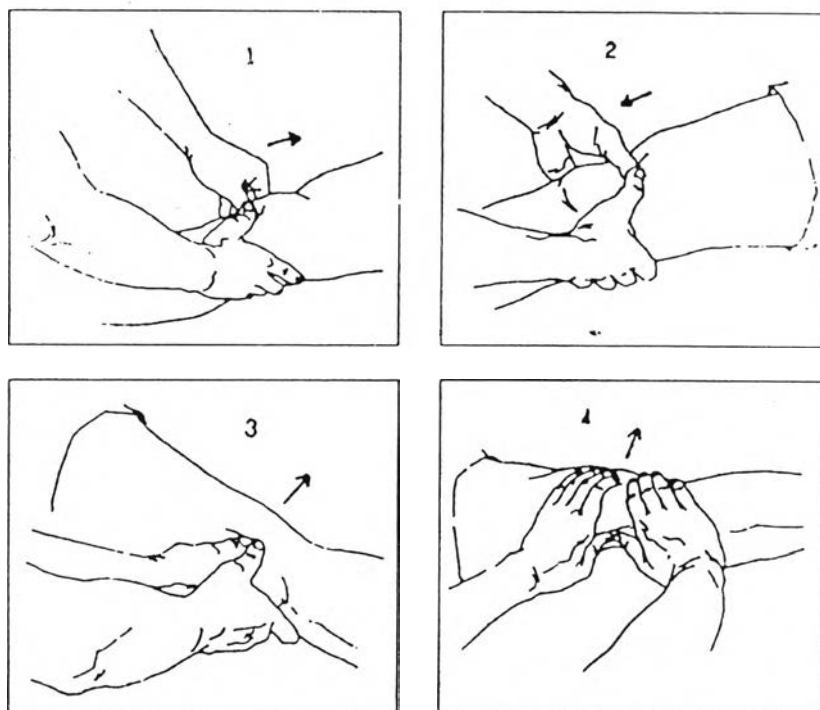
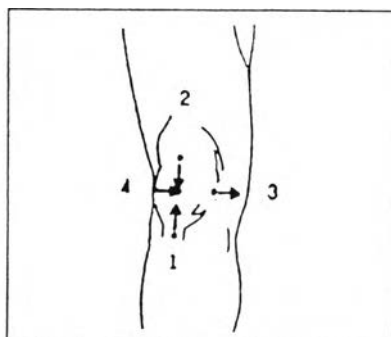
4. Straighten the leg once again and then on the inner side of the thigh using both thumbs together. The first line starts from a small dent above the knee. Another way to locate the starting point for this line is to draw an imaginary square around the kneecap and start from the upper corner on the inside of the thigh. Work your way up until you are close to the groin then move back to the second path which lies parallel to and under the first one. An indentation in the space between two muscles can be felt at the starting point on this line.



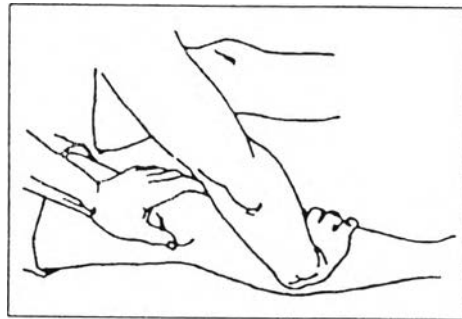
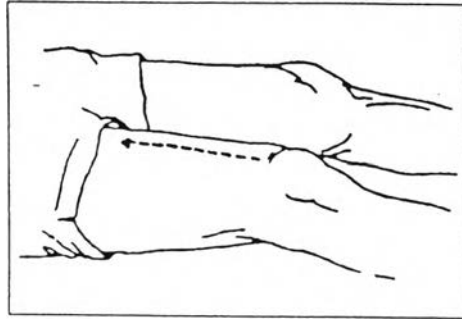
5. The give gets up at this point and moves over to the other side (right side) of the receiver. Still working on the same leg (right leg, in this case), he presses with both thumbs on the point where the shin bone meets the foot bones. The following point is on the top of the foot, then the thumbs are separated in order to press on the four points in the grooves between the toes. Press two points simultaneously but try to leave one point between the two being pressed so that the thumbs will not bump into each other.



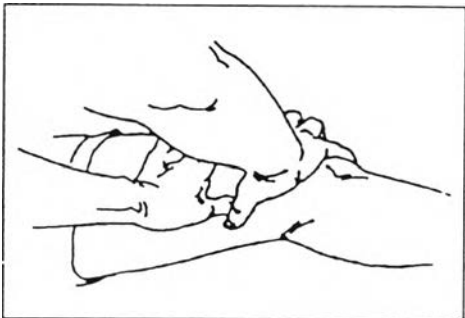
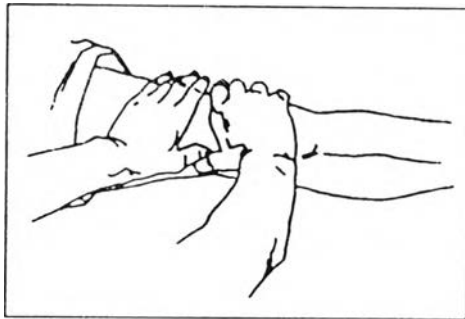
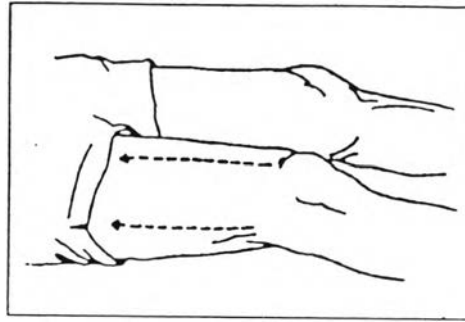
6. Work on the next three lines on the outer side of the leg using both thumbs, one on top of the other . The first line is next to the edge of the shin bone (remember always to roll your thumbs whenever you work on the edge of a bone). The second line can be located by feeling for a ridge above the ankle bone (the fibular). Press along the top side of this bone parallel to the first one. The third is farther down right below the fibular, and' also parallel to the second line. If this last line is hard to get at, you can bend the leg up and use one hand to pull on the knee while the other hand, using the thumb (pointing upward toward the knee), presses along the line.



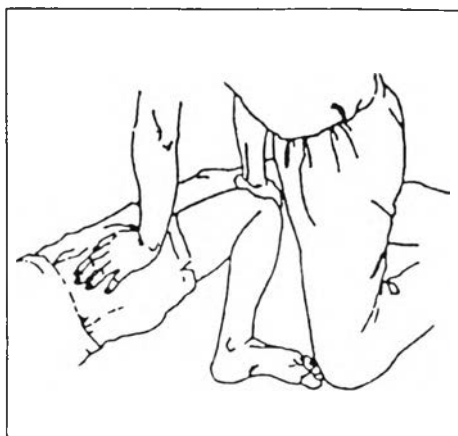
7. Work on the knee cap by pressing on the four points as indicated in the illustration. Press toward the centre of the knee cap on points 1, 2, 4 but push point 3 away in the opposite direction. For points 1 and 2, one thumb is placed on top of the other, the giver sits facing the receiver's head. For point 3, the giver sits face across, thumbs are placed side by side pointing away from the kneecap. For point 4, press with the thumb tips touching.



8. Using the heel of one hand (left hand in this case), press on the line directly above the knee. The hand should cup around the shape of the thigh with the thumb on one side and the fingers on the other, to prevent slipping. Fingers should be pointing toward the foot while the other hand rests lightly below the knee, keeping in mind the principle of making the “circuit of energy”.

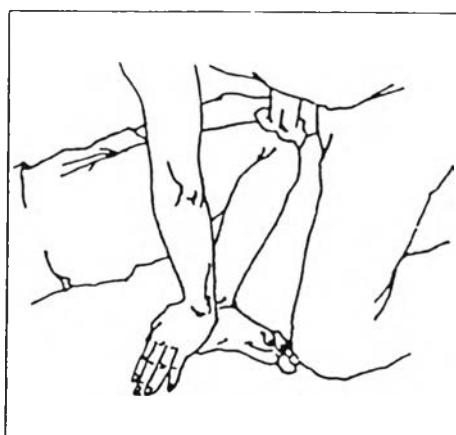


9. Press on the two lines on the outer side of the upper leg with both thumbs, one on top of the other. The first line starts at the upper corner of the imaginary square around the kneecap and the second one starts on the indentation between the two muscles below and parallel to the first line.

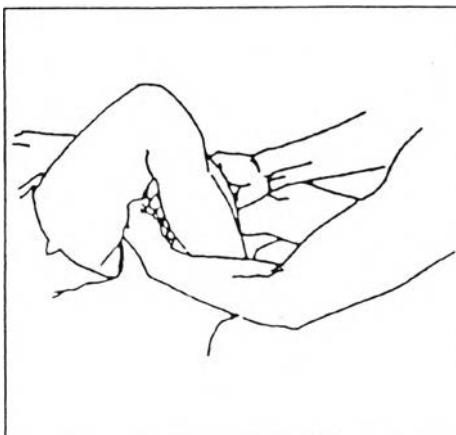


10. Bend the leg by picking the knee up and placing the sole of the foot touching the floor close to the hip. Then push the bent leg down toward the left knee so that the sole of the foot on the side of the small toes slides up and away from the floor while the big toe side is pressed down.

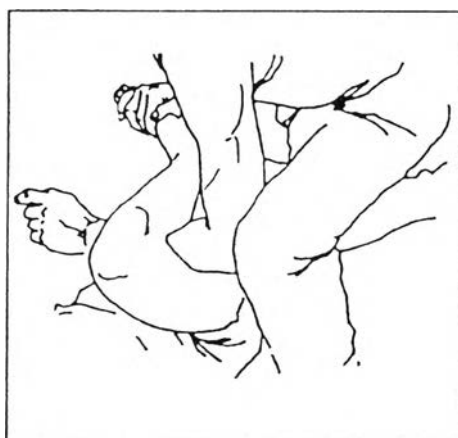
With one hand on each end of the leg, fingers pointing away from each other, push down and out, using the heels of the hands. Do this three times, each time moving the left hand a little closer to the right hand above the knee which stays in the same place.



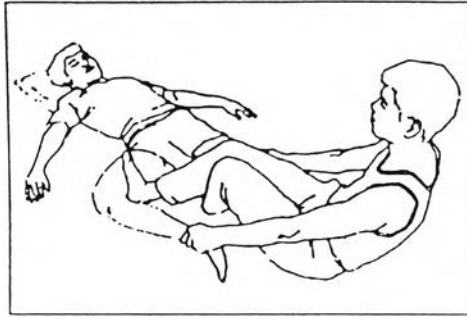
Then move the left hand to the side of the heel directly under the ankle bone, press both hands down and out once more.



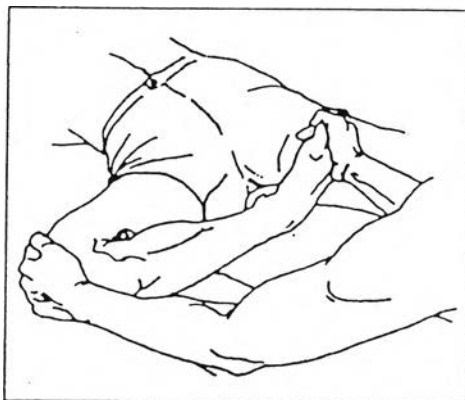
11. Release the hands so that the knee moves back to its former position away from and almost perpendicular to the floor. Slide the foot out a little; the leg is now like an A standing on the floor. Use both hands alternately to pull on the calf muscle while holding the foot in place with both knees from a kneeling position. Work up and down along the back of the calf a few times.



12. Lift leg and the foot away from the floor. With the right hand holding on to the right foot, insert the left wrist and lower arm between the calf and the back of the thigh. Press the right foot toward the abdomen so that the ankle is stretched, the calf is pressed on the arm and the arm is then pressed on the thigh. Move this arm up and down and press several times.



13. Turn the leg so that its outer side is touching the floor. Then, with the right foot, press on the back side of the right thigh. While the foot pushes out, the right hand grasps the recipient's left knee and the left hand grasps the right ankle, and then pull with both hands simultaneously. Work up from the area above the knee to the top of the thigh using either the outer edge of the foot or the heel. Repeat a few times.



14. Insert the left foot behind the receiver's right knee with the heel close to or touching the thigh. Fold the leg by pushing on the back of his foot toward the groin with the right hand and pull on the top of the knee with the left hand as if you are turning a big wheel. This is to stretch the muscles on the front of the leg and the ankle. In stretching, always keep in mind that each person has his own level of flexibility. Do it slowly and, once you reach the limit, try to hold still for a few seconds before releasing to give the muscles time to relax.



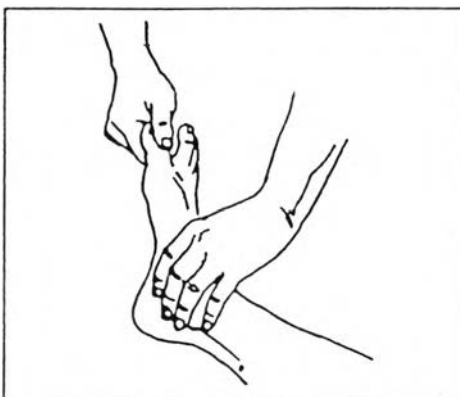
15. With the middle joint of the right hand index finger resting lightly on the upper corner of the pelvic bone, the heel of the hand is turned slightly inward so that it covers the spot directly above the artery on the groin. Place your left hand on top of the right hand and, leaning forward, slowly press your body weight on the area directly above the artery. Stay put in that position for 50 seconds then very slowly release the pressure. Upon this release, the receiver should feel a surge of warmth rushing toward the foot. This effect is caused by the rush of the blood down the leg in the femoral artery after the let up in pressure. This is believed to stimulate the flow of the “prana” as well as blood circulation. Hence, the Thai technical term for this is “pred pra-too lome” (opening the gate of the wind). The “wind” in this context means “prana”. Because the application of this technique can cause a strain on the heart, it is not advisable to use it on a person with high blood pressure or heart condition.



16. Stretch the muscles on the front of the leg and the ankle by placing one hand on the thigh and the other on the back of the foot, then press down and outward. Move the upper hand along the top of the thigh after each release. Repeat a few times.



17. Hook one hand under the heel so that the ball of the foot and the toes are touching the inner side of the forearm. Pull on the heel and stretch the Achilles tendon by pressing the toes toward the shin while the other hand presses down above the knee. Do this once or twice; remember to hold the stretch for a few seconds each time.



18. Crack each toe by pulling at them one by one. Make sure that you do not pull too strongly and cause injuries to the joints. This technique is best executed when the giver kneels at the side of the receiver facing across, and leaning sideways away from the receiver each time you pull on a toe.

This technique can also be replaced by just kneading each toe without pulling on it if the receiver is anxious about having the toes cracked.

19. Now you should be in the starting position for the other leg. Repeat the process from 1 to 18 on the left leg. Remember to reverse the instructions from “right” to “left” and vice versa. Once you have acquired enough skill to do leg massage without consulting the book, it should take about 20 or 30 minutes at most to finish both legs. The whole body massage should last from one and a half to two hours, depending on the need of the receiver and on your meticulousness.

BIOGRAPHY

Miss Monthakan Homsuwan was born Nov 21, 1976 in Kanchanaburi, Thailand. She graduated Bachelor of Science (Sports Science) from the Faculty of Medicine, Siriraj Hospital, Mahidol University 1997.

