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APPENDICES

APPENDIX 1

Ultrasound image measurements

measurements. The mean thickness of three measurements was calculated for each image.

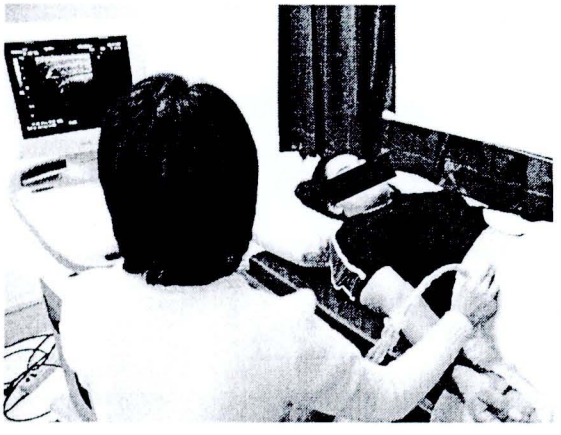


Figure A1-1 Ultrasound imaging with a 12-MHz linear array was used to measure lateral abdominal muscles (LAM) thickness. The ultrasound transducer was aligned perpendicular to the right side of anterolateral abdominal wall.

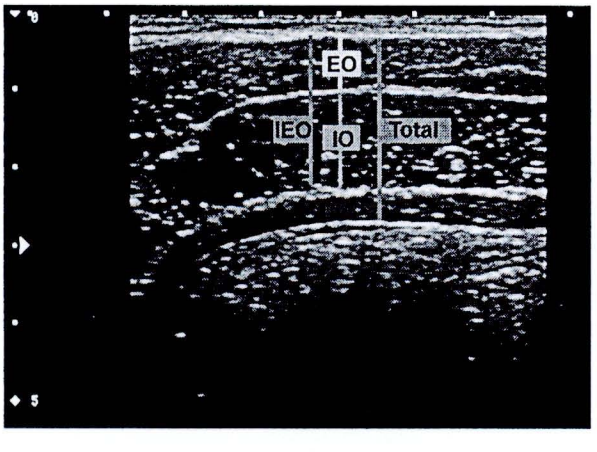


Figure A1-2 Ultrasound image of lateral abdominal muscles at rest. Muscle thickness of transversus abdominis (TrA), internal oblique (IO), external oblique (EO), internal and external oblique (IEO) and total of lateral muscles (Total) were measured from superior to inferior border of each muscle.

LM measurements

CSA of LM muscle Ultrasound imaging of CSA of LM muscle was measured using B-mode with 5-MHz curvilinear transducer. Measurement of the LM muscle was performed with subjects in prone lying with a pillow placed under the abdomen to eliminate the lumbar lordosis (Figure A1-3). Investigator manually palpated the spinous processes of L2-L5 lumbar vertebral levels and marked on the skin with a pen. The subjects were instructed to relax, ultrasonic gel was applied, and the transducer was placed longitudinally along the midline of the lumbar spine to confirm the location of each lumbar spinous process. The transducer was rotated in transverse section and placed in the middle of each spinous process. Bilateral images of LM were obtained except in the case of larger LM where left and right sides were imaged separately. The ultrasound images were taken from L2-L5 with subjects in a relaxed state and images were stored for offline analysis (Figure A1-4). The program Image J was used to calculate the CSA of the LM muscle (version 1.36b, http://rsb.info.nih.gov/ij) at the L2-L5 vertebral levels. CSA measurements were made by tracing the inside edge of the inner border of LM muscle. The measurement was carried out three times on one image and averaged for each image.

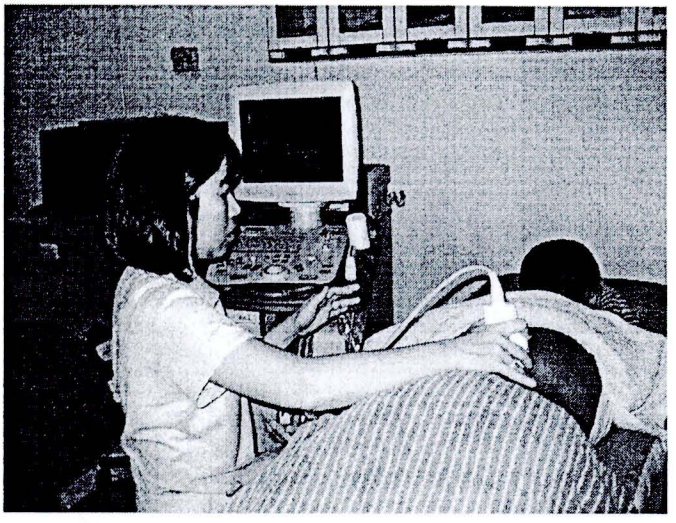


Figure A1-3 Ultrasound imaging with a 5-MHz curvilinear array was used to measure lumbar multifidus muscles (LM) in a prone lying with a pillow placed under the hip to minimize the lumbar lordosis.

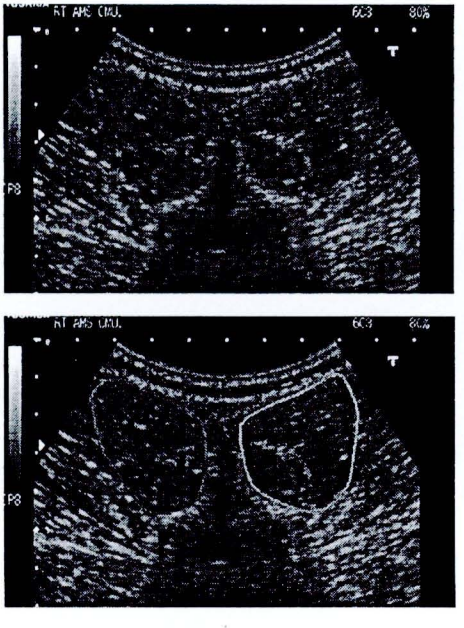


Figure A1-4 Bilateral transverse images at the L3 vertebral level showing the shadow of the spinous process in the center of the image and the lumbar multifidus muscle, with and without the CSAs traced.

Thickness of LM muscle Images of the LM muscles were taken in prone position (Figure A1-3). The transducer was placed longitudinally along the midline of the spine, first over the L5 vertebral level, then moved laterally and tilted slightly medially until the L4-5 zygapophyseal joint was visualized. This allows visualize the zygapophyseal joint, LM bulk and TLF (Figure A1-5). After identifying the sacrum, the transducer was move superiorly until the L4-5 zygapophyseal joint was centred on the screen. All images were saved and measured offline using NIH, Image J program. A measurement from the hyperechoic zygapophyseal joint to the plane between the subcutaneous tissue and the LM muscle is considered LM thickness. The LM thickness measurement were made between the tip of the L4-5 and L5-S1 zygapophyseal joint to the inside edge of the superior border of LM.

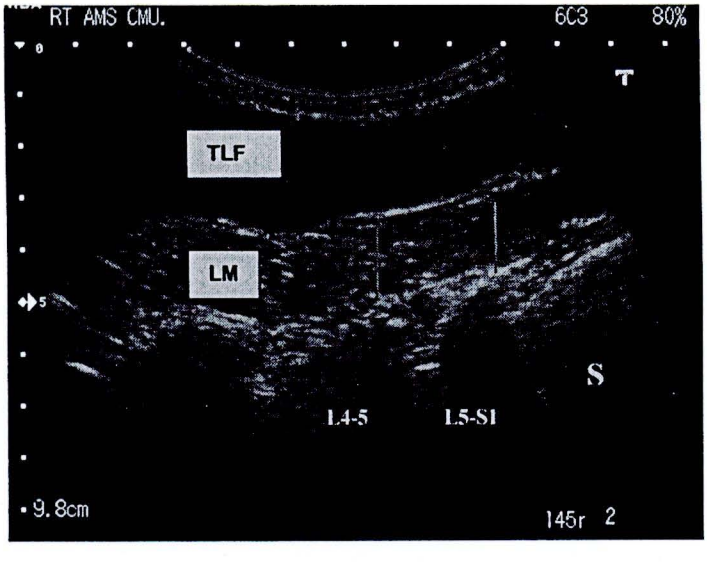


Figure A1-5 Ultrasound image of right lumbar multifidus (LM) muscle in longitudinal section. Sacrum (S) and thoracolumbar fasia (TLF) were identified in the image. LM muscles thickness were measured from the tip of L4-5 and L5-S1 zygapophyseal joint to the inside edge of the superior border of LM.

APPENDIX 2

Ethical clearance

CERTIFICATE OF ETHICAL CLEARANCE
Human Experimental Committee
Faculty of Associated Medical Sciences (AMS)
Chiang Mai University, Thailand

Title of project	:	Role of trunk muscles on lumbopelvic stability among elite weightlifters
Investigator	:	Assistant Professor Dr. Patraporn Sitilertpisan
Participating Faculty	:	Department of Physical Therapy Faculty of Associated Medical Sciences Chiang Mai University, Thailand

Approved by Human Experimental Committee on January 11, 2008
Expiration Date: January 10, 2009

.....

(Mr. Netr Suwankrughasn)
Chairman of the Committee

.....

(Assist.Prof.Dr. Audomsark Haesungcharern)
Dean of the Faculty of Associated Medical Sciences

APPENDIX 3

Consent form

เอกสารยินยอมการเข้าร่วมการวิจัยของผู้ใหญ่

คณะกรรมการจริยธรรมการวิจัย คณะเทคนิคการแพทย์ มหาวิทยาลัยเชียงใหม่

ข้าพเจ้า นาย/นาง/นางสาว .....

ให้ความยินยอมของตนเองที่จะเข้าเกี่ยวข้องในการวิจัย/ค้นคว้า เรื่อง..... บทบาทของกล้ามเนื้อหน้าลำตัวต่อความมั่นคงของกระดูกสันหลังและเชิงกรานในนักกีฬายกน้ำหนักระดับแนวหน้า (Role of trunk muscles on lumbopelvic stability among elite weightlifters) ..... ซึ่งผู้วิจัย ได้แก่ ผศ. ภัทรพร สิทธิเลิศพิศาล.. ได้อธิบายต่อข้าพเจ้าเกี่ยวกับการวิจัยครั้งนี้แล้ว (ตามรายละเอียดที่แนบมากับหนังสือยินยอมนี้)

ผู้วิจัยมีความยินดีที่จะให้คำตอบต่อคำถามประการใดที่ข้าพเจ้าอาจจะมีได้ตลอดระยะเวลาการเข้าร่วมการวิจัยครั้งนี้ ผู้วิจัยรับรองว่าจะเก็บข้อมูลเฉพาะที่เกี่ยวข้องกับตัวข้าพเจ้าเป็นความลับ และจะเปิดเผยได้เฉพาะในรูปที่เป็นสรุปผลการวิจัย และผู้วิจัยจะได้ปฏิบัติในสิ่งที่ไม่ก่อให้เกิดอันตรายต่อร่างกายหรือจิตใจของข้าพเจ้าตลอดการวิจัยนี้ และรับรองว่าหากเกิดมีอันตรายใด ๆ จากการวิจัยดังกล่าว ข้าพเจ้าจะได้รับการรักษาอย่างเต็มที่

ข้าพเจ้ายินยอมเข้าร่วมการวิจัยโดยสมัครใจ และสามารถที่จะถอนตัวจากการวิจัยนี้เมื่อใดก็ได้ ทั้งนี้โดยไม่มีผลกระทบต่อการรักษาพยาบาลที่ข้าพเจ้าจะได้รับถ้าหากข้าพเจ้าเป็นผู้ป่วย และในกรณีที่เกิดข้อข้องใจหรือปัญหาที่ข้าพเจ้าต้องการปรึกษากับผู้วิจัย ข้าพเจ้าสามารถติดต่อกับผู้วิจัย คือ..ผศ. ภัทรพร สิทธิเลิศพิศาล... ได้ที่... ภาควิชากายภาพบำบัด คณะเทคนิคการแพทย์ มหาวิทยาลัยเชียงใหม่.... โทรศัพท์ที่ทำงาน ...053-949243..... โทรศัพท์เคลื่อนที่....081-7721244..... โทรสาร...053-946042....

โดยการลงนามนี้ ข้าพเจ้าไม่ได้สละสิทธิ์ใด ๆ ที่ข้าพเจ้าพึงมีทางกฎหมาย

ลายมือชื่ออาสาสมัคร ..... วันที่.....

(.....)

ลายมือชื่อผู้ให้ข้อมูลการวิจัย..... วันที่.....

(.....)

พยาน* ..... วันที่.....

(.....)

*พยานควรเป็นบิดาหรือมารดาของอาสาสมัคร ในกรณีอาสาสมัครยังไม่บรรลุนิติภาวะ (อายุไม่ถึง 20 ปี)

APPENDIX 4

Questionnaire form

แบบสอบถาม เรื่อง อาการปวดหลังในนักกีฬายกน้ำหนัก

คำชี้แจง – กรุณาตอบคำถามต่อไปนี้

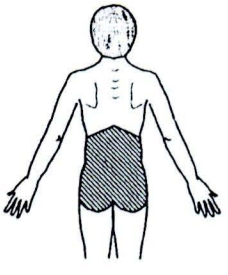
ตอนที่ 1 ข้อมูลทั่วไป

1. ชื่อ.....
2. วัน/เดือน/ปี เกิด .....อายุ.....ปี เพศ ☐ ชาย ☐ หญิง
3. น้ำหนัก.....กิโลกรัม ส่วนสูง.....เซนติเมตร
4. ความถนัด ☐ ขวา ☐ ซ้าย

ตอนที่ 2 คำถามเกี่ยวกับการยกน้ำหนัก

5. ท่านเป็นนักกีฬายกน้ำหนักในรุ่น.....กิโลกรัม
6. ท่านฝึกซ้อมยกน้ำหนักครั้งละ.....ชั่วโมง รวมประมาณ .....ชั่วโมงต่อสัปดาห์
7. ท่านฝึกซ้อมการยกน้ำหนักตั้งแต่อายุ.....ปี
8. ท่านเล่นกีฬายกน้ำหนักมาเป็นเวลา.....ปี
9. น้ำหนักสูงสุดที่ท่านยกได้ในท่าสแนทช์ คือ.....กิโลกรัม เมื่อ.....
10. น้ำหนักสูงสุดที่ท่านยกได้ในท่าคลีนแอนเจอร์ก คือ.....กิโลกรัม เมื่อ.....

ตอนที่ 3 คำถามเกี่ยวกับอาการปวดหลัง



อาการปวดหลัง คือ อาการปวดที่เกิดตั้งแต่บริเวณบั้นเอวลงไปถึงขอบก้นด้านล่าง

11. ท่านเคยมีอาการปวดหลังในบริเวณที่แรเงาหรือไม่
    ☐ ไม่เคย (ถ้าท่านตอบว่า "ไม่เคย" ให้จบการตอบแบบสอบถาม)
    ☐ เคย (ถ้าท่านตอบว่า "เคย" ให้ตอบแบบสอบถามต่อไป)
12. ปัจจุบันท่านมีอาการปวดหลังหรือไม่ ☐ ปวด ☐ ปวด
13. ลักษณะอาการปวดหลังของท่าน
    ☐ มีอาการปวดหลังติดต่อกัน ☐ มีอาการปวดหลังเป็นๆหายๆ
14. โปรดทำเครื่องหมายลงบนเส้นด้านล่างนี้ แสดงระดับความรุนแรงของอาการปวดโดยเริ่มจากไม่มีอาการจนถึงปวดมากที่สุด

ไม่มีอาการปวด ปวดมากที่สุด

15. ระยะเวลาโดยเฉลี่ยที่ท่านมีอาการปวดหลัง

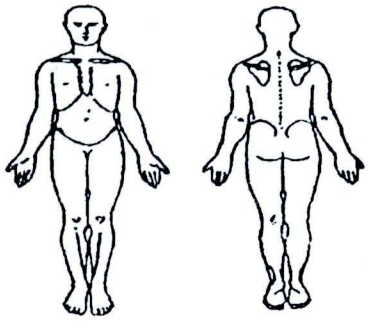
☐ น้อยกว่า 4 สัปดาห์

☐ 1- 3 เดือน

☐ มากกว่า 3 เดือน

16. ท่านเริ่มมีอาการปวดหลังตั้งแต่เมื่อใด _____ (ระยะเวลาที่ปวด _____วัน / เดือน / ปี)

Physical examinations



Active movement

☐ Flexion _____

☐ Extension _____

☐ Left lateral flexion _____

☐ Right lateral flexion _____

☐ Left rotation _____

☐ Right rotation _____

☐ Combine movement _____

Palpation

_____

_____

Accessory movement

PA	Left unilateral PA	Right unilateral PA
☐ L1		
☐ L2		
☐ L3		
☐ L4		
☐ L5		

APPENDIX 5

Publications

REFEREED PUBLICATIONS FROM THESIS

Patraporn Sitilertpisan, Ubon Pirunsan, Aatit Paungmali, Jongjin Ratanapinunchai. Characteristics of lateral abdominal muscles in elite female Thai weightlifters. Journal of Sports Science and Technology (In-press).

Patraporn Sitilertpisan, Ubon Pirunsan, Aatit Paungmali, Jonjin Ratanapinuanchai, Suchart Kiatwattanacharoen, Hudsaleark Neamin, James J. Laskin. Comparison of lateral abdominal muscle thickness between weightlifters and matched controls. Physical Therapy in Sports (In-press).

PROCEEDING

Patraporn Sitilertpisan, Julie Hides, Warren Stanton, Ubon Pirunsan. Intrarater and interrater reliability of assessesment of lumbar multifidus muscle cross-sectional area using ultrasound imaging. The 2nd Graduate Students Academic Day. Faculty of Associated Medical Sciences, ChiangMai University. 12 November 2008. 15-18.

Patraporn Sitilertpisan, Aatit Pungmali, Jonjin Rattanapinunchai, Suchart Kiatwattanacharoen, Hudsaleark Neamin, Ubon Pirunsan. Intra and interrater reliability of lateral abdominal muscles thickness measurement using B-mode ultrasound imaging. 10th Mae Fah Luang Symposium and International Conference on Tea Production and Tea Products. 26-28 November 2008. 881-889.

CONFERENCE PRESENTATION

Patraporn Sitilertpisan, Ubon Pirunsan, Aatit Paungmali, Jonjin Ratanapinanchai, Suchart Kiatwattanacharoen, Hudsaleark Neamin. Comparison of lateral abdominal muscles size between weightlifters and sedentary subjects. The 31th Annual Scientific Meeting on Mahidol's Day. Faculty of Medicine, Chiang Mai University; 24 September 2007.

Patraporn Sitilertpisan, Aatit Pungmali, Jonjin Rattanapinunchai, Suchart Kiatwattanacharoen, Hudsaleark Neamin, Ubon Pirunsan. Intra and interrater reliability of lateral abdominal muscles thickness measurement using B-mode ultrasound imaging. 10th Mae Fah Luang Symposium and International Conference on Tea Production and Tea Products. 26-28 November 2008.

CURRICULUM VITAE

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Education

1990 B.Sc., Physical Therapy Faculty of Associated Medical Sciences, Chiang Mai University, Chiang Mai, Thailand

1993 M.S., Physiology Faculty of Sciences, Mahidol University, Bangkok, Thailand

Scholarship

The Scholarship of Commission on Higher Education, Ministry of Education, Royal Thai Government, Thailand.

Publications

Related study work

Paungmali A, Hancharoenkul B, Sitilertpisan P, Pirunsan U, Chamnongkich S. Hypoalgesic effects of sport massage and lumbo-pelvic core stabilization on female elite nation weightlifters. Poster presentation, Annual Scientific Meeting Manchester, 13th – 16th April, 2010.

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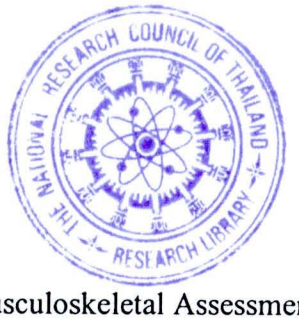
Irun D, Paungmali A, Sitilertpisan P, Pirunsan U, Chamnongkich S, Keawyot W, Avirutdhakarn P. Effects of knee educational program in Thai national weightlifters. Journal of Sports Science and Technology. 2009; 9(1): 205-218

Conferences

Postgraduate Research Conference in the School of Health and Rehabilitation Sciences. 21 November 2007. School of Health and Rehabilitation Sciences, The University of Queensland, Princess Alexandra Hospital, Woolloongabba, Brisbane, Queensland, Australia.



Training

Rehabilitative Ultrasound Imaging in Musculoskeletal Assessments. 1-20 November 2007. Division of Physiotherapy, School of Health and Rehabilitation Sciences, The University of Queensland and Mater/UQ Back Stability Clinic, Mater Health Services, South Brisbane, Queensland.