

PostScript

LETTERS

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Rehabilitation of lumbar multifidus dysfunction in low back pain: strengthening versus a motor re-education model

Regarding the article "Effects of three different training modalities on the cross sectional area of the lumbar multifidus in patients with chronic low back pain",¹ I would like to extend my appreciation to Dr Danneels and his colleagues for their interest in contributing to the literature on this important and clinically relevant topic. Unfortunately, there are important design and methodological flaws inherent in this study which call into question its results and primary conclusions. I respectfully submit this review of the study, its findings, and the authors' clinical recommendations.

The objective of the investigation of Danneels *et al* was to determine the potential for different exercise models to reverse the pathology related atrophy of the lumbar multifidus muscle in people with low back pain. As described by various researchers, the lumbar multifidus experiences a number of morphological and neurophysiological changes following low back injury.²⁻⁴ One of these changes is a segmental atrophy which develops at the level of pathology, on the symptomatic side and as quickly as 24 hours after the injury.³ Further, these changes have been shown to persist beyond the resolution of symptoms,⁵ and for at least five years after surgical intervention for intervertebral disc herniation.⁴ There is evidence that such findings are indicative of a neurologically mediated process rather than a simple disuse or weakness phenomenon.⁶

In their study, Danneels and colleagues¹ compared the motor re-education model, originally developed by Richardson *et al*⁷ and as studied by O'Sullivan and colleagues,⁸ against two variations of a traditional strengthening model. The first of these strength training variations utilised typical concentric and eccentric lumbar extensor loading motions. The other added a static or

isometric component which was to be maintained between the concentric and eccentric phases of the exercise.

The authors concluded that, in order to correct the atrophy observed in the lumbar multifidus, patients should perform strengthening exercises targeting the lumbar extensors, ideally incorporating an isometric "pause" into these exercises. Danneels *et al* reported that this was the only exercise model tested that developed sufficient hypertrophy to correct the multifidus atrophy seen in their experimental population.

These findings conflict with those of Hides and colleagues,^{5,9} who have published data showing correction of the pathology-induced lumbar multifidus atrophy using a considerably more specific and subtle activation of the multifidus muscle.⁷

Unfortunately, the method by which the authors measured the cross sectional area (CSA) of the multifidus muscle introduced a large degree of methodological error, calling into question the study's findings and therefore its clinical recommendations. Using computed tomography scanning, Danneels *et al* took measurements from three arbitrary levels of the lumbar spine (the L3 superior end plate, the L4 superior end plate, and the L4 inferior end plate) recording the CSA of the multifidus muscle at each of these levels bilaterally. They then summed the right and left multifidus CSA at each of these segments resulting in a single multifidus score for each level.

In preselecting the levels from which CSA measurements would be taken, it is possible, indeed even likely, that the pathological level would have been missed entirely in at least some of the subjects. This is important because previous studies have shown that the multifidus muscle experiences its greatest loss of CSA at the primary level of pathology.^{3,10} Also problematic was the decision to sum the CSA scores at each of the preselected levels. A number of studies have shown that the lumbar multifidus, ipsilateral to the pathological side, experiences a cascade of neuro-morphological changes, including atrophy, in the presence of both acute and chronic pathology, whereas the multifidus contralateral to the pathological side experiences no such changes.^{2-5,10}

Taken together, the preselection of measurement levels and the summation of the bilateral multifidus CSA would have had the effect of attenuating any side to side differences in multifidus CSA even if a subject's level of pathology happened to coincide with one of the levels from which measurements were obtained. Through either of these mechanisms, this measurement scheme would have introduced a substantial mass of healthy, non-motor dysfunctional muscle into each of the multifidus CSA measurements. The net effect of the measurement approach employed by Danneels *et al*, although probably intended to more discretely reflect the pathological side multifidus, was to bias the outcome of the experimental intervention toward an exercise model with the ability to cause hypertrophy in healthy muscle—that is, a strengthening exercise. It is likely that the "dynamic-static" exercise recommended by the authors as being most effective for correcting the pathological atro-

phy of the multifidus instead caused hypertrophy of the non-pathological, non-atrophied multifidus muscle segments included in the three measurement scores. Ultimately, the study's recommendations are unsupported given this flaw in methodology.

The low load multifidus activation exercise, developed by Richardson *et al*⁷ and used by O'Sullivan and colleagues,⁸ is to be performed as a co-contraction with the transversus abdominis muscle, and is intended to correct a neurologically mediated loss of normal multifidus muscle volume, not unlike that seen in the vastus medialis following trauma or surgery involving the knee joint.¹¹ In studies in which the CSA of a pathological multifidus muscle has been compared with its contralateral and "healthy" segmental partner, this form of motor re-education exercise has been shown to normalise the CSA of the pathological multifidus in as little as four weeks.⁵

It is critical that both researchers and clinicians appreciate that a significant body of research now shows that the "atrophy" seen in the multifidus muscle in people with low back dysfunction is representative of a form of impaired motor control, not simple disuse weakness. As such, traditional strengthening exercises will often fail to correct this fault, just as daily physical activities fail to maintain a normal segmental CSA at the pathological level. Certainly, the historical lack of success of the rehabilitation and medical professions in treating low back pain using the wide variety of strength based clinical models used over the last 50 years should serve as sufficient motivation to look to more evidence based models as an explanation for the condition. The motor control dysfunction model as developed over the past decade by a variety of researchers^{4,6,7,9,12,13} holds great promise, both as a basis for understanding the causes of back pain and in developing more effective treatment strategies for our patients.

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The event side doctor: the role of the orthopaedic surgeon

Orthopaedic surgeons have long had a close association with sport. International rugby players have similarly gone on to careers in orthopaedic surgery, examples being Jonathan Webb and JPR Williams.

Without doubt, finding appropriate medical personnel to care for the needs of spectators and athletes at major sporting events is a challenge.¹ Event organisers have required the skills of volunteer orthopaedic surgeons.²

I recently volunteered as a competitors' doctor for the XVII Commonwealth Games in Manchester. As a specialist registrar in orthopaedics, and previously an emergency medicine registrar, I felt suitably skilled to be an event side doctor for the time trial, mountain biking, and road race events.

During the course of the events, I reviewed cyclists with dyspepsia and back muscle spasm. I also reviewed a cameraman with hay fever and one with eye irritation possibly caused by an insect bite or allergy. Regarding true "orthopaedic bone problems", a mountain biker presented with carpal injury, query fracture, and a mountain biking spectator with a fractured clavicle. With no x ray facilities at the event centre, all I could do was to provide immobilisation, ice treatment, analgesia, and reassurance, before referring on to a facility to provide definitive diagnosis and treatment.

Although I had a very enjoyable Games and gained greatly from the experience, I felt a little inexperienced in event side medical problems and that my occupational skills were under used because of event side facilities. The event side medical centre had adequate first aid and resuscitation equipment. Most problems could be treated by paramedics, a physiotherapist and a general practitioner trained in sports medicine.

Volunteers should appreciate that the event side doctor needs to have general rather than specialist skills.³ My position as an orthopaedic registrar clearly lies in the hospital setting with x ray facilities and an operating theatre. I have not, however, been discouraged from volunteering for future events.

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RESEARCH LETTER

Increased endothelin-1 levels in athletes

Endothelin-1 (ET-1), a potential vasoconstrictor peptide, may contribute to the exercise induced redistribution of blood flow in muscles.^{1,2} On the other hand, the latter parameter in athletes may be expanded secondary to muscle volume and as a consequence of increased ET-1 production.³ In this study, we found a difference in basal serum ET-1 levels between trained male athletes and normal matched male controls.

We studied 13 male professional football players (mean (SEM) age 27 (1.02) years; mean (SEM) body mass index 24.2 (1.2) kg/m²) and an equal number of sedentary or moderately physically active men (age 26 (1.3) years; body mass index 24.4 (1.8) kg/m²). All subjects gave written consent and had a negative family history of diabetes and hypertension. Blood samples were collected at 8 am after an overnight fast; all subjects remained at rest for 20 minutes in a supine position, before collection of the blood specimen. ET-1 concentration in serum was measured by radioimmunoassay (Peninsula Lab Inc, Belmont, California, USA). Data were analysed by Student's *t* test for independent samples.

The concentration of ET-1 in the serum was significantly higher in the athletes than control subjects (22.16 (0.87) v 7.74 (0.29) pg/ml, *p*<0.001; values are mean (SEM)). Serum creatine kinase was also found to be significantly higher in athletes than controls (331.84 (43.3) v 110.5 (17.3) U/l, *p*<0.001; values are mean (SEM)).

The increased creatine kinase levels may be attributed to the increased muscle mass in athletes, and the increased serum ET-1 levels can be explained as being a consequence of a widening of the vascular bed resulting from the increased muscle weight and size.

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References

- 1 Maeda S, Miyauchi T, Goto K, et al. Alteration of plasma endothelin-1 by exercise at intensities lower and higher than ventilatory threshold. *J Appl Physiol* 1994;77:1399-402.
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BOOK REVIEW

Reckoning with risk: learning to live with uncertainty

G Gigerenzer. Allen Lane Penguin Press Penguin Books Ltd, 2002, £14.99, pp 310. ISBN 0713995122

Gerd Gigerenzer has a passion for improving statistical numeracy which is rarely encountered in the normally dry statistics texts. He has researched and published extensively on how doctors and other professionals interpret risks and convey that information to their patients. He has also shown how clinicians' understanding of risk can be improved dramatically by changing the way they process information about risk.

The early chapters of the book look at Gigerenzer's research into clinicians' understanding of statistics and Bayes's rule, and shows just how poor senior clinicians' understanding of risk is. He shows that similar problems exist in other professions as well. He indicates how confusing it can be for our patients when we try to convey our understanding of risks to them. There is a section devoted to how companies and researchers try to change our opinion, to their advantage, with statistics. He then proceeds to show a more intuitive way to deal with statistics. Gigerenzer's methods are powerful tools for explaining to a patient the true nature of their risks.

This book has been written for the general public, but if you find risk statistics difficult to interpret and convey, then this book is definitely for you. It is written in a gently instructive and well thought out style, and covers a diverse range of problems encountered in everyday as well as clinical life. I think it should be on the curriculum for all postgraduate medical courses.

Analysis

Presentation	14/20
Comprehensiveness	12/20
Readability	17/20
Relevance	18/20
Evidence basis	17/20
Total	78/100

D Humphries

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CALENDAR OF EVENTS

Skills Course in Musculoskeletal Ultrasound

6-8 January 2003, Oxford, UK

Further details: Alison Davies, Department of Radiology, Nuffield Orthopaedic Centre, Headington, Oxford, OX3 7LD, UK; tel: +44 (0)1865 227765; fax: +44(0)1865 227347; email: alison.davies@noc.anglox.nhs.uk

BASICS Refresher course

28-29 November 2002, Madingley Hall, Cambridge, UK

This two day course is directed at previous participants on the pre-hospital emergency care and immediate care courses. The aim is to maintain and update skills, incorporating the latest developments in pre-hospital care.

Further details: BASICS Education Ltd; tel: +44 (0) 870 165 4999; fax: +44 (0) 870 165 4949; email: educ@basics.org.uk
Web site: www.basics.org.uk

Athletes Heart Symposium

17 December 2002, University College London, UK

An international multidisciplinary symposium for physiologists, cardiologists, sports scientists, and physicians in associations with the Physiological Society.

Further details: Lynn Coombs, Cardiac Department, Homerton University Hospital, Homerton Row, London E9 6SR, UK; email: ahsymp@btinternet.com

2nd World Congress of Science and Medicine in Cricket

4–7 February 2003, University of Port Elizabeth, South Africa

Further details: Dr Richard Stretch, University of Port Elizabeth, PO Box 1600, Port Elizabeth 6000, South Africa; tel: +27 41 5042584; fax: +27 41 5832605; email: sparas@upe.ac.za

The 2003 NSW Conference of Science and Medicine in Sport

1 March 2003, AJC Convention Centre, Alison Road, Randwick, NSW, Australia

Keynote speaker: Professor Nikolai Bogduk, University of Newcastle.

Further details: www.smansw.com.au or email smasw@dsr.nsw.gov.au

SMX 2003

22–23 March 2003, University of Melbourne, Victoria, Australia

The Victorial Conference of Science and Medicine in Sport and Exercise in conjunction with The Gastrolyte VIS International Science and Football Symposium.

Further details: members@vic.sma.org.au

Sports Medicine Seminar at the Hong Kong Sevens

27 March 2003, Hong Kong

This will be the first of an annual conference on Sports Medicine to coincide with the premier 7s event. Please visit the website www.droid.cuhk.edu.hk/events/sms.htm.

Further details: Iain Stewart, National Diagnostic Imaging, Woden, ACT 2606, Australia; tel: +61 2 6282 2888; email: ncdi@ozemail.com.au

Vth World Congress on Science & Football

April 2003, Lisbon, Portugal

Further details: Dr J Cabri; email: Jcabri@fmh.utl.pt

Web site: <http://www.fmh.utl.pt/wesf>

2003 SMA Queensland State Conference

3–4 May 2003, Nara SeaWorld Resort, Gold Coast, Australia

Speakers: Dr John Best, Medical Director for the 2003 Rugby World Cup; Associate Professor Kim Bennell, Director, Centre for Sports Medicine Research and Education, (School of Physiotherapy), University of Melbourne, Victoria, Australia.

Further details: www.sportsmedicine.com.au

3rd Québec International Symposium on Cardiopulmonary Rehabilitation Evidence Based Interventions: Science to the Art of Cardiopulmonary Rehabilitation

11–13 May 2003, Québec City Convention Center, Québec, Canada

Call for abstracts deadline is 1 November 2002. The abstract submission form and complete programme can be printed from the web site.

Further details: email: Jean.Jobin@med.ulaval.ca

Web site: www.ulaval.ca/symp-rehab

The 6th STMS World Congress on Medicine and Science in Tennis in conjunction with the LTA 2004 Sports Science, Sports Medicine and Performance Coaching Conference

19–20 June 2004, London, UK

Keynote speakers include Professor Per Renstrom (SWE), Professor Peter Jokl (USA), Professor Savio Woo (USA), Dr Carol Otis (USA), Dr Mark Safran (USA), Dr Ben Kibler (USA), Prof Bruce Elliott (AUS), and Professor Ron Maughan (UK).

Further details: Dr Michael Turner, The Lawn Tennis Association, The Queen's Club, London W14 9EG, UK; email: michael.turner@LTA.org.uk

International XVII Puijo Symposium

25–28 June 2003, Kuopio, Finland

This symposium "Physical activity and Health—Gender Differences Across the Lifespan".

Further details: Ms Auli Korhonen, Project Secretary, Kuopio Research Institute of Exercise Medicine, Puijo Symposium Secretariat, Haapaniementie 16, 70100 Kuopio, Finland; tel: +358 17 288 4422; fax: +358 17 288 4488; email: puijo.symposium@uku.fi

NOTES AND NEWS

Winners of the annual BASEM Prizes

Dr Eileen Mackie (Clopidogrel inhibits platelet activation and exercise induced ischaemia in stable coronary artery disease) and Mrs Eleanor Curry (Role of exercise in multiple sclerosis) (joint winners).

The poster prize was won by Dr Stuart Reid (Injury patterns and injury prevention strategies in the winter sports population attending the English medical centre in Val D'Isere).

Diploma in Sport and Exercise Medicine for Great Britain and Ireland

Details for the above exam can be found on the Royal College of Surgeons of Edinburgh Web site at www.rcsed.ac.uk alternative applicants can write to: The Royal College of Surgeons of Edinburgh, Eligibilities Section, Careers Information Services, 3 Hill Place,

Edinburgh; tel: +44 (0)131 668 9222 or Mrs Yvonne Gilbert, Intercollegiate Academic Board for Sport and Exercise Medicine, Royal College of Surgeons of Edinburgh, Nicolson Street, Edinburgh EH8 9DW; tel: +44 (0)131 527 3409; email: y.gilbert@rcsed.ac.uk

Intercollegiate Academic Board of Sport and Exercise Medicine Diploma Exam

The following were successful diplomates in the Intercollegiate Academic Board of Sport and Exercise Medicine Diploma Exam:

7 July 2000

- Dr Prabodh C Agarwal

- Dr Robert Bleakney

- Dr Trevor W Fleet

8 November 2000

- Dr James P Robson

- Dr Samantha L Fee

- Dr David C Watkins

- Dr RS Prabu

For further information contact: Donald AD Macleod, Chairman, Intercollegiate Academic Board of Sport and Exercise Medicine.

www.basem.co.uk

The British Association of Sport and Exercise Medicine has launched its new web site—www.basem.co.uk. The site provides information about the educational opportunities in sport and exercise medicine and advice to those wishing to become involved in this area.

Interested in Sports Medicine? Gain a higher degree from Australia's leading university

The Centre for Sports Medicine Research and Education is a multidisciplinary Centre located in the Faculty of Medicine, Dentistry and Health Sciences at the University of Melbourne, Australia. It combines world-class researchers and clinicians working in the area of sports medicine.

Research Higher Degrees

The Centre offers Doctor of Philosophy (PhD), Master of Sports Medicine, Master of Physiotherapy, Master of Science, and Doctor of Medicine degrees. These are available to graduates of health and medical science courses such as physical therapy, medicine, and human movement.

Educational programme

The Centre offers a one month full time Postgraduate Certificate in Sports Physiotherapy: spine, pelvis, and lower limb. Instructors are leading clinical experts and researchers in the multidisciplinary approach to sports medicine. The Certificate will run from Nov 4–29 in 2002.

Please contact: Professor Peter Brukner: p.brukner@unimelb.edu.au (Research Degrees), Professor Kim Bennell: k.bennell@unimelb.edu.au (Research Degrees), Mr Henry Wajswelner: h.wajswelner@unimelb.edu.au (Certificate Courses), www.physioth.unimelb.edu.au/csmre

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Web site: www.med.unsw.edu.au/sportsmed

NCPAD NEWS

A monthly publication of the National Center on Physical Activity and Disability. NCPAD is the leading source for information about

organisations, programmes, and facilities nationwide providing accessible physical activity and recreation. NCPAD also has a large and growing online library of fact sheets, monographs, and contact information on physical activity and recreation for people with disabilities.

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Study Sports Physiotherapy in Australia's sporting capital at The University of Melbourne

Qualified physiotherapists may now apply for the Master of Physiotherapy by Coursework (Sports Physiotherapy), the Postgraduate Certificate in Physiotherapy (Sports Physiotherapy of the Spine, Pelvis and Lower

Limb) or the Postgraduate Certificate in Physiotherapy (Sports Physiotherapy of the Spine, Shoulder and Upper Limb).

The School of Physiotherapy at the University of Melbourne now has approval for these courses and applications are open to international students for full time study.

- Applications for the Master of Physiotherapy by Coursework (Sports Physiotherapy) close **1 October 2002**.
- Applications for the Postgraduate Certificate in Physiotherapy (Sports Physiotherapy of the Spine, Pelvis and Lower Limb) close **1 November 2002**.
- Applications for the Postgraduate Certificate in Physiotherapy (Sports Physiotherapy of the Spine, Shoulder and Upper Limb) close **1 April 2003**.

Please check the website for updates and information about the courses: www.physioth.unimelb.edu.au/postgrad.html