

PostScript

LETTERS

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Scuba diving can induce stress of the temporomandibular joint leading to headache

In ordinary recreational scuba diving, many anatomical parts can be involved in disorders of cranial regions: ears and eyes are involved but also sinuses. Dental problems are generally involved in barotraumas because of bad dental fillings or other matters of interest to the general dental practitioner.¹ Very few papers have looked at the articular and periarticular problems of the temporomandibular joint (TMJ).²

Local factors such as joint laxity, anatomical factors, capsular or muscular inflammation, and articular stress of long duration resulting from holding the regulator mouthpiece in scuba diving or the snorkel mouthpiece in skin diving can lead to TMJ disorders including headaches and myalgic symptoms.³

We examined the biomechanics of the TMJ (fig 1) in relation to diving, particularly looking at the disc-condylar position during mouthpiece biting and with the mouth closed

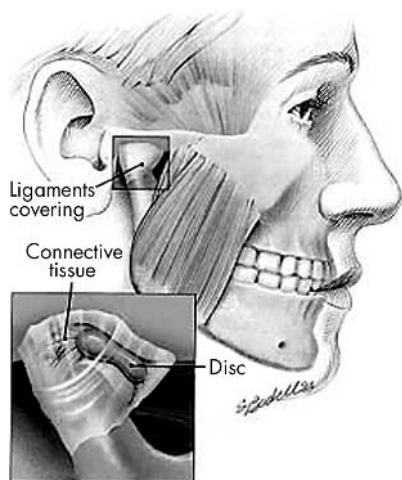


Figure 1 Diagram illustrating the structure of the temporomandibular joint.

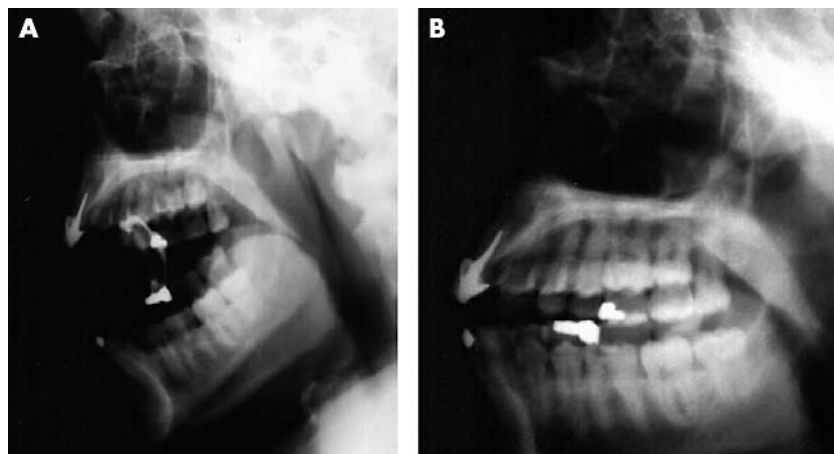


Figure 2 (A) Radiograph of a diver with a large plastic tube (40 mm diameter) inserted in the mouth. (B) The same diver with a standard mouthpiece inserted.

and wide open (submaximal opening). The aim was to see if during scuba diving the TMJ is maintained in a stressed position leading to pathology (myalgia, headaches, discal subluxations) under certain conditions.

Methods

To measure condylar and discal displacement in divers, we studied 30 TMJs in a population of 15 divers aged 18-55, including six women. None had symptoms of TMJ disorder such as joint noise, pain, or luxations. All were fully informed about the experimental paradigm and agreed to have magnetic resonance imaging (MRI) of both TMJs.

MRI was used so that the intra-articular disc and condyle body could be viewed in the same image and scale to allow angular measurements. Six sagittal and parasagittal slices were viewed on each side (T1 weighted sequences, performed with a 6.5 cm circular coil at each side of the head). All the procedures were consistent with actual TMJ MRI techniques. Measurements were made on the same subject in three standard mouth positions:

- (1) Closed mouth (biting position)
- (2) Mouth holding regular diving mouthpiece
- (3) Mouth submaximally opened holding a 40 mm uncompressible non-magnetic plastic tube (fig 2)

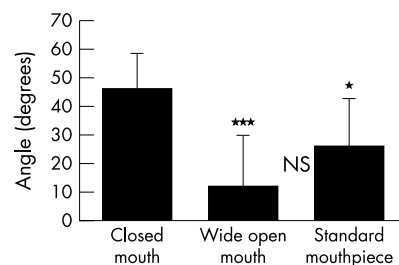


Figure 3 Angular variations between the condyle axis and the medial part of the disc. *** $p < 0.001$; * $p < 0.05$ compared with the closed mouth position.

The different angles calculated for the whole samples were computed for statistical analysis by standard procedures including mean, standard deviation, median, and analysis of variance after the Kolmogorov Smirnov test for normality. Post-discriminant tests included Tukey-Kramer and Bonferroni.

Results

Figure 3 shows that there was a significant difference between the closed mouth position and the two other standard mouth positions (wide open, $p < 0.001$; holding a standard mouthpiece, $p < 0.05$), but no difference was found between the two latter positions.

Conclusions

From the results we cannot reject the hypothesis that the prolonged position of the TMJ during scuba diving may induce pain as the result of stress to the retrodiscal portion of the joint, which is near neurovascular elements. It is recommended that divers should be taught not to overstress the TMJ to avoid headache and other myalgic syndromes. The reader is referred to the paper on temporomandibular dysfunction in scuba divers by Aldridge and Fenlon (p ??).

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- 1 Jagger RG, Jackson SJ, Jagger DC. In at the deep end: an insight into scuba diving and related dental problems for the GDP. *Br Dent J* 1998 Mar;184:209.
- 2 Steingerwald DP, Verne SV, Young D. A retrospective evaluation of the impact of TMJ arthroscopy on the symptoms of headache, neck pain, shoulder pain, dizziness and tinnitus. *J Craniomandibular Pract* 1996;14:46-54.
- 3 Taddey J. Scuba diving and TMD. *Cranio* 1993;11:73-4.

Metabolic risks of completing Giro, Tour, and Vuelta in the same season

In a recent issue, Lucia *et al* suggested that an experienced professional cyclist can safely complete the three major cycling stage races (Giro d'Italia, Tour de France, and Vuelta a España) within the same season, over a five month period.¹ The authors reached this conclusion mainly on the basis of heart rate telemetry, showing that the total amount of near maximal exercise in athletes with a predominant team role as domestiques is relatively low and compatible with the high requirements of the three races. Although this observation may be true from a physical point of view, it does not consider several substantial biochemical aspects. A bulk of evidence indicates that strenuous and prolonged physical exercise leads to amplified muscle oxygen use, increased electron flux and leakage through mitochondria, and consequent overproduction of reactive oxygen species (ROS). The excessive ROS generation may overwhelm the scavenger capacity of the main antioxidant defences, inducing oxidative damage to lipids, proteins, and nucleic bases and promoting the development of severe and progressive degenerative disorders, such as aging, cancer, atherosclerosis, diabetes, and neurodegeneration. In addition, the oxidative stress following physical exercise has been associated with overtraining, decreased physical performances, muscular fatigue, inflammation, and damage, leading to a decline in fitness and athletic performance in the short term.² Therefore, although a trained athlete can probably fulfil the physical requirements of the three major cycling stage races over a very limited period of time, we suggest that the unfavourable metabolic effects of the increased ROS generation should be carefully considered and eventually prevented or counteracted. In this respect, we believe that a diet enriched in natural antioxidants from fruits and vegetables or the administration of dietary antioxidant supplements may be advisable in elite athletes routinely engaged in strenuous and prolonged physical exercise.³

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- 1 Lucia A, Hoyos J, Santalla A, *et al*. Giro, Tour, and Vuelta in the same season. *Br J Sports Med* 2003;**37**:457–9.
- 2 Konig D, Wagner KH, Elmadfa I, *et al*. Exercise and oxidative stress: significance of antioxidants with reference to inflammatory, muscular, and systemic stress. *Exerc Immunol Rev* 2001;**7**:108–33.
- 3 Urso ML, Clarkson PM. Oxidative stress, exercise, and antioxidant supplementation. *Toxicology* 2003;**189**:41–54.

BOOK REVIEW

Lore of running, 4th edn.

T D Noakes. Human Kinetics Europe, £17.95, 2003, pp 944, hardcover. ISBN 0873229592

What are your favourite books of all time? Which books have changed your life? Many people include *Lore of running* among the answers to those questions. Approaching the 20 year anniversary of the genesis of this “runner’s bible”, Tim Noakes has released the extremely comprehensive, yet very practical 4th edition.

Unlike J K Rowling, who dices her adolescent psychology and astral physiology research into seven books and four movies, T D Noakes provides his reader with the equivalent of four substantial books within the covers of this 1277 page tome. Firstly, *Lore* is a fascinating historical biography of runners and running. The running reader loves to know the secrets of the champion’s mind and motor, and *Lore* provides almost 200 pages of unique insights into the Who’s Who of running, including Deerfoot (1861), Paavo Nurmi, Arthur Newton, Emil Zatopek, Jim Peters, Kip Keino, Bruce Fordyce, Grete Waitz, Robert De Castella, Carlos Lopes, Frank Shorter, to list just some. Noakes provides enough detail to satisfy the most diligent of trainers, yet weaves the psychological and personal insights with the training details to craft a fascinating tapestry. This part alone (Chapter 6, Learning from the experts) is worth the price of the book and is a substantial expansion and update from its popular predecessors in earlier editions of *Lore*.

Next, *Lore* provides up to date exercise related physiology and biochemistry in a manner that is understandable by those with, and without, training in the formal biological sciences. This has always made *Lore* unique among “running” books (it is so much more than that alone!). A particular feature of this edition is the quality of the artwork that explains the science, and the very useful case histories of how athletes have had their problems solved by sports science. In this part, an exercise physiologist outlines, for the first time, the dominant role played by the brain in determining performance in any form of physical activity.

The importance of this new model is illustrated in what I consider the 3rd book within *Lore*—a practical guide to training for and racing over distances from 10 k to the ultramarathon. When a patient presented asking my advice for the “Marathon of the sands” (a 7 day 150 mile race across the Sahara desert in Morocco, <http://web.outsideonline.com/system/tv/mds99/>), I dithered between making a psychiatric referral and lending my personal copy of *Lore*. It seems that the latter sufficed—an extremely happy (but thin, with big blistered feet) borrower returned the book saying it had been a crucial factor in his success. Where else does one find over 50 pages with eight different detailed training schedules dedicated to ultramarathon alone? Noakes himself acknowledges having run over 70 marathons, but given that this count credits each 92 km Comrades marathon as just one, his personal marathon experience is over 100. This, combined with his access to leading athletes and South Africa’s tradition in endurance events, explains why *Lore* provides unique insight for the distance minded runner.

Finally, and importantly, *Lore* is a practical sports medicine book with almost 300 pages devoted to the role of ergogenic aids, tips on staying healthy, and discussion of the benefits and hazards of running. This section includes a self help approach to treating injuries, discussion of the most common

injuries, and cutting edge research both from Noakes’ own laboratory—for example, exercise associated collapse, avoiding water intoxication—and that of others whose work affects runners’ health.

Those who have been fortunate enough to attend Noakes’ (the Michael Moore of sports medicine (www.michaelmoore.com)) international conference presentations will be aware of his attention to detail and aesthetics, and this book mirrors that care. From the historical black and white prints of runners such as Nurmi to the clear, extremely informative figures, every page is an invitation.

Examples of boxed panels that will capture the curiosity of many include “the 15 laws of training”, “animals with great athletic ability”, “physiological explanations for the superior distance running ability of black africans”. The section discussing Sir Roger Bannister’s mental approach is compulsory reading. Also, *Lore* has international appeal—it is for runners whether they live in Aachen or Zyryanovo or any place between.

If you enjoyed a previous edition of *Lore* (as I have), you must see this 4th edition with its wonderfully expanded minibiographies, detailed schedules to help you with training and racing, and the exposition of crucial scientific data that have lain unexplored for 75 years. You are unlikely to need much convincing.

If you are new to *Lore*, but a runner, or friends with a runner, please take my advice to examine this masterpiece. You will be very pleased you did. *Lore* will add to your joy of running. This edition will again enhance the lives of many readers. I have presented copies to several close friends and graduating scientists and clinicians and I know they treasure it, as I do.

Analysis

Presentation	19/20
Comprehensiveness	20/20
Readability	18/20
Relevance	20/20
Evidence basis	17/20
Total	94/100

K Khan

CALENDAR OF EVENTS

The 7th Scandinavian Congress on Medicine and Science in Sports

25–27 March 2004, Stockholm, Sweden

Abstracts: deadline 15 January 2004

Further details: Email: ingrid.canholm-pluntky@kirurgi.ki; website: www.svenski-drottmedicin.org.se/scandinaviansportscongress

Medicare India

6–8 April 2004, New Delhi, India

This exhibition and conference will be held for the first time, following India’s ambitious “health for all” programme launched in 2002.

Further details: Rob Grant, Kinex Log, 5 New Quebec Street, London W1H 7DD, UK; tel: +44 (0)207 723 8020; fax: +44 (0)207 723 8060; email: rob.grant@kinexlog.com; websites: www.medicare-expo.com and www.kinexlog.com

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

The Leeds Sports Imaging Course

6–7 September 2004, Leeds, UK

This two day course is aimed at both radiologists and clinicians who are involved in sports imaging. The course will comprise an imaging and clinical overview of all relevant joint, bone and soft tissue sporting injuries.

The faculty will comprise internationally recognised skeletal imaging and clinical

experts from the UK, Europe and North America who will deliver state of the art lectures and lead sessional discussions. Each session will cover the spectrum of injury for a specific anatomical area beginning with clinical lectures that will allow the subsequent imaging lectures to be placed in context. All aspects of imaging will be discussed but will concentrate on the use of ultrasound, conventional MR imaging and MR arthrography for the diagnosis, staging and prognosis of sporting injuries. Therapeutic image guided intervention using fluoroscopy, CT and ultrasound will also be demonstrated.

13 RCR category one CME credits have been awarded.

Further details: Carol Bailey, Course coordinator, MRI Department, B Floor, Clarendon Wing, Leeds General Infirmary, Leeds LS1 3EX; tel: +44 (0)113 3922826; fax: +44 (0)113 3928241; email: Carol.Bailey@leedsth.nhs.uk

BASEM Conference 2004

14–17 October 2004, Belfast, UK

Main themes: Overuse Sports Injuries and Muscle Injuries. Keynote speakers include: Chris Bradshaw, Medical Director, Olympic

Park Medical Centre, Melbourne and Kim Bennell, Assistant Professor, School of Physiotherapy, Melbourne University.

Further details: Email: fionnuala.sayers@greenpark.n-i.nhs.uk

1st World Congress on Sports Injury Prevention

23–25 June 2005, Oslo, Norway

This congress will provide the world's leading sports medicine experts with an opportunity to present their work to an international audience made up of physicians, therapists, scientists, and coaches. The congress will present scientific information on sports injury epidemiology, risk factors, injury mechanisms and injury prevention methods with a multidisciplinary perspective. Panel discussions will conclude symposia in key areas providing recommendations to address the prevention issue in relation to particular injuries and sports.

Further details: Oslo Sports Trauma Research Centre and Department of Sports Medicine, University of Sport and Physical Education, Sognsveien 220, 0806 Oslo, Norway. Email: 2005congress@nih.no; website: www.ostrc.no

CORRECTION

Owing to the change over of typesetters at the BMJ Group the authors' corrections to the paper by Cassell *et al*, which was published in the October 2003 issue (Epidemiology of medically treated sport and active recreation injuries in the Latrobe Valley, Victoria, Australia *Br J Sports Med* 2003;37:405–409) were omitted. This mistake is much regretted and we would like to offer our sincerest apologies to the authors. The major error on page 407 of the Results section (ED presentations: first sentence of fourth paragraph) should read: Approximately 8% of people who attended an ED with a sports injury were subsequently admitted to hospital.

A fully corrected version of the paper will be posted on the web in the near future.

ECHO

Fitness to dive should rest on a clear CT chest scan



Please visit the *British Journal of Sports Medicine* website [www.bjsportmed.com] for a link to the full text of this article.

Professional divers should have a computed tomographic (CT) examination during their initial medical for certification to exclude conditions that can lead to fatal lung damage during diving. This is especially important if they smoke or have had chest infections, as one case series from Turkey has shown.

The three male divers were aged between 25 and 56 years with 6 months' to 15 years' diving experience. Two were regular long term smokers, smoking 20 cigarettes/day for 20 years and 23–30 cigarettes/day for 10 years, respectively. Symptoms occurred during ascent from a dive and included chest pain, breathing difficulties, and—in two instances—neurological symptoms. All divers recovered eventually with treatment, but all were excluded from diving.

CT scans of the chest showed air cysts or bullae predisposing to pulmonary barotrauma that were simply not evident in plain chest x ray films for each diver. In one case a large apical bulla was present; in another an azygous lobe on the right side and many air cysts in both lungs; and in the third a small bleb in the upper right lung.

Smoking and lung infections increase the risk of air sacs or bullae developing in the lung. These in turn increase the risk of pulmonary barotrauma, a complication of which—arterial gas embolism—caused almost a third of deaths from diving, according to one study.

▲ *Occupational and Environmental Medicine* 2003;60:606–608.