SPORTS MEDICINE AUSTRALIA

sport health

VOLUME 27 • ISSUE 2 • WINTER 2009

Publisher
Sports Medicine Australia
PO Box 78 Mitchell ACT 2911
T (02) 6241 9344
F (02) 6241 1611
E smanat@sma.org.au
www.sma.org.au

Circulation: 4000
ISSN No. 1032-5662

Editors
John Orchard & Janelle Gifford

Managing Editor
Lesley Crompton

Chief Executive Officer
Gary Moorhead

Subscription Manager
Ken Warwick

Advertising Manager
Lesley Crompton

Design/Typesetting
Papercut

SMA STATE BRANCHES

ACT
ACT Sports House
100 Maitland St Hackett ACT 2602
T (02) 6247 5115

New South Wales
PO Box 3176 Rhodes NSW 2138
T (02) 8116 9815

Northern Territory
PO Box 2331 Darwin NT 0801
T (08) 8981 5362

Queensland
Sports House 150 Caxton St Milton QLD 4064
T (07) 3367 2700

South Australia
PO Box 219 Brooklyn Park SA 5025
T (08) 8234 6369

Victoria & Tasmania
Sports House
375 Albert Road South Melbourne VIC 3205
T (03) 9674 8777

Western Australia
PO Box 57 Clarement WA 6010
T (08) 9285 8033

SUBSCRIPTION RATES
Australia A$35
Overseas A$50

SMA members receive Sport Health as part of their membership fee

Single copies and back copies A$15 (includes postage)

PP No. 226480/00028

For subscriptions contact Ken Warwick
T (02) 6241 9344
E smanat@sma.org.au

Cover photograph
SMA

Preventative Health Smorgasbord: Could I have fries with that?

The Australian Preventative Health Taskforce was established last year to provide evidence-based advice for the Federal Government's National Preventative Health Strategy. The Strategy's targets are the problems of chronic disease caused by obesity, tobacco and excessive use of alcohol. As part of the process, submissions were sought from interested agencies and more than 400 responses received.

Reducing junk food advertising and increasing alcohol taxes were two of the suggestions that have received significant media coverage. A substantial increase in tobacco taxes has already been signalled.

The problem for the politicians will be choosing the tastiest morsels offered up from this massive smorgasbord of suggestions – and naturally, the Preventative Health Taskforce itself will have a list of suggested priorities.

Priorities for the politicians will be modified by obvious matters such as the cost of proposals and the scientific evidence for their efficacy. But equally important will be how they think any proposed measures will go down with the voting public – particularly if these measures are likely to be ridiculed by the media or subject to a denigrating publicity campaign from adversely-affected vested interest groups (e.g. the food industry).

Of the three problem areas, tobacco is easy (quit!) and Australia is a world leader in reducing smoking rates. Alcohol is harder, but thanks to media stories about drunken behaviour amongst young people and the efforts of some NRL players, the public is probably ready for some tightening of the leash. (Maybe Ricky could do his media conferences wearing his green baggy instead of the VB cap?)

Obesity: complex problem; complex solutions?

But obesity? This is where the game gets much more complex. Probably the great majority of the 400 suggested answers to the Taskforce will have been addressing some element of the obesity problem – and most will have some merit.

This is a major problem for politicians – and the media. They prefer simple messages – and ideally, someone to blame. (Quit smoking! Evil big tobacco! This was perfect).

But quit eating? The food industry will also line up a bevy of its own experts to "prove" that junk food advertising has no relationship with kids' consumption and find other ways to muddy the waters. Doesn't McDonalds have a tick from the Heart Foundation? Can't be all bad – and what about all that fabulous charity work?

And what about the solutions? Most people understand that you get fatter as a result of energy imbalance – too much food and not enough physical activity. But almost all of the suggested solutions will focus on just one side or the other of the energy balance equation. The greatest challenge for the policy makers will be finding some unified course of action. They will need to reconcile:

- Obesity has two causes, but as mentioned above, most suggested solutions will be looking at just one of these causes.
- The fat/fit argument. Physical activity alone can have health benefit without weight change, but if weight reduction is the measure of success, will people stay motivated to be more active?
- What is healthy weight? The traditional measure – Body Mass Index (BMI) is under increasing challenge and the lumping together of overweight with obese to make a more compelling case just ends up misleading. Obese people almost certainly have a pending health problem; many active overweight people do not.
- Sitting time. Can people who meet both the weight and the p.a. guidelines have a potential health problem just because they sit a lot? (If you really want to understand this issue, make sure you attend "Be Active '09" in Brisbane, where the world's leading researchers in this field will be presenting. See www.beactive09.com for more details)
- Variations of age and gender. A solution for one population group may not be appropriate – or needed – for all.

One of the greatest temptations – and dangers – for the politicians will be to make children the priority. Politicians are probably the only adults who can kiss babies and frolic with children who aren't their own and not get arrested as potential paedophiles. Showing concern for children – and particularly at risk children – is a guaranteed vote winner. But making children the priority in any policy response to the obesity issue would be a public policy disaster.

The Obesity Crisis is with adults – not kids!

Put simply – there is an obesity crisis, but it is not with children, it is with adults – and you cannot obesity-proof people in childhood.

At the recent conference of the International Society of Behavioural Nutrition and Physical Activity (ISBNPA), two papers were presented that emphatically illustrated this fact.

In Sweden, schoolchildren are measured and weighed at age 10–11. These data show that rates of obesity in children in Sweden have in the main, decreased since 2000[1].In Australia, analysis by Professor Tim Olds of 28 surveys of childhood weight status undertaken between 1985 and 2007, show that contrary to the popular view that there is an "obesity epidemic" rather the rates have "plateaued" in the last 5–10 years and that *"the prevalence of childhood overweight is not following the trajectory suggested by health experts and the popular media"*[2].

Shoot the Messenger

Interestingly, both Olds and the Swedish researcher, Lissner, indicated that they had experienced a great deal of difficulty in getting their research on this topic published. In fact, when Olds announced his research findings earlier this year, they were questioned or criticised by many other researchers.

There are two dangers in dismissing the findings of Olds and Lissner. The first is that by exaggerating the potential problems with children, we are ignoring the real crisis of obesity, which is with adults. The second is that we threaten the credibility of suggested policy solutions if it can be demonstrated that researchers have been "crying wolf" about obesity in children. It will make it all the easier for vested interests to lobby against policy solutions that might discomfort them.

An example of this was provided by another presenter at the ISBNPA Conference. British policy on obesity will be informed by the "Foresight Project", which following detailed analysis has recommended *"that tackling obesity required far greater change than anything tried previously and at multiple levels (personal, family, community and national) and the need for partnership across Government, science, business and civil society"*[3].This is exactly the type of multifaceted approach needed to combat a problem as complex as obesity. Sadly, the Foresight Project has included in their advice a prediction that childhood obesity will hit 60 percent in the UK in the next forty years.[4] When it becomes apparent to policymakers that this base prediction is wildly off the mark, they may decide to dump all of the group's other, more worthy, recommendations.

It is to be hoped that when the Preventative Health Taskforce makes their recommendations in September they will discharge their charter and make sure that they are indeed, evidence based – and look at all the evidence, including that of Olds and Lissner.

Gary Moorhead

CEO, Sports Medicine Australia

gary.moorhead@sma.org.au

Professor Tim Olds will be re-presenting his material from the ISBNPA Conference at **be Active '09** in Brisbane in October.

References

1 Lissner A et al. Is the childhood obesity epidemic taking a break in Sweden? *Abstract* SJ4.2, 2009 ISBNPA Annual Conference Book of Abstracts.

2 Olds T et al. The prevalence of childhood overweight and obesity in Australia has plateaued. *Abstract* OK5.4. Ibid.

3 Kopelman, P. Changing behaviours for the prevention of obesity: how to inform policy makers? The Foresight Project. *Abstract* SJ4.1. Ibid.

4 Kopelman, P. Changing behaviours for the prevention of obesity: how to inform policy makers? The Foresight Project. *Presentation*. Ibid.

When a tunnel downgrade is a surgical upgrade: Why getting an ACL register in Australia is so critical

ACL injuries are the most discussed injuries in the world of sports medicine, something that hasn't changed in the last 30 years. Aspects of ACL injuries that *have* changed in the last 15 years include increased use of MRI scans to diagnose these injuries and surgical techniques for ACL reconstruction (amongst others, see Table 1). But have these things left our patients much better off? Possibly in some ways, but for all the extra money we now spend on ACL injuries, (Table 2) I suspect our *overall* results (as a country) are perhaps still no better than they were 15 years ago. In one of the only (but still very basic) ACL registries we have in Australia (associated with the AFL injury survey) it can be seen that approximately 15% of ACL reconstructions in high level athletes need revision. This rate hasn't improved over the life of the survey[1] and is pretty high given that AFL clubs are probably choosing the most reputable surgeons in their respective cities. The revision rate for the general population (Table 2) is lower, probably because of lower patient expectation than professional athletes rather than better surgery, but is steadily increasing.

Our fee-for-service structured Medicare system funds a rapidly-increasing tab for knee MRI scans and knee reconstructions (Table 2) without questioning whether we are getting value for money. With all the hot air that Kevin Rudd and Nicola Roxon have puffed about reforming the health system, there is still no sign of an ACL reconstruction register on the horizon, even though the Scandinavian countries have successfully introduced these already[2]. Our government seems to have no problem with the $100 million p.a. of direct costs of ACL injuries (and perhaps 10x this in indirect costs, when you consider future decreased productivity, disability pensions, decreased rates of exercise, osteoarthritis and obesity), increasing way faster than CPI. The suggestion that we urgently need a federal government body that monitors sports injuries[3], which would include a national ACL register as the first step, continues to get ignored. Can it possibly be for fear of excessive cost (of a laughably small few hundred thousand per year), when our heads are in the sand with respect to the huge annual cost increases for knee scans and knee surgery?

Table 1 – Changes in ACL management in the last fifteen years

Changes in ACL management over the past 15 years	Advantages of the change	Disadvantages of the change
More knee MRI scans performed to assess the ACL	Fewer cases where the diagnosis of ACL rupture is missed and the patient continues sport on an unstable knee	Clinical examination is downgraded in importance; far more knee reconstructions being done on patients with borderline instability and/or who would have survived well with conservative management; increased cost
Trend towards hamstring tendon graft reconstruction	Shorter hospital stays and quicker rehab, meaning some reduced cost per operation	See below (fixation devices); perhaps a trade-off against knee stability
Ever-expanding number of fixation devices & techniques	Perhaps one of them is better than the others (but without a register, how would you know?)	Less of a focus on correct graft positioning; likelihood that some fixation devices actually lead to worse outcomes,? e.g.cross-pin
More conservative recommendations about full return to sport	Perhaps fewer graft failures from early return	A lot of patients give up sport anyway (which begs the question of whether the reconstruction was really needed)!

Table 2 – Knee reconstruction surgery and knee MRI scans under Medicare (figures from https://www.medicareaustralia.gov.au/statistics/mbs_item.shtml and therefore *exclude* publicly-performed (or Workcover, Third Party) knee reconstructions, ACL injuries treated conservatively and MRI scans paid for privately).

Australian numbers	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Growth over the decade
Privately performed knee reconstructions (Items 49536, 49539, 49542)	5,458	5,879	6,410	6,829	7,022	7,338	7,799	7,913	8,389	8,672	58.9%
Private revision knee reconstructions (Item 49551)	279	338	348	356	408	421	445	487	542	602	115.8%
Medicare-funded knee MRI scans (63328)	17,828	22,226	29,964	36,032	41,017	47,364	54,981	64,676	73,776	78,190	338.6%
Revision percentage	4.9%	5.4%	5.1%	5.0%	5.5%	5.4%	5.4%	5.8%	6.1%	6.5%	33.5%

So would an ACL register save us money? It depends on whether it actually recorded patient outcomes and whether we bothered to act on the findings. But to support my argument that an ACL register should be saving us bucketloads, I'm going to throw a cat amongst the pigeons and say that potentially a huge number of ACL reconstructions performed in Australia are a waste of money, because the operations aren't being optimally done. Just as a joint replacement register in Australia will hopefully, eventually, allow us to follow the Scandinavian countries' lead and get better outcomes from total joint replacement[4], we surely will eventually follow their lead and get an ACL reconstruction register. Sadly it will probably be later rather than sooner because the Australian Orthopaedic Association (AOA) will probably drag the chain in pushing for an ACL register. Why would you ask for resources to be devoted to improving the quality of surgery when under the current system surgeons are guaranteed to get paid full-fare even if the quality of surgery is bad?

There are examples which I would consider obvious of sub-optimal surgical technique that automatically get fully funded under Medicare[5]. I'm pretty suspicious there is a Sydney surgeon who uses a central portal (cutting directly through the patellar tendon) for knee arthroscopes. This is based on patients I've seen who have developed patellar tendinopathy after a knee arthroscopy and where the portal scar seems to be dead centre rather than either side of the patellar tendon. But even if it is true that this is happening, our Medicare system would completely give this the green light. A surgical rebate is fixed and sacrosanct irrespective of good, poor or uncertain surgical technique.

In contrast, pharmaceutical companies increasingly need to demonstrate quality and efficacy (on a cost-benefit basis) to justify our PBS money being spent on expensive drugs. Why does this scrutiny not apply to surgeons? Once you have jumped the single hurdle of getting a provider number (which you'll have pretty much for life), it is virtually impossible to choose a surgical technique that is so bad that Medicare will stop rebating your patients. We have many good surgeons in Australia who deservedly get very well paid for their work, but our system gives an armchair ride to those surgeons who are demonstrably bad at certain procedures but can fool some of the referring doctors enough of the time to still be seeing patients.As with the PBS, the Medicare system muse one day start taking into account relevant techniques and indications for surgery[5].

You might think that a rogue Dr Death in Bundaberg or a single surgeon doing arthroscopies through the patellar tendon might be considered exceptions. But what if there was an example of poor surgical technique endemic in the system for a major procedure? How could we recognise it and stop it, when the potential checks in the system (like follow-up registries) basically don't exist? Unfortunately I'm coming to the conclusion that ACL reconstruction surgery may fit into this category.

Admittedly I set the bar pretty high, with the perspective of a gold-standard for ACL reconstruction set by the top surgeons of the North Sydney group[6–8]. They have what is perhaps the most-renowned sports orthopaedic practice in Australia. Some of the areas in which they were pioneers have been replicated elsewhere, such as surgical subspecialisation into various joints and a strong involvement of sports physicians, radiologists and physiotherapists in the overall sports medicine centre. But it is worth noting also that one of the planks on which they have built the success of the practice is that they do very good ACL reconstructions[9]. I've sung the praises of their senior surgeons before in this journal[10] and recently I invited them to debate the merits of patellar tendon versus hamstring tendon grafts in the BJSM[7–8]. The constraints of this debate didn't allow them to venture on to the topic of correct graft placement, but I'm going to venture down this treacherous path.

The North Sydney view, which I subscribe to and which now has a lot of objective evidence to back it up, is that the correct femoral graft position for an ACL reconstruction is at the 10 o'clock (for a right knee) or 2 o'clock (for a left knee) position on the lateral wall (Figure 1), not the 11 o'clock or 1 o'clock position higher up in the notch (Figure 2 a and b)[6, 11]. For those who are familiar with the new double-bundle techniques, this is primarily a reconstruction of the posterolateral (PL) bundle, rather than the anteromedial (AM) bundle[12–13]. Why pick the posterolateral bundle? For the simple reason that this is the part of the ACL that controls lateral knee stability from 0–30 degrees of flexion, and controls the "screw home" mechanism into full extension. The AM bundle controls lateral knee stability at 90 degrees, where you don't really need it for changing direction (Table 3). It is the same logic which allows you to arrive at the conclusion that the majority of PCL tears don't need reconstruction (unless you are an AFL ruckman or downhill skier) as most people can live with a lax knee at 90 degrees. Of course, many ACL tears involve both bundles but if you are going to tear a single bundle then in 99% of athletes you would prefer to have a stable PL bundle.

Table 3 – Differences between the two ACL bundles

	Posterolateral bundle	Anteromedial bundle
Primary clinical diagnosis	Pivot shift test and Lachman's (15–30 degrees)[12–13]	Anterior drawer (90 degrees)
Attachments	10 am (right) or 2pm (left) on the lateral wall of the notch and just in front of the PCL footprint on the tibia	11am (right) or 1pm (left) on the superolateral wall of the notch and on the anterior tibial spine
Functional effect of deficiency	Unable to change direction whilst running, i.e. very important	Problems with bent knee activities (e.g. ? downhill skiing)
MRI appearance	Hard to assess on coronal/sagittal MRIs because of oblique path	Particularly well seen on a sagittal MRI
Mechanism of injury	Fixed foot and internal rotation of the tibia on the femur.	Valgus mechanism
Associated injuries	Lateral femoral condyle bone bruise, lateral meniscal tear	Medial ligament tear

There is now even an RCT to show that the low tunnel reconstructions do better than high tunnel position reconstructions[14] along with other cadaver and clinical studies showing that a more horizontal graft is better than a vertical one at correcting knee instability[15–16]. Superior knee surgeons often comment that the majority of their revisions from elsewhere have failed the primary reconstruction simply because the original graft position was poor (too vertical). I suspect an ACL register could further confirm this argument if graft position photos were kept and clinical results were analysed according to position.

I used to think that "other" surgeons were probably competent at doing most ACL reconstructions but maybe missed the optimal graft position a bit more frequently and hence may have had higher failure rates. I'm starting to worry that there might be "other" surgeons our there who *routinely* use an incorrect graft position. Recently I did a Google Image search on ACL grafts and was shocked by what I saw – a lot of the grafts were in the wrong overly-vertical position (Figure 2). Even worse was that these images weren't from one-off "stuff-ups", but from the surgeons' own websites indicating what their "optimal" ACL grafts looked like. The images from Figure 2 seem to originate from overseas, but I warn you that I went very close to including some graft pictures published on the web from reputable Australian surgeons that I thought were closer to Figure 2 than Figure 1.

Over the last few years I have become more nosey in asking other sports physicians how other surgeons operate. To my dismay, I've heard that a significant number of surgeons in Australia use a transtibial technique (Figure 3) for the femoral tunnel (drill the tibial tunnel and use the same tunnel to keep going up to drill the femoral tunnel). When companies who manufacture devices (Figure 3) promote this technique, it may be forgivable for surgeons to follow their instructions (although there should always be some scepticism about companies trying to flog their own fixation devices). From my knowledge of knee anatomy, this almost guarantees that the position of the femoral tunnel will be more vertical than horizontal. I've convinced the best way to get a correct (low) femoral tunnel position is to come in through an anteromedial arthroscopy portal with the knee in full flexion[6, 17–18] (Figure 4).

I also have grave concerns about the use of any form of cross-pin fixation on the femoral end, with a high likelihood again that the tunnel will be too vertical (unless the cross-pin is pointing more towards the patient's opposite shoulder than their opposite knee). I would hypothesise that an ACL register would almost certainly show worse results for this type of fixation in a genuine athlete. There may be some good results in patients who have incorrect tunnel placement for their ACL reconstructions, but I would argue that the number one reason for a good result would be that the patient elects to not attempt rapid change of direction on the knee after the reconstruction – meaning of course that he or she didn't need the reconstruction in the first place!

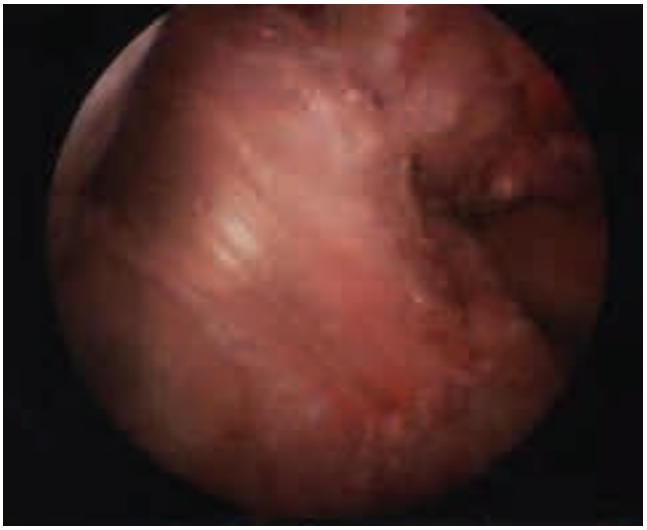


Figure 1 – correct positioning of a right ACL graft (at 10 o'clock, filling up the lateral wall of the notch)

Figures 2 (a) and (b) – Incorrect positions of ACL grafts (too vertical, almost at 12 o'clock), published on the web on overseas websites as allegedly "good" grafts

The modern obsession with MRI scans perhaps means that there may be a greater tolerance for poor graft position than in the pre-MRI days. A dysfunctional graft will give a positive pivot shift test, which (apart from the patient's tolerance of change-of-direction) is the best way to assess knee stability. An incorrect graft position will actually show up the intact graft more clearly on an MRI than a correct one, as the pictures are generally done in coronal and sagittal planes, which is better for showing vertical grafts. The MRI seems to be used more and more as a replacement for good clinical examination.

There is an important debate amongst knee surgeons about the merits of various ACL grafts[7–8] – do you go for a bone-patellar-bone graft for stability or a 4-strand hamstring graft for lower graft morbidity? For this debate to be relevant, you need to have the graft in the correct position in the first place. If you have a vertical graft, then the knee won't be stable in the functional positions of multi-directional sports. For a badly positioned graft, you might as well go all the way to an artificial ligament (or not do an operation at all), since you'll want every ounce of quads and hamstring proprioception to hold the knee together at 30 degrees when the ACL graft won't.

Proponents of the double-bundle reconstructions will argue that it is more anatomically correct to reconstruct both of the bundles. In one sense this is faithful to the anatomy, but in a virgin knee there isn't a bony wall between the two bundles of the ACL. I would certainly think a double-bundle reconstruction is better than a vertical single-bundle one. However, if the PL bundle is the critical one for functional knee stability, which I believe is the case, then I believe that bone-PT-bone or 4-strand hamstring is going to be stronger in this position than 2-strand hamstring, as per the double-bundle technique. I think it is another question with room for reasonable debate, but yet again one that we should be trying to answer with a national ACL register. If there was political will it would be so easy to create and fund an ACL register – just devote 5% of the Medicare funding for each ACL reconstruction to maintaining a register, or 100% of the rebate of any recalcitrant surgeon who doesn't want to participate. We should immediately move to the position that if you want public funding to operate for high volume surgeries you should be part of a register which tries to improve the quality of surgical outcomes. If there are any surgeons who are scared of being part of an ACL register, you'd have to ask questions why they wouldn't want to have their results scrutinised.

So if you are not a surgeon and are shocked at the graft position next time you see a post-operative photo, what can you do about it? If the surgeon doesn't have

a good explanation, then someone as frank as me would suggest trying to steer patients who need ACL reconstructions to surgeons who are aiming to get a low/better tunnel position (by drilling the femoral tunnel through the medial portal rather than with a transtibial technique). But rather than upset the apple cart, maybe it is more politically correct to just join the campaign for us to follow the Scandinavian lead and get an ACL register in Australia.

Dr J

References

1. Orchard J, Seward H. AFL Injury Report: Season 2008. Sport Health 2009;27(2): http://www.injuryupdate.com.au/images/research/AFL_Injury_Report_2008.pdf.
2. Eriksson E. A European ACL register. *Knee Surgery, Sports Traumatology and Arthroscopy* 2006;14(4):309.
3. Orchard J, Leeder S, Moorhead G, Coates J, Brukner P. Australia urgently needs a federal government body dedicated to monitoring and preventing sports injuries. *Medical Journal of Australia* 2007;187:505–506.
4. Kolling C, Simmen B, Labek G, Goldhahn J. Key factors for a successful National Arthroplasty Register. JBJS (Br) 2007;89:1567–73.
5. Orchard J. Health insurance rebates in sports medicine should consider scientific evidence [editorial]. *Journal of Science and Medicine in Sport* 2002;5(4):v–viii.
6. Chapman A, Murray J, Cross T, Cross M. The ACL reconstruction question: bone-patellar tendon-bone vs. hamstring tendon. Sport Health 2006;24(1):11–15, http://www.injuryupdate.com.au/images/research/RationalePatellaACLreco.pdf.
7. Carmichael J, Cross M. Why Bone – Patella Tendon – Bone grafts should still be considered the gold standard for Anterior Cruciate Reconstruction. *British Journal of Sports Medicine* 2009;43(5):323–5.
8. Pinczewski L, Roe J, Salmon L. Why autologous hamstring tendon reconstruction should now be considered the gold standard for anterior cruciate ligament reconstruction in athletes. *British Journal of Sports Medicine* 2009;43(5):325–7.
9. Orchard J. Surgical procedures performed at an NRL club over 10 years. *Sport Health* 2009;27(1):17–29, http://www.injuryupdate.com.au/images/research/NRLsurgerySH.pdf.
10. Orchard J. Evidence-based medicine and ACL reconstructions. *Sport Health* 2006;24(1):3–6.
11. Pinczewski L, Salmon L, Jackson W, von Bormann R, Haslam P, Tashiro S. Radiological landmarks for placement of the tunnels in single-bundle reconstruction of the anterior cruciate ligament. *JBJS (Br)* 2008;90(2):172–9.
12. Ishibashi Y, Tsuda E, Yamamoto Y, Tsukada H, Toh S. Navigation Evaluation of the Pivot-Shift Phenomenon During Double-Bundle Anterior Cruciate Ligament Reconstruction: Is the Posterolateral Bundle More Important? *Arthroscopy* 2009;25(5):488–495.
13. Petersen W, Zantop T. Partial rupture of the Anterior Cruciate Ligament. *Arthroscopy* 2006;22(11):1143–45.
14. Jepsen C, Lundberg-Jensen A, Faunoe P. Does the position of the femoral tunnel affect the laxity or clinical outcome of the anterior cruciate ligament-reconstructed knee? A clinical, prospective, randomized, double-blind study. *Arthroscopy* 2007;23(12):1326–33.
15. Brophy R, Pearle A. Single-Bundle Anterior Cruciate Ligament Reconstruction: A Comparison of Conventional, Central, and Horizontal Single-Bundle Virtual Graft Positions. Am J Sports Med. 2009. *American Journal of Sports Medicine* 2009:Mar 27. [Epub ahead of print].
16. Chhabra A, Kline A, Nilles K, Harner C. Tunnel expansion after anterior cruciate ligament reconstruction with autogenous hamstrings: a comparison of the medial portal and transtibial techniques. *Arthroscopy* 2006;22(10):1107–12.
17. Lubowitz J. Anteromedial portal technique for the anterior cruciate ligament femoral socket: pitfalls and solutions. *Arthroscopy* 2009;25(1):95–101.
18. Steiner M. Independent drilling of tibial and femoral tunnels in anterior cruciate ligament reconstruction. *J Knee Surg* 2009;22(2):171–6.

Figure 3 – Taken from a device manufacturer's website showing the technique for drilling of the femoral tunnel through the tibia. Perhaps it should be titled "How to get a poor (too vertical) graft position"!

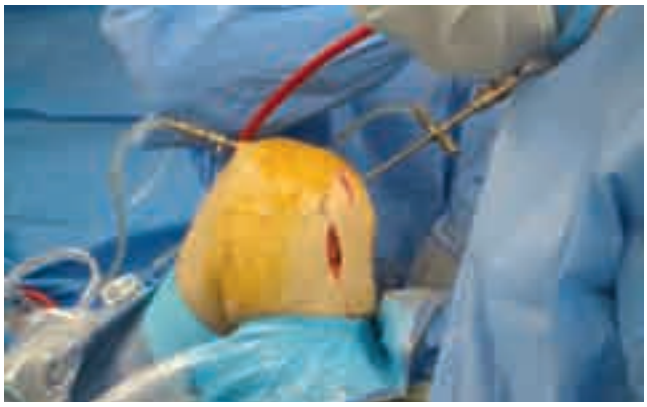


Figure 4 – Fully flexed knee – the best position for drilling the femoral tunnel through the medial arthroscopy portal to get a 10 o'clock or 2 o'clock tunnel position. This position will lead to a more horizontal femoral tunnel than the technique seen in Figure 3

Pain. Do you get it?

Controlled experimental studies have shown that the more dangerous a stimulus, the more it activates C-fibres, the greater the brain activity and the more it hurts. As my daughter says – it's hardly rocket surgery. Is it, however, really *that* simple? Do such experiments reflect the real world? I think we have to be careful when we interpret these experiments because this kind of result can lull us into a simplistic idea of what pain actually is. In fact, such results lend themselves to the idea that pain is something that occurs in the tissues of the body and is detected or transduced by pain receptors, transmitted by pain fibres and ultimately perceived by the brain. This idea was most famously proposed by Rene Descartes[1] a few centuries ago but remains the dominant paradigm of pain to this day.

Some of the profound scientific discoveries along the way that should have enlightened us, for example the discovery of high-threshold neurones, now labelled C or A-δ fibres and collectively called *nociceptors*, instead strengthened the hold of the paradigm on clinical practice. However, as pointed out twenty years ago, "the labelling of nociceptors as pain fibres was… an unfortunate trivialization"[2] p254. There is compelling evidence at every level of the evidence heirarchy against the idea of an isomorphic relationship between nociception and pain, but the idea persists, perhaps because it is, at first glance, so deliciously simple. I contend, however, that it fails many people in pain and the people it fails are those for whom our expertise, services and knowledge are most important.

So, pain is not simply a measure of nociception and nociception is not simply a measure of the state of the tissues of the body. This somewhat inconvenient truth begs the question "What then, is pain?" The International Association for the Study of Pain (IASP) defines it as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms thereof". I think that definition undervalues the importance of the brain in pain and still implies that pain is something that occurs in the tissues and is "registered" by the brain. I prefer to think of pain as a protective mechanism that depends on the brain's implicit evaluation of the need to protect body tissue. This idea of pain accounts for the forest-loads of articles that describe the modulatory effect of this belief, or that movement, or this immune state, or that mood, or this context, or that social situation, on pain. Reconceptualising pain as a complex conscious event that reflects a complex unconscious appraisal, instead of a conscious marker of nociception, is in some ways a drag – the simplicity of the old model is far more attractive.

Ignorance, however, is not bliss. There is now a growing body of compelling evidence to suggest that a strong structural-pathology model of pain is bad, but reconceptualisation of pain as a conscious protective device based on a complex biology is good, particularly for patients with persistent pain. For example, we must accept that for the patient with chronic back pain, the sensitivity of spinal nociceptors and cortical pain-evoking neural networks is enhanced. We can no

longer focus our assessment and management solely on the tissues of their back. Instead, what is now known about the biology of pain implores us to first identify and second modify, everything that might be telling the brain that the back is in danger. Importantly, the patient is the key agent of this process and should therefore have an understanding of pain biology in line with our own. In fact, when patients better understand the biological processes that underpin pain, they have a higher pain threshold[3], less worry and distress[4], better motor performance[5–6], and less pain and disability[7].

So, how do we teach patients about pain? Obviously, promoting conceptual change when the prevailing paradigm is so dominant, is not a trivial task. However, it is very doable (I bet you are thinking "maybe so for some patients, but not the patients *I* see". I have two responses to that: First, you are not alone – most health professionals underestimate the capacity of their patients to understand the biological processes that underpin pain, and second, you are wrong – most patients can grasp the information relatively easily and demonstrate clear conceptual shifts toward a more accurate understanding of the biology of pain[8]).

Promoting the reconceptualisation of pain is now considered a therapeutic strategy in its own right. One research interest of mine is to investigate the clinical utility and efficacy of trying to change the way people understand pain, as a therapeutic strategy. Cross sectional studies, conventional experiments and randomised clinical trials seem to suggest a three-stage approach:

i Engage the person in pain, get them thinking about pain, for example via emotionally engaging or inherently interesting material that illustrate key aspects of pain, or which can be used as metaphors to do so.

ii Give them hard scientific facts concerning both their current and the accurate conceptualisation, but do it in an interesting, valuing and compassionate way – "slowly release the truth".

iii Give them the resources to test the new conceptualisation via working examples. This is where modern cognitive-behavioural principles are key. There is a very large amount of excellent literature on the use of cognitive-behavioural principles in pain *management*. I contend that the power of that work is greatly enhanced when it occurs on the back of the first two prongs.

This three-stage process is not novel – it is easily recognisable within cognitive theory, conceptual change theory and the biology of learning. Surprisingly however, it *is* novel to the pain and rehabilitation science community. Herein lies the obvious barrier: getting patients to reconceptualise their pain in a way that better aligns with the last 50 years of progress in pain science first requires health professionals to reconceptualise pain in the same way. Available data suggest this is happening, albeit slowly. Take heart however, because we once thought the world was flat and that, if you put your foot in a flame, it pulls on a cord that runs up your leg and rings a tiny bell in your head so the tiny tiny person in your head can tell you that your foot hurts[1]. Now that *is* ridiculous. Isn't it?

G. Lorimer Moseley PhD

NHMRC Senior Research Fellow
Prince of Wales Medical Research Institute, Sydney, Australia.

lorimer.moseley@gmail.com

Lorimer Moseley is co-author of *Explain Pain* (2003), now in four language, and is author of *Painful Yarns. Metaphors and stories to help understand the biology of pain* (2007). He has written over 60 articles in top-flight journals such as Proceedings of the National Academy of Sciences, Current Biology, Pain, Brain and the British Medical Journal. He was the first physiotherapist to be appointed Nuffield Medical Research Fellow at Oxford University and, in 2007, was judged the outstanding mid-career clinical scientist working in a pain-related field by the International Association for the Study of Pain. He now lives and works in Sydney.

Lorimer Moseley will be a keynote speaker at **be active '09**

References

1. Descartes R. *In Lectures on the history of physiology during the 16th, 17th and 18th centuries*. (ed. Foster, M. T.) (Cambridge University Press, Cambridge, 1901).
2. Wall P & McMahon S. *The relationship of perceived pain to afferent nerve impulses. Trends Neurosci* 1986;9:254–255.
3. Moseley GL. Evidence for a direct relationship between cognitive and physical change during an education intervention in people with chronic low back pain. *European Journal of Pain* 2004;8:39–45.
4. Moseley GL, Nicholas MK & Hodges PW. A randomized controlled trial of intensive neurophysiology education in chronic low back pain. *Clinical Journal of Pain* 2004;20:324–330.
5. Moseley GL. Widespread brain activity during an abdominal task markedly reduced after pain physiology education: fMRI evaluation of a single patient with chronic low back pain. *Australian Journal of Physiotherapy* 2005;51:49–52.
6. Moseley GL & Hodges PW. Reduced variability of postural strategy prevents normalization of motor changes induced by back pain: A risk factor for chronic trouble? *Behavioral Neuroscience* 2006;120:474–476.
7. Moseley GL. Combined physiotherapy and education is effective for chronic low back pain. A randomised controlled trial. *Aus J Physioth* 2002;48:297–302.
8. Moseley L. Unraveling the barriers to reconceptualization of the problem in chronic pain: the actual and perceived ability of patients and health professionals to understand the neurophysiology. *The Journal of Pain* 2003;4:184–189.

THE EDGE

Energise your body and experience faster recovery!

Optimum performance depends on great technique, appropriate diet and training, not to mention focus, commitment and a positive mental attitude. But what about hydration, is that important?

You bet!

Two thirds of your body is water – athletes who know how to manage this internal fluid system have the 'EDGE'!

'I love my Alphion'

Australian Triathlete Felicity Abram drinks energised alkaline water.

2nd place in ITU World Cup 2008.

Jupiter Science Alphion Water Alkaliser

Energised Alkaline Water is:

- **Alkaline** – from 10 to 1000 times more alkaline than filtered tap water, neutralises acid in the body which accumulates through acidic power foods, excessive exercise and stress.
- **Energised** – live water donates negative ion electrons to your body = more energy.
- **Oxygen Saturated** – approximately 100% more than in filtered tap water.
- **Antioxidant** – donates powerful antioxidant, negative hydrogen ions (the primal antioxidant).
- **Micro-clustered** – tiny molecules pass through cells penetrating the entire body, neutralising acid toxins and ensuring complete hydration.

Most medical conditions and sports injuries are inflammatory and are caused, aggravated or made worse by acidic environments. **Alkaline neutralises acid – it's a scientific fact!**

What are you, Acid or Alkaline?
Ask for a FREE pH Test Kit

WANTED! Business Associates

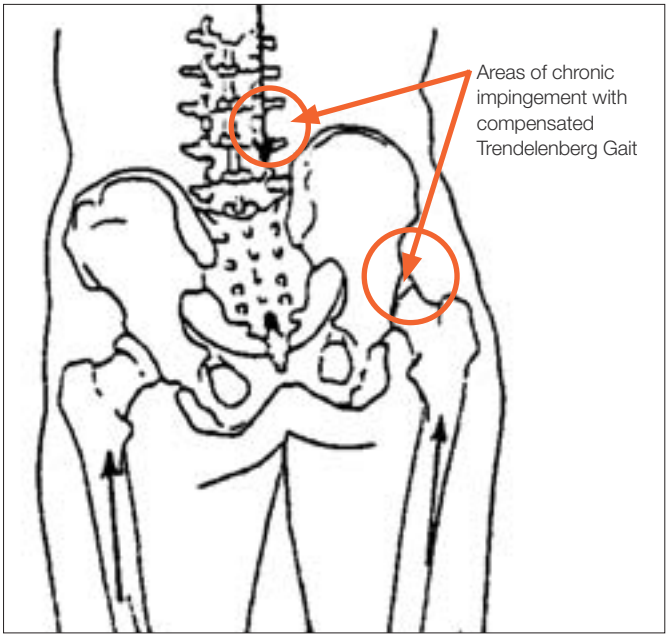
For information and support call an Alkaline Specialist NOW!

Freecall 1800 268 469
or visit www.alkaway.com.au

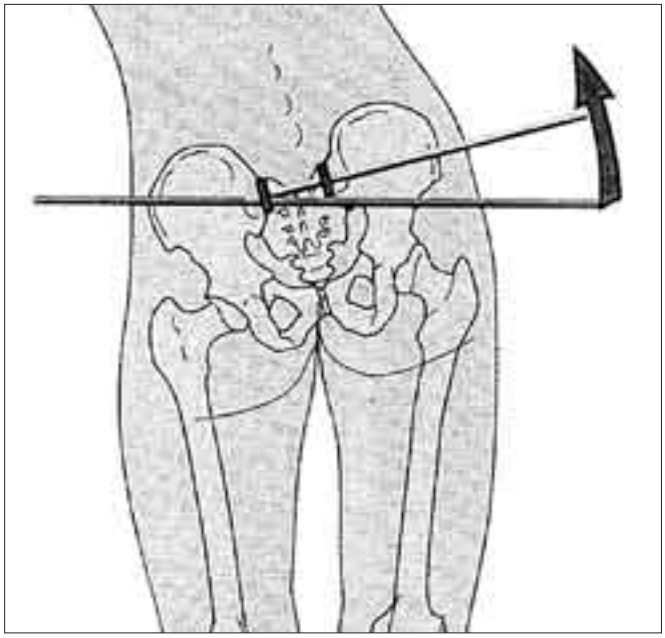
ALKAWAY
THE BEST WAY TO ALKALISE

The testimonials herein do not necessarily reflect any guarantee of therapeutic benefits.
Alkaway recommends you consult a health professional before making any health regimen change.

Diagnosis of low back pain: Is a diagnosis really necessary?



Assymetrical Syndrome = postural overload



Assymetry of Gait – Compensated Trendelenberg Gait

The problem

Historically our efforts to assist people who present with low back pain have been to diagnose the structure that is injured and then devise a management program to treat this structure. Manual therapists through the years as well as physicians and surgeons have adopted this approach. But is it really helpful for our patients that we adopt this approach?

If one looks at the literature prior to 1932 when Barr and Mixter[1] first described their landmark paper on vertebral disc herniation, most of the literature focused around the similarity of symptoms experienced by some pregnant women and those who presented with low back pain. Barr and Mixter's paper changed that focus and since then the major focus of research has tended to be around problems at the intervertebral disc.

There have been many more studies looking at other structures around the vertebrae and many have found to be pain generators. In particular, the facet joints[2],ligaments, and dural structures. All having their own particular way of diagnosing that particularly hinges on imaging modalities. These consist of plain X-ray, CT scanning, Nuclear bone scanning and MRI scans. All these modalities tend to look at bone and bone structure. The newer modalities can also look at some of the soft tissues and can show us discal material and even loss of muscle (CT scans and MRI, axial views with fatty infiltration of the multifidus,).

Given that most studies suggest that, at best we diagnose only 15% of people who present with low back pain as having a structural cause for their pain, then perhaps we can make a case that perhaps the Structural diagnosis approach may not be the best way to approach this issue.

There is an aspect of management of this problem that seems to be based upon the craft group from whom the patient seeks assistance. If a surgeon is approached then the most likely answer will be that the patient does or does not need surgery. Well that is good to know, but does it solve the problem for the patient?

General practitioners, even those with an interest in musculoskeletal medicine, will tend to prescribe medication and refer to a manual therapist. Manual therapists have many different paradigms in which they formulate a management plan depending upon their particular craft group. Massage therapists (also known as soft tissue therapists) will usually use a direct massage approach to alleviate the hypertonic muscles that have occurred as a result (?)/ cause of the problem. Manipulative therapists (chiropractors, osteopaths and some physiotherapists) will use manipulation in several different forms and/or in association with other modalities such as electrotherapeutic machines, deep tissue massage, stretching and even exercise. All of these approaches also contain variations that can be applied. Despite this, our research shows us that most people recover within 5–6 weeks

and prevention of future events can occur if a specific exercise intervention is made.

So do we think we are doing a good job with treating this problem for our patients?

This problem of low back pain certainly was one I felt least prepared to tackle when I first commenced practice. I know many of my colleagues prefer not to treat it and even go so far as to avoid it, a view fairly common in medicine. As doctors we have defaulted the treatment of this condition to our manual therapy colleagues, unless of course they fit quite nicely into one of the 15% of people with structures we can treat within the medical paradigm.

Is there another way of approaching this Problem?

Perhaps it is time we began to approach this problem differently. There is a greater body of knowledge that now can incorporate not just the structural approach, but also the functional. We are becoming very aware that **HOW** the body moves through space and, disturbances of this function, may be just as important as any effects on the structural elements.

We are built as symmetrical beings and our structural elements prefer to have equal forces placed upon them. We have muscle agonists and antagonists. The concept of a muscular neutral resting tension is well known, as is Panjabi's suggestion of a neutral zone for joints. If the excessive pulling of an agonist holds the joint outside the neutral zone and in a position at its extreme end of range, this will create stress on the components of that joint and their accompanying "soft tissues", i.e. joint capsule, joint ligaments.

For instance, Porterfield has suggested a mechanism that explains joint stresses over our lifetime which he terms the Asymmetry Overload. If we look at the whole process over a period of time we can postulate that muscular dysfunction will lead to asymmetry in joints and to their eventual degeneration themselves. Wolfe's Law proposes that joints adapt to the stresses placed upon them and during this adaptive phase they will cope by placing down more bone and strengthening the ligamentous and capsular supports, but eventually the stress upon the joint may well exceed the ability of the joint to adapt. It is then that we see joint degeneration commence.

For example, if we look at perfect function in single leg stance, then all systems (both structural and functional) are in balance and joint forces are evenly spread upon the joint surfaces that were designed for maximal stress. If muscular dysfunction occurs then distribution forces become asymmetrical and there will be increased forces upon joint surfaces. This would appear to be a very simple engineering principle, for those with this background, but one which we as health practitioners do not necessarily ascribe to.

Other newer areas of interest that are being developed are the roles that fascia play in development of dysfunction and pain. Like the area of sacroiliac joint dysfunction and the role that altered muscle recruitment pays in pain generation, the fascia group are now conducting international conferences to encourage multidisciplinary research and clinical exchanges of ideas. The International Conference of the Pelvis and Lumbar Spine began in 1992 and is now held 3 yearly. This endeavour has allowed clinicians from all around the world and from different disciplines to come together and exchange ideas from their own empirical backgrounds. The knowledge base as research progresses has enabled a great deal of understanding and changed clinical practice in this realm.

Challenges

So are we asking the right question when we ask what structure is injured?

Should we not be asking WHY or what changes to function have occurred?

The challenge for us as practitioners is to maintain brain activity and challenge the strict paradigms within which we were taught to view the musculoskeletal system. We need to continue to learn and listen from each other, initially as clinician to clinician, then as clinician to researchers, to assist us to work out the basis for many of our empirical treatments. This will eventually allow us to sort out which treatment methods work for which areas of dysfunction and also the timing of these interventions.

For too long we have had a tendency to BLAME the patient when they refuse to get better with our treatments. Perhaps it's time to rethink the complex nature of our bodies and the role that all our systems play in our dysfunctions.

Dr Jeni Saunders MBBS FACSP
acsp@bigpond.com

References

1 1. Mixter WJ, Barr JS. Rupture of the intervertebral disc with involvement of the spinal canal. *N Engl J Med* 1934;11:210–5.

2. Hides J, Jull GA, Richardson CA. Long-Term Effects of Specific Stabilizing Exercises for First-Episode Low Back Pain. *Spine* 2001;26(11):E243–E248.

Who chooses to use multi-purpose recreation facilities for their physical activity setting?

Introduction

Activities that take place in multi-purpose recreation facilities—also known as leisure centres, health/fitness centres, gyms, sports centres—are popular forms of physical activity in Australia[1]. In Australia in 2002, 11.2% of adults participated in aerobics/fitness/ aquarobics activities, 10.9% participated in swimming and 0.9% participated in weight training[2]—all activities commonly offered in these facilities. Although such facilities are a popular setting for physical activity participation, little is known about who uses them or why.

One key to increasing future participation in physical activity is to increase the use of existing recreational facilities[3–4] To achieve this, we need a better understanding of the relationship between different types of people (older, younger, male, female, urban, rural etc) and the places in which they choose to be physically active[4]

This paper presents the results of a descriptive study of the demographic profile of, reasons for attending by, and the amount and type of physical activity undertaken by, a large sample of facility users (clients, customers, patrons, participants etc).

Methods

A convenience sample of four multi-purpose recreation facilities, based on location and infrastructure—all had to have a pool, gym, group fitness area and sports hall—was selected from a Victorian industry database of over 340 facilities. The sample consisted of one metropolitan, one regional and two rural facilities.

A Facility Users Questionnaire was developed and used to collect information about: demographic characteristics; physical activity participation; reasons for facility attendance; and reasons for specific facility selection.

A survey desk was located near the facility reception desk between 9am – 12pm and 5pm – 9pm over four consecutive mid-week days between July and August 2003. Users were approached and invited to participate in the study as they entered or left the facility. All users aged 18+ years engaged in physical activity within the facility who accepted the invitation to participate, were included in the study. A Plain Language Statement was provided with every questionnaire administered and consent was implied with the user's completion of the survey. Monash University and Deakin University Human Research Ethics Committees' approved the study.

The data is presented as the proportion of respondents in categories of interest (e.g. gender, age, etc). Chi-squared tests were used to compare responses across different category levels.

Results

Overall, 972 users were approached to complete the questionnaire and 729 agreed to do so (75% response rate). The final analysis consisted of 703 eligible surveys of which 210 were from the metropolitan facility, 291 from the regional facility, and 129 and 73 respectively from the two rural facilities.

Of the 651 users who indicated gender, 63% were female. The 645 users who reported their age ranged from 18–78 years, with a mean of 37 years; 62% were <40 years of age and 17% were 50+ years of age.

Of the 645 users who reported their highest level of education, 46% had university/higher degrees, 33% had finished high school, and 18% had Technical and Further Education or trade qualifications. Professionals (30%) were the most strongly represented occupational category among users, followed by home duties (18%), managers (11%) and students (10%).

The most frequently reported reasons for attending the facility were to improve fitness/health (44%); maintain fitness/health (22%); enjoyment (15%); weight loss (11%); and rehabilitation/medical (11%). More women than men nominated enjoyment ($p<0.001$) and weight loss ($p=0.001$) as reasons for attending; more men reported rehabilitation ($p=0.002$). Older users were more likely to nominate rehabilitation and improved fitness/health and less likely to nominate enjoyment and weight loss as reasons for attending the facility.

The major reason nominated by users for selecting their particular facility was it being close to home (58%), followed by its health/fitness programs (36%) and range of equipment (25%). Other common reasons were its good reputation (19%), cleanliness (17%), appearance (14%), other family members attended it (13%) and financial cost (13%). Twelve percent of users reported choosing their facility because it was safe. More women than men (40% versus 31%, $p=0.016$) selected their particular facility for its health/fitness programs. Older users were more likely to have selected the facility for its health/fitness programs, and less likely to have selected it for its reputation, appearance or proximity to home.

Swimming was the most popular activity undertaken at the facilities (66%), followed by gym (49%) and aerobics (26%). Formal sport (3%) and other activities (3%) were undertaken by a small proportion of users. More women participated in aerobics than men (38% vs 7%, $p<0.001$). Fewer women, than men, used the gym (47% vs 56%, $p=0.041$) or went swimming (62% vs 73%, $p=0.008$). Older users were less likely use the gym.

Discussion

Creating supportive environments for health is a fundamental health promotion goal[5] and understanding the relationship between individual, social and environmental determinants of physical activity participation is a key challenge[6–7]. Multi-purpose recreation facilities are an important community infrastructure for promoting physical activity. Knowing more about who uses them and why, is the first step in further developing these environments and the programs they offer to meet the needs of specific population groups, particularly older adults, who are a growing but under-represented user-group for such facilities[4]. To our knowledge, most information available about facility users comes from north American, mainly fitness industry-based, studies of members of health clubs[8–10]. Enabling people to use facilities is important because members of physical activity-related clubs have been shown to be 2.5 times more likely than non-members to achieve recommended levels of physical activity[7].

This study has shown a wide range of ages, education levels, and occupations among facility users. Most commonly, users were female, <40 years old, held university degrees, and were either professionals, involved in home-duties, managers, or students. These demographic findings are similar to other research[8–10] and support the idea that education level and household income are positively associated with physical activity participation[7].

The most frequently reported reasons for attending the facilities were improving fitness/health and maintaining it, followed by enjoyment, weight loss, and rehabilitation. In contrast, people in the U.S. generally expect to have fun and meet new people when they exercised at a health club[9]. The reasons identified in this study are similar to those identified as motivating people to be involved in voluntary sporting organisations in Norway[11] and could be exploited in facility marketing to increase use and participation in physical activity.

Proximity to home was the most frequently reported reason for selecting a particular facility. This supports the notion that facility use is sensitive to the distance users are required to travel to access the facility[3, 12]. American health club members have previously indicated that they do not want to travel more

than 12 minutes to access facilities and that they often look for specific pieces of equipment and exercise programs when selecting a new facility[10].

These data suggest that women are more likely than men to use a facility for enjoyment and weight loss, to select their particular facility for its fitness/health programs, and to do aerobics. Men were more likely to attend for rehabilitation, and to go swimming and use the gym. Men are more likely to join a U.S. health/athletic club for practical reasons (e.g. need a place to exercise) while women are more likely to join for physical (want to get healthy) and psychological (need motivation) reasons[10]. These findings support previous work which established that men and women have different reasons for accessing physical activity facilities and participating in sporting club activities[8, 11].

Older facility users appear to be more likely to attend the facility for rehabilitation and improved fitness/health, and less likely to attend for enjoyment and weight loss. They are also more likely than younger users to select their facility for its health/fitness programs but less likely to select it for its reputation, appearance, and proximity to home. Older users also seem to be less likely to undertake gym activities. This supports previous research establishing that older and younger people derive different types of benefits and have different reasons for participating in sporting club activities[11].

It has been argued that many physical activity interventions have achieved limited success because they were not targeted specifically to meet the needs of the people whose behaviour they were designed to influence, and that the application of the concept of market segmentation could be usefully applied in the targeting of physical activity interventions[4]. Our results show that different types of facility users – older/younger, male/female – have different behaviours, motivations and needs. Those wishing to encourage people to use facilities as settings for physical activity participation can use this information to better target their efforts.

This descriptive study is limited in that the number of facilities was small. Nonetheless, over 700 users were surveyed, adding some robustness to the data. The information was provided by current users only, and it is possible that people who no longer used the surveyed facilities may have expressed different views to those summarised here. Finally, the survey collected self-report information only and the findings were not independently validated.

This study has implications for future physical activity promotion initiatives and service provision. Despite the recent interest in the impact of the built environment on physical activity, interventions still need to be targeted at people. Various categories of facility users are subtly but significantly different from each other and physical activity promoters, and facility providers are probably more likely to successfully meet community needs and recruit and retain facility users if they understand these similarities and differences.

Acknowledgements

The State of Victoria funded this research through its Department of Human Services (DHS). The views and conclusions are those of the authors and do not necessarily represent those of the DHS. Caroline Finch was supported by an NHMRC Principal Research Fellowship and contributed to the fieldwork associated with this study while at Monash University and the University of New South Wales. The authors would like to thank Mardie Townsend, Zorica Babic and Amirali Minbashian for their contribution to this research. Phallika Neung administered the survey as part of her honours degree.

Caroline Finch[1], Alex Donaldson[1], Mary Mahoney[2], Leonie Otago[1]

[1] School of Human Movement and Sport Sciences, University of Ballarat.

[2] School of Health and Social Development Deakin University.

c.finch@ballarat.edu.au

References

1. Australian Bureau of Statistics, Sport and Recreation: *A Statistical Overview, Australia*, 2007 (Edition 1). Catalogue no. 4156.0. 2007, Australian Bureau of Statistics: Canberra
2. Australian Bureau of Statistics, *Participation in sport and physical activities* 2007;Report 4177.0.
3. Corti B, Donovan R and Holman C. Factors influencing the use of physical activity facilities: results from qualitative research. *Health Promot J Aust* 1996;6:16–21.
4. Giles-Corti B. People or places: what should be the target? *Journal of Science and Medicine in Sport* 2006;9:357–368.
5. World Health Organisation (1986) *The Ottawa Charter for Health Promotion*.
6. Ball K. People, places...and other people? Integrating understanding of intrapersonal, social and environmental determinants of physical activity. *J Sci Med Sport* 2006;9:367–370.
7. Giles-Corti B, and Donovan R. The relative influence of individual, social and physical environment determinants of physical activity. *Soc Sci Med* 2002;54:1973–1812.
8. Riva M, Gauvin L and Richard L. Use of local area facilities for involvement in physical activity in Canada: insights for developing environmental and policy interventions. *Health Promotion International* 2007;22(3):227–235.
9. International Health Racquet and Sportsclub Association. *Why people don't join: a look at the behavioural barriers that inhibit health club membership* 2006 [cited 17 July 2008].
10. International Health Racquet and Sportsclub Association. IHRSA/ASD health club trend report: a comprehensive study of consumer attitudes toward physical fitness and health clubs. 2008 [cited 17th July 2008].
11. Seippel O. The meaning of sport: fun, health, beauty and community. *Sport in Society* 2006;9:51–70.
12. McGormack G, Giles-Corti B and Bulsara M. Correlates of using neighbourhood recreational destinations in physically active respondents. *Journal of Physical Activity and Health* 2007;4:39–53.

Risk factors for paediatric sports injuries presenting to the emergency department of a busy private hospital

Abstract

Study of paediatric knee injuries presenting to the emergency department of a busy private hospital.

The Sydney Adventist Hospital is currently the largest private hospital in Sydney. A large proportion of its clientele draws from district level sport and school sport. Knee injuries are a common occurrence in the population aged 5–14 years (Purvis and Burke, 2001). A retrospective survey of all knee injuries in the population aged 5–21 presenting to emergency was conducted. It has two aims.

Aims

1. To accurately document the incidence of knee injuries and classify them according to sport, mechanism and diagnosis in the 5–21 year old age group.
2. To implement a streamlined knee injury prevention and management program based on international Olympic committee (IOC) recommendations (Engebretsen, 2008)

Data was obtained from the medical record system. The computer database was able to identify all presentations to emergency for knee pain in the years 2003 – end 2007. A list of patients was then generated and details of sport, mechanism of injury and type of injury were recorded. Data was deidentified and limited to 5–21 years of age. Retrospective data was analysed and is discussed.

The majority of knee injuries affecting 5–21 year olds (n=110) presenting to the SAN emergency department between 2003 and December 2007 were male (67.2% vs 32.8% female) and involved the left lower limb (58.2%). This contrasts with seminal studies from Scandinavia and the US. The majority of injuries occurred in autumn 38.2% and winter 36.4%(p=0.00). Non-contact sports were less likely to cause knee injuries compared to contact sports such as soccer and rugby (41% vs 59%) though 63.2% and 42% were non-contact injuries for these respective sports. A large proportion of injuries between 2001 and 2008 were diagnosed as non-specific knee pain (44.5%) while 55.5% were classified as sprains and strains. A definite diagnosis of ACL rupture was made in 2.7% (3/110) of total injury presentations. In 34% of the injuries the mechanism was described as twisting with valgus strain and/or giving way.

A targeted prevention program for contact sport in autumn and winter with a focus on prevention of twisting injuries is proposed. This program would involve parents, coaches, physiotherapists, emergency physicians and orthopaedic surgeons. An 8% rate of ACL injury was found as reported in the literature (Myer et al, 2004). Frequent non-specific diagnosis identifies the need for adequate referral. An injury surveillance program would develop a database for further refining prevention strategies.

Background

The Australian child and adolescent is a very active individual. 1.61 million children in Australia play sport which accounts for 2 out of 3 children[1]. All sport whether contact or non-contact is a part of the normal healthy development but can be marred by musculoskeletal injury. Such injuries may be simple bruises and strains the majority of which will recover with rest and time. However, evidence now shows that significant cost and prolonged functional impairment may rise from sporting injuries sustained during the growing years. In the United States it is estimated that 2.24 million medically treated sporting injuries cost 33 billion dollars[4]. This would form a significant

part of health costs in a system that struggles to cope with adult musculoskeletal injuries such as we have in Australia. More evidence for ongoing costs has been published in the literature.

Roos et al (2005) found 51% of women and 41% of men who had sustained anterior cruciate injuries developed osteoarthritis in 12 to 14 years[2]. A vicious cycle of deconditioning leading to further joint damage and functionally limiting pain makes a strong case for preventing knee ligament injuries in the paediatric sporting population. The concept of tissue homeostasis suggests that any knee made to function out of its safe envelope will sustain acute injury and a cycle of inflammation and repair with further decrement of the performance envelope[3]. It is therefore inevitable that acceleration of joint degeneration occurs with repeated acute injury. Prevention of such injury would serve to break the cycle of injury and possibly stop the cycle of re-injury and functional loss.

Multiple risk factors have been described for knee injuries in the general sporting population. The most significant injury from an orthopaedic perspective is the anterior cruciate ligament injury. Up to 14.8 injuries per 1000 game hours in soccer is described[4]. Other factors described are described in a nebulous haze as related to environment, anatomical variation, physiological condition, neuromuscular coordination and skill[5]. It therefore stands to reason that the paediatric group are the most vulnerable to injury on several counts. Firstly, the non-professional sporting environment is not necessarily well maintained. Soccer grounds often have concrete cricket pitches laid across the middle as a hazard. Poor upkeep of grounds and worn sporting equipment further endanger the paediatric sports person[11]. Anatomical variation is an unknown. Children progress at different stages of physical and mental development resulting in significant anatomical and physiological variation. A certain percentage would be at risk of injury purely from a developmental standpoint. Females with the increased q-angle of the knee bear risk on purely anatomical grounds. Significantly, the vast majority of ACL injuries occur in the ages 15 to 45[6]. Neuromuscular coordination is a great unknown due to a complexities of measurement. Skill and neuromuscular coordination are interlinked in the view of the authors.

Ligamentous laxity is a factor worth considering. A level II diagnostic study found increased ACL laxity in children aged 11 to 18[12]. While no correlation was made with injury rates, a significant correlation was found between global joint laxity and ACL laxity. Grounds for injury in a setting of insufficient secondary knee constraints thus exists. The incidence of injury and its contributors remains to be documented in the paediatric population.

The accepted view is that there are multiple variables contributing to the development of knee injuries ACL injuries foremost[4]. In recent years, there has been a call for further research into sports injury surveillance, and strategies to prevent sports injury[5–6]. Studies from Norway trialled prevention programs for handball players focusing on landing technique, neuromuscular control, planting skills and balance exercises, resulting in reduced rates of knee injuries and ACL tears[7–8]. Other programs aimed at female soccer and basketball athletes have also shown promising results[8–9]. In order to implement similar targeted prevention programs in Australia, a greater understanding of the aetiological trends in knee injuries of children is required.

The concept of surveillance is supported by several authorities [8–11, 13, 15]. Despite various frameworks for surveillance being espoused by these authors, little has been done in the paediatric area. The aims of the study are therefore firstly to document the incidence of knee injuries presenting to the emergency department of a busy private hospital on Sydney's north shore and secondly to describe the characteristics of the injuries presenting to the department.

Method

The medical records of all patients presenting to the Emergency Department of the Sydney Adventist private hospital with a sports injury to the knee between 2003 and December 2007 were reviewed. Over this five year period 1690 people presented with a knee complaint, of these, there were 190 cases that were due to sports participation. 110 cases aged 5–21 were identified and analysed.

Basic demographic data including age, sex, season, side (left or right) were collated using the Emergency department computer database. The medical records of all patients were reviewed to determine the sport played and the mechanism of injury. The mechanism was recorded based on the documented history supplied by the treating emergency Physician and/or letters supplied by a treating Orthopaedic Surgeon. The mechanism of injury has been analysed in two categories, contact versus non-contact, and a more detailed description of the mechanism of injury based on the patient history. Where documentation was scarce or patient recollection of events was poor, the mechanism was reported as unknown.

The research design was approved by the ethics committee at the Sydney Adventist Hospital. No patient contact was required and complete privacy was maintained for all cases.

Results

In a cohort of 5–21 year old sports injuries, a total of 110 knee injuries presented to the emergency department of the Sydney Adventist hospital between January 2003 and December 31 2007. The ratio of male to female was 2:1 which contrasts with that reported in the literature (Figure 1). Greatest involvement of the left lower limb indicates a trend towards non-dominant limb injury (Figure 2). Autumn and winter were the main contributors to emergency presentations forming 38.2 and 36.4% of the total injury burden (Figure 3). With all football codes being played in these seasons, there is a trend towards football codes as primary contributors to knee injury. Traumatic knee injury could therefore be a more significant contributor to knee injury. Among emergency presentations, contact injuries were more prevalent than non-contact injuries (Figure 4). A large proportion of injuries were diagnosed as non-specific knee pain (44.5%). 55.3% were classified as sprains and strains (Figure 5). Two were identified as fractures (tibial plateau). A definite diagnosis of ACL rupture was made in 3% (9/110) of the cohort. This is despite the mechanism of injury in 34% of cases being described as twisting with valgus strain with giving way. The potential for ligamentous injury thus remains given the wide range of sports involved (Figure 6).

Discussion

The total sample size presenting to emergency over the period of time suggests that most paediatric sporting injuries do not present to emergency departments and may be treated by general practitioner, allied health practitioners or individuals trained in first aid. This raises the question of whether significant knee injuries are being missed and ignored to the detriment of the young sportsperson. 24% of injuries sustained playing football involved the knee. Population data is absent for the north western Sydney population. A significant opportunity for surveillance of sports injuries thus exists for the population of the upper north shore.

The predominance of males in the cohort suggests that males are more likely to present to emergency. This leaves 50% of the sporting population either undiagnosed or being managed by primary care. The risks posed to female athletes cannot be understated in view of current evidence[13–15].

Limb dominance is poorly understood in the lower limb. It is an accepted fact that that 2/3 of the population are right side dominant and are more likely to push off, step kick with the dominant side. There is a paucity of research into the role of dominance in determining the incidence of knee injuries. Slightly more than half of the knee injuries obtained involved the left lower limb. This suggests that dominance could influence the risk of knee injury in the paediatric population in relation to neuromuscular control.

Surprisingly, contact sports were more likely to cause knee injuries (58.2%). Trauma on the sporting field was implicated as the cause of injury in the majority of these presentations. Together with the predominance of the football codes, it appears that collisions are a large part of paediatric knee injuries. This is supported by a larger study conducted at the Sydney Adventist Hospital[17]. Prevention would therefore involve factors such as matching participants according to weight and not just age when organising competition structures.

A lack of specific diagnosis among knee injuries is a significant limiting factor. 44.5% of cases were treated as non-specific knee pain. Among this cohort there is no indication of further referral for assessment. 55.3% of cases were initially identified as sprains or strain. Further referral resulted in the definite diagnosis of ACL rupture in 9/110 cases or 8%. Without adequate surveillance there is no follow up on the progress of the undiagnosed group to identify the factors surrounding the injury.

Conclusion

Paediatric sporting knee injuries are an important part of orthopaedic practice and are a significant contributor to emergency department presentations. Paediatric ACL tears result in disability and surgical reconstruction does not necessarily reduce long term morbidity.

The results of this study indicate that retrospective data collection of paediatric sports knee injuries in a private hospital emergency department is significantly limited in data reliability and accuracy.

Sports injury prevention is evolving as an important topic in the current literature. Several adult knee injury prevention programs have documented a significant reduction in knee injury rates.

The trends in this study indicate that a sports knee injury prevention program initiated in the pre-season targeting the left knee of male football athletes may provide a starting point for injury surveillance.

Limitations

This study samples a narrow range of knee injuries presenting to the emergency department of a large private hospital in the northern suburbs of Sydney. Data from this study does not include many other knee injuries occurring in the wider paediatric sporting population in the same geographical

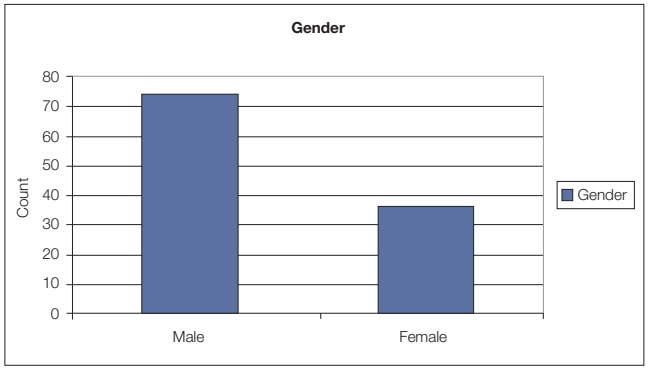


Diagram 1

Diagram 2

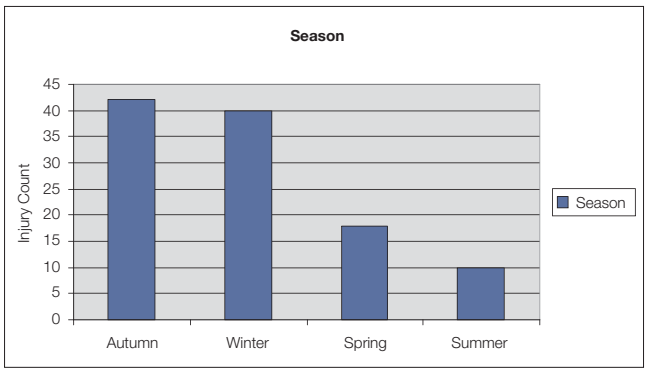


Diagram 3

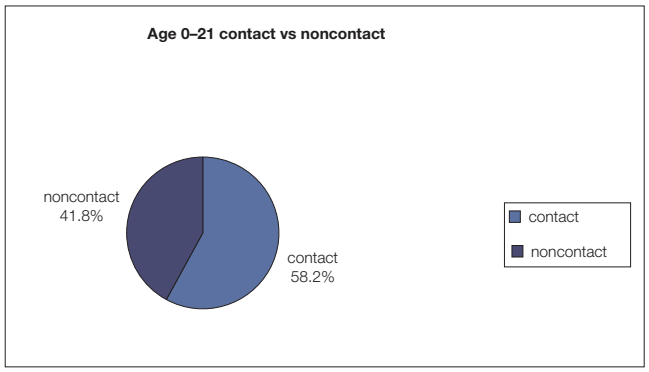


Diagram 4

region. Details on the mechanisms of injury are lacking in the retrospective information gathering process.

Recommendations

A specifically designed injury surveillance study is required to improve data integrity and to scientifically assess the efficacy of injury prevention programs.

Dr Andrew Stephens – Orthopaedic Registrar
Dr Adam Woodbridge – Orthopaedic Registrar
Dr Nigel Hope – Orthopaedic Surgeon

Correspondence: Dr Andrew Stephens arstephe@bigpond.com

A Paediatric sports medicine symposium will be a feature of the program on Saturday 17th October at **be active '09**

References

1 Australian Bureau Of Statistics (2006d). Sport and recreation: A statistical overview, Australia. Ed. 1 cat. No. 4156.0, *ABS Canberra*.

2 Roos EM. Joint injury causes knee osteoarthritis in young adults. *Current Opinion in Rheumatology* 2005;17:195–200.

3 Bartz RL and Laudicina L. Osteoarthritis after Sports Knee injuries. *Clinics in Sports Medicine* 2005;24:39–45

4 Griffin LY, Agel J, Albohm MJ et al. Non-contact Anterior cruciate ligament injuries: Risk factors and prevention strategies. *Journal of the American Academy of Orthopaedic Surgeons* 2000;8(3):141–150.

5 Griffin, L.Y., Albohm, M.J., Arendt, E.A. et al (2006). Undertsanding and preventing noncontact anterior cruciate ligament injuries. A review of the Hunt Valley II meeting, January 2005. *The American Journal of Sports Medicine*, 34, 9, 1512 – 1532

6 Van Mechelen W, Hlobil H and Kemper, HCG. Incidence, Severity, Aetiology and Prevention of Sports Injuries. A review of Concepts. *Sports Medicine* (1992):14(2)82–99.

7 Myklebust G, Engebretsen L, Braekken IH, Skjolberg A, Olsen, O-E and Bahr R. Prevention of Anterior cruciate ligament injuries in female team handball players: A prospective intervention study over three seasons. *Clinical Journal of Sports Medicine* 2003;13(2)71–78.

8 Myer GD, Ford, KR and Hewett TE. Methodological approaches and rationale for training to prevent anterior cruciate ligament injuries in female athletes. *Scandinavian Journal of Medicine and Science in Sports* 2004;14(5):275–285.

9 Granan L-P, Bahr R, Steindal K, Furnes O and Engebretsen L. Development of a National Cruciate ligament surgery registry : The Norwegian National Knee Ligament registry. *American Journal of Sports Medicine* 2008;36(2):308–315.

10 Engebretsen L, Alonso JM, Renstrom P, Mountjoy M, Aubry M. and Dvorak J. Injury surveillance in multi-sport events-the IOC approach. *British Journal of Sports Medicine, BJSM online* 2008 BJSM.BMJ.com 10/4/2008.

11 Routley V. Sports injuries in children – the five most commonly presented sports. Hazard 1991;9:1–16. *Victorian injury surveillance system*. Monash University Accident Reserch Centre.

12 Hinton RY, Rivera VR, Pautz MJ and Sponseller PD. Ligamentous laxity of the knee during childhood and adolescence. *Journal of paediatric orthopaedics* 2008;28(2):184–187.

13 Finch C. A new framework for research leading to sports injury prevention. *Journal of Science and Medicine in Sport* 2006;9:3–9.

14 Sell TC, Ferris CM, Abt JP, Tsai YS, Myers JB, Fu FH and Lephart SM. Predictors of proximal tibia anterior shear force during a vertical stop jump. *Journal of Orthopaedic Research* 2007;25(12)1589–1597.

15 Purvis JM and Burke RG. Recreational Injuries in Children: Incidence and Prevention. *Journal of the American Academy of Orthopaedic Surgeons* 2001;9(6)365–374.

16 Gabbett TJ. Incidence of injury in junior rugby league players over four competitive seasons. *Journal of Science and medicine in sport* 2008;11:323–328.

17 Woodbridge A, Stephens A, Smith M and Hope N. Aetiological Trends in Sports Knee Injuries in Northern Sydney. Submitted for publication to the *Journal of Medicine and Science in Sport* November 2008.

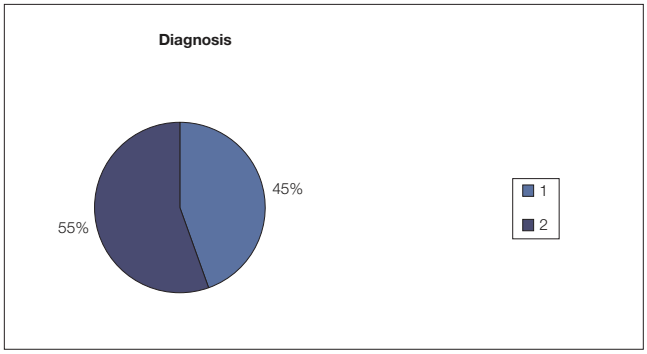


Diagram 5: 1. Non-specific knee pain, 2. Sprains and strains

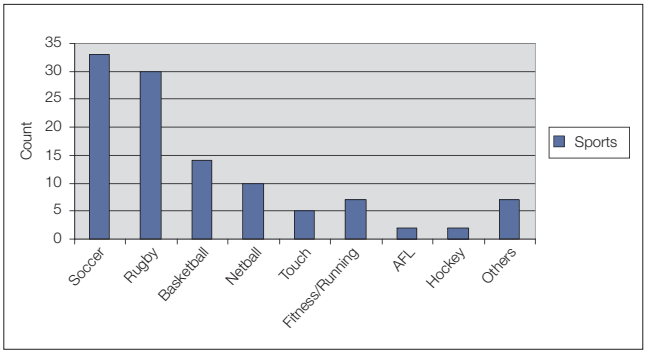


Diagram 6: Others – Judo, Cricket, Surfing

Knee Sporting Injury Report

The information provided is for medical and research purposes and will be treated confidentially.
This is based on the IOC Approach to Injury Surveillance (*Br. J. Sports Med.* published online 7 Apr 2008)

Practitioner's Name:			
Practitioner's Contact Phone:			
Date of Report:			
Athlete's Name:			
Athlete's Date of Birth:			
Sport:			
Injury occurred during (tick)	☐ Training	☐ Warm-up	☐ Competition
Date of Injury (day / month / year)**:**			
Time of Injury:			
Injured Knee (tick only one)	☐ Right	☐ Left Dominance L R	
Type of Injury – Diagnosis (circle one)			
1. (*code not used*)		11. strain / muscle rupture / tear	
2. fracture (traumatic)		12. contusion / haematoma / bruise	
3. stress fracture (overuse)		13. tendinosis / tendinopathy	
4. other bone injuries		14. bursitis	
5. dislocation, subluxation		15. laceration / abrasion / skin lesion	
6. tendon rupture		16 (*code not used*)	
7. ligamentous rupture with instability		17. nerve injury	
8. ligamentous rupture without instability		18. muscle cramps or spasm	
9. sprain (injury of joint and/or ligaments)		19. others	
10. lesion of meniscus or cartilage			
Cause of Injury (circle one or more)			
1. overuse (gradual onset)	11. contact with another athlete	21. field of play conditions	
2. overuse (sudden onset)	12. contact: moving object (e.g.ball)	22. weather condition	
3. non-contact trauma	13. contact: stagnant object (e.g. net)	23. equipment failure	
4. recurrence of previous injury	14. violation of rules (foul play)	24. others	
Estimated duration or absence from training or competition (in days) (circle one)			
0 = 0 days	14 = 2 weeks	> 30 = more than 4 weeks	
1 = 1 day	21 = 3 weeks	>180 = 6 months or more	
2 = 2 days	28 = 4 weeks		
7 = 1 week			

Sports Medicine Australia SA Branch

2010 State Conference

Sunday 17th January 2010

Conference theme: Cycling

Adelaide Convention Centre, North Terrace, Adelaide

Sports Medicine Australia SA Branch invites all health care professionals with an interest in Cycling and Sports Medicine to attend the 2010 State Conference. A number of world renowned specialists in the area of cycling are included in this one day program.

Shayne Bannan, National Performance Director & Head Coach (CA/AIS); Dr Peter Barnes, TDU Medical Director; Dr Nick Brown, AIS - Head of the Department of Biomechanics and Performance Analysis; Stan Garland, AIS - Track Cycling Team Physiotherapist. Ms Matti Clements, AIS - Performance Psychology Consultant.

Topics for the conference include: Injuries - Keeping them on the Road; Australian Cycling Pathways; Bike Setup - Biomechanical factors.

Two optional Workshops; Bike Setup and Body, Bike Bits, Maintenance &Equipment being are planned to complement the world renowned Tour Down Under 2010.

Register your interest at members@smasa.asn.au or call SMA-SA 08 8234 6369

Amy Gillett FOUNDATION
Safe together

"The Amy Gillett Foundation was created in 2005 after the tragic death of Australian international rower and cyclist Amy Gillett. Since then the Foundation has created a number of innovative programs to assist in meeting their objective of decreasing the incidence of accidents between motorists and cyclists on Australian roads."

Exercise and oxidative stress: Is antioxidant supplementation beneficial?

There is a vast range of antioxidant supplements commercially available. Supermarkets, chemists and health food stores have dedicated sections for antioxidant supplements including vitamin E, vitamin C, beta carotene, coenzyme Q10 and alpha lipoic acid – to name just a few. The aim of supplementary antioxidants is to decrease oxidative stress, a complicated process implicated in certain diseases and muscle fatigue. Antioxidant manufacturers advertise their supplements as a means for exercising individuals to "train more strenuously", "perform better", "recover faster" or even "offset potential deleterious health effects of exercise". Whether individuals who exercise regularly need or will benefit from antioxidant supplements are common questions. Although antioxidant supplementation is a widespread practice in exercising individuals, the evidence supporting this regimen is weak. Indeed, recent studies indicate that disrupting the antioxidant/oxidant balance by consuming supplementary antioxidants may have negative effects on muscle function, exercise performance and health. The aim of this article will be to first provide an overview of the theory regarding antioxidants before examining the evidence investigating the effects of antioxidants in exercising individuals.

Exercise-induced oxidative stress

While marketing uses words such as free radicals, oxidative stress and antioxidants to capture our attention, these terms refer to important molecules, compounds and processes. During normal metabolism, oxygen is utilised in the mitochondria for energy production. A small percentage of oxygen is not completely reduced which leads to the production of oxygen intermediates known as reactive oxygen species (ROS). Some of these are known as free radicals, a term that is more widely used, especially in antioxidant marketing. ROS can damage important structures in our body such as cell membranes, leading to decreased cellular and physiological functioning. When we exercise, our oxygen consumption can increase by up to 20 times more than resting values. In the mitochondria of exercising muscle cells this translates to a 200 times greater oxygen useage compared to rest. The increased oxygen movement during exercise means more ROS are generated and has led to concerns regarding possible adverse health effects.

However, to defend against the damage from ROS we have developed highly effective antioxidant defense systems.

These include non-enzymatic, enzymatic and dietary antioxidants. Examples of these include glutathione (non-enzymatic), superoxide dismuatse (enzymatic) and vitamin E (dietary). Antioxidants act either through stabilizing ROS or by removing reactive intermediates. During exercise, there is the potential for ROS to overpower the antioxidants and if this imbalance occurs it is known as exercise-induced oxidative stress. The most vulnerable biological targets of oxidative stress are proteins, lipids and DNA. Although oxidative stress has been implicated in a growing list of human diseases such as cardiovascular, inflammatory, metabolic and neurodegenerative diseases as well as cancer and the ageing process[31] we currently do not know the implications of exercise-induced oxidative stress on these conditions.

Although ROS are associated with harmful biological events they are also essential to every cell's development and optimal function. ROS participate in important molecular signaling processes, play crucial roles in gene activation, cellular growth, modulation of chemical reactions and biosynthesis of other molecules[3]. After decades of research it is now clear that maintainance of oxidant-antioxidant balance is critical for cell survival and normal function. Therefore, any attempts to upset this balance such as by consuming antioxidant supplements, may lead to negative heath effects.

Exercising muscle; the role of reactive oxygen species

Significant progress in understanding the role of ROS in muscle function has been made since the first studies in the 1970s. We now know that ROS participate in signal transduction and metabolic pathways and are obligatory for optimal contractile function[14]. Moreover, exercise training causes the body to adapt to exercise-induced oxidative stress and become more resistant to subsequent oxidative challenges. This is achieved through a number of different mechanisms including the upregulation of the body's antioxidant enzymes[16]. It is likely that ROS are responsible for stimulating these adaptations[25]. Therefore, attempts to decrease the effects of ROS, such as through antioxidant supplementation, may lead to a blunting of positive exercise training effects on the body's own antioxidant systems[13].

General considerations for antioxidant supplements

It has been known for a long while that a diet rich in antioxidants leads to improved health[34]. Therefore, it is not surprising that companies have tried to provide these nutrients in a more consumable product (e.g. capsules). As mentioned earlier, there are a plethora of vitamins, minerals and extracts commercially available as antioxidant supplements. These are found individually or combined into products that may contain up to ten nutrients said to have antioxidant capacities. Because many of these supplements have not been adequately studied it is difficult to formulate recommendations regarding all antioxidant supplements.

The majority of research into antioxidants has been directed at health outcomes using vitamin E, vitamin C and beta carotene. Large clinical trials with tens of thousands of individuals have shown that these antioxidants have no effect on cardiovascular disease outcomes in the general population[1–2]. Generalising these results to all antioxidant supplements and individuals who may experience more oxidative stress may be problematic. For example, individuals who engage in large amounts of exercise may represent a sub group who, due to their increased oxygen and subesequent oxidative stress may benefit more from supplementary antioxidants than the general population.

Why exercising individuals take antioxidant supplements?

The three main reasons why people who exercise take antioxidant supplements are because of beliefs that they will a) improve their performance, b) improve their recovery and/or c) decrease the possible deleterious effects of exercise-induced oxidative stress on their health. These motivations are more due to clever marketing rather than sound scientific evidence.

Will antioxidant supplements help you perform better and/or recover faster?

Nearly all studies investigating the effects of antioxidant supplements on exercise performance report no benefits. This includes vitamin E supplementation not influencing the endurance performance of male swimmers[30], professional cyclists[27], marathon runners[5], athletic students [12] and sedentary older adults[22]. Furthermore, studies using combinations of vitamins E, C, coenzyme Q10 and other vitamins and minerals also found no effects on the physical performance of runners[33], triathletes[23], soccer players[37], resistance-trained men[11] and ultraendurance runners[18].

In contrast, some studies have shown that antioxidant supplements may be detrimental to exercise performance. Vitamin E has been shown to decrease muscle force[8], vitamin C has slowed racing greyhounds[19] and impair training efficiency[13]. Moreover, since they attenuate the production of

ROS, vitamin C supplements has been shown to hinder the post-exercise recovery process which could be detrimental to future physical performance[6].

Studies have provided inconsistent results in regards to the effects of antioxidant supplementation on recovery processes. Some investigations report supplementation with vitamin C and/or E could offer protection from exercise-induced cell damage[15, 20], attenuate the inflammatory response to exercise[10, 24] and reduce muscle force loss[15, 29], however others have found no significant effect of antioxidant supplementation on indices of muscle damage[9, 21], inflammation[4, 20] and muscle soreness[6, 7, 29]. It is likely that the additional ROS produced in the days following muscle-damaging exercise are not responsible for any loss of muscle function and muscle soreness. Conversely, they may play an important role in mediating the recovery and protect the cell from future damage[6]. This may mean that the use antioxidant supplements during this time may limit these adaptations. This is an interestig area for future research.

Will antioxidant supplements improve the health of exercising individuals?

Although there is evidence that ingesting supplemental antioxidants may decrease exercise-induced oxidative stress[37] there is no evidence that this confers health benefits. An important issue in this discussion is the difficulty in quantifying oxidative stress and then understanding the health implications of these measures. Indeed, the measurement of oxidative stress is difficult and not routinely available. For example, doctors can not request a measure of oxidative stress from pathology departments. These measures are usually carried out in research laboratories. Indeed, in research, there are dozens of compounds that are assessed as measures of oxidative stress. These include by-products of lipid, protein and DNA damage as well as antioxidants. There are also concerns regarding the accuracy and validity of many of these measures. Furthermore, the use of oxidative stress biomarkers as surrogate measures of disease is not universally accepted. The majority of prospective trials investigating the relationship between oxidative stress measures and onset of a disease have not shown a close relationship. Therefore, although antioxidants decrease exercise-induced oxidative stress we do not know if this will result in health benefits. Large randomised controlled trials in exercising individuals consuming a variety of antioxidant supplements and using hard end-points such as onset of disease would need to be conducted to adequately address this question.

Two recent studies have indicated that antioxidants may inhibit health promoting effects of exercise. Wray et al (2009) demonstrated that a combination of vitamins C, E and alpha-lipoic acid blunted training-induced improvements in vasodilation and blood pressure reduction in mildly hypertensive older men[36]. Ristow et al (2009) found that supplementation with vitamins E and C had an adverse effect on exercise-induced improvements in insulin sensitivity[26]. Given that blood pressure and insulin sensitivity are cardiovasuclar disease risk factors, the findings that antixoidants hamper exercise-training induced improvements in these may have far reaching implications. Indeed, these two studies provide the strongest evidence to date that consuming supplemental antioxidants is more likely to adversly impact on the health of exercising individuals rather than be a benefit.

Optimising nutrition; current recommendations

In summary, there is insufficient evidence to recommend antioxidant supplements for exercising individuals who consume the recommended amounts of dietary antioxidants through food. Antioxidant supplements do not improve physical performance. There is some evidence that they may benefit recovery although further work is required to adequately answer this question. There is no evidence that

additional antioxidants will benefit the health of athletes. Indeed, we now have reports that antioxidants can seriously interfere with ROS-mediated beneficial health processes such as lowering blood pressure and improving insulin sensitivity. Therefore caution in the use of supplements is prudent. The message should be that physically active individuals need to optimise their nutrition. They should be consuming diets rich in antioxidants, attained by consuming a variety of fruits, vegetables, whole grains and nuts. Indeed, whole foods, rather than capsules, contain antioxidants presented in beneficial ratios. They also act together, in synergy, to optimise the antioxidant effect. Situations that may warrant antioxidant supplementation are when individuals struggle to meet the dietary antioxidant requirements. This may lead to specific nutirent and antioxidant deficiencies although we currently do not have adequate laboratory based tests to determine if antioxidants are required. In these situations, a qualified sports dietician may assist.

Tina-Tinkara Peternelj and Jeff S. Coombes
School of Human Movement Studies
The University of Queensland

jcoombes@hms.uq.edu.au

A 'Supplement update' workshop will be held on Thursday 15th October at **be active '09**

References:

1. Effects of ramipril on cardiovascular and microvascular outcomes in people with diabetes mellitus: results of the HOPE study and MICRO-HOPE substudy. Heart Outcomes Prevention Evaluation Study Investigators. *Lancet* Jan 22 2000;355(9200):253–259.
2. MRC/BHF Heart Protection Study of antioxidant vitamin supplementation in 20,536 high-risk individuals: a randomised placebo-controlled trial. *Lancet* Jul 6 2002;360(9326):23–33.
3. Allen RG, Tresini M. Oxidative stress and gene regulation. *Free Radic Biol Med* Feb 1 2000;28(3):463-499.
4. Beaton LJ, Allan DA, Tarnopolsky MA, Tiidus PM, Phillips SM. Contraction-induced muscle damage is unaffected by vitamin E supplementation. *Med Sci Sports Exerc* May 2002;34(5):798–805.
5. Buchman AL, Killip D, Ou CN, et al. Short-term vitamin E supplementation before marathon running: a placebo-controlled trial. *Nutrition* Apr 1999;15(4):278–283.
6. Close GL, Ashton T, Cable T, et al. Ascorbic acid supplementation does not attenuate post-exercise muscle soreness following muscle-damaging exercise but may delay the recovery process. *Br J Nutr* May 2006;95(5):976–981.
7. Connolly DA, Lauzon C, Agnew J, Dunn M, Reed B. The effects of vitamin C supplementation on symptoms of delayed onset muscle soreness. *J Sports Med Phys Fitness* Sep 2006;46(3):462–467.
8. Coombes JS, Powers SK, Rowell B, et al. Effects of vitamin E and alpha-lipoic acid on skeletal muscle contractile properties. *J Appl Physiol* Apr 2001;90(4):1424–1430.
9. Dawson B, Henry GJ, Goodman C, et al. Effect of Vitamin C and E supplementation on biochemical and ultrastructural indices of muscle damage after a 21 km run. *Int J Sports Med* Jan 2002;23(1):10–15.
10. Fischer CP, Hiscock NJ, Penkowa M, et al. Supplementation with vitamins C and E inhibits the release of interleukin-6 from contracting human skeletal muscle. *J Physiol* Jul 15 2004;558(Pt 2):633–645.
11. Fry AC, Bloomer RJ, Falvo MJ, Moore CA, Schilling BK, Weiss LW. Effect of a liquid multivitamin/mineral supplement on anaerobic exercise performance. *Res Sports Med* Jan–Mar 2006;14(1):53–64.
12. Gaeini AA, Rahnama N, Hamedinia MR. Effects of vitamin E supplementation on oxidative stress at rest and after exercise to exhaustion in athletic students. *J Sports Med Phys Fitness* Sep 2006;46(3):458–461.
13. Gomez-Cabrera MC, Domenech E, Romagnoli M, et al. Oral administration of vitamin C decreases muscle mitochondrial biogenesis and hampers training-induced adaptations in endurance performance. *Am J Clin Nutr* Jan 2008;87(1):142–149.
14. Jackson MJ. Free radicals generated by contracting muscle: by-products of metabolism or key regulators of muscle function? *Free Radic Biol Med* Jan 15 2008;44(2):132–141.
15. Jakeman P, Maxwell S. Effect of antioxidant vitamin supplementation on muscle function after eccentric exercise. *Eur J Appl Physiol Occup Physiol* 1993;67(5):426–430.
16. Ji LL. Modulation of skeletal muscle antioxidant defense by exercise: Role of redox signaling. *Free Radic Biol Med* Jan 15 2008;44(2):142–152.
17. Ji LL, Peterson DM. Aging, exercise, and phytochemicals: promises and pitfalls. *Ann N Y Acad Sci* Jun 2004;1019:453–461.
18. Knechtle B, Knechtle P, Schulze I, Kohler G. Vitamins, minerals and race performance in ultra-endurance runners-Deutschlandlauf 2006. *Asia Pac J Clin Nutr* 2008;17(2):194–198.
19. Marshall RJ, Scott KC, Hill RC, et al. Supplemental vitamin C appears to slow racing greyhounds. *J Nutr* Jun 2002;132(6 Suppl 2):1616S–1621S.
20. Mastaloudis A, Morrow JD, Hopkins DW, Devaraj S, Traber MG. Antioxidant supplementation prevents exercise-induced lipid peroxidation, but not inflammation, in ultramarathon runners. *Free Radic Biol Med* May 15 2004;36(10):1329–1341.
21. Mastaloudis A, Traber MG, Carstensen K, Widrick JJ. Antioxidants did not prevent muscle damage in response to an ultramarathon run. *Med Sci Sports Exerc* Jan 2006;38(1):72–80.
22. Nalbant O, Toktas N, Toraman NF, et al. Vitamin E and aerobic exercise: effects on physical performance in older adults. *Aging Clin Exp Res* Apr 2009;21(2):111–121.
23. Nielsen AN, Mizuno M, Ratkevicius A, et al. No effect of antioxidant supplementation in triathletes on maximal oxygen uptake, 31P-NMRS detected muscle energy metabolism and muscle fatigue. *Int J Sports Med* Apr 1999;20(3):154–158.
24. Nieman DC, Peters EM, Henson DA, Nevines EI, Thompson MM. Influence of vitamin C supplementation on cytokine changes following an ultramarathon. *J Interferon Cytokine Res* Nov 2000;20(11):1029–1035.
25. Radak Z, Chung HY, Goto S. Systemic adaptation to oxidative challenge induced by regular exercise. *Free Radic Biol Med* Jan 15 2008;44(2):153–159.
26. Ristow M, Zarse K, Oberbach A, et al. Antioxidants prevent health-promoting effects of physical exercise in humans. *Proc Natl Acad Sci USA* May 26 2009;106(21):8665–8670.
27. Rokitzki L, Logemann E, Huber G, Keck E, Keul J. alpha-Tocopherol supplementation in racing cyclists during extreme endurance training. *Int J Sport Nutr* Sep 1994;4(3):253–264.
28. Rousseau AS, Hininger I, Palazzetti S, Faure H, Roussel AM, Margaritis I. Antioxidant vitamin status in high exposure to oxidative stress in competitive athletes. *Br J Nutr* Sep 2004;92(3):461–468.
29. Shafat A, Butler P, Jensen RL, Donnelly AE. Effects of dietary supplementation with vitamins C and E on muscle function during and after eccentric contractions in humans. *Eur J Appl Physiol* Oct 2004;93(1–2):196–202.
30. Sharman IM, Down MG, Sen RN. The effects of vitamin E and training on physiological function and athletic performance in adolescent swimmers. *Br J Nutr* Sep 1971;26(2):265-276.
31. Sorg O. Oxidative stress: a theoretical model or a biological reality? *C R Biol* Jul 2004;327(7):649–662.
32. Urso ML, Clarkson PM. Oxidative stress, exercise, and antioxidant supplementation. *Toxicology*. Jul 15 2003;189(1–2):41–54.
33. Weight LM, Myburgh KH, Noakes TD. Vitamin and mineral supplementation: effect on the running performance of trained athletes. *Am J Clin Nutr* Feb 1988;47(2):192–195.
34. Williams MH. Dietary supplements and sports performance: introduction and vitamins. *J Int Soc Sports Nutr* 2004;1:1–6.
35. Williams SL, Strobel NA, Lexis LA, Coombes JS. Antioxidant requirements of endurance athletes: implications for health. *Nutr Rev* Mar 2006;64(3):93–108.
36. Wray DW, Uberoi A, Lawrenson L, Bailey DM, Richardson RS. Oral antioxidants and cardiovascular health in the exercise-trained and untrained elderly: a radically different outcome. *Clin Sci (Lond)* Mar 2009;116(5):433–441.
37. Zoppi CC, Hohl R, Silva FC, et al. Vitamin C and e supplementation effects in professional soccer players under regular training. *J Int Soc Sports Nutr* 2006;3:37–44.

Injury Report 2008: Australian Football League

Table 1 – Key indicators for all injuries over the past eleven seasons

All injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Incidence (new injuries per club per season)	41.9	40.3	36.9	37.4	35.8	34.4	34.1	34.8	35.3	34.1	34.7	36.6
Incidence (recurrent)	8.4	7.6	5.2	5.9	5.5	4.4	4.6	3.7	4.8	4.1	5.6	4.9
Incidence (total)	50.3	47.9	42.1	43.3	41.3	38.7	38.7	38.5	40.1	38.2	40.4	41.5
Prevalence (missed games per club per season)	159.2	141.9	135.9	131.8	136.4	134.7	118.7	131.0	129.2	139.5	147.5	147.0
Average injury severity (number of missed games)	3.8	3.5	3.7	3.5	3.8	3.9	3.5	3.8	3.7	4.1	4.2	4.0
Recurrence rate	20%	19%	14%	16%	15%	13%	14%	11%	14%	12%	16%	13%

Introduction & Methods

The Australian Football League (AFL) has commissioned a continuous annual injury surveillance system since 1992. From 1997 onwards, the definition of an injury has been an "injury or medical condition which causes a player to miss a match". The methods of the survey have been described in full detail previously. This report updates data after season 2008.

The full report (including methods) is available at: http://www.injuryupdate.com.au/images/research/AFL_Injury_Report_2008.pdf

Results

Key indicators for the past twelve years are shown in Table 1. The injury incidence (number of new injuries per club per season) for 2008 was slightly higher (36.6 new injuries per team per season) than the low rates seen in recent years. Injury prevalence was similar to the rates of season 2007. Recurrence rate (13%) fell from the level of 2007 (16%) and has generally shown a decline over the last twelve years.

Average injury severity has been creeping up slightly over the same time period, with the inference that team medical staff have become more conservative over the past decade (keeping players out for longer and achieving a lower recurrence rate because of this).

2.1 Injury incidence

Table 2 details the incidence of the major injury categories. From 1997, the compliance of the survey has been 100% for those conditions causing players to miss games. Notable findings to report for injury incidence in 2008 include that the rates of concussion and facial fractures were very low and continue to demonstrate a long-term decline. The rate of shoulder sprains/dislocations was higher than usual. The injury incidence for the majority of other categories was similar to the long-term averages.

Table 2 – Injury incidence (new injuries per club per season)

Body area	Injury type	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Head/ neck	Concussion	0.6	0.7	0.5	0.6	0.7	0.7	0.3	0.3	0.7	0.3	0.3	0.3
	Facial fractures	0.8	0.6	0.7	0.7	0.4	0.4	0.6	0.8	0.6	0.3	0.4	0.2
	Neck sprains	0.1	0.2	0.2	0.2	0.1	0.0	0.0	0.1	0.2	0.3	0.1	0.2
	Other head/neck injuries	0.2	0.2	0.2	0.1	0.3	0.2	0.3	0.2	0.1	0.2	0.2	0.1
Shoulder/ arm/ elbow	Shoulder sprains and dislocations	1.0	0.9	0.7	0.7	1.1	0.9	1.3	1.0	1.4	1.6	1.0	1.8
	A/C joint injuries	0.9	0.9	0.6	1.3	0.9	1.1	0.3	1.1	0.8	1.2	0.8	0.7
	Fractured clavicles	0.4	0.4	0.3	0.5	0.3	0.3	0.2	0.6	0.3	0.3	0.3	0.1
	Elbow sprains or joint injuries	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.3	0.1	0.1	0.1	0.1
	Other shoulder/ arm/elbow injuries	0.6	0.5	0.2	0.5	0.5	0.8	0.5	0.4	0.6	0.3	0.2	0.3
Forearm/ wrist/ hand	Forearm/wrist/hand fractures	1.1	1.7	1.7	1.4	0.8	1.1	0.8	1.1	1.3	1.1	0.9	1.2
	Other hand/wrist/ forearm injuries	0.4	0.4	0.4	0.5	0.3	0.4	0.7	0.4	0.3	0.3	0.6	0.4
Trunk/ back	Rib and chest wall injuries	1.2	0.6	1.0	0.8	0.4	0.9	0.8	0.7	0.4	1.0	0.4	0.7
	Lumbar and thoracic spine injuries	1.8	1.4	1.4	2.2	1.4	0.9	0.8	1.6	2.1	1.5	1.3	1.4
	Other buttock/back/ trunk injuries	1.2	1.0	1.1	0.8	0.5	0.4	0.5	0.6	0.4	0.6	0.5	0.7
Hip/ groin/ thigh	Groin strains/osteitis pubis	4.1	3.2	3.1	3.0	3.5	3.8	2.9	3.1	2.9	3.3	4.1	3.2
	Hamstring strains	6.6	6.4	6.7	5.6	6.0	4.4	5.7	6.3	5.2	6.4	6.7	6.6
	Quadriceps strains	2.5	3.0	2.4	2.0	1.6	1.7	2.0	1.9	1.9	1.7	1.8	1.8
	Thigh and hip haematomas	1.3	1.3	1.1	1.1	0.6	1.0	0.3	1.1	1.0	1.1	0.6	0.5
	Other hip/groin/thigh injuries	0.4	0.2	0.3	0.3	0.3	0.3	0.4	0.3	0.2	0.3	0.8	0.8
Knee	Knee ACL	1.2	0.8	0.7	0.5	0.9	0.8	0.6	0.5	0.6	1.0	0.7	0.9
	Knee MCL	0.7	1.3	1.2	0.9	1.2	0.9	1.0	0.7	1.0	0.8	1.4	1.3
	Knee PCL	0.6	0.3	0.7	0.5	1.0	0.4	0.5	0.7	0.4	0.3	0.2	0.3
	Knee cartilage	0.9	1.1	1.1	1.2	1.9	1.3	1.7	1.2	1.3	1.0	1.2	1.7
	Patella injuries	0.2	0.4	0.1	0.2	0.2	0.4	0.1	0.1	0.3	0.3	0.3	0.2
	Knee tendon injuries	0.5	0.6	0.7	0.7	0.5	0.8	0.7	0.4	0.7	0.4	0.3	0.3
	Other knee injuries	1.4	0.4	0.9	1.3	0.8	0.5	0.7	0.7	0.9	0.2	0.8	1.0
Shin/ ankle/ foot	Ankle sprains or joint injuries	2.7	2.8	2.1	2.7	2.0	2.5	2.6	2.5	2.5	2.1	2.2	2.5
	Calf strains	1.9	2.3	1.4	1.9	1.6	2.2	1.6	0.9	1.9	1.6	1.2	2.0
	Achilles tendon injuries	0.4	0.3	0.5	0.4	0.2	0.4	0.4	0.2	0.3	0.3	0.4	0.6
	Leg and foot fractures	0.5	0.8	1.1	0.6	1.0	0.8	0.5	0.5	0.4	0.7	0.5	0.5
	Leg and foot stress fractures	0.8	0.7	0.8	0.5	0.9	0.7	0.9	0.9	0.9	1.1	1.1	0.8
	Other leg/foot/ankle injuries	1.9	1.7	1.3	1.3	1.7	0.8	1.5	1.7	1.3	1.5	1.3	1.1
Medical	Medical illnesses	2.5	2.8	1.5	1.9	1.8	2.3	2.4	2.0	2.2	0.7	1.9	2.1
Non-football injuries		0.1	0.2	0.2	0.2	0.2	0.3	0.4	0.1	0.1	0.2	0.2	0.3
NEW INJURIES / CLUB / SEASON		**41.9**	**40.3**	**36.9**	**37.4**	**35.8**	**34.4**	**34.1**	**34.8**	**35.3**	**34.1**	**34.7**	**36.6**

Table 3 – Recurrence rates (recurrent injuries as a percentage of new injuries)

Recurrence rates	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Hamstring strains	38%	36%	31%	37%	25%	30%	27%	22%	26%	16%	22%	25%
Groin strains and osteitis pubis	36%	31%	6%	16%	20%	23%	20%	24%	23%	28%	38%	20%
Ankle sprains or joint injuries	20%	21%	9%	11%	17%	16%	6%	11%	15%	10%	20%	9%
Quadriceps strains	35%	20%	20%	18%	10%	17%	9%	6%	20%	19%	18%	15%
Calf strains	15%	15%	17%	32%	17%	13%	14%	6%	12%	7%	9%	5%
All injuries	20%	19%	14%	16%	15%	13%	14%	11%	14%	12%	16%	13%

Table 4 – Average weekly player status by season

All injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Playing AFL	21.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Playing lower grade football	11.8	11.4	11.4	11.3	12.9	12.1	12.0	11.9	12.2	11.8	11.9	11.7
TOTAL playing	32.8	33.4	33.4	33.3	34.9	34.1	34.0	33.9	34.2	33.8	33.9	33.7
Not playing because of injury	7.7	6.7	6.4	6.2	6.7	6.6	5.7	6.4	6.4	7.0	7.4	7.4
Not playing for other reasons	1.9	1.6	1.8	1.8	1.8	2.3	2.5	2.5	2.8	3.1	2.9	3.4
TOTAL not playing	9.6	8.3	8.3	8.0	8.5	8.9	8.2	8.9	9.1	10.1	10.4	10.8
Players in injury survey (per club)	42.3	41.7	41.7	41.4	43.4	43.0	42.2	42.8	43.3	43.9	44.2	44.6
Injury prevalence (%)	18.1%	16.1%	15.4%	15.0%	15.5%	15.3%	13.5%	14.9%	14.7%	15.9%	16.8%	16.7%

2.2 Injury recurrence

Table 3 and Figure 1 show the rate of recurrence of some of the common injury types, particularly muscle strains which have a comparatively high recurrence rate. Most contact-mechanism injuries, such as fractures, concussions and "cork" injuries have a low recurrence rate. The rate of injury recurrence has been showing a fairly steady decline over the last 10 years, with all of the common muscle strains showing a steady decline in recurrence rate[12]. Groin injuries do not seem to be following the long-term downward trend in recurrence rates, although the recurrence rate dropped from 2007 to 2008. Across the board there is certainly a trend for team medical staff to be more conservative with injury management (slower return to play and fewer recurrences).

2.3 Weekly player status and injury prevalence

Table 4 details player status on a weekly basis over the past ten seasons. This reveals increased injury prevalence over the past three years, mainly related to increased injury severity (number of weeks that players miss per injury) rather than an increase in injury incidence.

Table 5 details the amount of missed playing time attributed to each injury category. Hamstring injuries remain the number one injury in the game with respect to missed playing time, surpassing both groin injuries and knee anterior cruciate ligament (ACL) injuries. Based on injury prevalence (missed playing time), these three categories are consistently the highest categories for injury prevalence. There was an increase in the amount of missed playing time lost to hamstring injuries in 2008, with knee ACL prevalence similar to 2007 and groin injury prevalence lower than the corresponding figure in 2007.

Shoulder injuries showed an increase in the amount of lost playing time in 2008, whereas facial fractures dropped to a level that was lower than previous years. Even though there is year-to-year variation amongst the values, there is far more consistency than differences in the injury profile from season to season.

Table 5 – Injury prevalence (missed games per club per season)

Body area	Injury type	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Head/ neck	Concussion	0.7	0.7	0.5	0.7	1.3	2.0	0.6	0.3	0.9	0.3	0.3	0.5
	Facial fractures	2.5	2.0	2.2	2.0	1.3	1.4	1.0	2.2	1.4	0.8	0.7	0.5
	Neck sprains	0.6	0.7	1.6	0.3	0.2	0.0	0.0	0.6	0.3	0.3	1.1	1.1
	Other head/neck injuries	0.3	0.2	0.4	0.8	1.5	0.2	0.7	0.2	0.2	1.1	1.6	0.1
Shoulder/ arm/ elbow	Shoulder sprains and dislocations	5.3	5.9	5.6	4.0	5.4	5.9	5.7	5.9	7.7	10.8	6.4	10.2
	A/C joint injuries	2.2	2.1	0.9	3.1	2.1	2.4	0.7	2.5	1.9	2.7	1.4	1.5
	Fractured clavicles	1.4	1.6	1.2	3.0	1.6	2.0	1.0	3.5	1.3	1.7	1.8	1.1
	Elbow sprains or joint injuries	0.7	1.2	0.2	0.1	0.4	0.3	0.4	0.7	0.4	0.7	0.8	0.5
	Other shoulder/ arm/elbow injuries	2.4	1.9	0.3	1.3	1.3	3.4	1.6	1.6	2.4	1.7	0.7	0.7
Forearm/ wrist/ hand	Forearm/wrist/hand fractures	4.1	5.4	5.9	5.6	2.7	3.1	2.5	3.9	3.8	4.3	2.3	3.2
	Other hand/wrist/ forearm injuries	0.6	1.3	0.9	1.4	0.3	2.2	2.9	1.2	1.2	0.5	3.1	1.4
Trunk/ back	Rib and chest wall injuries	2.8	1.0	2.0	1.3	0.7	1.5	1.7	1.3	0.6	2.2	1.9	1.3
	Lumbar and thoracic spine injuries	9.7	4.3	7.9	8.4	5.6	5.8	2.1	5.4	6.4	5.4	2.8	5.0
	Other buttock/back/ trunk injuries	6.0	1.6	2.3	2.6	1.5	1.6	1.6	2.3	0.7	1.3	1.7	1.3
Hip/ groin/ thigh	Groin strains/osteitis pubis	17.4	13.6	9.4	7.5	13.6	15.7	13.7	13.3	11.2	14.0	18.0	12.4
	Hamstring strains	20.9	21.0	22.3	22.4	21.3	15.6	18.6	21.6	18.6	21.8	24.3	25.8
	Quadriceps strains	8.6	9.5	6.7	5.6	3.8	4.3	6.0	4.2	6.4	5.5	5.6	6.5
	Thigh and hip haematomas	2.4	1.8	1.5	1.8	0.6	1.9	0.5	1.7	1.6	1.4	1.0	0.6
	Other hip/groin/thigh injuries	1.7	0.5	2.3	1.4	1.7	1.2	1.5	2.6	1.0	2.3	4.5	3.4
Knee	Knee ACL	19.8	15.8	10.8	4.8	13.6	15.3	10.8	10.1	9.3	15.3	15.9	15.3
	Knee MCL	3.3	4.3	3.3	3.5	4.8	2.8	2.9	2.9	3.0	1.7	4.7	4.0
	Knee PCL	1.9	2.2	5.2	2.3	5.9	2.3	2.0	6.5	2.7	1.8	1.6	2.2
	Knee cartilage	4.0	5.6	5.3	8.6	12.5	6.0	7.0	6.1	7.8	5.7	9.1	8.9
	Patella injuries	0.9	1.6	0.8	1.8	0.8	2.5	0.6	0.1	0.8	1.2	2.7	1.0
	Knee tendon injuries	2.4	1.6	3.9	3.9	2.5	3.7	2.9	0.9	2.6	1.8	0.7	1.1
	Other knee injuries	3.9	0.8	2.2	3.6	2.5	1.0	2.4	1.3	3.8	0.2	2.6	2.7
Shin/ ankle/ foot	Ankle sprains or joint injuries	7.2	6.9	3.9	6.8	4.3	5.9	5.3	6.4	9.2	8.1	7.1	7.0
	Calf strains	5.8	6.4	3.4	5.7	3.4	4.4	3.8	1.7	4.5	3.4	3.1	4.3
	Achilles tendon injuries	1.3	1.4	1.3	1.6	0.7	0.9	1.5	0.8	1.9	2.1	2.2	4.1
	Leg and foot fractures	2.6	5.4	8.8	4.6	7.0	7.9	2.9	3.7	2.7	5.7	2.7	3.2
	Leg and foot stress fractures	4.9	4.0	6.7	3.8	4.4	3.9	5.3	6.3	5.1	8.2	6.8	7.3
	Other leg/foot/ankle injuries	6.4	5.1	3.1	3.9	4.2	2.3	3.7	4.3	4.2	4.1	4.2	4.6
Medical	Medical illnesses	4.2	3.7	2.8	2.8	2.6	2.9	3.8	4.2	3.6	0.7	3.1	3.5
Non-football injuries		0.1	0.8	0.6	0.6	0.3	2.4	1.0	0.4	0.1	0.5	1.0	0.7
MISSED GAMES / CLUB / SEASON		**159.2**	**141.9**	**135.9**	**131.8**	**136.4**	**134.7**	**118.7**	**131.0**	**129.2**	**139.5**	**147.5**	**147.0**

Table 6 – Key indicators for hamstring strains over the past twelve seasons

Hamstring injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Incidence	6.6	6.4	6.7	5.6	6.0	4.4	5.7	6.3	5.2	6.4	6.7	6.6
Prevalence	20.9	21.0	22.3	22.4	21.3	15.6	18.6	21.6	18.6	21.8	24.3	25.8
Severity	3.2	3.3	3.3	4.0	3.5	3.5	3.2	3.4	3.6	3.4	3.6	3.9
Recurrence rate	38%	36%	31%	37%	25%	30%	27%	22%	26%	16%	22%	25%

Table 7 – Key indicators for major knee ligament injuries over the past twelve seasons

Knee ligament injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
PCL incidence	0.6	0.3	0.7	0.5	1.0	0.4	0.5	0.7	0.4	0.3	0.2	0.3
PCL prevalence	1.9	2.2	5.2	2.3	5.9	2.3	2.0	6.5	2.7	1.8	1.6	2.2
PCL severity	3.3	7.4	7.2	4.8	5.9	5.9	4.4	9.0	7.0	6.8	9.7	8.2
Number of centre bounce PCL injuries (compared to total injuries)	0/10	2/5	3/12	4/8	4/18	3/7	2/8	5/13	1/7	0/5	0/3	2/5
ACL incidence	1.2	0.8	0.7	0.5	0.9	0.8	0.6	0.5	0.6	1.0	0.7	0.9
ACL prevalence	19.8	15.8	10.8	4.8	13.6	15.3	10.8	10.1	9.3	15.3	15.9	15.3
Number of graft ruptures (compared to total ACL injuries)	3/21	2/15	0/8	1/8	1/17	4/15	0/11	2/9	1/10	4/19	2/13	4/17

2.4 Analysis and discussion for significant injury categories

(a) Hamstring injuries

Hamstring strains remain the most common and prevalent injury in the AFL (Table 6). Previous analysis of hamstring and other muscle strain data shows a high rate of recurrence[12–19]. The current AFL data shows that management of these injuries has become more conservative over the last twelve years in the AFL, with recurrence tending to decrease but prevalence and severity tending to increase. This change in management strategy has possibly been led by research showing that recurrence rates remain high for many weeks after the initial injury[13] and that performance of players is often decreased in the matches soon after return from hamstring strain[19]. Hamstring injuries are known to affect older players and those with a past history of injury more often[12–19].

(b) Knee ligament injuries

The two major knee ligament injuries show continuing divergent trends, with posterior cruciate ligament (PCL) injury rates decreasing in recent years but anterior cruciate ligament (ACL) injury prevalence slightly increasing (Table 7). There was a continuation of the low rates of PCL injuries since the introduction of the centre circle rule. Table 7 shows that there were only five reported PCL injuries in season 2008, and although two of these did occur at centre bounce ruck duels, these are the first from this reported mechanism since 2005. There has certainly been a long-term decline in the incidence and prevalence of PCL injuries.

Knee ACL injury incidence has been generally steady over the past few seasons (Table 7). However ACL injury prevalence (time missed due to these injuries) has increased over the past three seasons. This is in keeping with the trend observed with other injuries that players are being managed more conservatively (that is, staying out of the game for longer following their initial injury). Unfortunately with respect to ACL injuries, this does not seem to have also been associated with a lower rate of injury recurrence, with four players in 2008 suffering a re-injury to their previous ACL graft. Although it would make intuitive sense that a more conservative return should increase the success rate on return (as has been observed with muscle strains), this does not seem to be the experience with ACL reconstruction.

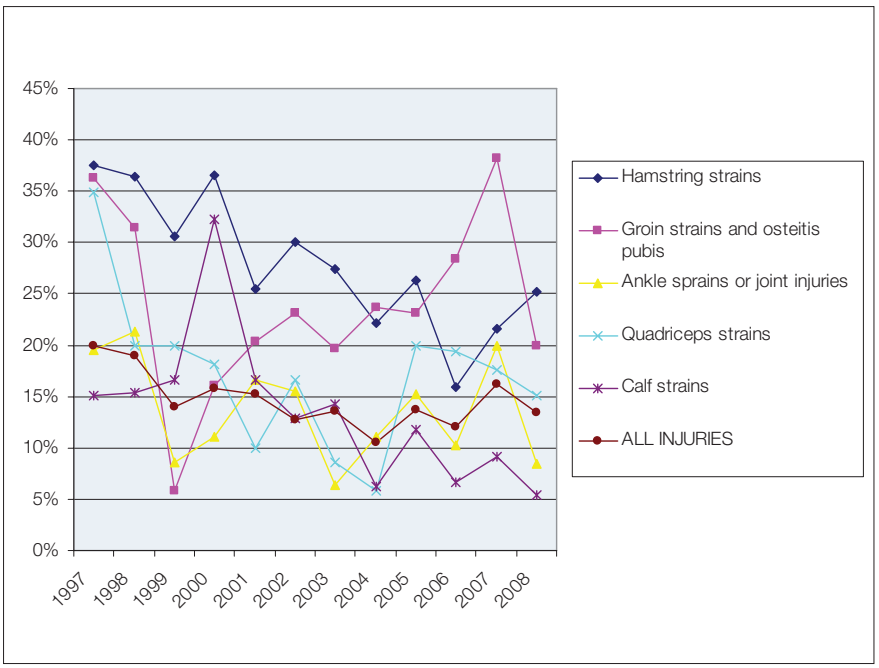


Figure 1- Recurrence rates (recurrent injuries as a percentage of new injuries)

Figure 3 – Ruck duel

Table 8 – Key indicators for head and neck injuries over the past twelve seasons

Head & neck injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Incidence	1.8	1.6	1.6	1.6	1.5	1.2	1.2	1.4	1.6	1.0	0.9	0.8
Prevalence	4.1	3.5	4.6	3.8	4.2	3.7	2.2	3.3	2.7	2.5	3.7	2.2
Severity	2.3	2.2	3.0	2.3	2.9	3.0	1.8	2.4	1.7	2.6	4.0	2.8

(c) Head and neck injuries

Table 8 shows consistently low incidence and prevalence for head and neck injuries (combined) over the past decade. Season 2008 reported both the lowest incidence and prevalence of head and neck injuries since the survey commenced. This suggests that reduced tolerance of head-high contact and stricter policing of dangerous tackles along with the introduction of rules to penalise a player who makes forceful contact to another player with his head over the ball has contributed to these positive trends. The reduced tolerance of head-high contact relates to the AFL Player Rules and Tribunal Guidelines regarding rough conduct which stipulate that players are liable for head high contact caused by a bump where the player laying the bump had a realistic alternative to either contest the ball or tackle.

(d) Shoulder injuries

Table 9 shows a slight but steady increase in the rates of shoulder injuries over the past twelve years, with the exception of recurrence rates which are falling. It is possible that the number of or risk associated with tackles has slightly increased the likelihood of shoulder injury over this time period. However, the observed data are also consistent with the notion that perhaps players and some teams are electing in certain circumstances to end a player's season early to undertake shoulder reconstructive surgery. Unlike knee reconstructions, shoulder reconstructions can often be delayed until the end of the season. However, the recommended six month recovery time after a shoulder reconstruction would tend to lead to a delayed start for the following season. There is a possibility that there is a greater tendency for teams to end a player's season somewhat earlier which is impacting on the observed rates of shoulder injury.

Table 9 – Key indicators for shoulder injuries over the past twelve seasons

Shoulder sprains & dislocations	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Incidence	1.0	0.9	0.7	0.7	1.1	0.9	1.3	1.0	1.4	1.6	1.0	1.8
Prevalence	5.3	5.9	5.6	4.0	5.4	5.9	5.7	5.9	7.7	10.8	6.4	10.2
Severity	5.3	6.5	8.5	5.6	4.9	6.7	4.4	5.9	5.6	6.7	6.3	5.8
Recurrence rate	12%	13%	27%	17%	10%	13%	9%	11%	20%	13%	16%	9%

Table 10 - Key indicators for groin injuries over the past twelve seasons

Groin injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Incidence	4.1	3.2	3.1	3.0	3.5	3.8	2.9	3.1	2.9	3.3	4.1	3.2
Prevalence	17.4	13.6	9.4	7.5	13.6	15.7	13.7	13.3	11.2	14.0	18.0	12.4
Severity	4.3	4.2	3.0	2.5	3.9	4.1	4.8	4.4	3.9	4.3	4.4	3.9
Recurrence rate	36%	31%	6%	16%	20%	23%	20%	24%	23%	28%	38%	20%

(e) Groin injuries

Groin injuries (including osteitis pubis) are consistently one of the three injury categories that cause the most missed playing time in the AFL. As a group, groin injuries represent a number of overlapping diagnoses, including adductor muscle strains, tendinopathy, osteitis pubis and sports hernias. In general these injuries have a high rate of recurrence and a high rate of becoming chronic. Incidence appears to be quite constant from season to season (3–4 new injuries per club per season) but prevalence (missed playing time) and recurrence rates vary from season to season. Previous study has shown that groin injuries do not affect older or younger players more often, although there is a perception that younger players are susceptible to osteitis pubis (possibly due to the fact that younger players suffer fewer injuries overall, leaving groin injuries to make up a greater percentage of the injuries suffered in younger players).

Conclusion

The AFL injury profile, compared to most of the other football codes, exhibits predominantly more non-contact than contact mechanism injuries. Some of the major contact-mechanism injuries such as head and neck injuries, rib injuries and knee PCL injuries have been reducing in incidence in recent years. There has been no such reduction and hence there remains a challenge for the AFL and clubs to control the most significant non-contact soft tissue injuries such as hamstring and groin strains.

The AFL injury profile continues to be consistently defined and published in sports medicine scientific literature and in public media releases 3 9 20 213 9 22-28 and interventions which have improved the safety of the AFL competition (e.g. ruck rule changes to decrease PCL injuries).

Acknowledgements

The authors and AFL Medical Officers would like to acknowledge the following people who contributed to the survey in 2008: David Binney, Dr Andrew Potter (medical services coordinator and doctor, Adelaide), Dr Paul McConnell (doctor, Brisbane), Dr Ben Barresi (doctor, Carlton), Dr Andrew Jowett, Gary Nicholls (doctor and physiotherapist, Collingwood), Bruce Connor (physiotherapist, Essendon), Jeff Boyle and Norm Tame (physiotherapist and football staff, Fremantle), Dr Chris Bradshaw (doctor, Geelong), Dr Peter Baquie + Andrew Lambart (doctor and football staff, Hawthorn), Dr Andrew Daff (doctor, Melbourne), Dr Con Mitropolous (doctor, Kangaroos), Dr Peter Barnes and Michael Heynan (doctor and football staff, Port Adelaide), Dr Greg Hickey (doctor, Richmond), Dr Tim Barbour (doctor, St. Kilda), Dr Nathan Gibbs (doctor, Sydney), Paul Tucker (physiotherapist, West Coast Eagles), Dr Gary Zimmerman (doctor, Western Bulldogs), Dr Peter Harcourt and Dr Harry Unglik (AFL Medical Commissioners), Shane McCurry, Rod Austin, Jill Lindsay and Adrian Anderson (AFL administration), Champion data, all football operations staff at clubs who complete weekly player movement monitoring forms and all those acknowledged in the injury reports for previous years.

Associate Professor John Orchard

Adjunct Associate Professor, University of Sydney

Dr Hugh Seward

Executive Officer, AFL Medical Officers Association

johnorchard@msn.com.au

Sports Injury epidemiology, diagnosis, treatments and prevention sessions will be held each day of **be active '09**

References

1. Seward H, Orchard J, Hazard H, Collinson D. Football Injuries in Australia at the elite level. *Medical Journal of Australia* 1993;159:298–301.
2. Orchard J, Wood T, Seward H, Broad A. AFL Injury Report 1996. *Football record* 1997;86(8):S14–S23.
3. Orchard J, Seward H. Epidemiology of injuries in the Australian Football League, seasons 1997–2000. *British Journal of Sports Medicine* 2002;36:39–45.
4. Hagglund M, Walden M, Bahr R, Ekstrand J. Methods for epidemiological study of injuries to professional football players: developing the UEFA model. *British Journal of Sports Medicine* 2005;39:340–346.
5. Fuller C, Molloy M, Bagate C, Bahr R, Brooks J, Donson H, et al. Consensus statement on injury definitions and data collection procedures for studies of injuries in rugby union. *Clinical Journal of Sport Medicine* 2007;17(3):177–181.
6. Fuller C, Ekstrand J, Junge A, Andersen T, Bahr R, Dvorak J, et al. Consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries. *British Journal of Sports Medicine* 2006;40:193–201.
7. Thacker S. Editorial: Public Health Surveillance and the Prevention of Injuries in Sports: What Gets Measured Gets Done. *Journal of Athletic Training* 2007;42(2):171–172.
8. Orchard J, Hoskins W. For Debate: Consensus injury definitions in team sports should focus on missed playing time. *Clinical Journal of Sport Medicine* 2007;17(3):192–196.
9. Orchard J, Seward H. AFL Injury Report 2007. Melbourne: AFLMOA, 2008.
10. Hodgson L, Gissane C, Gabbett T, King D. For Debate: Consensus Injury Definitions in Team Sports Should Focus on Encompassing all Injuries. *Clinical Journal of Sport Medicine* 2007;17(3):188–191.
11. Rae K, Orchard J. The Orchard Sports Injury Classification System (OSICS) Version 10. *Clinical Journal of Sport Medicine* 2007;17(3):201–204.
12. Orchard J, Best T, Verrall G. Return to play following muscle strains. *Clinical Journal of Sport Medicine* 2005;15(6):436–441.
13. Orchard J, Best T. The Management of Muscle Strain Injuries: An Early return Versus the Risk of Recurrence [guest editorial]. *Clinical Journal of Sport Medicine* 2002;12:3–5.
14. Orchard J. Intrinsic and Extrinsic Risk Factors for Muscle Strain Injury in Australian Footballers. *American Journal of Sports Medicine* 2001;29(3):300–303.
15. Bennell K, Wajswelner H, Lew P, Schall-Riaucour A, Leslie S, Plant D, et al. Isokinetic strength testing does not predict hamstring injury in Australian Rules footballers. *British Journal of Sports Medicine* 1998;32:309–314.
16. Gabbe B, Bennell K, Finch C. Why are older Australian football players at greater risk of hamstring injury? *Journal of Science and Medicine in Sport* 2006;9(3):in press.
17. Gabbe B, Branson R, Bennell K. A pilot randomised controlled trial of eccentric exercise to prevent hamstring injuries in community-level Australian Football. *Journal of Science and Medicine in Sport* 2006;9(1–2):103–109.
18. Verrall G, Slavotinek J, Barnes P, Fon G, Spriggins A. Clinical risk factors for hamstring muscle strain injury: a prospective study with correlation of injury by magnetic resonance imaging. *British Journal of Sports Medicine* 2002;35:435–439.
19. Verrall G, Kalairajah Y, Slavotinek J, Spriggins A. Assessment of player performance following return to sport after hamstring muscle strain injury. *Journal of Science and Medicine in Sport* 2006;9(1–2):87–90.
20. Cromwell F, Walsh J, Gormley J. A pilot study examining injuries in elite gaelic footballers. *British Journal of Sports Medicine* 2000;34:104–108.
21. Orchard J, Seward H. AFL 1999 Injury Report: Injuries on the Decline. *AFL Record* 2000;89(5):29–32.
22. Orchard J, Chivers I, Aldous D, Bennell K, Seward H. Ryegrass is associated with fewer non-contact anterior cruciate ligament injuries than bermudagrass. *British Journal of Sports Medicine* 2005;39:704–709.
23. Orchard J, Seward H. AFL Injury Report 2002. *Sport Health* 2003;21 (2):18–23.
24. Orchard J, Seward H. AFL Injury Report 2003. *Journal of Science and Medicine in Sport* 2004;7(2):264–5.
25. Orchard J, Seward H, McGivern J, Hood S. Rainfall, evaporation and the risk of non-contact Anterior Cruciate Ligament knee injuries in the Australian Football League. *Medical Journal of Australia* 1999;170:304–306.
26. Orchard J, Seward H, McGivern J, Hood S. Intrinsic and Extrinsic Risk Factors for Anterior Cruciate Ligament Injury in Australian Footballers. *American Journal of Sports Medicine* 2001;29(2):196–200.
27. Orchard J, Verrall G. Groin Injuries in the Australian Football League. *International Sportsmed Journal* 2000;1(1).
28. Orchard J, Wood T, Seward H, Broad A. Comparison of injuries in elite senior and junior Australian football. *Journal of Science and Medicine in Sport* 1998;1(2):82–88.

Smartplay's winter sport fact sheets

As winter is upon us many will undertake winter sports.

Smartplay, Sports Medicine Australia's sports injury prevention program, has a range of winter sport fact sheets to help your patients best prepare and prevent injuries in their chosen winter sport.

These include:

Australian Rules football
Basketball
Cross-country skiing
Downhill skiing
Hockey
Netball
Rugby league
Rugby union
Snowboarding
Soccer

To download or order these Smartplay fact sheets visit www.smartplay.com.au

Smartplay is funded by the Australian Government Department of Health and Ageing.

Smartplay Victoria is funded by VicHealth and the Department of Planning and Community Development (Sport and Recreation Victoria).

Smartplay Western Australia is funded by Healthway and the Government of WA Department of Sport and Recreation.

SMARTPLAY

REPAIR, RECOVER & REFUEL.

The Melbourne Vixens netball team represent their home city in the elite Australia and NZ Championship competition. The Melbourne Vixens includes Australia's best female athletes and a new generation of netball stars, with seven Australian squad members in the team, including recent World Champions Julie Prendergast, Bianca Chatfield and two-time Commonwealth Games gold medallist Sharelle McMahon.

Sports Dietitian Kerry Leech speaks with Sharelle McMahon, captain of the Melbourne Vixens Netball team.

Q. What is your favourite food?
I'm a little partial to chocolate but my favourite meal is chicken and vegetable risotto.

Q. Cereal or toast for breakfast?
Definitely a cereal girl, eating muesli, yogurt and milk helps me to keep going through the morning.

Q. Sharelle, you are working with Netball Victoria as well as playing and training with the Vixens - how do you fit it all in?
I'm very busy. I manage it with a very up to date diary!

Q. So how do you manage healthy meals on the run?
I need to be organised and pack food each morning. It makes drinks like Sustagen important as I can have them in the car on the way to or after training.

Q. What flavour Sustagen is your favourite?
That's easy, Chocolate - I told you I am a chocolate girl!

Q. How do you feel Sustagen helps your recovery?
Netball is a hard game, I tend to come out of each game with a few bumps and bruises. Sustagen after each game helps to get the recovery process started and provides a great source of protein and carbohydrate.

Q. So what now for Sharelle McMahon?
The Vixens are finished for the season but the Australian team has international matches over the next few months against New Zealand and England. So plenty of training camps, travel and tough matches. No slowing down for me!

www.sustagensport.com

VIXENS MELBOURNE

SportsDietitians AUSTRALIA

Comparing AFL Injury Surveillance to other Codes

Injury surveillance is becoming more consistently recognised as a fundamental responsibility of sports governing bodies around the world[1–5]. This is especially the case with elite football competitions, for which injury rates are typically higher than other sporting codes (Table 1).

It is still difficult to compare the injury rates in different codes and competitions, because of differences in injury definitions and the nature of competitions. The injury definition used in the AFL works for our competition because it means that we can aim to achieve and deliver 100% compliance with the definition. Other football codes – such as soccer and rugby union[2–3] – have elected to use a much broader definition inclusive of more minor injuries. This certainly has some benefits but leads to difficulty with ensuring compliance[6].

Even if all other competitions used a similar definition to the AFL, it may still be difficult to compare relative injury rates. For example, in the European soccer competitions it is commonplace for teams to play two matches per week and for players to be rested from the second match with minor conditions. In the AFL, with one match per team per week there is less likelihood of this occurring.

It is also common for other injury surveillance reports to separate match and training injuries and to express the incidence of these in number of injuries per 1000 player hours. Because of the relatively high number of "overuse" injuries in Australian Football that are difficult to characterise as solely being a "match" or a "training" injury, we prefer to express injury incidence as number of injuries per club per season. We also find that this unit of measurement is easier to comprehend when reading the reports; a lay person can understand that a club will experience 6 hamstring injuries per season, on average, but reading that the rate is 8 injuries per 1000 player hours does not give the same sense of how common these injuries are.

Despite the comparative difficulties, some general trends and differences between sports can be noted and can assist the AFL in assessing whether the way our sport is played leads to an acceptable rate of certain injuries (Table 2). In the past the AFL has acted when it has felt that the rate of certain injuries was unacceptable. One example is the centre circle rule which has successfully led to a reduction in PCL injuries in ruckmen. Another example is the reduced tolerance of head-high contact, stricter policing of dangerous tackles, and the introduction of rules to penalise a player who makes forceful contact to another player with his head over the ball.

Those football codes which have the highest number of tackles occurring and allow the most leniencies within the rules with respect to tackling have the highest rates of contact mechanism injuries. On the other hand, a greater number of tackles will generally result in a more limited range of free running, and hence running-related non-contact injuries will tend to be more common in the football codes with less tackling.

Table 1 – Injury surveillance in major football competitions in Australia and around the World

Competition/body	Publications	Notes on published injury data
Australian Football League (AFL)	Annual public release since 1996 plus multiple research journal articles[4, 7–14].	Injury profile generally of a non-contact nature. Documented 100% compliance with injury definition over the past 12 seasons[6].
National Rugby League (NRL)	Internal reports published15. No external papers arising yet but related rugby league publications[16–21].	High number of injuries involving contact and tackles[15]. Annual injury prevalence at one club averaged 15%20 although statistics for the NRL as a whole are not published.
Australian Rugby Union (ARU)	No annual public release but papers arising published[22–24].	Wallaby injuries increased in the professional era to 74 per 1000 player hours[24].
Football Federation of Australia (FFA)	Injury surveillance studies commencing but no reports published yet[25].	No publications.
National Football League (NFL, USA)	No annual public release but multiple arising research publications over many years[26–31].	High rate of contact mechanism injuries including to upper body.
English Premier League (EPL, England)	Some previous journal publications[32–34].	Average 1.3 injuries per player per season with 24 days missed per injury, 78% of injuries causing a missed game[32]. Primarily non-contact profile.
National College Athletic Association (NCAA)	Annual reports released at www.ncaa.org/iss with multiple publications in sports medicine literature[35–37].	36 injuries per 1000 player games in men's gridiron[35], 19 injuries per 1000 player games in men's soccer[37].
Super League (Rugby League, England)	Multiple sports medicine journal publications[38–41].	Rates of injuries increased when the competition moved from winter to summer[38, 41].
UEFA	Annual reports to team and journal publications[1, 42–44].	High rate of lower limb injuries – low rate of upper body injuries. Average injury prevalence for Champions League clubs in 2007/08 was 13–15%[42].
Gaelic Football	No official surveillance but some published studies[45–46].	1.7 injuries per player per season reported[46].

Certainly compared to American Football, Rugby League and Rugby Union, Australian Football has fewer contact mechanism injuries but more non-contact injuries. The injury profile of the AFL is most similar to Soccer and Gaelic Football.

Compared to other football codes, Australian Football is played on a larger field. Although there is officially 80 minutes of playing time in an AFL match, there is a greater amount of time added for stoppages than in other codes, so that the average time played in an AFL match is greater than 100 minutes. This combination of a large field and extended playing duration means that Australian Football players on average generally run further distances than athletes in other codes. The aerobic demands for AFL players are possibly higher than any other football code. This possibly explains the relatively high rate of non-contact injury in Australian Football.

Despite the high physical in-game demands for an AFL player, AFL players have the advantage of a lighter playing schedule in comparison to Soccer, Rugby League and Rugby Union players. Soccer players in Europe often must play twice per week within a season that is also long in duration. Rugby League players are often required to play with less than a 6 day break between games whereas Rugby Union players have a very short off-season, with northern hemisphere tours sometimes running until November and the Super 14 season starting in February.

Associate Professor John Orchard
University of Sydney

Dr Hugh Seward
AFL Medical Officers Association

johnorchard@msn.com.au

Table 2 – Difference in game parameters between professional football codes

Sport	Duration of game	Size and nature of playing field	Amount of tackling	Spacing of games	Off-season length for professional players
Australian Football	Relatively long	Very large	Moderate – tacking to head, neck and legs not allowed	One week (at least 6 days) apart	Relatively long
Rugby League	Medium	Medium	Very high	Generally one week apart but sometimes shorter durations between matches, especially for representative players	Medium duration (e.g. four months)
Rugby Union	Medium	Medium	Relatively high	Generally one week apart	Very short for national level players
American Football	Very short (minimal playing time with many stoppages)	Relatively small (narrow, often artificial surfaces)	Extremely high, including players without the ball (blocking)	Generally one week apart	Very long (6 months)
Soccer	Fairly long	Medium	Low (although leg to leg tackling allowed)	Teams often play two matches per week	Very short for national level players
Gaelic Football	Relatively short	Relatively large	Relatively low	Generally one week apart	Relatively long

A paper comparing sports injury prevention in Australia and New Zealand will be presented on Thursday 15th October at **be active '09**

References

1. Hagglund M, Walden M, Bahr R, Ekstrand J. Methods for epidemiological study of injuries to professional football players: developing the UEFA model. *British Journal of Sports Medicine* 2005;39:340–346.
2. Fuller C, Molloy M, Bagate C, Bahr R, Brooks J, Donson H, et al. Consensus statement on injury definitions and data collection procedures for studies of injuries in rugby union. *Clinical Journal of Sport Medicine* 2007;17(3):177–181.
3. Fuller C, Ekstrand J, Junge A, Andersen T, Bahr R, Dvorak J, et al. Consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries. *British Journal of Sports Medicine* 2006;40:193–201.
4. Orchard J, Seward H. Epidemiology of injuries in the Australian Football League, seasons 1997–2000. *British Journal of Sports Medicine* 2002;36:39–45.
5. Thacker S. Editorial: Public Health Surveillance and the Prevention of Injuries in Sports: What Gets Measured Gets Done. *Journal of Athletic Training* 2007;42(2):171–172.
6. Orchard J, Hoskins W. For Debate: Consensus injury definitions in team sports should focus on missed playing time. *Clinical Journal of Sport Medicine* 2007;17(3):192–196.
7. Orchard J, Chivers I, Aldous D, Bennell K, Seward H. Ryegrass is associated with fewer non-contact anterior cruciate ligament injuries than bermudagrass. *British Journal of Sports Medicine* 2005;39:704–709.
8. Orchard J, Seward H. AFL Injury Report 2002. *Sport Health* 2003;21 (2):18–23.
9. Orchard J, Seward H. AFL Injury Report 2003. *Journal of Science and Medicine in Sport* 2004;7(2):264–5.
10. Orchard J, Seward H. AFL Injury Report 2007. Melbourne: AFLMOA, 2008.
11. Orchard J, Seward H, McGivern J, Hood S. Rainfall, evaporation and the risk of non-contact Anterior Cruciate Ligament knee injuries in the Australian Football League. *Medical Journal of Australia* 1999;170:304–306.
12. Orchard J, Seward H, McGivern J, Hood S. Intrinsic and Extrinsic Risk Factors for Anterior Cruciate Ligament Injury in Australian Footballers. *American Journal of Sports Medicine* 2001;29(2):196–200.
13. J, Verrall G. Groin Injuries in the Australian Football League. *International Sportsmed Journal* 2000;1(1).
14. Orchard J, Wood T, Seward H, Broad A. Comparison of injuries in elite senior and junior Australian football. *Journal of Science and Medicine in Sport* 1998;1(2):82–88.
15. O'Connor D. NRL Injury Surveillance Report 2007 Season. Sydney: National Rugby League + University of Sydney, 2008:28.
16. Gibbs N. Injuries in professional rugby league. A three-year prospective study of the South Sydney Professional Rugby League Football Club. *American journal of sports medicine* 1993;21(5):696–700.
17. Seward H, Orchard J, Hazard H, Collinson D. Football Injuries in Australia at the elite level. *Medical Journal of Australia* 1993;159:298–301.
18. Gabbett T. Influence of the limited interchange rule on injury rates in sub-elite Rugby League players. *Journal of Science and Medicine in Sport* 2005;8(1):111–15.
19. Estell J, Shenstone B, Barnsley L. Frequency of Injuries in Different Age-groups in an Elite Rugby League Club. *Australian Journal of Science and Medicine in Sport* 1995;27(4):95–97.
20. Orchard J. Missed time through injury and injury management at an NRL club. *Sport Health* 2004;22(1):11–19.
21. Orchard J, Hoskins W. Rugby league injuries at State of Origin level. *Sport Health* 2007;25(2):19–24.
22. Best J, McIntosh A, Savage T. Rugby World Cup 2003 Injury Surveillance Project. *British Journal of Sports Medicine* 2005;39(11):812–817.

23. Savage T, McIntosh A. Rugby Union Injury Surveillance Study Results from 2002–2004. Sydney: University of New South Wales, 2005.
24. Bathgate A, Best J, Craig G, Jamieson M. A prospective study of injuries to elite Australian rugby union players. *British Journal of Sports Medicine* 2002;36:265–269.
25. Epidemiology of Football Injuries – Football Federation Australia. 3rd Football Australasia Conference; 2008; Melbourne.
26. Carlisle J, Goldfarb C, Mall N, Powell J, Matava M. Upper Extremity Injuries in the National Football League. Part II: Elbow, Forearm, and Wrist Injuries. *American Journal of Sports Medicine* 2008;36(10):1945–1952.
27. Feeley B, Powell J, Muller M, Barnes R, Warren R, Kelly B. Hip Injuries and Labral Tears in the National Football League. *American Journal of Sports Medicine* 2008;36(11):2187–2195.
28. Orchard J, Powell J. Risk of knee and ankle sprains under various weather conditions in American football. *Medicine & Science in Sports & Exercise* 2003;35(7):1118–23.
29. Powell J, Schootman M. A multivariate risk analysis of selected playing surfaces in the National Football League: 1980 to 1989: An epidemiological study of knee injuries. *American Journal of Sports Medicine* 1992;20(6):686–694.
30. Powell J, Schootman M. A Mutivariate Risk Analysis of Natural Grass and Astroturf Playing Surfaces in the National Football League 1980–1989. *International Turfgrass Society Research Journal* 1993;7(23):201–210.
31. Carey J, Huffman G, Parekh S, Sennett B. Outcomes of Anterior Cruciate Ligament Injuries to Running Backs and Wide Receivers in the National Football League. *American Journal of Sports Medicine* 2006;34(12):1911–1917.
32. Hawkins R, Hulse M, Wilkinson C, Hodson A, Gibson M. The association football medical research programme: an audit of injuries in professional football. *British Journal of Sports Medicine* 2001;35:43–47.
33. Hawkins R, Fuller C. A prospective epidemiological study of injuries in four English professional football clubs. *British Journal of Sports Medicine* 1999;33:196–203.
34. Hawkins R, Fuller C. Risk assessment in professional football: an examinatin of accidents and incidents in the 1994 World Cup finals. *British Journal of Sports Medicine* 1996;30:165–170.
35. Dick R, Ferrara M, Agel J, Courson R, Marshall S, Hanley M, et al. Descriptive Epidemiology of Collegiate Men's Football Injuries: National Collegiate Athletic Association Injury Surveillance System, 1988–1989 Through 2003–2004. Journal of Athletic Training 2007;42(2):221–233.
36. Dick R, Putukian M, Agel J, Evans T, Marshall S. Descriptive Epidemiology of Collegiate Women's Soccer Injuries: National Collegiate Athletic Association Injury Surveillance System, 1988–1989 Through 2002–2003. Journal of Athletic Training 2007;42(2):278–285.
37. Agel J, Evans T, Dick R, Putukian M, Marshall S. Descriptive Epidemiology of Collegiate Men's Soccer Injuries: National Collegiate Athletic Association Injury Surveillance System, 1988–1989 Through 2002–2003. *Journal of Athletic Training* 2007;42(2):270–277, http://www.nata.org/jat/readers/archives/42.2/i1062–6050–42–2–270.pdf.
38. Hodgson Phillips L, Standen P, Batt M. Effects of seasonal change in rugby league on the incidence of injury. *British Journal of Sports Medicine* 1998;32:144–148.
39. Gissane C, Jennings D, Kerr K, White J. Injury rates in rugby league football: impact of change in playing season. *American Journal of Sports Medicine* 2003;31(6):954–958.
40. Gissane C, White J, Kerr K, Jennings D. Physical collisions and injury rates in professional super league rugby. *Cleveland Clinic Journal of Medicine* 2001;4:137–46.
41. Gissane C, Jennings D, White J, Cumine A. Injury in summer rugby league football: the experiences of one club. *British Journal of Sports Medicine* 1998;32:149–152.
42. Ekstrand J, Hagglund M, Walden M. UEFA Injury Study 2007/08 season report. Linköping, Sweden: Linköping University + UEFA Medical Committee, 2008.
43. Ekstrand J, Timpka T, Hägglund M. Risk of injury in elite football played on artificial turf versus natural grass: a prospective two-cohort study. *British Journal of Sports Medicine* 2006;40:975–980.
44. Walden M, Hagglund M, Ekstrand J. Injuries in Swedish elite football – a prospective study on injury definitions, risk for injury and injury pattern during 2001. *Scandinavian Journal of Medicine & Science in Sports* 2005;15:118–125.
45. Wilson F, Caffrey S, King E, Casey K, Gissane C. A 6-month prospective study of injury in Gaelic football. British *Journal of Sports Medicine* 2007;41:317–321.
46. Cromwell F, Walsh J, Gormley J. A pilot study examining injuries in elite gaelic footballers. *British Journal of Sports Medicine* 2000;34:104–108.

Dr Karl Landorf is a Senior Lecturer and Research Coordinator in the Department of Podiatry at La Trobe University. He is also Leader of the Foot and Ankle Group in the Musculoskeletal Research Centre at La Trobe and is Deputy-Editor of the new free-access online journal, the Journal of Foot and Ankle Research. Karl's main research focus is the evaluation of the effectiveness of musculoskeletal interventions and he has a particular interest in plantar fasciitis/plantar heel pain. Karl's main presentation, *'What do we really know about plantar heel pain/plantar fasciitis?'* will be timely given the prevalence and disabling nature of this condition.

Most practitioners believe that they have a good understanding of plantar heel pain, however new research has begun to challenge what we know about this condition. For example, recent research has brought back into the spotlight the humble heel spur. For many years now we have been taught that heel spurs don't cause the pain, and as a consequence they have largely been ignored as a component of the pathology. However, Kumai and Benjamin in 2002 (J Rheumatol) re-ignited the role of the heel spur in plantar heel pain with their vertical compression hypothesis. Last year Menz and colleagues' research (J Foot Ankle Research) supported Kumai and Benjamin's hypothesis; that is that plantar calcaneal spurs are an adaptive response to vertical compression, rather than due to traction. Although spurs do not contribute to all plantar heel pain, they may have a greater role in causing symptoms than currently thought.

In addition, the diagnosis of plantar heel pain is still quite a mystery. While most believe they can diagnose the condition clinically, the question needs to be asked, "what exactly are clinicians diagnosing?" Is it just pathology of the plantar fascia, or are there wider pathologies present that could be contributing to the symptoms. Diagnostic imaging has, for example, demonstrates that often there is sub-periosteal pathology in the calcaneus. Further, it is clear now that when present, heel spurs are often not associated with the plantar fascia, but are often deep to the fascia. These insights into this condition question what we understand causes plantar heel pain.

Finally, there are an ever increasing number of randomised trials that are assisting clinicians guide their treatment of plantar heel pain. Many of the common interventions used to treat this condition have little evidence to support them, or there is evidence to suggest that they are not as effective as originally thought. In his presentation, Karl will discuss some of these important findings to update practitioners on the aetiology, diagnosis and treatment of this common condition.

BIO ORGANICS®
The Science of Wellbeing

NATURALLY FERMENTED CoQ10

MORE FUEL MEANS MORE ENERGY.

The CoQ10 formula with BioActive Plus™ ingredients

Bio-Organics® combines the power of naturally fermented Co-enzyme Q10 (60mg) with **BioActive Plus™ ingredients to create a specialised energy supplement.**

CoQ10 is an antioxidant that naturally occurs in the body. It works in the mitochondria to help maintain the body's biochemical pathways for **energy production.** BioActive Plus™ ingredients have been added to **support energy metabolism.** Importantly this combination may be valuable in people who exercise regularly as it **improves stamina** during times of peak demand and **helps the body deal with physical and mental stress.**

This formulation makes Bio-Organics® a great choice for your energy needs.

BioActive PLUS™ Extra active ingredients.

AD-CQ30-409 CHC40418-06/08

Calendar of upcoming events

Sports Dietitians Australia (SDA)

Career development pathway for sports dietitians

SDA's mission is to inspire, educate and empower sports dietitians to be world leaders in sports nutrition practice. SDA therefore over the past two years have undertaken a major review process of their current membership structure and continuing education opportunities with the view to implement a Career Development Pathway (CDP) for sports dietitians from July 2009. The CDP will encourage members to seek recognition for their dedication to professional development and continuing education.

For upcoming events see www.sportsdietitians.com.au

Nutrition for exercise and sport course 2009 course dates:
SA 22 August
VIC 5 September
QLD 31 October
SA 14 November

Topics covered:
Eating for health and sport
Metabolism and weight control
Fuels for exercise
Protein and bulking up
Performance nutrition
Pre-exercise and recovery nutrition
Fluids in sport

Australian Association for Exercise and Sports Science (AAESS)

AAESS amnesty period for AEP applications

AAESS is offering experienced [clinical] exercise physiologists who have worked in clinical exercise practice for at least the past five years in full time employment (EFT) the opportunity to submit an application for AEP accreditation that includes claims for exemptions for some of the accreditation criteria.

The offer is valid until 31 October 2009. For complete conditions to these applications please refer to the AAESS website: www.aaess.com.au

Upcoming events

From research to practice
Registrations are now open for the aaess 2010 conference
Proudly supported by Sports Dietitians Australia
9–11 April 2010, Gold Coast, Queensland
Details: www.aaess.com.au

College of Sports Psychologists – Australian Psychological Society

Upcoming events

Autism spectrum disorder workshop
Friday 28 & Saturday 29 August 2009
9.00am – 5.00pm (registration at 8:30am)
Royal on the Park, Cnr Alice & Albert Streets, Brisbane QLD
Details: www.psychology.org.au/Events

Journal of Science and Medicine in Sport

Top 3

1. Maximising performance in triathlon: Applied physiological and nutritional aspects of elite and non-elite competitions *Volume 11, Issue 4, 1 July 2008, Pages 407-416* Bentley, D.J.; Cox, G.R.; Green, D.; Laursen, P.B.
2. Effect of Kinesio taping on muscle strength in athletes-A pilot study *Volume 11, Issue 2, 1 April 2008, Pages 198-201* Fu, T.C.; Wong, A.M.K.; Pei, Y.C.; Wu, K.P.; Chou, S.W.; Lin, Y.C.
3. The effects of compression garments on recovery of muscle performance following high-intensity sprint and plyometric exercise Duffield, R.; Cannon, J.; King, M.

Podcasts

Listen to interviews with authors discussing their work and the latest from JSAMS, via podcast at www.jsams.org or through iTunes by searching "Journal of Science of Medicine and Sport"

Impact Factor

The 2008 Impact Factors have been released and the success is amazing. JSAMS now has an Impact Factor of 1.913 (compared to 1.091 in 2007). This has brought the journal up from a position of 39 out of 72 Sports Science journals in 2007 to a position of 16 out of 71 journals in 2009. It is now in the top 25% of journals in this category, and getting very close to other journals such as British Journal of Sports Medicine (IF = 2.126, ranked 10th).

What makes these people tick?


Lorimer Moseley


Willem van Mechelen


Mark Fenton

What rings their bells?

Insights into the *Be Active '09* Conference speakers

For the benefit of readers considering attending the Sports Medicine Australia national conference – this year badged "Be Active '09" and to be held in Brisbane from 14–17 October – the major speakers at the Conference have contributed to this article, the aim being to reveal a little more about them, their backgrounds and interests.

All speakers were asked to respond to the following four questions:

1. What do you consider the most important piece of work or research you have undertaken and why (or of which you are most proud)?
2. What persons, events or specific research had a significant influence on your career development?
3. What is the most exciting project you have planned for the future?
4. What single piece of advice would/ could you give to policy-makers seeking to turn research into policy and practice in your field?

More details about the speakers can be found at www.beactive09.com/speakers/default.asp

1. What do you consider the most important piece of work or research you have undertaken and why? (Or of which you are most proud).

Over the past five years my research has focused on evaluating exercise interventions for improving fitness, function and quality of life in children with chronic disease. I consider this research extremely important, as the opportunity to make a difference in the lives of seriously ill children is challenging yet greatly rewarding.

Dr Carolyn Broderick

Two large multi-centre national cohort studies, involving approximately 2000 players/year, in consecutive years examining "The effect of policy related to body checking in paediatric ice hockey players" and "A program of research in minor hockey" focuses on the knowledge translation component of this research program. Results of these studies have significant implications for policy related to body checking in youth ice hockey and these will be presented at "Be Active '09".

Dr Carolyn Emery

Early in my career I studied the biomechanics of walking and injury rates in fitness walking. Bottom line – vast health and fitness benefits can be attained through mere walking, with little risk of injury, cost, or for that matter formal guidance. More recently, I've been studying what creates environments where people are more likely to be routinely physically active.

Mark Fenton

My early research led to national guidelines for sports injury surveillance that have since informed other international developments, including the International Classification of Diseases activity (at time of injury) codes. More recently, I developed a new framework for sports injury research to help guide research directions that could directly lead to injury prevention practice (published in JSAMS in 2006).
Caroline Finch

On the subject of the effectiveness of sport surface evaluation and test methods, we have shown the strength of links between player perceptions of surface performance and mechanical test methods and the results have been widely disseminated.

In addition, I set up the very successful sport surfaces research network 'SportSURF' that has brought together a range of parties from interested disciplines and the industry – through a series of workshops, seminars and a dedicated conference (STARSS 2007).
Paul Fleming

From a personal perspective, I'm most proud/important of the work on prevention of permanent spinal injuries in Rugby Union (*BMJ* 2007; 334; 7604;1121–1172). Using a 30 year analysis the predicted number was 18.9 and there were 8 after implementation, so ten people not in wheelchairs. From a discipline perceptive build a cost model to show that sports injury prevention was a solid investment using insurance cost rather than social cost.
Simon Gianotti

Inactivity Physiology – showing that physical inactivity can at times have incredibly potent effects on physiology and biochemistry. This includes stuff like seeing that the key enzyme which is responsible for vacuuming fat out of the bloodstream became turned off when lab rats were not standing up. Or learning that many dozens of genes get turned on and off at the transition from when moving from standing, to not standing, to walking slowly and standing again. This sort of data changed how I look at lifestyle. Now I view my 3 hours of weekly exercise as a "supplement to add on top the main course", which is my activity or inactivity during the rest of the 168 hours of the week. So "inactivity physiology" is a term and concept we like to teach people about because unlike exercise physiology that teaches us about what happens when you work out, there are not currently any opportunities to teach us what happens inside our bodies when we sit down.
Marc Hamilton

Difficult to pick one as my research has covered a number of areas which aren't necessarily comparable. I like to think that the latest will be the most important and one the one that I can be most proud. I've yet to do an experiment where I didn't think afterwards, "if only I could do that again!"
Steve Harridge

A project in which I evaluated the effectiveness of different types of foot orthoses for plantar fasciitis. We also have a fantastic group of young researchers that I'm involved with at La Trobe University. It is very exciting seeing their development.
Karl Landorf

A collaboration to develop an athlete mental health screening program to assist with the identification of athlete mental health issues and the implementation of early intervention and follow up programs.
Michael Loyd

The development and testing of a procedure for the repair of anterior cruciate ligaments in prepubescent children. This operative procedure has stood the test of time and its ongoing follow-up published studies show a very high success rate without need for further surgery. When we first developed this surgery approximately 25 years ago, we thought it would be an interim procedure and the adult type of operative repair would be required as a secondary procedure. This has turned out not to be the case.
Lyle Micheli

About15 years ago I sat in the casualty department of Royal North Shore Hospital, rated injuries according to how gory they were and then asked the injured person how much it hurt. The complete lack of a relationship between goriness and pain was very important for me because it made me wonder if pain is not a measure of the state of the tissues, then what, by crikey, is it?
Lorimer Moseley

My most important piece of work I have undertaken and that I am most proud of is my new clinic "twelve9teen sports physiotherapy", which is totally dedicated to active teenagers. I have always been involved in and passionate about adolescent health care and feel that adolescents, in general, are not well catered for in our health system.
Loretta O'Sullivan


Loretta O'Sullivan


Karl Landorf

I've had a number of different content foci in my career, including tobacco control, sexual health and now active travel and obesity prevention. For example, in sexual health I initiated the first large scale national sexual health survey in Australia- the Australian Study of Health and Relationships. I am now very focused on active travel as the smart way to increase population levels of physical activity. The recent national report "Cycling – getting Australia moving: barriers, facilitators and interventions to get more Australians physically active through cycling" represents an important summary of the evidence and recommendations for improvements.
Chris Rissel

The sports injury prevention work that we have done has been pioneer work in the broad field of physical activity and health. In addition we were one of the first to introduce on a broad scale worksite physical activity intervention programs and to evaluate them for their cost-effectiveness.
Willem van Mechelen

In a recently conducted RCT on the secondary preventive effect and cost-effectiveness of neuromuscular training for the prevention of ankle sprains, we have shown that low impact preventive intervention programmes are not only effective injury-wise, but also have a huge positive impact on the monetary side of things.
Evert Verhagen

2. What persons, events or specific research had a significant influence on your career development?

My clinical practice is a wonderful mix of recreational athletes, elite adolescent athletes and children with chronic disease. The lessons learnt from each of these populations can have a significant application for the other. Observing the potential impact of physical activity and sport in improving quality of life, health measures and even survival in some instances encouraged me to become involved in research to examine the role of physical activity in children with chronic disease. While the scientific evidence is currently lacking in many paediatric populations, I believe that in the near future, exercise will form part of the routine medical management of children with chronic diseases. Sick children and their families continue to inspire me and this group has significantly influenced the direction of my career.
Carolyn Broderick

Dr. Willem Meeuwisse – research mentor – Sport Medicine Physician and Epidemiologist – International opportunities to participate in World Congress on Injury Prevention in Sport in Norway (2006 and 2008) early in my academic career.
Carolyn Emery

Three influences of note:

i) Growing up as a "free range" child in a small town in western New York State, I was allowed to walk and bicycle to school, friends homes, the movie theater, etc. Without realizing it, I was experiencing the routinely active lifestyle that I now work to promote.
ii) Competing in the 50K racewalk at the national level and studying biomechanics which led to the opportunity to coach everyone from elite athletes to beginning health and fitness walkers.
iii) As a writer and editor for health magazines, I was able to interview and learn from the very best researchers in the world, including Russ Pate and Jim Sallis, Steve Blair and Adrian Bauman, Larry Frank and Reid Ewing.

Mark Fenton

I was fortunate to "be in the right place, at the right time" when I began my research into the epidemiology of sports injuries in Australia in the early 1990's. My methodological background, and experience in injury research in other contexts, provided the right mix to be able to undertake innovative sports injury prevention research. Since then, I have been fortunate to work with people from both national and state Government Departments of Health and Sport and Recreation who have shared a high commitment to promoting safety issues in sport and who also recognised the critical value of good-quality data to underpin prevention programs. I have also enjoyed strong partnerships with various sports bodies like the Victorian Squash Federation, the Australian Football League and Cricket Australia.
Caroline Finch

For the area of sport surfaces in the main my very understanding Head of Department! He has fully supported my evolution of our sport surfaces research team and laboratory facilities here at Loughborough over the past several years.
Paul Fleming

Patria Hume from AUT University and Caroline Finch from University of Ballarat. Being a sports coach (of no great significance, let's be clear about that) at the grass roots level as this gives me an end user/target group approach to sport injury prevention. This has been crucial when building prevention programmes to not only to test with the target group but to ask myself if I would use it as a coach.
Simon Gianotti

Many things have worked together for good that were totally out of my control. Jeremy Morris was writing articles years ago with data in it that showed the men who had to sit down all day to do their jobs were most likely having unnecessary but deadly heart attacks because of their inactivity. A big turning moment for me professionally was the day that I saw data we collected in just a single day showing how the enzyme which is responsible for vacuuming fat out of the bloodstream became almost totally turned off when our lab rats were not standing up.

Marc Hamilton

I have been fortunate to have worked with many who have influenced me in many ways. Certainly having had the opportunity to work with Bengt Saltin in Stockholm and Copenhagen provided me with not only great learning experiences, but a conduit for so many subsequent opportunities.

Steve Harridge

There have been a two in particular: Firstly, Dr Anne-Maree Keenan, the Director of the NIHR Leeds Musculoskeletal Biomedical Research Unit; Secondly, Associate Professor Rob Herbert from George Institute, Sydney, a leading figure in evidence-based physiotherapy.

Karl Landorf

I believe that quality supervision plays an integral role in the career development of Sport Psychology professionals. In my case, three very distinct, but highly skilful supervisors at the University of Southern Queensland: Professor Gershon Tenenbaum (research), Mr Steven Christensen (practicum and professional development), and Professor Peter Terry (research and professional practice).

Michael Lloyd

Professor John E. Hall, Chief of Orthopaedics at Children's Hospital Boston and my direct mentor for over 20 years, taught me that the primary responsibility of a practicing physician is through the care of each individual patient, teaching and research are both very important but are always secondary to providing the best care to each patient.

Lyle Micheli

Professor Patrick Wall, who backed me, humbly and wholeheartedly, on what could only have been a hunch.

Lorimer Moseley

Doing my doctorate of clinical physiotherapy – this has equipped me to take on advanced practice roles with in physiotherapy, assisted in passing my specialisation exams, provided me the academic credibility to sub-specialise in adolescents in sport, and is providing with me the research skills to investigate one of the most common sporting complaints in teenagers – patellofemoral pain.

Loretta O'Sullivan

As a young health promotion officer Penny Hawe significantly influenced my understanding of health promotion planning and evaluation, Simon Chapman my understanding of the


Carolyn Finch


David Dunstan

media and public health advocacy, and Adrian Bauman has further influenced my health promotion development and understanding of physical activity. All three continue to be role models!

Chris Rissel

Difficult to name any specific person or event. My career has mostly been a matter of making the right choice at the right time and meeting the right people at the right place at the right time. What has driven me most is that whatever I do, it needs to be fun and meaningful to society.

Willem van Mechelen

I was a middle distance runner performing at the junior national level; however, my sports career ended after a knee injury, which made me decide to study Human Movement Sciences and learn all about what had happened to me. At the end of my study I was required to write a master thesis. I considered this all to be a big hassle that was required to gain my masters degree, I didn't care about research that much. However, Willem van Mechelen convinced me to do my best and as it turned out I actually liked the whole process, finished my thesis with a big smile, and got my first international publication.

Evert Verhagen

3. What is the most exciting project you have planned for the future?

A study aimed at determining the transient increase in risk of bleeding associated with exercise and sport in children with haemophilia. There has been conflicting advice as to whether children with haemophilia should play sport or not. Exercise and sport has many advantages in this population but it also comes with risk, namely the risk of bleeding into muscles and joints. This study will enable us, for the first time, to quantify the risk associated with sport and physical activity so that children with haemophilia, and their families, can make informed decisions about sports participation.

Carolyn Broderick

Injury Prevention research clinic in youth to examine risk factors and prevention strategies through individually targeted preseason musculoskeletal assessment and prevention programs. Long term outcomes include early onset osteoarthritis.


Evert Verhagen


Lyle Micheli

Partnerships with obesity prevention researchers to examine the effectiveness of a combined injury prevention and obesity prevention program in junior high schools.
Carolyn Emery

I do a lot of work with community planning, transportation, and public health collaboratives working to increase community-level physical activity rates. There is a tremendous need to figure out which are, and how to replicate, the most effective interventions. Whenever possible I collaborate on these studies, particularly of policy level interventions, and feel they are the highest priority. I¹m also working with a group developing the US's first National Physical Activity plan – a huge opportunity, given that we have finally have a presidential administration that may actually be receptive to substantive recommendations.
Mark Fenton

All of them are exciting! I just hope the funding bodies also think so and support sports injury prevention research in Australia at even higher levels than they have done in the past.
Caroline Finch

Several in the pipeline, some utilising the very latest state of the art technology in our Sports Technology Institute which will include a dedicated instrumented outdoor research test bed facility to look at in-game player movement and surface interactions.
Paul Fleming

Using the dataset in New Zealand to identify people at greater risk of re-injury when they first present with that injury. This allows for targeting at risk people when they visit a medical professional. We are starting out with ankle then if it passes the all important peer review, moving to other injury sites (e.g., knee, shoulder). We will then move to an injury site such as backs and work out if there are the preceding injury types so a does an ankle or knee injury create instability issue that results in a back injury at a latter time.
Simon Gianotti

Studies that will look at the most potent biological triggers fired off inside the body when we sit down too much, but are responsible for making people get sick unnecessarily, even causing unexpected heart attacks.
Marc Hamilton

The one I have just had rejected by the Medical Research Council
Steve Harridge

My trip to Brisbane in October for the SMA conference! I'm also excited about working with the next wave of young researchers we have at La Trobe University; they are very inspiring.
Karl Landorf

I have been asked to establish and coordinate the Cricket Australia National Standards Program for Sport Psychology. The program has a number of objectives including: national screening protocols and review data collected from national initiatives; establish an Australian minimum service standard in psychology for first class cricketers; improve the preparation of state athletes for international honours.
Michael Lloyd

We are presently raising funds for the establishment of a research center for the pediatric athlete in our hospital. We ultimately hope to answer the question of how much is enough exercise and training for the child and how much is too much.
Lyle Micheli

The next one.
Lorimer Moseley

Research into the quality of performance of the single leg squat task in active teenager girls with and without patellofemoral pain syndrome.
Loretta O'Sullivan

Analysing the data from a three year intervention study to promote cycling and the use of cycling infrastructure in south-western Sydney and to look at its effect on physical activity levels. After that, possibly a workplace cycling promotion project, an analysis of cycling in the media, and a study to explore what the risk exposure of cycling really is.
Chris Rissel

We are now trying to push the political Public Health agenda forward based on the outcome of our studies. In addition, we have started as of May 18th 2009 a spin-off company called Evalua Nederland B.V. (see at www.evalua.nl and at www.evalua.fi) that aims at reducing absenteeism form work through the IT-based use evidence-based monitoring tools.
Willem van Mechelen

There are many exciting things floating around in my head.
Evert Verhagen

4. What single piece of advice would/could you give to policy-makers seeking to turn research into policy and practice in your field?

Policy should be based on good science and should always be directed at improving patient outcomes. Too often policy decisions are made with the health system not the patient in mind.
Carolyn Broderick

Facilitate collaborations with researchers to ensure policy and practice decisions are informed by evidence which is rigorous methodologically.
Carolyn Emery

Two simple points:

i) Focus on routine physical activity, not just structured exercise or leisure time physical activity.
ii) Use policy level carrots and sticks to encourage active transportation. For example, not just inviting bicycle and pedestrian facilities, but also perhaps congestion charges, parking fees, and toll roads (what economists call internalizing the external costs of these activities) to discourage driving.

Mark Fenton

Greater recognition that research for knowledge gain or to increase the evidence-base for sports medicine is different to research into knowledge transfer and uptake of that evidence – and we need both. Internationally, research into the uptake of evidence into policy and practice is still in its infancy but by working together, both groups can significantly influence the translation of research evidence into real-world health promotion and injury prevention gains.
Caroline Finch

Invest in better communication with researchers, raise the important challenges with them and provide appropriate support in return for deliverables that can be implemented! In a nutshell, more money but also more interaction and implementation.
Paul Fleming

Don't expect results overnight, changing behaviours takes time. Set realistic timelines and targets. When these are exceeded be happy. If there was a silver bullet we would have found it by now.
Simon Gianotti

Tell them that hazards that are common and seemingly safe might actually be quite deadly and avoidable, but nevertheless avoidable with their help. It used to be that every gathering room in the house had ash trays, which promoted a hospitable environment for smoking. Then someone taught us that smoking had incredibly potent effects on the body. Currently every gathering room is stuffed with chairs because not enough science has taught us about inactivity physiology research showing us physical inactivity (most commonly sitting) has incredibly potent effects on the body.
Marc Hamilton

Difficult to answer this, but in terms of the health benefits of exercise for all, look at the evidence that's already there! How to turn in to practice? Over to the psychologists and sociologists…
Steve Harridge

I think this is starting to happen with the higher education reforms we are seeing being pushed through by the current Labor government. Clearly, more money for research is a good thing, but greater training opportunities will be a very worthwhile investment in the future.
Karl Landorf

Actively seek and facilitate comprehensive input from all stakeholders and employ a clear and rigorous methodology that is evidence based, strategic, and sustainable.
Michael Lloyd

The numbers of children participating in organised sports training and competitions is increasing rapidly. In the United States, approximately 50 million children now participate in organised sports programs either at the school or the community level, while less than 10 thousand individuals participate in professional sports. Clearly, our research efforts are in the area of injury prevention and proper training should be focused at the children of our country and the world.
Lyle Micheli

From each according to their abilities, to each according to their needs. It is not immediately obvious how one can make this relevant to turning research into policy and practice, but surely, there must be a way.
Lorimer Moseley

It must first be evidenced based; secondly that health care is more than just doctors and nurses and goes beyond drugs and surgery; thirdly, that we need to look beyond the symptoms and look for the causes; and that the funding of health care needs to be reflective of the base of evidence; should be inclusive of all health professionals and should focus largely on preventative and educational strategies.
Loretta O'Sullivan

There is no single strategy that will get more people cycling – a combination of infrastructure, education, and barriers to driving will be necessary. It helps to remember that cycling is fun, and that people want to cycle if it's easy and stress free.
Chris Rissel

Changing people's physical activity behaviour is not a single shot event. This will only truly work if normative thinking about lifestyle issues will change and when politicians get rid of their fear to fundamentally intervene in a person's options for lifestyle change. Unhealthy lifestyles reflect in my view normal behaviour in an abnormal environment. Consequently, politicians, and we all alike, should change this abnormal, unhealthy environment.
Willem van Mechelen

Keep your audience in mind. Governments require different information in a different "language" than for instance athletes do.
Evert Verhagen

POWER breathe®

MAKE EVERY BREATH COUNT℠

Powerbreathe is the World's leading Inspiratory Muscle Trainer (IMT) and a Class one Medical Device

Inspiratory Muscle Training has been Clinically Proven to:

- ***Reduce Breathlessness*** [1]
- ***Increase Performance*** [2]
- ***Accelerate Recovery*** [3]

Respiratory effort can account for up to 15% of cardiac output, and when the inspiratory muscles tire they divert blood away from the working muscles such as arms and legs.

The benefits of a Powerbreathe warm-up have been known for some time. However, recent research shows that IMT can increase 5000m running performance[2] and reduce lactate concentration faster than a passive recovery[3].

Available to SMA members at special prices.

healthMG

HEALTH I FITNESS I PERFORMANCE PRODUCTS

For more information visit www.powerbreathe.com
Phone 1800 000 180
Email info@healthmg.com.au
www.healthmg.com.au

SPORTS MEDICINE AUSTRALIA

SPORTS MEDICINE APPROVED PRODUCTS

Wellness Model

- Drug Free
- Improves Lung Function
- Improves Quality of Life

Fitness Model

- Reduces Breathlessness
- Increases Exercise Tolerance
- Improves Fitness

Sport Model

- Improves Warm-up
- Enhances Performance
- Accelerates Recovery

1. Volianitis S, McConnell AK, Koutedakis Y, Jones DA. Specific respiratory warm-up improves rowing performance and exertional dsypnea Med Sci Sports Exerc 2001:33(7):1189-93
2. Edwards AM, Wells C & Butterly R. (2008). Concurrent inspiratory muscle and cardiovascular training differentially improves both perceptions of effort and 5000 m running performance compared with cardiovascular training alone. Br J Sports Med 42, 523-527
3. Chippa GR, Roseguini BT, Alves CN, Ferlin EL, Neder JA, Ribeiro JP. Blood lactate during recovery from intense exercise: impact of inspiratory loading. Med Sci Sports Exerc 2008:40(1):111-6

2009 Australian Conference of Science and Medicine in Sport "Active Sports Medicine for all"

Seventh National Physical Activity Conference "ReActivating Australia"

Sixth National Sports Injury Prevention Conference "Staying Safe to Be Active"

be active '09

3 concurrent events

14 - 17 October 2009, Brisbane Convention & Exhibition Centre

Program at a glance

Wednesday 14 October

Plenary Speakers
Mark Fenton
Lorimer Moseley
Willem Van Mechelen

Keynote Speakers
Steve Harridge
Marc Hamilton
Lyle Micheli

Invited Speakers
Paul Fleming
Carolyn Emery
Evert Verhagen

Symposia
Physical activity policy, practice and research

Risk management of natural and synthetic surfaces in sport

Physical activity and sustainability

Practice what you preach - healthy lifestyles for clinicians

Sedentary behaviour across the lifespan: opportunities for intervention

Wearable technologies for performance assessment

Workshops
Measurement of physical activity

Beyond Textbook Recovery: Exploding the Myths of Chronic Pain

Nordic walking: global trend set to make an impact on Australia's health and fitness

Talking to / using the media

Assessment of cycling biomechanics to optimise performance and minimize injury

Exercise prescription following a diagnosis of cancer

Sports medicine emergency care course

Seeing is Believing: Using Systematic observation to Assess Physical Activity and its Contexts

Other Highlights
Free paper sessions
Trade Exhibition opening
Welcome Reception

Thursday 15 October

Keynote Speakers
Mark Fenton
Lorimer Moseley
Mark Tarnopolsky
Caroline Finch

Invited Speakers
Michael Lloyd
Simon Gianotti
Karl Landorf

Symposium
How important is motor skill proficiency to physical activity participation?

Workshops
Starting up a private practice

Tai Chi, Qigong and Health - for allied health practitioners

Examination of the shoulder

Retraining graded and functional control of the Hip region

Dealing with different cultures

CPR certification

The appropriate use of analgesia - guidelines for clinicians

Supplement update

Ultrasounding tennis elbow

Diagnosis of shoulder pathology

Ultrasound in a general sports practice

Other Highlights
Free paper sessions
Poster session
Trade Exhibition
ASMF Fellows Dinner & AGM
Brisbane River Dinner Cruise

Friday 16 October

Keynote Speakers
Willem Van Mechelen
Chris Rissel

Invited Speakers
Mark Tarnopolsky
Tom Marwick
Simon Gianotti

Symposia
Physical activity in early childhood: characteristics, influences and interventions

Eat well be active: a state-local strategic government initiative analysis

Workshops
Getting your work published

New technologies in body composition

Tips to treat tendons

Designing a spinal stability program to break the recurrent pain cycle

Wrist / hand

CPR certification

Working with difficult patients and clients: why do things go pear-shaped in service delivery?

Exercise for healthy necks

Clinical examination of the knee

Ultrasounding foot and ankle

Sclerotherapy for tendinopathy

Shoulder injection techniques

Other Highlights
Free paper sessions
Discipline Specific Afternoon
Trade Exhibition
Discipline Group Dinners & AGM's

Saturday 17 October

Invited Speakers
Carolyn Emery
Paul Fleming
Simon Gianotti
Evert Verhagen
Caroline Finch
David Dunstan
Karl Landorf
Thomas McKenzie
Carolyn Broderick
Lyle Micheli
Loretta O'Sullivan

Symposia
Sporting injury concerns: a world view

Drugs in sport: informing athlete support personnel

Paediatric sports medicine

The design and conduct of large-scale prospective injury prevention trials – lessons from the PAFIX randomised controlled trial

Debates
Pain is there for a reason

Is exercise medicine?

Workshops
Improving your conference presentation skills

Ultrasound evaluation of the shoulder

Podiatric screening of active feet for sports physicians, doctors and physiotherapists

Tips to treat tendons

CPR certification

Food provision for athletic groups

Working effectively within a multidisciplinary sports medicine framework

Other Highlights
Free paper sessions
Best of the Best - Asics Medal
SMA AGM
QLD Government Be Active Conference dinner

Notice of Annual General Meeting and Call for Nominations

Notice is hereby given that the Annual General Meeting of Sports Medicine Australia will be held at the Brisbane Convention Centre, South Bank, Brisbane at 5.00pm Saturday 17 October 2009.

Agenda

1. Opening and President's Welcome
2. Roll Call, Apologies and Proxies
3. Minutes of the Previous AGM
4. Reports
5. Consideration of financial statements & audit report
6. Board Election (if required)
7.. Appointment & remuneration of auditors
8. Special Business

Call for Nominations – Board of Directors

Members are asked to provide nominations for positions on the Board of Directors of Sports Medicine Australia.

Executive Members:

- President
- Vice President
- Financial Director

National Directors

- NSW
- South Australia

Discipline Director

I……..of…….
……
hereby nominate…….
for the position of……
on the National Board of Directors of Sports Medicine Australia

Proposer's Signature …….. Date ……

Seconder (full name)……

Seconder's signature …….. Date ……

Nominations should reach: Sports Medicine Australia, PO Box 78, Mitchell, ACT 2911 or fax to (02) 6241 1611 BY NO LATER THAN 5.OO PM (EST) ON Friday 25 September 2009

Notes to the validity of nominations to the Board of Directors of SMA

Appointment and Election of the Executive

Any nominee for the Executive shall not be eligible unless they have served on the Board for 2 of the last 5 years. A nominee for the position of President must also have served on the Board for the 12 month immediately prior to nomination.

A retiring President shall not be eligible for any Executive position for a period of 2 years following retirement from the office of President.

Appointment and Election of National Directors

Each State Branch shall elect a National Director from and by the Federation membership in their state through elections coordinated by the CEO.

Any nominee for National Director must be a resident of the state for which they are nominating.

Appointment and Election of the Discipline Director

Discipline Groups will be asked to vote for nominations to the position of the Discipline Director at their Discipline Group AGM.

The Discipline Director will be elected at the AGM by the Council of Disciplines.

Any nominee for Discipline Director must be a member of a Discipline Group.