Sport Health

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Are Australians Becoming More or Less Active?

By Gary Moorhead

Despite the constant news about a looming health crisis in Australia as we get older and fatter – and despite the important role physical activity plays in counteracting the adverse health affects of overweight and obesity – there has been no national survey of physical activity levels since November 2000. So how do we know how effective campaigns and other measures to promote sport and activity have been?

Sports Medicine Australia's (SMA's) Mission Statement says that as an organisation we are concerned with promoting the beneficial health affects of physical activity and with working to overcome the adverse affects of inactivity – like obesity. SMA therefore has a strong interest in the effectiveness of programs to promote physical activity.

Thanks to support from pharmaceutical company Pfizer, SMA has been able to conduct a survey providing data on national physical activity rates comparable with the last national survey in 2000 (the Active Australia Survey) (1). This data (from the SMA/Pfizer National Survey of Physical Activity in Australia) was published last December (2007). (2)

The SMA/Pfizer Survey showed that while there were more Australians (seven percent) meeting the recommended minimum level of physical activity for health benefit (30 minutes of moderate intensity activity on most days of the week), of continuing concern from a population health perspective was the fact that close to half – 47 percent – of the population were still not meeting the 30 minutes a day recommendation. (2)

It is obvious that much more needs to be done to increase population levels of physical activity. Obesity has been estimated to cost the Australian economy $21 billion annually in health and disability costs, premature death and productivity costs. (3) A continuation of the previous national government's piecemeal approach and expressed preference for duck-shoving the responsibility onto individuals (or families in the case of children) simply won't do. Responses to a number of other questions asked by the Survey could provide some useful leads for policy makers.

The Survey asked respondents for perceived barriers to increasing their physical activity levels. Two thirds felt hours spent working and travel time to and from work were a barrier to doing more activity and that time spent at work also adversely influenced eating habits. Injecting more opportunities for activity into the workplace and encouraging active transport could pay immediate dividends.

Respondents were also asked for their recall of public health media campaigns. While 97 percent remembered "Slip Slop Slap" and 74 percent "the Grim Reaper", only 33 percent could recall the 2007 "Red chair" campaign aimed at increasing physical activity in children and only 12 percent the Active Australia – "take it regularly, not seriously". To be fair, the red chair campaign targeted children and Active Australia did not run in all states. Interestingly, 89 percent claimed to remember "Life be in it", the oldest of the campaigns surveyed. (2)

Obviously, policy makers have some thinking to do in planning future physical activity media campaigns. This becomes even more important when other findings from the Survey are taken into consideration.

Of perhaps greater significance for policy makers was the finding that 46 percent of those surveyed agreed with the statement *"to get health benefits from physical activity it is important to really work hard, and puff and pant and sweat"*. This was quite a surprise to the SMA public health researchers because perceived wisdom is that the population as a whole understands the 30 minutes a day recommendation – the issue is that half don't do it. In fact, the results are consistent with those from an earlier SMA/Pfizer Survey.(4) In that survey, people were asked whether they agreed with the statement "no pain, no gain" in relation to sport and exercise. 58% did agree. At the time, these results were considered to be a statistical flaw.

The biggest reality check in regard to lack of understanding of the Guidelines came during the media campaign to promote the Survey in early December. The Sunrise program on Channel Seven decided not to use one of the SMA spokespersons but to recruit their own psychologist to interpret the results. This erudite gentleman took frisbees onto the show and talked about how activity should be fun, but then shot himself in the foot with the concluding statement that "no-one should have problems doing 15 minutes of vigorous activity three times a week!" Hello? If health professionals don't know or understand the guidelines, what

hope the general public? At the recent SMA national conference, this level of understanding was actually surveyed – a repeat of a survey undertaken at the 1999 Conference. (5) This 1999 survey showed only a third of delegates attending had heard of the US Surgeon general's Physical Activity Recommendations. I understand that preliminary analysis shows a much better result for 2007 – you would hope so!

But clearly, if people think a particular activity is not going to provide benefit, then they won't do it. It would be interesting to know if the 47 percent not meeting the 30 minute recommendation include the 46 percent who believe it provides no benefit!

Another barrier to participating in sport and physical activity is injury - or the fear of becoming injured. We also know from other research that this barrier increases with increasing age and increasing weight. (6) With an ageing and increasingly overweight population, it becomes imperative that the message gets through that health benefit comes from moderate intensity activity, not activity where "you really have to work hard and puff and pant and sweat."

It also a reasonable assumption that many people are confused over what is actually good for them – and for what. The main culprit here is messages that confuse "health benefit" with messages about weight loss and preventing weight gain. In the last edition of Sport Health I reported on presentations by Professors Wendy Brown and Adrian Bauman which came to the conclusion that there are simply not enough hours in the day for a person to control their weight through increases in recreational physical activity. (7) If people are encouraged to take up or increase physical activity in the belief that this alone will have an impact on their weight, it is not surprising that they will drop the activity if their weight does not change.

More information about the Survey can be found on the SMA website www.sma.org.au.

References/Further Reading

1. Bauman A, Ford I, Armstrong T. "Trends in population levels of reported physical activity in Australia. 1997,1999 and 2000." Active Australia.
2. SMA/Pfizer Survey "Inactive Australia? – another look". StoltzNow Market Research Report July 2007. See Pfizer Health Report at www.sma.org.au
3. Dr Lesley Russell, Menzies Foundation Fellow, Sydney University (The Weekend Australian 15 December 2007)
4. SMA/Pfizer Survey "inactive Australia? StollzNow Market Research Report June 2006.
5. Bauman A & Finch C. "Awareness of and Attitudes to the New Physical Activity Recommendations – Perceptions of Attenders of the 5th IOC World Congress on Sport Science." JSAMS 3:4 2000 Page 493 (the carrot survey)
6. Finch C, Owen N et al MSSE
7. Sport Health Spring 2007

National Conference Highlights

The 2007 National Conference built on the model established in 2005 in Melbourne. Under the banner ***"be active '07"***, the Conference was a collaboration that saw the concurrent running of the Australian Conference of Science and Medicine in Sport, the Sixth National Physical Activity Conference, the Fifth National Sports Injury Prevention Conference, the SA Recreation & Sport Development Conference and the SMA SA Sports Trainers Conference.

To foster multidisciplinary information exchange and maximise networking opportunities, all sessions and all social events were open to all delegates attending on the day. A total of 980 attended the Conference, with 237 from South Australia, 648 from other states in Australia and 95 overseas delegates. There was also a 78 booth trade exhibition. Details of Conference research award winners are listed below.

SMA owes a debt of thanks to the organising committees of each of the separate conferences and especially to the Conference Chairs, Dr Jill Cook (ACSMS), Professor Wendy Brown and Dr Jo Salmon (Physical Activity) and Dr Leonie Otago (Injury) as well as our tireless Conference manager, Davina Sanders. A collage of photos from the Conference is included and abstracts will be published as an electronic supplement to the Journal of Science and Medicine in Sport (JSAMS).

In 2008, the National Conference will be held on Hamilton Island (16-18 October) as one of the SMA series of "boutique" Conferences. Speakers confirmed include former coach of the Australian Cricket Team, John Buchanan.

In 2009, we will return to the combined format in Brisbane (14-17 October) with the Heart Foundation partnering in the organisation of the National Physical Activity Conference and the Australian Council of Health, Physical Education and Recreation (ACHPER) joining for the first time since 2000 (which was also in Brisbane).

The Asics Medal

The funding available to support the Australian Sports Medicine Federation Fellows research awards was substantially increased in 2001 by SMA national sponsor Asics. In 2003, Asics took this support a step forward with the inauguration of the presentation of the Asics Medal for the best research paper overall at the Conference. In 2007, Asics International Marketing Manager, Mark Doherty (that's him in the red shoes) decided to have a special medal struck to present to winners of the "Asics Medal".

Design of the "Medal" became the subject of a competition between Asics' in-house designers in Japan, with the winner receiving a free trip to Australia. Sufficient medals were struck to enable the four previous winners to receive a copy. These were presented at the National Conference Award Ceremony along with the Medal awarded to the 2007 winner, Dr Dennis Taaffe from the University of Queensland, for a paper entitled "Physical activity, physical function and incident dementia in elderly men". The full list of research prize winners for 2007 follows:

Australian Sports Medicine Federation Fellows Awards 2007

ASICS Medal - Best Paper Overall

($5000 prize including Best Paper award)
Dr Dennis Taaffe, University of Queensland
Physical activity, physical function and incident dementia in elderly men
Co Authors - F. Irie & K. Masaki

ASICS Best Paper - Clinically Relevant Conditions

(*Presentation Package at ACSM*)
Dr Adam Bryant, University of Melbourne
Estrogen alters the mechanical behaviour of the human Achilles tendon in vivo
Co Authors - R. Clarke, S. Bartold, A. Murphy, E. Hohmann, K. Bennell, S. Marshall, C. Payne & K. Crossley

ASICS Best Paper - Performance Enhancement and Basic Science

($2000)
Dr Dennis Taaffe, University of Queensland
Physical activity, physical function and incident dementia in elderly men
Co Authors - F. Irie & K. Masaki

Australian Government Department of Health and Ageing Best Paper - Injury Prevention

($2000)
Dr Dara Twomey, University of Ballarat
The use of Australian football player's attitudes to lower limb injury risk and injury prevention strategies to inform future research
Co Authors - C. Finch & E. Roediger

ASICS Best Paper - Health Promotion

($2000)
Associate Professor Elizabeth Eakin, University of Queensland
Short-Term Results from the Logan Healthy Living Program: A Telephone Counselling Intervention for Physical Activity & Diet
Co Authors - M. Reeves, S. Lawler, N Graves, B. Oldenburg, C. Del Mar & K Wilkie

ASICS Best Paper - Lower Limb

($2000)
Dr James Smeathers, Queensland University of Technology
Strength Exercise Results in an Acute Decrease in Achilles Tendon Thickness
Co Authors - S. Wearing & S. Hooper

Ken Maguire Award for Best New Investigator - Clinically Relevant Conditions

($2000)
Dr Karen Holzer, University of Melbourne
The impact of exercise-induced bronchoconstriction on exercise performance
Co Authors - P. Brukner, L. Irving, & L. Davies

ASICS Award for Best New Investigator - Lower Limb

($2000)
Miss Melinda Franettovich, AIS & University of Queensland
Augmented low-Dye tape induced reduction in muscle activation persists following removal of tape
Co Authors - A. Chapman, P. Blanch & B. Vincenzino

John Sutton Award for Best New Investigator - Performance Enhancement and Basic Science

(*Presentation Package at ACSM*)
Miss Joanna Vaile, Australian Sports Commission
Effect of hydrotherapy on the recovery of exercise-induced fatigue and performance
Co Authors - S. Halson, N. Gill & B. Dawson

NSW Sporting Injuries Committee Award for Best New Investigator - Injury Prevention

($2000)
Mr Cameron Gosling, Monash University
Is it time to alter the heat policy? The tale of two race events: A Melbourne triathlon experience
Co Authors - B. Gabbe, J. McGivern & A. Forbes

ASICS Award for Best New Investigator - Health Promotion

(*Presentation Package at ACSM*)
Dr Clare Hume, Deakin University
Are children's perceptions of the neighbourhood environments associated with their physical activity?
Co Authors - J. Salmon, K. Ball, M. Jorna & D. Crawford

Wendy Ey, Women in Sport Award

($500)
Miss Halla Malik, University of South Australia
From placenta to lunchbox: mothers, the media and fat kids
Co Authors - N. Szetu & T. Olds

Queensland Academy of Sport Best Poster - Clinically Relevant Conditions

($500)
Not awarded

Australian Government Department of Health and Ageing Best Poster - Health Promotion

($500)
Ms Jonine Jancey, Curtin University of Technology
The effect of a physical activity intervention for older adults
Co Authors - A. Lee, P. Howat, A.Clarke & T. Shilton

Australian Government Department of Health and Ageing Best Poster - Injury Prevention

($500)
Mr Trevor Savage, University of New South Wales
Development of a method to study injury risk factors associated with the tackle in Rugby Union
Co Authors - A. McIntosh, B. Frechede & P. McCrory

AOK Health Best Poster - Performance Enhancement and Basic Science

($500)
Mr Blair Crewther, HortResearch NZ & Southern Cross University
Salivary hormones and anaerobic exercise in healthy males
Co Authors - T. Lowe & R. Weatherby


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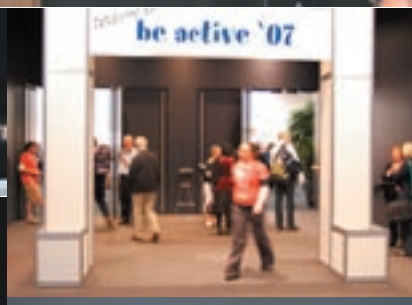
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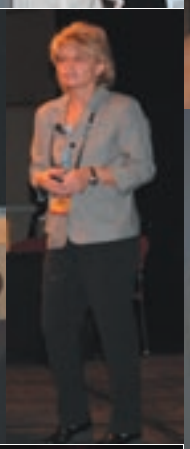
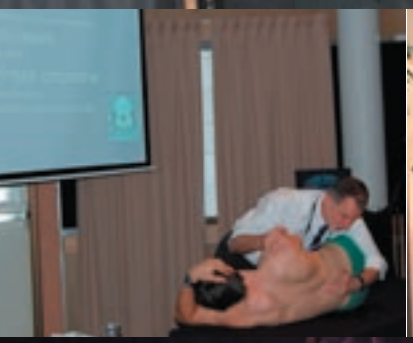



What can we learn about physical activity from other approaches to advocacy







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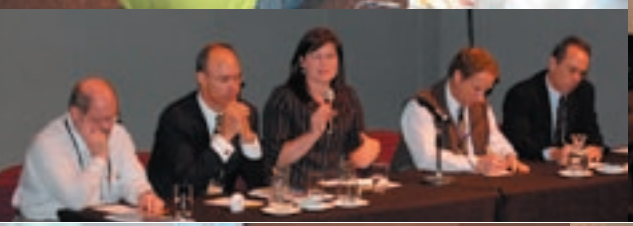
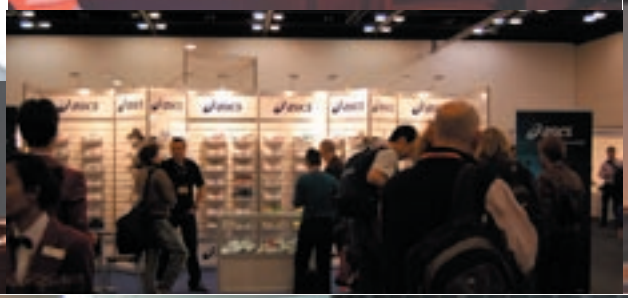


Can the 'other' drug problem get fixed?

By Dr J

The distinguishing feature of the 2007 sporting year has unfortunately been the shadow cast by drugs – both the performance-enhancing and the illicit or 'social' types. It is a pity that the All Blacks lost the rugby world cup: if they had managed to win it then 2007 might have gone down as a landmark year for a more positive reason, namely that almost all of the major sporting competitions of the year would have actually been won by the best team (or competitor). Unfortunately is in only the minority of us with statistically-orientated brains that see the 'best' performers for what they are (those who win the most events the most often) rather than those who win a specifically designated single game that is called a "Final".

Perhaps fortunately (as ignorance is bliss) those who are not as statistically-orientated do not understand the unbelievable extent to which the results of straight-line events (running, cycling and swimming) can be affected by performance-enhancing drugs. Whilst I am quite a cynic in this sense, I still strongly believe that where we can reliably detect harmful performance-enhancing drugs, we have a strong duty to keep such drugs illegal (e.g. anabolic steroids). We are definitely in a better state than 20 years ago, when the women's track sprint world records were 5% superior than today's best times, yet sadly those who hold them have not made (or will not make) old bones. It is when the harmful and performance-enhancing drugs are easy to mask that the situation becomes messy. I've written before that I don't think it is worth having a drug on the banned list if you can't properly detect it. Readers can make up their own minds about whether HGH and EPO currently fall into this category.

Many of the straight-line sports (e.g. track sprints, cycling) struggle to hold currency in Australia because of our perception that they are riddled with drugs. The exception is swimming, which may be cleaner or about which we may be in denial because we can't believe that our top athletes would have the same propensity to cheat as the rest of the world. The football codes in Australia fortunately don't suffer from a perception that performance-enhancers are rife, but the opposite is true for ecstasy and cocaine. When Dale Lewis made the famous '75% have used at some stage' estimate a few years back, he was ridiculed, but the general public probably perceives that he is close to the mark now. One of Oscar Wilde's many good lines is "the only thing worse than being talked about is not being talked about". Ben Cousins, Andrew Johns and their fellow party boys have tested the maxim that "any publicity is good publicity" to the limit in 2007. It still, however, hasn't hurt the ratings of the footy codes one bit. Despite the eventual post-retirement public humiliation, Andrew Johns (like Gary Ablett senior before him) was such a brilliant footballer that he was protected from ever being called to account when he was still playing. Ben Cousins was a great player, but being one notch down in the hierarchy of supremely gifted footballers and also being very close to the dreaded 30 has meant that the West Coast Eagles finally decided they had had enough of him. If he was the same age as, say, Daniel Kerr, he would be possibly still be getting more chances than Simone Warne gave Shane. Anyone who "can't play", by comparison, becomes a poster child for the "one strike" policy that the government and talkback radio kings preach.

So how do we solve the problem of illicit 'party' drugs? I'm a none-time user but with the benefit of no experience I still believe that they are dangerous enough that we should be stamping out their use. Not much has worked to date in the football codes, but as everyone keeps pointing out this is pretty reflective of society in general. The Federal government in recent years has gone close to declaring 'war' on the AFL for being "soft on drugs" but isn't this a case of the pot calling the kettle black? How many small-time social drug users have been treated harshly by our legal system over the past decade? Just about the only public figure who was tough on drugs in Australia in 2007 was Chris Lilley on *Summer Heights High*. "Hard on drugs" is a badge that governments in South East Asia can wear, but, please, not in our country. Our population doesn't really want this draconian approach, so let's not be hypocritical and ever say we want to have 'zero tolerance' for drugs. Zero tolerance in Asia is a firing squad, which rightly arouses outrage in a free country such as ours.

So does a middle ground exist between execution and slap on the wrist with a feather? It has to, and to see where this might lie you need to be clever enough to draw analogy with areas in which clampdowns have had success. My preferred one is drink driving, which still occurs in society, but perhaps only at 10% of the rate of 30 years ago. Blind Freddy can tell you that the reason why most people no longer drink drive is not the risk of dying in a car crash. It is unfortunately human nature to ignore this risk, just as people ignore the risk of stimulants blowing your brains out. It is almost certainly random breath testing and the threat of license suspension that are the major reasons keeping most people sober behind the wheel. So how can we stop people popping E's or snorting 'blow'? Although implementing this solution would be difficult, describing it is not: if you get caught in possession or having taken

any amount of any 'party' drug, you should be suspended from nightclubs and pubs for 12 months. If this solution was implemented in Australia, you wouldn't be able to stop people taking these drugs in the privacy of their own home, but you'd put a serious dent in the aspirations of the, say, 90% of users who are doing it in pubs and clubs.

So how does the legal system ban someone from a nightclub when most parents can't even manage it for their 16-year old children? I'm not going to say it is easy, but it isn't impossible either. You could make a rule that to get into a nightclub or pub you need to produce either a driver's licence, passport or proof of age card. If you ever get caught with "just one tablet" or fail "just one drug test" anywhere then your licence, card and passport all get confiscated and the new ones you get issued with refer to you as "Jacques, the pill popper: not to enter nightclubs until 2009". If it is your passport, it is probably going to seriously affect your chances of getting through customs in Indonesia as well, but, hey, you were the one who took the pill. Any nightclub or pub who lets patrons in without a valid licence can cop fines or loss of their own licence, depending on degree of their transgression(s).

The benefit of a system like this would be that you could actually act on those punters that the police are nailing. Under the current situation, I would expect that the cops would find charging small time drug users to be a major pain in the backside and general waste of their time. If you actually manage to nick someone for having two 'E's in their pocket, a mountain of paperwork later and what they are going to cop? Maybe a reprimand and a $200 fine? Who knows exactly what it will be, but whatever it is, it isn't currently acting as enough of a disincentive to use. How much more rewarding would it be if the cops could instead just grab their licence and say "pleased to meet you, Jacques the pill popper. No more nightclubs for you until January 2009. Here is your licence back which now denotes what a lowlife you have been and why you need to stay out of trouble for 12 months".

Think that this sounds like a stupid solution? Well what other ideas do you have in between the traditional Australian slap on the wrist with a goose feather and the "20 years in jail" approach of the Indonesians? A two strike policy with mandatory counselling? Spare me.

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NOVARTIS

How a national sports injury body could work in Australia

John Orchard, Jessica Coates, Gary Moorhead

Background

Sports injuries are a substantial cost to the health system in Australia. Financially, the burden may now be close to $2 billion in direct costs [1]. Sports injuries also have a negative impact on the amount of exercise that Australians undertake. Currently almost half the population (47 percent) do not meet the minimum amount of physical activity for preventing those diseases associated with inactivity [2]. Those who are injured are often unable to exercise and, in addition, fears of injury and/or injury costs are barriers to Australians who are considering taking up exercise. Most importantly, there is increasing evidence that some sports injuries are preventable if managed systematically by government[3]. The basic template for systematic sports injury prevention was described by Van Mechelen in 1992. This involves four stages as shown in Table 1

Advancements on the Van Mechelen paradigm have been described, including a Translating Research into Injury Prevention Practice (TRIPP) paradigm (Table 1) [4]. However, the basic Van Mechelen formula is behind the successful approach of the New Zealand government body the Accident Compensation Corporation (ACC, http://www.acc.co.nz/index.htm) which has demonstrated cost savings from such an injury prevention approach[3].

On this basis, there is a strong argument for Australia to implement a Federal government body with responsibility for monitoring and preventing sports injuries [1, 5]. What is less clear is how to deliver such a body in a way that makes it functional, rather than an overseeing committee with little power or influence on sports injuries. We can look to New Zealand and identify that their system for monitoring, compensating and preventing sports injuries is superior to Australia's position, given our lack of any comparable system[1]. There are some other useful international comparisons, such as Switzerland and Finland (which have national government owned insurers), Quebec in Canada (with has a regulatory board), the USA (which has some national injury surveillance registers) and Norway which has recently implemented a national knee reconstruction register [6].

However, New Zealand is logically where we should look to first, given our proximity, cultural and sporting similarities, the fact that their ACC system has been functioning successfully for over 20 years and also that it has recently demonstrated cost effectiveness of injury prevention programs in sports that are commonly played in Australia[3]. New Zealand also has a much greater proportion of government health spending on public health and prevention than in Australia (7.4% compared to 2.1%)[7] and is not showing the same rate of increase in obesity being exhibited in Australia [7]. As certain sports injury rates in New Zealand also appear to be lower than Australia[5], there is a strong argument to use the New Zealand system as a benchmark for comparison.

Table 1 – TRIPP framework (developed from Van Mechelen)

Stages of injury prevention (TRIPP)	Van Mechelen stage
1. Injury surveillance	Stage 1
2. Establish aetiology and mechanisms of injury	Stage 2
3. Develop possible preventive measures	Stage 3
4. 'Ideal conditions' scientific evaluation of preventive programs	Not included
5. Describe implementation of preventive programs into 'real world'	Not included
6. Monitor success of intervention	Stage 4

Comparison with New Zealand system

A quick glance at the current Australian and New Zealand system leads to the view that it would be difficult to import the New Zealand ACC structure in its entirety (Table 2). Sporting bodies might find some advantages with this option, but there would be plenty of opposition to such a proposal in Australia from powerful lobby groups including the following:

- Sports insurers, who would instantly lose all of their business overnight to a government monopoly.
- Private health insurance companies, who would lose one of the major incentives for younger members to join (that, currently, operations for sports injuries are able to be performed in a more timely fashion in the private system)
- Some health care providers may also object if the fee schedule for a sports compensation system was lower than their standard charges. The ACC, like the Workers Compensation systems in Australia, funds patients 100% for their health care, but caps payments. Workers Compensation bodies in Australia keep the peace with health care providers by making their capped payments very generous. However, the Australia public would be unlikely to fund generous payments to all providers out of general revenue, with health care providers unlikely to be happy with capped payments that weren't lucrative.

Table 2 – comparison of New Zealand and Australian systems

Characteristic	New Zealand system currently	Australian situation currently	Desired Australian situation (?)
National surveillance of all sports injuries by a single body	Has been implemented for >20 years	Very little data kept with no monitoring of this data	Highly desirable in the longer term. However, if a single government payer was not implemented, the more cumbersome option of paying multiple bodies (Medicare, sports insurers, private insurers, sporting bodies, public hospitals) for their data would be required.
Preventive programs to lower the rate of sports injuries	Already in place for 8-9 major sports with some very effective [3]	Haphazard at best and non-existent in many cases	We must move in this direction, but as per the Van Mechelen [8] and TRIPP [4] paradigms, successful injury surveillance is a crucial stage towards this.
Full government compensation for immediate treatment of all health care costs associated with sports injuries	Already in place for all sports. However, covers 'acute onset' injuries only	No Federal government compensation other than Medicare (+indirectly through public hospitals and private health rebate)	Full compensation may not be affordable or necessary (given that it is not currently taken for granted by Australians). However, partial compensation may be affordable (and in fact a necessary incentive to obtain sports injury data)
Full government compensation for lost wages when unable to work due to a sporting injury	Already in place for all sports. At an extreme, this means that someone totally permanently disabled by a sporting injury could receive lifetime compensation payments of up to NZ$14 million [5, 9].	Not available. Lump sum insurance payments for total and permanent disablement (e.g. quadriplegia) from sport are currently not greater than A$300,000 [5, 10]	Similarly this may not be considered affordable. However, partial compensation, if affordable, may be an incentive towards encouraging physical activity. Such a government body must also contribute to solving the inadequacy of current insurance payments for total and permanent disablement from sport.

- Plaintiff law groups, who would fear that any move towards a no-fault universal sports injury compensation system would also be accompanied by the New Zealand style restrictions on right to sue for negligence involved in sports injuries.
- Fiscal conservatives in the Federal government who saw government support of sports injury insurance as substantially a form of 'middle-class' welfare would also need convincing that such a system was cost effective.

The potential objectors listed above makes the problem of implementing a national sports injury insurance scheme in Australia somewhat analogous to the much bigger issue of the entire health care system in the United States. From the outside, it is easy to point the finger at the USA's inefficient privatised health system and insist that they should implement a nationalised government system to replace it. However, with the pre-existing massive private health infrastructure in the USA, starting from scratch with a government system appears to be close to impossible to achieve. Many Americans, along with their associated lobby groups, would be certain to object to the job losses, tax increases and waiting lists that would be part of a government monopoly system, despite the potential advantages of better health outcomes for much of the population.

It is not constructive just to assert that it would impossible for the New Zealand system to be translated over to Australia and therefore to conclude that nothing better could be done in this country. Table 2 lists the advantages of the New Zealand system showing which features should be a high priority for implementation in Australia and those which may be considered less feasible or affordable. An important aspect of Table 2 is the concept that a 'partial compensation' model may be a 'middle ground' which could make a national system acceptable. A Federal government contribution towards sports insurance claim payments and private hospital episode payments, payable only on receipt of episode injury data, solves many problems in one hit. It is a government contribution towards those playing sport (and hence a 'rebate' for the physically active), it forces recording of basic injury data details and it would put sports insurers and private health insurers 'on side' with the new system. In a similar fashion, the government would need to add an additional rebate within its own Medicare system to facilitate collection of data (for example, a 'bonus' rebate per attendance payable on receipt of diagnosis, sport and basic mechanism information). The amount per episode needs to be calculated as a trade-off of cost vs. compliance (i.e. what is the minimum cost to government which would lead to acceptable compliance by data providers). It may be sensible to trial such a scheme in a pilot region (e.g. ACT) to gauge whether a small co-payment is enough to capture the majority of data or whether more generous payments are needed.

An alternate option would be to make sports (and perhaps other non-traffic and non-work) injuries ineligible for Medicare payments, but to create a parallel Federal government system. This system could differ from Medicare in that (1) rebates were slightly more generous, giving an incentive for this

system to be used over Medicare with a qualifying injury, but (2) rebates were only paid on receipt of basic injury data. Finally, consideration would need to be given to partial government funding of paramedical presentation for sports injury, such as physiotherapy, podiatry and exercise physiology. The most effective model for this in Australia would probably be in a similar vein to physiotherapy rebates after 'chronic care' plans have been completed by the GP, using GPs as a gatekeeper for appropriate referrals (for limited visits).

Weaknesses of the New Zealand system

Table 3 lists some of the weaknesses of the New Zealand system, with a view that some of these structural weaknesses could be prevented when designing an Australian system from scratch. One of the biggest strengths of the New Zealand system is that by generously funding sports injury, the New Zealand government is providing a government support or 'rebate' for sports and physical activity. Just as all Western governments now heavily tax smokers, it would theoretically be sound for governments to 'tax' inactivity, as inactivity is closing in on smoking as the greatest preventable cause of disease in Western society [11, 12]. However, the New Zealand system, by rebating on an injury-by-injury basis, is giving relatively higher rebates to the riskier sports. The theoretically-perfect sport or exercise which provided all of the health benefits of physical activity but with a zero risk of injury would therefore receive no rebate under the ACC system. By contrast, sports which are so likely to cause major injury that their net health risks exceed their benefits are those which are most generously funded under the ACC model. It is perhaps not coincidental that 'extreme' sports seem to have greater popularity in New Zealand than in other countries.

The realistic model for Australia: implementation in stages

A premium model, with semi-fixed government contributions for all active individuals, would give stronger incentives towards participation in the safest sports. By capping government contributions to riskier sports, such a system could reduce the amount of government funding required, compared to the New Zealand model, and arguably gives greater incentive towards participation in safer sports. Those individuals who are regularly active in sports that are proven by claims received data to be highly safe (for example, power walking, indoor cycling, swimming, golf, pilates) may have their entire premium and injury payments funded by the government system, as a reward for participating in exercise with excellent risk-benefit profile. Generous government contributions (but perhaps not 100%) could be awarded to sports with a 'healthy' profile but low-medium risk (for example, tennis, surfing, touch football, basketball, cricket). Contributory payments could be made to high risk sports (for example, rugby league and union, skiing, horse rising) which would still require substantial individual funding of injury episodes and/or premiums, with a strong incentive for these sports to devote major resources towards lowering injury rates to move downward in injury incidence to a more generous level of government funding.

However, in the short-term the Australian government may not be in a position to commit substantial funds to sports injury surveillance and prevention. A model which is more likely to be embraced by our government is spelt out in Table 4. This involves implementation of sports injury surveillance and prevention in stages. Stages 1 & 2 may be acceptable to the government at comparatively low cost, with the expectation that stage 2 may be able to lead to demonstrated prevention of injuries in the medium term. Areas that are suggested as priorities for stage 2 include spinal injuries in sport, dental injuries in sport and knee ACL injuries. The New Zealand experience suggests that spinal injuries in rugby are somewhat preventable[3, 9, 14] and it would not require a great deal of government funding to expand Australia's existing spinal cord registry[15] to include an annual assessment of injury incidence rates in the major high-risk sports. Dental injuries have been shown to be highly preventable under the New Zealand model [13]. Knee ACL injuries are one of the strongest risk factors for knee osteoarthritis, which is one of the most prevalent chronic medical conditions in Australians [16]. Norway has recently successfully instituted a national ACL register [6] based on a similar model to international registers on joint replacements. It is noteworthy that the recent report on Osteoarthritis in Australia[16] highlighted both regular

Table 3 – strengths and weaknesses of the New Zealand system

Strengths of the New Zealand system	Weaknesses of the New Zealand system
• Excellent data collection for all sports injury episodes • Generous compensation for those injured during activity (a government 'rebate' for the active, providing an incentive for physical activity and sport) • Strong incentive for the ACC to fund prevention programs to reduce claims • Prevention model is able to be applied, although with some limitations • Cost effectiveness of preventive programs can be tested	• Weak collection of exposure data (best estimate is number of active participants in each sport, but no record is made of participation time for each individual) • Very little measurement of intrinsic or extrinsic risk factors for injury in the ACC model (for example ACC does not receive data to detect if there are more injuries than expected at a certain playing venue) • As sports and players don't pay premiums themselves (or even contributions to injury episodes), there is little financial incentive for the sports themselves (as opposed to the ACC) to reduce injuries • 'Acute' injuries are funded by ACC model but not 'overuse' or gradual onset sports injuries, providing an incentive for players to falsify mechanism data in order to gain funding.

Table 4 – possible stages of implementation of a national sports injury body

Stage	Additional responsibilities of national body	Specifics	Relative cost
1.	Creation of a body with responsibility for sports injury prevention and monitoring.	National board reporting to sports and/or health ministry.	Minimal and recommended immediately[1,5].
2.	National monitoring and prevention programs for a specific small number of conditions for which successful prevention programs have already been demonstrated.	(1) spinal injuries in sport[3]; (2) dental injuries in sport[13]; (3) knee anterior cruciate ligament (ACL) injuries[6].	Moderate, although New Zealand has already demonstrated cost effectiveness[3].
3.	Local implementation of a pilot for monitoring of all sports injuries (and then further prevention efforts arising from this monitoring).	Perhaps ACT would be a good size jurisdiction for such a pilot.	More substantial. Would be an appropriate investment if stage 2 has proven effective.
4.	National implementation of monitoring of all sports injuries.	Expansion of stage 3 pilot.	High, so appropriate when stage 3 has proven cost effectiveness.
5.	Full government compensation for all sports injuries (both organised sport and casual activity).	System already in place in New Zealand.	May be appropriate later when funded national physical activity targets are in place.

exercise (to avoid obesity and muscle weakness) and avoidance of joint injury when playing sport as important ways to prevent osteoarthritis. It is clear from this example that in promoting exercise, which is critical, Australia must not neglect sports injury prevention.

If successful prevention of injuries from stage 2 (and the resultant decrease in costs to Medicare and the public hospital system) can be demonstrated, further stages may be approved for funding.

Link with physical activity promotion

A further advantage of getting better data on the activities that individuals are participating in (despite its cost) would be that this information could drive greater government action on promoting physical activity. A national sports injury system should have the triple aims of: (1) enrolling as many members of the public on to a register of regular participation of sports and exercise in some form (2) encouraging individuals to choose sports with relatively safe benefit-risk profiles in terms of disease prevention through fitness compared to injury risk (3) encouraging the sports themselves to make as many interventions as possible to improve their own benefit-risk profile in order to further recruit participants to the sport.

Although not related to the core aims of such a body (i.e. injury surveillance and prevention) because of the potential to record realtime sports and exercise participation statistics, such a body could assist with exercise promotion objectives. For example, a potential vehicle for promoting participation in physical activity could be the Federal government's private health insurance rebate. Currently this rebate is 30% of all premiums paid for young and middle aged citizens but up to 40% of all premiums paid for older individuals. The 40% benefit for the elderly is extremely generous and perhaps a 'sop' to the grey vote, when it is remembered that the enforced principle of community rating is already a massive subsidy to the elderly. Community rating means that all members pay the same premiums regardless of risk, so the elderly (whose true risk-rated payments may be over ten times higher than some younger members) are very generously looked after even prior to the bonus 10% extra rebate. Perhaps the 10% bonus for the elderly could be phased out and replaced with a 30 vs 40% distinction based on proof of low patient risk through modifiable factors. To be eligible for the 10% further bonus on the rebate, a member may need to prove that he or she: (1) is a non-smoker (2) has maintained health body weight (e.g. BMI <30) (3) undertakes regular physical activity. Such a policy would further encourage healthy behaviour and would provide justification for physical activity statistics to be collected for individuals that could be used to judge eligibility under part (3).

Conclusion

Irrespective of the final powers and structure of a national sports injury surveillance and compensation system, establishment of a working party should be a new Federal government priority[5]. Such a working party could:

- Debate the possible systems that could be implemented in Australia.
- Assess funding models for the various options.
- Assess likely beneficial effect (or otherwise) on physical activity levels in Australia based on the various models.
- Receive submissions from interested stakeholders, such as national sporting bodies, the private health and sports insurance industries, Sports Medicine Australia and health provider organisati ons such as the AMA and APA.
- Make recommendations to the Ministers for Health and Sport.

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Sports dietitians: growing the profession

by Janelle Barnard, Greg Cox, Greg Shaw, Sophy Porter, Helen O'Connor

Sports nutrition is a rapidly evolving area of research and professional expertise. As an indicator, in the last two decades the number of review articles on "sports nutrition" (in general) has increased by 200%. Dietitians are a unique professional group because they have an expert knowledge and understanding of the science of nutrition, as well as the essential skills to provide practical, context-driven food-based advice to individuals and groups.

Specialist sports dietitians have additional expertise in sports nutrition and have emerged as leaders in the understanding of knowledge and delivery of practical sports nutrition messages to active Australians. Sports Dietitians Australia (SDA) recently celebrated its 10 year anniversary as a specialist sports nutrition organisation. Similar to the evolution of other professional sports organisations, it has been timely for SDA to review its history in relation to the current environment, and recognise that another pivotal point has been reached in helping our profession to grow and develop with the times.

In 1990, the Australian Sports Medicine Federation (now SMA), established a multi-disciplinary sports nutrition interest group. This was the beginning of a group of dedicated dietitians with a vision and commitment to professional excellence, and recognition of the specialisation of sports nutrition in Australia1. Six years on, SDA was established as a separate entity with the blessing of SMA and the Dietitians Association of Australia. SDA remains the only Australian specialist group of dietitians to be structured as a dedicated professional member organisation. SDA maintains and nutures its links with SMA and other professional sports and dietetic organisations; this being integral to a healthy sports professional community.

With the ongoing links and support with our members, other professional organisations, and valued partners, SDA has achieved a national and global reputation with sports nutrition education at the core. SDA's first sport nutrition course for dietitians was held in 1992. The sports nutrition continuing education course has been delivered to more than six hundred dietitians to-date, and in 2006 the scope of the course was extended internationally. The course builds on the 4-5 year under- and/or postgraduate dietetic degrees and clinical experience to practically train dietitians to a higher level of sports nutrition expertise. Currently a dietitian completing SDA's course (or equivalent accredited course) achieves sports dietitian status.

Why change?

The rapid growth and change within the sports dietetics profession brings with it an imperative for SDA to grow and change. As a priority, SDA has created a soon-to-be implemented career development pathway for its sports dietitian members. A key step in implementing this pathway is to inform the wider sporting community of this initiative. It's important to ensure that all Australian health professionals are made aware of the impending change, and identify the different modes of practice in which sports dietitians may operate along with the range of experience and expertise available to assist with specific sports nutrition-related needs.

Some key issues underpin the career development pathway;

- Other sports nutrition organisations have established comprehensive accreditation requirements for full membership such as Sport and Exercise Science (New Zealand)
- Sports science sports medicine disciplines have well established requirements for full accreditation (i.e. Sports Medicine and Sports Physiotherapy);
- The need to formally encourage our members to maintain "expert" status amongst the wider sports community. As with any specialty, there is the potential for harm when untrained professionals attempt to deliver advice outside the bounds of professional codes of conduct;
- And finally, provide clients (i.e. sporting organisations/athletes) with information about the level of experience and development of individual SDA members.

The proposed model

The proposed career development pathway (Table 1) is a multi-level membership model which aims to assist members in attaining the highest levels of qualification available in sports nutrition. It will recognise different levels of qualifications and experience that currently exist within SDA and will equip members with opportunities and resources to provide state-of-the-art sports nutrition information to all Australians.

Within the model, SDA will require dietitians to complete the SDA course to ensure a minimum standard level of knowledge and practical skills. This means that all sports dietitians are competent across a range of knowledge and skills needed in sports dietetic practice. In addition to the course, a set number of accredition points will be required to gain full SDA membership. The new accreditation points system for Accredited Sports Dietitians is designed to achieve a balance of professional development activities (such as formal study, conference attendance/ scientific presentations and publications) and

Table 1: Proposed SDA membership structure and career development pathway

SDA Supporter	Associate SDA Member	Accredited Sports Dietitian	Accredited Sports Dietitian (Advanced)	Accredited Sports Dietitian (Fellow)
• General Public • Physical Education Teachers & Fitness Leaders • Exercise Science and Sports Science Specialists	• DAA Membership (Australian resident) • Member National Dietetic/Nutrition • Organisation (Overseas) Dietetic Students	APD Member of DAA Requirements • Completion SDA course • Accreditation points required (minimum points set from each professional development and professional experience areas) • Minimum 2 years clinical experience	APD Member of DAA Requirements • Met requirements for SDA Full Member • Accreditation Points required (minimum points from each professional development and professional experience areas) • Minimum 5 years clinical experience	APD Member of DAA Requirements • Met requirements for SDA Full Member • Met requirements of Research or Education Fellow

DAA = Dietitians Association of Australia; APD = Accredited Practising Dietitian; ISAK International Society for the Advancement of Kinanthropometry

professional experience activities (such as specific sports nutrition related employment/volunteer work, sporting group presentations, contribution to the media). In order to reward professional service to SDA, selected activities that contribute to SDA are weighted accordingly.

The Process

To come up with the proposed model, SDA reviewed several models of membership and accreditation from other sports nutrition and sports medicine organisations. A steering committee was formed to assist the SDA Education team in shaping the model. The model has been communicated in several forums including the 2007 DAA National Conference, and at the recent ACSMS conference in Adelaide. The model will now be presented to each state branch and made available to members on the SDA website for comment. At each forum feedback has and will be collected and collated. Already we are aware, for example, that the needs of remote/rural and isolated members will need to be carefully considered in accreditation requirements. We have began to build necessary administrative strucutres to support this key development, and will "roll out" implementation at the upcoming AAESS conference in 2008.

What does it mean for sports dietitians?

SDA's current membership has a wide range of experience and practice expertise. Some have an interest in sports nutrition and include sports nutrition practice within a wider portfolio of practice interests. Others aspire to full-time sports nutrition practice and would benefit from opportunities and direction on how to further immerse themselves and advance their career. A small group are full- time employed in sports dietetics with professional sporting teams or state/national academies or institutes. At each of the membership levels presented, from associate to advanced level, the model provides stepping stones to achieve and maintain more advanced levels of expertise in sports nutrition.

What does it mean for clients?

While in the past it was appropriate to have one level of accreditation, the field has moved such that multi-level sports dietetic accreditation is better suited to client needs. Other health professions and clients will be able to use the model to assist in identifying a sports dietitian that suits the needs for specific tasks.

In addition to supporting it's members' professional development, SDA has made the decision to open up membership to other professionals as supporters of SDA. This level of membership will allow our clients to stay in touch with developments within the sports nutrition arena.

When and how is it happening?

The SDA Board has approved the proposed career development pathway and new membership structure at the November 2007 planning meeting. A series of communication and feedback mechanisms are being put into place for members, as well as the development of technological and administrative systems to support the new system. Members will have a grace period to gather the requirements necessary to achieve their desired level of accredition. It is planned to have the model fully implemented in January 2009. Throughout 2009, members will be asked to lodge the accrediation requirements for their relevant accreditation level.

SDA's Board are really excited about growing the sports nutrition profession by providing a distinct quality assurance and career development pathway. It is a model that will benefit the professional growth of its members as well as the needs of our wider sports medicine community. We welcome queries and feedback from sports dietitians as well as other health professionals via www.sportsdietitians.com.au.

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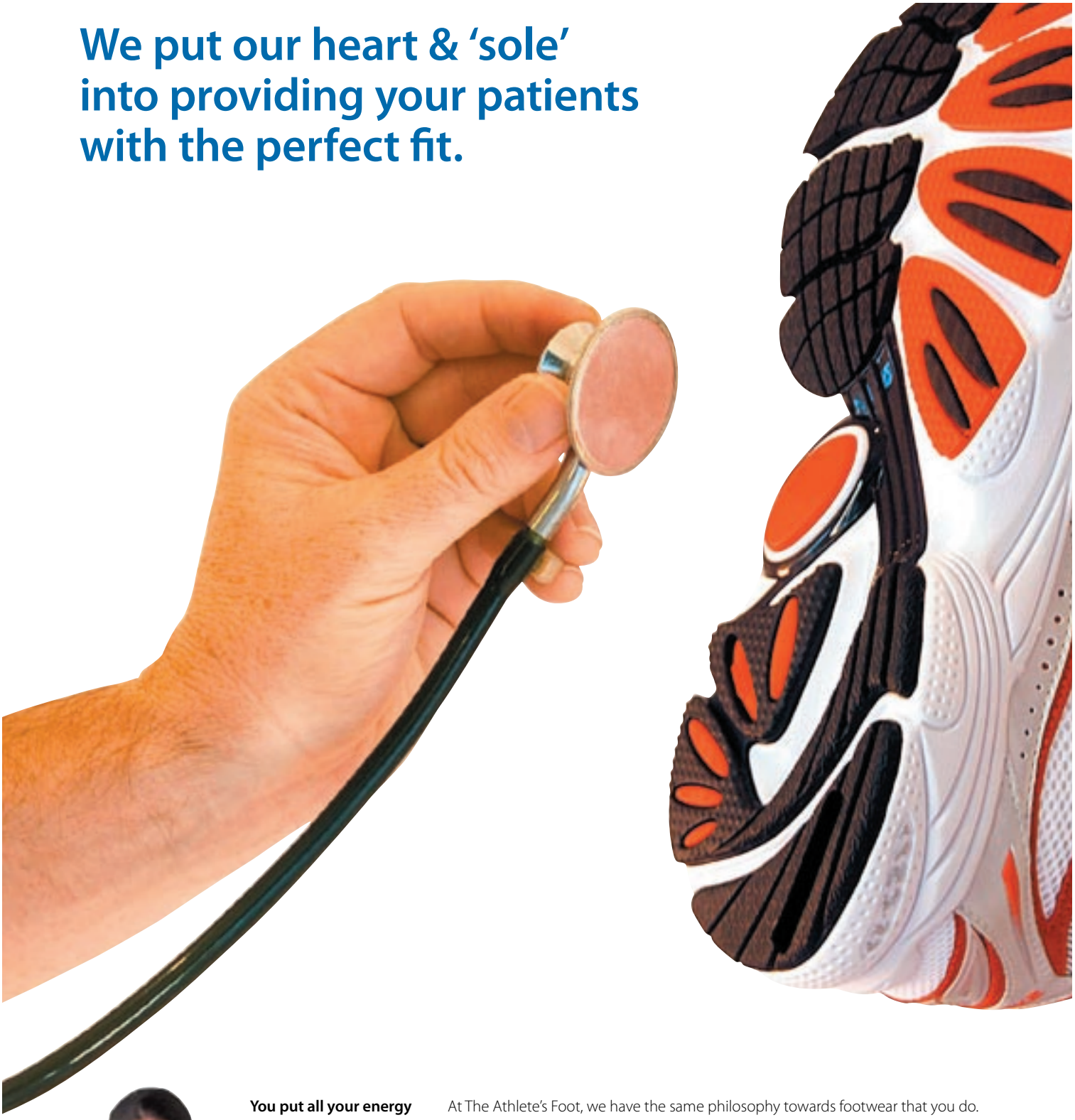

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Biomechanics of The Running Drop Punt Kick with respect to the development of quadriceps strains

By John Orchard, Andrew McIntosh, Raul Landeo, Trevor Savage and Karen Beatty

Quadriceps strains affect the muscles at the front of the thigh, particularly rectus femoris. They are one of the most common injury types in the AFL, extracting a heavy toll on a club's injury list. Video evidence suggests that rectus femoris strains may often occur due to under-striding when trying to slow down in running. Under-striding when 'slowing down' the kicking leg during the final step of the running drop punt kick in Australian football is the likely 'cause' of quadriceps strains. The deceleration component of the final step of the kicking leg before ball contact is very similar to the mechanics observed in a deceleration movement in which a quadriceps strain can occur whilst running. It is therefore highly probable that deceleration movements, whether occurring during running or a running kick, are more likely to result in a quadriceps strain compared to other movements. This combination of under-striding when trying to slow down causes the body to lean backwards and the leg to move farther behind the body than normal, which places extra stress and strain on the rectus femoris. It is not established whether strain injury actually occurs during the back-swing phase (when the muscle is at greater length) or the ground contact phase (when there is greater stress on the muscle from external forces), but it is considered unlikely that quadriceps strains regularly occur during ball contact. Wet weather conditions (i.e. heavier balls) are not be a risk factor, nor is ball inflation pressure. Quadriceps fatigue, weakness or dysfunction may contribute to an under-stride (by failing to progress the leg fully during the preceding swing phase) and therefore these factors may also be risks for quadriceps strain injury.

Muscle strain injuries are often cited as the most frequent injury in sport [1-6]. This should not be surprising given that skeletal muscle constitutes the largest tissue mass in the body, comprising up to 45% of the total body weight [7]. In particular, the most common strains are to the long muscles of the lower limb, particularly the hamstring muscle group, the rectus femoris (quadriceps group)[8] and gastrocnemius (calf group) [9, 10]. Despite their frequency, little is known about the risk factors[11]. The assessment of risk factors is best made through a combination of epidemiological studies[11] and biomechanical analysis.

It is known that strain injury is the result of excessive forces and that in the laboratory external forces can be created and measured for an isolated muscle [12-15]. The forces (moments) affecting individual joints during the gait cycle *in vivo* can be estimated using well established models [16-18]. There are also models which can estimate muscle length during sprinting gait [19]. However there is no established model to determine the external force (or stress) that individual muscle groups or muscle fibres are subject to at any given time of the gait cycle, making it very hard to assess why strain injury actually occurs[20].

Gastrocnemius muscle strains are known to commonly occur late during single-leg stance phase of a push-off manoeuvre. Clinical and anecdotal evidence is in agreement with direct video evidence that has recently been reported [21]. Although hamstring muscle strains are a more common injury, authors have disagreed about whether strains occur during late swing or early stance during sprinting [21-23]. Rectus femoris (quadriceps) strains are known to commonly occur during kicking in Australian football and soccer, but no previous study has addressed the question of whether they primarily occur during ball contact, back swing, or ground contact during the step before kicking [10].

Clinical sports medicine teaching asserts that two-joint muscles strain during sprint activities when undergoing eccentric contractions, which is well summarized in the works of Garrett [9, 24]. However, Garrett admits in these reviews that he is merely summarizing popular opinion of the clinical sports medicine literature rather than stating proven fact, for example "most clinicians would agree that muscle strain injuries occur when the muscle is either stretched passively or activated during stretch" [25-27]. This paradigm suggests that hamstring muscles are prone to strain injury in late swing phase (eccentric phase) rather than early ground contact (when the hamstring contraction is concentric) [22]. This model would also suggest that the rectus femoris is prone to strain in the early swing phase of sprinting and early backswing of the kicking motion. These phases are when the rectus femoris is eccentrically contracting [28, 29].

Change of movement (angular velocity) of a joint is determined by a sum of the forces (moments) acting on the joint. These forces can be divided into the net moment generated by muscles acting on the joint ('muscle moment') and the net moment generated by external forces ('external moment'), such as ground reaction forces and gravity. It is quite complicated to consider these forces for a single joint, such as the knee, and it is extremely complicated to consider how these forces interact for two joint muscles such as the hamstrings and rectus femoris.

In real life activities such as sprinting and kicking, the greatest lengths (stretches or strains) of the hamstring and rectus femoris muscles occur during swing phases. However, maximum external joint moments (forces which oppose muscle action) and consequent stress on muscles occurs during ground phases.

A human muscle strain injury model can be simulated in the laboratory [12, 13] by over-stretch of *isolated* animal muscle (i.e. *not* animal muscle during a running activity). Injury generally occurs at the musculo-tendinous junction (as seen in human *in vivo* strains) although can sometimes occur in the muscle belly [9, 14].

Almost all laboratory simulated muscle strain injury experiments have found that strain (amount of lengthening of the muscle or muscle fibre, expressed in units of mm/mm) is the property that correlates most with muscle damage. Strain has been shown to have a greater correlation with muscle damage than muscle force [12], velocity [15], strain rate [14] and contraction status of the muscle [30]. These findings suggest that amount of strain (muscle length) should be the property that correlates most with risk of muscle strain injury *in vivo*.

Unfortunately with respect to real life human activities, strain alone does not explain why muscles sustain injury. The greatest strain (displacement) that a muscle can undertake is a movement from being fully shortened to fully lengthening, for example during a slow muscle stretching exercise, yet a slow stretch rarely if ever results in a muscle strain injury. As a muscle is stretched towards its maximum length, it passively resists the stretch [31]. In activities that typically cause muscle strain injuries (e.g. hamstring strains during sprinting) maximal range of motion of muscle groups (and hence maximal strain) is not nearly reached, yet a muscle strain injury can result. This implies that one or more of stress (tension), velocity, strain rate and/or contraction status are also relevant to creating a muscle strain injury in real life.

The laboratory studies, in showing that amount of strain is an important factor, suggest that muscles probably need to be in a relatively stretched state in order to create a strain injury. They also suggest that muscles are unlikely to be injured in a shortened state, irrespective of the forces involved, such as the rectus femoris muscle during ball contact in kicking.

Video analysis of hamstring strains, whilst not revealing the time of injury during the gait cycle, shows that they are likely to occur during overstriding when close to maximum speed and trying to maintain speed[20]. During this type of movement, the hamstring muscles are relatively more stretched than during a stride of normal length at maximum speed, although they do not reach maximum muscle length. As mentioned previously, authors have disagreed about whether the actual muscle injury occurs during late swing or early stance during sprinting [21-23]. This is because the external forces and consequent muscle stress are greater during the ground phase, whereas the maximum length (muscle strain) is in the swing phase.

The quadriceps femoris, the largest muscle of the body, is the main extensor of the knee joint and has four parts: rectus femoris and the three vastus muscles- lateralis, intermedius and medialis. Ryan, over 30 years ago, appreciated the seriousness of quadriceps muscle strain injury [1].

There have been multiple papers presenting a series of quadriceps muscle strain injuries, all describing rectus femoris injuries, which are the most common and serious of quadriceps strains. [8, 32]. The location of rectus femoris strain has been shown to occur in either the distal musculotendinous junction or in the mid-muscle belly as a lesion of the intramuscular indirect head tendon [8, 33, 34].

Quadriceps strains are particularly common injury in Australian football [5] and soccer [6]. A relatively high proportion of these injuries occur during training [5] and the most commonly injured of the four quadriceps muscle is rectus femoris [24].

Analysis of quadriceps strains in the AFL

Analysis of the AFL injury database up until 2001 [5] revealed that of 411 quadriceps strains that caused matches to be missed, 216 of these definitely occurred during matches whereas 159 occurred during training, with the onset of the remainder uncertain or gradual. Of the common injuries in the AFL, this is the injury type with the highest proportion of occurrence during training sessions. When a specific quarter of a match was nominated as the time of injury, this was most likely to be the second quarter, with a distribution across the four quarters of first – 19; second – 30; third – 26; last –16.

Quadriceps strains occurring in AFL players in 2001 were extracted from the database to gain further information about the likely mechanism(s) of injury, with video analysis and interviews with doctors, physiotherapists and players made.

Players who were injured during training could sometimes nominate a specific kick in which they felt they were injured. Usually this was during a kicking drill from a kick 'on the run'. Sometimes this was during a shot at goal after practising many shots in a row. Players injured at training sometimes felt that fatigue was a factor as the injury occurred towards the end of a long session with many kicks, although some players strained a quadriceps muscle early in a session.

Players who were injured during matches were generally unable to nominate a specific kick when they felt an injury occur. The most common description was that the player felt a gradual onset of pain during running and kicking in the dominant leg quadriceps muscle that did not force him to leave the field. This is in contrast to hamstring and calf strains, which generally occur during a running motion, and in which the time of injury can generally be pinpointed by the player or seen on video. For example, a calf strain injury in a batsman in cricket has recently been captured on video at the exact time of injury [21].

Table 1

Quad strain during game?	Matches	Average ball pressure (Psi)									
		1st quarter		2nd quarter		3rd quarter		4th quarter		Spare balls	
		Start	End	Start	End	Start	End	Start	End	1	2
Yes	8	10.9	10.5	10.9	10.8	10.9	10.8	10.9	10.8	12.6	12.5
No	72	11.0	10.6	11.0	10.7	11.0	10.8	11.0	10.9	12.3	12.4

Sometimes players mentioned that they felt a quadriceps strain was caused by a recent cork thigh to the quadriceps, or contributed to by a recent hamstring strain or tightness. Many players were unsure about the exact timing of a quadriceps strain during a kicking motion, although a few players felt the strain occurred during ball contact. One player felt specifically that he felt his quadriceps had strained during a kick motion in the back swing before ball contact.

A consistent anecdotal observation is that the speed of the run-up, rather than the distance the ball is kicked, is associated with a greater risk of quadriceps strain. In Australian football, quadriceps strains are rare on long kick-outs from goal or kicking after a mark. By contrast, rectus femoris strain injuries often occur during short kicks when the player is running at high speed. The amount of foot-ball impact force is roughly proportional to the distance that the ball travels, yet because long kicks with a slow run-up do not tend to cause rectus femoris strain, it is unlikely that ball contact impact forces are the mechanism for quadriceps strain.

Descriptive data regarding quadriceps strains in other sports

Quadriceps strains in rugby league players are much more likely to occur during running than kicking. Examination of the primary author's database of injuries during 5 years of working with an NRL team (1998-2002) revealed 29 quadriceps strains, including 11 which caused matches to be missed. Only 3 of these injuries involved a kicking mechanism, and by comparison these injuries were minor (missing 0, 1 and 2 matches respectively). All other injuries occurred during running. There was one documented occasion of a specialist goal-kicker sustaining a quadriceps strain in his kicking leg with a running mechanism, who claimed that the mechanism of goalkicking placed less stress on his leg than running during general play. Kicking in rugby league is generally of two types: goalkicking, which is a set shot at goal from a standing start, and field kicking, which is usually performed by a player whilst running at slow speed within 3-4 steps of receiving the ball.

An ex-AFL player who had moved to a career as a punter in the NFL was interviewed, and he declared that quadriceps strains were almost an unknown injury in punters in the NFL, and were far more common in kicking in Australian football. Punters in the NFL kick off one to two steps, as they must complete the kicking task in a very brief time period but try to maximise force of the kick.

Ball and ground factors and relationship to quadriceps strains

The weight and more particularly the pressure of the football are relevant to the force on the quadriceps muscle during the ball contact phase of a kick. The rules of the game state that the dry weight of the ball when inflated should be between 450 and 500 grams. The home club provides the balls during the regular season and the umpires check the specifications before the game. The pressure measurement guidelines they use are 9-12 psi (0.62-0.82 km-2), with 11 psi the most common pressure measurement.

In 1975, the laws of soccer were modified to allow for a lowering of the ball pressure from 1.0 to 0.6-0.7 km^{-2} [35]. This was reversed in 1983, so that the laws now allow pressures of 0.6-1.1 km^{-2} [36]. A lowered ball pressure means that the ball deforms more, which increases the time of foot/ball contact (from 6 to 16ms when pressure is lowered from 1.0 to 0.6 km^{-2}) [35]. Estimated impact force at ball contact in soccer kicking is 1.0-1.1 kN.

Rebound resilience in soccer balls decreases as inflation pressure decreases [36]. Based on the studies of soccer ball mechanics, it is possible that a lowered inflation pressure of AFL footballs would decrease the peak force on the leg during kicking. Both soccer and the AFL allow for a surprisingly wide range of inflation pressures in their laws.

A further consideration is the type of football. The AFL uses leather (stitched) rather than synthetic (moulded) balls. Rugby league changed from leather to synthetic balls over 10 years ago, with an advantage being that synthetic balls do not retain water and become heavy in the wet. As a wet ball would be heavier, there may be a greater susceptibility to groin and quadriceps injuries, but the ball may be kicked in a different manner on a wet field to compensate for this. Ball contact time may vary between a dry and wet ball.

Stitched footballs have a slower ball contact phase than moulded balls, allowing more time to dissipate force. However, stitched balls become heavier than moulded balls in wet conditions, which increases impact forces [37].

Ball pressures were measured during 80 AFL games in Melbourne during the 2001 season, by the umpires' trainer, at the start of the game and before and after each quarter.

During these 80 matches, 8 players sustained quadriceps strains.

The average ball pressures during the games are listed below:

There was very little variation in ball pressure during AFL matches. The vast majority of AFL matches and AFL quarters started with a ball pressure of 11 psi, as the umpires were instructed to inflate balls to this pressure. The balls lost very little pressure, on average,

during quarters. At the end of each quarter the balls were either replaced (rotated) or re-inflated.

There was a much greater range in the pressures of balls before checking by the umpires, and generally the pressures were much higher. This suggests that clubs do not have the same scrutiny for checking ball pressures as umpires. This may be relevant for quadriceps strains which occur during training.

Quadriceps strains are more common in matches where there has been low rainfall over the previous week, which suggests a ground contact rather than a ball contact mechanism [10]. This is because that if quadriceps strains occurred during ball contact, it would be expected that these injuries would be more common on wet days, when the ball may be heavier. Quadriceps strains are also more likely after a recent hamstring strain [10].

If a rectus femoris strain injury occurred during the ball contact phase of kicking, it would be when the muscle was in a relatively shortened state, inactive and shortening further, apparently conditions where muscle is able to withstand greater force. A comparative set of conditions in the upper limb, where the shortening triceps muscle is resisted by the ball when serving or spiking in volleyball, does not lead to muscle strain injury.

Analysis of Penetrometer readings suggests minimal relationship, if any, between ground hardness and quadriceps strain injury. This suggests that the association between quadriceps strains and dry weather may be related to increased traction rather than increased hardness [38].

Video analysis of quadriceps strains

For those quadriceps strains that occurred during matches from a kicking mechanism during the 2001 Australian Football League (AFL) season, video of all kicks performed by the players concerned was obtained from Champion Data, Melbourne. These videos were analysed to try to isolate the occurrence of kicks which resulted in a quadriceps strain injury. Two cases of likely acute injury seen on video during this season.

Two cases of rectus femoris strain (one running, one kicking) that occurred in rugby league players have also been captured on video (Figure 1).

Video analysis of rectus femoris strain injuries shows similarity between the quadriceps strain occurring during running and those occurring during kicking. The common factor is deceleration of the kicking or standing leg with a relatively short stride. Normally during deceleration the leg providing the loss of momentum overstrides and lands well in front of the body, directing a strong ground reaction force backwards. However, this method cannot be used by the stance leg during a running kick, as the hips would also lower during this manoeuvre and the kicking leg could not swing through without hitting the ground. In fact, the opposite effect is needed, with a slightly short step in order to raise the hips to provide clearance for the kicking leg.

Although video evidence suggests that the 'under-stride' during deceleration is the gross mechanism for rectus femoris strain, like the hamstring strain it is not clear whether the actual muscle failure occurs during the ground contact phase or swing phase. Like the hamstring, the swing phase is associated with the greatest muscle length (stretch), whereas the ground phase is associated with the greatest potential impact of external force (ground reaction force). In contrast to the hamstring strain injury, in rectus femoris strain injury the ground contact phase of risk precedes, rather than follows, the swing phase of greatest stretch.

Video analysis reveals that the dual aims of the penultimate stride with the kicking leg, in running drop punts, are to slow the body down and to raise the height of the hips. Slowing the body down usually requires over-striding, to direct ground reaction forces behind the body. However, in order to raise the height of the hips, a shorter than normal step is required.

Risk factor data regarding quadriceps strains

Previously published information about the epidemiology of muscle strains has found that quadriceps strains in football players are more common in dominant kicking leg (RR 2.13, 95% CI 1.59-28.6), whereas hamstring and calf injuries are fairly evenly distributed [10]. Previous muscle strain injury is a strong risk factor for future strain injury to the same muscle group (and in some cases other muscles). Calf and hamstring (but not quadriceps) strains are more common in older players [10].

Quadriceps strains are more common in matches where there has been low rainfall over the previous week, which suggests a ground contact rather than a ball contact mechanism [10]. This is because that if quadriceps strains occurred during ball contact, it would be expected that these injuries would be more common on wet days, when the ball may be heavier. Quadriceps strains are also more likely after a recent hamstring strain [10].

Previous epidemiological study of the AFL has revealed that quadriceps strains (like many other non-contact lower limb injuries) are relatively more likely on northern AFL grounds, where ground traction and hardness are greater [39]. It is possible that on grounds with less traction available, alterations are made to gait including over-striding to increase ground contact time and quadriceps strains less likely. In grounds where traction is greater, the stride length may be relatively shorter, which makes an under-stride, and consequently a quadriceps strain, more likely.

Recent hamstring strain has been found to be a risk for quadriceps strain [10]. It is possible that during recovery from a hamstring strain, alterations are made to gait [40], which include reducing the stride length, protecting the weakened hamstring muscle from re-strain but increasing the chance of a secondary quadriceps strain.

Table 2

Penetrometer reading	Harder (2.5 or less)	Medium (2.6-3.0)	Softer (3.1 or greater)
Quadriceps strains match incidence (injuries per 1000 player hours)	0.8	1.3	0.7

Conclusions and Recommendations

1. Quadriceps strains are most likely during decelerations movements during a drop punt kick. The kicks most at risk are those which involve rapid steps in the run-up.
2. Players most at risk are those players with a recent or past history of quadriceps strain, and shorter players who are most likely to perform quick running kicks.
3. Quadriceps strains are almost as likely during training sessions as matches. They are the fourth most common injury overall and the second most common training injury (after hamstring strains).
4. Quadriceps strains are more common when there has been low recent rainfall, although this probably relates to increase shoe-surface traction rather than ground hardness.
5. Fatigue may be a risk factor for quadriceps strains, based on anecdotal evidence from players, and the theoretical concern that a fatigued quadriceps is more likely to lead to an under-stride.
6. Ball contact is not likely to be the mechanism of quadriceps strains.

A more detailed version of this study is available at:

http://www.injuryupdate.com.au/images/research/QuadsBiomechreportUNSW.pdf

Figure 1 Possible timing of quadriceps strain in a right foot kick of an NRL player (end of ground contact phase, early in swing phase or ball contact phase)

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Applied Positive Psychology for Health Professionals

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This is written for all health professionals who spend time encouraging patients to both adhere to treatment advice and consider lifestyle "behavior change". World Health Organisation (2003) figures on adherence to various treatments are scary - 14-21% patients never fill prescriptions, 30-50% don't take medications as recommended, 30-50% patients are non-compliant in some way, and only 50% adhere to treatment for chronic conditions including lifestyle changes. The purpose of this article is to inform health professionals about coaching approaches to behavior change that will help address non-adherence. A brief review of *positive psychology* and other *strengths-based coaching approaches* is presented, followed by examples of coaching conversations practitioners could use.

Positive Psychology and Strengths-Based Coaching

Martin Seligman (Seligman & Csikszentmihalyi, 2000) claims he began the positive psychology movement after an interaction with his 5 yr old daughter Nikki while gardening. Seligman had scolded Nikki for being a nuisance. She walked away then came back and said *"Daddy, do you remember before my 5th birthday – from the time I was three to the time I was 5, I was a whiner. I whined everyday. But when I turned 5 I decided not to whine anymore and that was the hardest thing I've ever done. And so daddy, if I can stop whining, you can stop being such a grouch!"* Seligman decided there and then that his focus in psychology needed to lighten up! His research on depression HAD made him into a grouch. So, rather than have practitioners focus on taking clients from a negative ailing state, to a neutral normal state - "from minus 5 to zero" - he realized the entire profession needed to ask what are the enabling conditions that make human beings flourish – to get them "from zero to plus 5"? Upon his election to the Presidency of the American Psychological Association (APA) in 1998 he invited Mihalyi Csikszentmihalyi and Ray Flower (APA CEO) to Akumal in Mexico for a weekend. By the end of that week the three had hatched plans for the first ever positive psychology conference to be held the following year in Akumal. Seligman's APA conference keynote address in 1998 changed the focus of psychology from "curing mental illness" to a *Science of Happiness* (Seligman, 2002), meaning the study of positive subjective experience (emotions), positive character traits, and positive institutions and organisations. Positive psychology directs attention to "what does work, is right, is improving?" and "mental health". Seligman believes people can enhance happiness by discovering their signature strengths, owning them and choosing to use them in the main realms of life. Peterson and Seligman (2004) have studied character strengths and values and defined 24 character strengths that seem to be valued by virtually every culture across all geographical boundaries. Successful living, therefore, comes from enhancing and using our character strengths rather than focusing on our weaknesses.

In addition to Seligman and Csikszentmihalyi several other researchers have been focusing on people's strengths particularly when change is the goal. Barbara Fredrickson's (2003) Broaden-and-Build Theory focuses on positive emotions, which *broaden* the scope of attention and thought-action repertoires, undo lingering negative emotions, fuel psychological resiliency, and *build* upward spirals toward improved emotional well-being. For practitioners the theory highlights the importance of starting a conversation by boosting positive emotions to enhance solution focussed responses and overall outcomes. Marcus Buckingham's (cf. Buckingham & Clifton, 2001) research with the Gallup Organization on positive leadership has focused on developing strengths as opposed to eliminating weaknesses. He and his colleagues have discovered 34 positive personality themes and subsequently coach individuals and leaders on how to build strengths-based work places with traits that are already there. David Cooperrider's (cf. Cooperrider & Whitney, 2005) Appreciative Inquiry (AI) is underpinned by core principles and core processes that are understood to have emerged from theoretical and research foundations grounded in Social Constructionism, the "new" sciences (e.g., positive psychology, chaos theory and self-organizing systems), and research on the power of imagery. Since the mid-1950s Western medical science has become increasingly aware of the power of the mind to heal the body – a concept that has always been the basis of healing in Eastern cultures. AI is, in part, the art of helping systems (individuals and organisations) create images of their most desired future. Based on the belief that a human system will show a heliotropic tendency to move toward positive images, AI is focused on the generative and creative images that can be held up, valued, and used as a basis for moving towards the future.

In addition to the above research approaches, three strengths-based movements have significant applied potential for health professionals. First, *coaching psychology* defined as "the systematic application of behavioural science, which is focused on the enhancement of life experience, work performance and wellbeing for individuals, groups and organisations

Table 1. Matching stages of readiness to change and coaching style.

Stage of Readiness to Change	Optimal Coaching Style
Pre-Contemplation - Unaware of need to change.	Ask 'better' questions to raise awareness.
Contemplation – Still only thinking about change – ambivalent, uncertain.	Roll with the resistance – avoid confrontation.
Preparation - Taking first small steps, starting out.	Get agreement and statement of commitment to action.
Action - Beginning regular behaviour and action.	Ensure regular actions and monitor progress (follow-up).
Maintenance - Getting results, "feeling good".	Set new stretching goals to ensure no relapse.
Relapse - Can occur at any stage for myriad reasons.	Reframe relapse as normal part of change process.

Table 2. Strengths-based "change talk" for health professionals (adapted from Berg & Szabó, 2005; Grant & Greene, 2001; O'Hanlon & Beadle, 1996).

Problems and Solutions	Coaching Conversations
To evoke experiences of resourcefulness: Use examples from client's own history.	Tell me about the times when you've recovered from ...(the problem). How did that happen? What did you do?
To find times without the problem: Examine how the client felt and acted when the current difficulty did not occur, even for a moment.	Tell me more about those times last week when ...(the problem) was not present.
To find exceptions to the problem: Look for times when the problem was expected but something happened differently or the client acted differently	You spent sometime today doing...(engaged in healthy behaviour)? Wow! Tell me how you managed that?
Assume times without problems and look for exceptions:	Client: I really hate doing this! Health Professional (HP): At the moment what you are doing isn't working for you. Which parts of what you are doing are less unpleasant for you?
To find what worked: Discuss what HAS worked for the client, or for others with the same difficulty.	You said you've coped with ...(the problem) before. How did you manage that then? You say you know others who have recovered from.... What worked for them?
To find competence: Find the client's areas of competence,interests and pleasure. Highlight and expand them. Everybody is good at something.	So you are good at...(skill). How did you go about developing those skills? How did you get interested in .....? How could you use some of that here?
To transfer competence: Help the client transfer competence from another place in her/his life to the problem area.	You have experienced...(the problem e.g., frustration) at work. How could you use the same coping skills here? You deal with... (the problem, elsewhere). What if you applied those skills to this?
Using humour appropriately - and with caution	Client: I feel like I'm such a stupid idiot HP: Yes, it's amazing you managed to get here today!!
The "Magic Question"	Client: It's hopeless. It's just not working well. HP: What if it was working well – what would be different?
How come it didn't get worse? Ask clients to explain what has restrained them from going further with their problem behaviour patterns.	How come you haven't gained more weight? How do you keep yourself from weighing more?
To find the stopping pattern: Ask clients how they stopped the problem or what they started doing once it was going away or went away.	What do you do when the (problem) is lifting that you weren't doing much of previously? How can you tell things will be better? What do you do once you see those signs?
Relapse prevention: Anticipate and plan for relapse. Its ok to let clients know that it happens. Make it clear that it is temporary to avoid self-fulfilling prophecies.	If it happens its OK – its just a normal phase in the change process. We're not going for perfection, only improvement.
Dealing with relapse: Coaching conversation highlights that using old solutions is OK, restore useful patterns that worked previously, minimise shame and embarrassment, normalise relapse as part of change process, move back into action by looking for past successes and build on them	Client: See, I've tried that and it didn't work - it never works! HP: What could you do differently to make it more likely to work this time? What have you (or others) tried recently that seems to work, even a little?

with no clinically significant mental health issues or abnormal levels of distress" (Grant & Cavanagh, 2007, p. 6); second, *health coaching* (www.healthcoachingaustralia.com), which "combines theory and practice from the fields of health psychology and coaching psychology to tackle lifestyle behaviour change for the prevention and management of chronic health conditions… and by necessity places a heavy emphasis on motivational interviewing " (Gale, 2007, p. 12); and third, *motivational interviewing* (MI), which involves: Collaboration - referring to a partnership that honours the client's experiences and perspectives and an atmosphere created that is conducive to change; Evocation - where the resources and motivation for change are presumed within the client and draw out the client's own perceptions, goals, values; and *Autonomy* - affirming the client's right and capacity for self-direction from informed choice (Rolnick, Miller, & Butler, 2008).

Perspective Integration and Enhancing Intrinsic Motivation

Taken together, *positive psychology, coaching psychology* and *health coaching* focus on subjective experiences of well-being, hope, happiness, positive individual traits and optimal functioning of people, groups, and institutions. They promote the 'plus side' of human nature and attending to people's strengths. Health professionals are encouraged to understand that "no matter what problems or setbacks their clients have faced, they are also resourceful and have experienced success" (Kaufman & Linley, 2007, p. 92).

In addition, according to *Self-Determination Theory* (SDT: Ryan & Deci, 2000) there are three key characteristics of intrinsically motivated clients that health professionals need to aware of: *Competence* – feeling of mastery and accomplishment; *Autonomy* – sense of being in control so that behavior is self-determined; and *Relatedness* – sense of belonging and security. So practitioners need to find ways of helping clients feel competent in what they do, provide opportunities for clients to exercise choice over their behavior, and facilitate an inclusive, cooperative and supportive environment. Health professionals also need to understand the '*readiness to change*' literature (Prochaska & Velicer, 1997), which convincingly argues that the change process is optimal only when 'change interventions' are matched with a person's readiness to change, as illustrated in Table 1.

Implications for Health Professionals: Promoting Adherence and Evoking Change.

Health professionals often have time for only a few minutes of conversation per patient and are unlikely to have received formal training and preparation in how to promote health behaviour change. However, they need to recognise that motivation to change is better elicited than imposed and that adopting a coaching style would be a more effective long-term and short-term strategy. For example, rather than asking clients/patients "why are you overweight?" and then telling them what to do, a coaching conversation would start by shifting the responsibility for both weight loss and attitude change away from the practitioner and towards the client/patient: *What worries you about your weight?* (disadvantages of status quo); *what would be good about losing weight?* (advantages of change); *what encourages you that you can lose weight if you want to?* (optimism about change); and *what do you think you might do?* (intention to change).

In Table 2 other coaching scenarios are identified together with examples of strengths-based statements that practitioners could use. The intention in each case is to help the client feel more competent and encouraged to persevere.

Summary

"Nothing can be taught to a man; but it is possible to help him to find the answer within himself." – *Galileo Galilei*

By adopting an applied positive psychology coaching style during interactions with clients all health professionals will improve treatment adherence and promotion of lifestyle behaviour changes. Clearly "advice is not enough" (WHO, 2003).

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Sledging and Violence in Australian Football

A Psychological explanation of the 2007 Selwood-Headland Incident

By John Kerr

The Australian term 'sledging' is a form of verbal aggression usually designed to put opposing players off their game. Professional players in most sports learn to ignore it, or reply in kind, because they understand what the opposing 'sledger' is trying to achieve by being provocative. Although a violent response is not in the interests of the recipient's team, in some cases the content of sledging can go too far, crossing the boundary of what is acceptable to an individual player, and that is what appeared to occur in this case.

Selwood's sledging concerned a tattoo that Headland has on his left shoulder which features his 6 year-old daughter. Selwood and Headland's accounts of what was said differ considerably. According to Headland, Selwood saw the tattoo and gestured to it and said "I f---ed her last night". Headland punched him in the stomach and told him it was his daughter, to which Selwood responded by saying she was a "slut" and that he had "f---ed her all night" [1]. Selwood said nothing specific was said before the punch and after it he saw the tattoo and said: "What's that shit on your arm? I was with a girl like that the other night." Headland then responded to what was said with a right-left combination to Selwood's head followed by some grappling on the ground. Headland had to be dragged off Selwood by players and the umpire. He was placed on report by the umpire. When the Freemantle coach, Connolly, removed Headland from the game, he was still fuming, screaming and ranting and when he reached the dugout he had to be restrained by several people from going into the Eagles' interchange bench [2]. Clearly, he was emotionally upset, angry and had lost control, in spite of the fact that "…former Collingwood captain and coach Tony Shaw and [Sydney] Swans captain Barry Hall argued…that sex sledging was widespread and widely accepted [in the AFL]" [3].

In short, Headland received two 'striking' charges (usually a six-match suspension) and a wrestling charge (normally a $1200 fine). Selwood was charged with using insulting language (usually a $1200 fine). However, once the story hit the media it started a very public debate, which focussed on paedophilia, ethics and players as role models for children [1]. The AFL decided on an investigation and gave the investigator clearance to question umpires, the Freemantle runner and other players.

In the AFL system, match officials make a report which is referred to the match review panel, which uses video recordings to assess all reports and referrals. This panel decides if an offence has occurred and the 'offence level' and grades it in terms of *conduct* (intentional, reckless or negligent), *impact* (severe, high, medium or low) and *contact* (high, groin or body). If the panel decides an offence has occurred, a player can accept the decision, plead guilty and be penalised, but receive a 25% reduction on fixed categories of offences. Depending on the offence, point scores determine the length of playing suspensions and there are accompanying fixed financial sanctions. If a player decides to contest a charge, or the level of a charge, it goes to a tribunal which has a fee of $2500. These are increased for repeat offenders. Retired county court judges chair the tribunals [4]. In this case, both players contested the charge and hired legal counsel to defend them at the tribunal.

The whole incident became even more controversial when the result of the tribunal hearings was announced. In an apparently contradictory decision, Selwood was cleared of making insulting remarks. Headland, despite being found guilty of striking Selwood during his furious response, was given no penalty because he had been provoked by "an insult liable to deprive a person of their self control" [1]. Headland shed tears after the tribunal's decision was announced. Many observers found the tribunal's decision was an obvious exercise in damage control by the AFL [1,2].

Parallels with the Zidane-Materazzi soccer incident

There are some obvious parallels between the Selwood-Headland AFL incident and an incident which took place in the 2006 Football (soccer) World Cup Final between France and Italy. Close to the end of extra-time in the match, French captain Zidane head-butted Italian defender Materazzi in the chest knocking him to the ground. Zidane, playing in his last match before retirement, was sent off the pitch for his violent foul play. In similar fashion to the Selwood-Headland incident, and because the incident occurred in such a high profile match, there was a huge furore and media interest. Later, it transpired that there had been a verbal exchange between the two players after Materazzi had held Zidane's shirt. Again, like Selwood and Headland, the accounts given by the two players differed. Zidane choose not to reveal the details of what was said, but did say that the words used concerned his mother and his sister. Materazzi admitted talking about Zidane's sister. Both incidents involved extreme sledging where the derogatory content referred to female family members. In the same way that Selwood's comments about Headland's daughter went beyond what was acceptable to Headland and provoked a

violent response, Materazzi's comments also crossed Zidane's personal boundary and his perception of codes of conduct and honourable behaviour, provoking the head-butt.

While there are some similarities between the two incidents, there were also some differences. Unlike Selwood and Headland, Zidane and Materazzi were given three and two-game suspensions (even though Zidane had retired), and hefty fines by the Fédération Internationale de Football Association (FIFA). It was the first time that FIFA had punished a player for provoking the physical confrontation by verbal aggression or sledging. Also, in contrast to Headland who was so incensed by Selwood's sledging that he was out of control during and immediately after the incident, Zidane, although also angry, remained in control.

A theoretical perspective from sport psychology

Recognition of the special nature of sport as a context in which certain types of aggressive behaviour are acceptable, sanctioned and encouraged, (provided they stay within the laws of the game), is crucial to any understanding of the relationship between sanctioned and unsanctioned aggression and violence in sport. AFL players can engage in aggressive and violent acts during a match, some of which would be considered criminal assault if they occurred off the oval away from the game. Kerr [5] has pointed out that a kind of contract in the pursuit of aggression (and violence) between consenting adults is in place when two opposing teams have willingly agreed to compete against each other. Headland broke both that implicit contract and the laws of Australian football when he committed an unsanctioned violent act against Selwood. Arguably, Selwood also breached the implicit contract when he engaged in the extreme sledging which provoked the incident.

Reversal theory [6] is a psychological theory that does recognise the special status of sanctioned aggression in sport [7] and was used to explain the motivation behind the Zidane-Materazzi incident [8]. In brief, reversal theory emphasises the subjective experience of cognition and emotion, as well as a person's own motivation, in a structural phenomenological approach. Human behaviour is thought to be founded on four pairs of mental or *motivational states*, combinations of these motivational states, and the reversals which occur between them. The names and characteristics of the eight states are: *serious-playful, negativistic-conformist, mastery-sympathy, and self-focused – other-focused*. Behaviour in the serious state is typically serious and goal- and future-oriented, often involving planning ahead and a preference for low arousal; behaviour in the *playful* state tends to be playful, impulsive and sensation-oriented, with a preference for high arousal. Rebellious, stubborn and defiant behaviour is typical in the *negativistic* state; agreeable and cooperative behaviour is typical in the *conformist* state. In the *mastery* state, a person feels the need to be strong, tough, masterful and in control; in the *sympathy* state, a person feels the need to be harmonious and feel sympathy or empathy with others. In the *self-focused* state, the outcome of any interaction is seen in terms of net gain or loss to oneself; in the *other-focused* state, a person is concerned with net gain or loss to others in interactions [6].

One state from each pair is operative at any one time, although some may be less salient than others. Combinations of operative states are therefore possible and give rise to four different types of aggressive and violent behaviour. Apter [7] has termed the four different types as: play violence (playful-mastery), *anger violence* (serious-negativism), *power violence* (serious-mastery), and *thrill violence* (playful-negativism).

Applying these types of violence to Australian football, *play violence* is what allows the game to be played under the implicit contract between competing teams and players can utilise their physicality without penalty within the laws. Here, the playful and mastery states are operative so that being playfully violent is about having fun and excitement while experiencing feelings of power and mastery over opponents during play (e.g., use of the hip or shoulder challenging for the ball, tackling). The other three types of violence are concerned with foul play. For example, *thrill violence* occurs when a player starts a punch-up just for the hell of it. *Power violence* occurs when, for example, a player deliberately tries to "take someone out of the game". A good example occurred at the start of the 1989 Grand Final when, with the first bounce at the start of the match, Geelong's Mark Yeates came through the centre square and caught Hawthorn's Dermott Brereton with a deliberate shoulder charge below the ribs, badly injuring him.

It is the fourth type, *anger violence*, which is most relevant to Headland's behaviour. Here the serious and negativistic states are operative so the violence is serious and often involves a reaction to a perceived slight or injustice. It appears that it was the disrespectful comments about Headland's daughter in Selwood's sledging that provoked reversals in Headland's motivational states and changed play violence into anger violence. The high arousal associated with excitement in play violence became intense anger and Headland began punching Selwood. In common with other team contact sports like rugby, American football, ice hockey and soccer, many acts of retaliation in Australian football can be classified as anger violence.

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The end of the world as we know it?

By Brad Hiskins

Sports medicine is a constantly evolving profession. Multidisciplinary practice has always been at the heart of the profession and of Sports Medicine Australia (SMA). The parent body of SMA, the Australian Sports Medicine Federation, withdrew from membership of the Australian Medical Association (AMA) in its formative years because the AMA would not allow a multidisciplinary membership. As the profession has evolved – and continues to evolve – balancing the virtues of multidisciplinary information exchange and practice against professional jealousies and encroachment fears has been a constant test for SMA members. Following is one member's reflection on the current state of play.

After 18 months with a persistent rib injury and a number of therapists and sports physicians under my belt, I thought I would try a chiropractic approach. I had only seen one chiropractor before; my uncle dragged me along when I was a kid. So with memories of trying to relax while someone attempted to rip my head off, I entered with a mild amount of apprehension. I had parked in a 30 minute zone believing that chiro's only treated people for a few minutes so I would be fine. Right?

Thirty five minutes later, after a good history taking, and a whole lot of soft tissue work, yes soft tissue work, and the treatment was over. Not one manipulation. Not one high velocity low amplitude (HVLA) thrust. And I was then given a number of take home exercises based on restoration of mobility to the local and indirect areas about my rib. Did I just visit a chiropractor?

My confusion left me sitting in my car (I escaped the parking fine), wondering what happened to the HVLA? And just when did chiro's start using soft tissue techniques and giving exercises? And why the lengthy treatment? If I hadn't have known the person was a chiropractor, I would have sworn I had just visited a soft tissue therapist, physiotherapist or maybe an osteopath? Moreover, the soft tissue work was pretty dam good!

Of course, this is just a sign of the times and it was my ignorance of a peer groups evolution that allowed my surprise. When I considered the situation further, I really had no idea of a chiropractors education, I had never sighted their competency standard or curriculum and I had never sat in one of their class rooms. I had never been to one of their conferences or sat in a room with them while they were discussing treatment philosophies. In fact this was only my second visit to a chiropractor in my entire life. So where was I getting my rather misinformed opinion of them from?

Further contemplation revealed my lack of true understanding of most of the Sports Medicine Australia (SMA) other disciplines. Although I have worked with physiotherapists, physiologists, acupuncturists, biomechanists, strength and conditioning, psychologists and sports physicians for many years, I remain quite ignorant of their fundamental education and what they truly have to offer within a sports medicine team or as an individual therapist. I suppose I have a fair indication from my experience at the AIS over 11 years – well you would hope so. In that time I observed the principles of training, prevention and treatment of all the above disciplines. Constant contact, regular meetings, it was inevitable I would develop some form of understanding of how each worked and how they integrated into 'the team'. Three years retired from the AIS and I'm questioning the autonomy these people had in that environment, which may have affected the way they operated and therefore my opinion on the efficacy of their service provision. In this environment, was this the necessary compromise that each individual needed to make to fit into a team, or was this a hierarchical system that suppressed some and stimulated others? Is this what occurs within professional teams around the country? Either way, is this system depriving some disciplines from utilising the skills they possess and therefore best practice treatment protocols?

An AIS Perspective

The lack of many disciplines at the AIS, such as (but no limited to) podiatrists, osteopaths and chiropractors, left my opinion on their service provision to be based on third party anecdotes and the occasional Sports Health article. I'm quite embarrassed now to have developed such opinions based on practically nothing and realise my peers are likely to do the same with myself and my industry. So is it my obligation to research these disciplines, or theirs to educate me? Surely in a 'team' environment, 'we' are obliged to educate and be educated from an industry perspective and individual niches. How else could a team utilise industry specific skills in a best practice manner? How else could a team realise the potential of not only an industry but individual practitioners niche skills and experience within those industries?

I know most Soft Tissue institutions invite guest speakers from most disciplines to describe their skill set and philosophy. I have no idea whether this occurs else where. I'm assuming most learn through personal contact and of course through SMA.

View from the "Real World"

Now living in a non-institutionalised world, I find the general practice of the disciplines I worked with at the AIS to be considerably different. In essence, they all practice with a very similar philosophy as those non AIS disciplines. They assess, treat, reassess, educate the client and form a treatment protocol based on this event and refer if necessary. They are delineated only by application of discipline specific techniques, some discipline specific philosophies, time spent with the client and price!!

However, and it is a big however, are these delineations slowly waning?

My experience with the chiropractor would suggest that discipline specific technique and philosophy are becoming or have become hazy. Some use the word encroachment of one on another? What ever the case, consumers must surely be confused.

What I see as the main reason for this developing haziness, is the explosion of post graduate education within each discipline. Further education has become a lucrative business as well as a necessity for ongoing points for association membership. And much of the ongoing education has been based around technique application—the very aspect that delineates one discipline from the next. In my chiropractic experience, I received soft tissue treatment and home based exercises rather than the traditional (well in my mind anyway) vertebral manipulation. Of course this ongoing education is not isolated to the chiropractors, not by any means. As a soft tissue therapist I have watched our industry follow the trend and embrace many none traditional techniques in the last two decades. Dry needling has become a standard modality, as it has with just about every discipline, take home exercises (basic mobility and stability exercises) are now fundamental in the competency and even some osteopathic techniques (muscle energy technique for example) have found their way in. There are many other examples of course.

But it's just not us, it's every discipline. Physiotherapists have a well organized post graduate manip's course (traditionally a technique of the chiropractors and osteopaths), courses in Pilates, orthotics, soft tissue therapy, dry needling and even acupuncture, as well as being able to bypass the docs and order Xrays—just to name a few. Sports Physicians are providing exercise rehab, GP's manipulating spines and on it goes. To even further confuse the situation, we have the impact of the exercise physiologists on the market and even the explosion of personal trainers, the greatest trend in Australia at the moment.

Is it this further education era that is potentially the reason for each discipline to resemble each other and in many cases cause conflict with regard to encroachment? And if so, can it be stopped? Should it be stopped? And who would stop it? Is it any one disciplines right to deny the professional growth of another? Can one discipline forge ahead with regard to technique acquisition, raping and pillaging what ever lies in their way, while attempting to deny another discipline the same right? Even threaten another discipline? Would we not be all hypocrites?

Looking for the Next 'X' Factor

This situation will not cure itself in the near future. Disciplines will continue to look for the next 'x' factor and incorporate them into their education where they see fit—hopefully with the adequate amount of underpinning knowledge. Disciplines will further resemble each other and our delineation will become even hazier. This I believe is inevitable.

In saying this, where does it leave us with regard to our 'sports medicine team'? As President of the ACT SMA branch, I am proud to say that we have an amazingly diverse board. We currently have a sports trainer, sports doctor, sports physician, exercise physiologist, chiropractor, podiatrist, physiotherapist, educator and a soft tissue therapist – myself - on the board. This I believe is a reflection of SMA's philosophy, 'the team behind the teams'.

But if this team of disciplines, a congregation of masters of their trade, fades to a collection of Jack of all trades, will the team remain a team? With integration difficult at the best of times with bias and often uneducated professional opinions, mixed with some ego and a touch of insecurity, what will happen to our team? Will the current sports medicine team hierarchies embrace the evolution of the disciplines and inspire their potential? Will roles diversify or will there be boxes in which individuals must remain? And what system is best? What system, what integration and how much autonomy will produce the most effective outcome – player injury prevention and performance?

On a more social setting, where does it leave our 'referral' system? How confident will any of us be referring to the local chiropractor knowing they will also provide the soft tissue component, or to the local physio knowing they cover most basis now, or the Sports Physicians knowing they provide many rehab exercises, to the Soft Tissue Therapists who provide beyond soft tissue work, etc, etc. Confidence must surely be low with the hazy delineations of what defines a discipline becoming ever more difficult to distinguish. And as each grasp for their share of the market, where is all this going? What will happen to our referral system – what there is of it anyway? Will it diminish? Will there be a growth of multidisciplinary clinics to avoid the conflict? Will the more powerful, well financed disciplines look to push others out of the market? Or will we all mosey on in an ideal world and fill the gaps that present to us as individuals?

Is this multitasking a good thing,. or bad? Does this competition produce the most effective, cutting edge practitioners the world has to offer? Or does trying to cover all bases diminish the art of practical service provision? Can a weekend workshop in MET (muscle energy technique) really match the five years the Osteopaths train in this modality for? A weekend workshop in orthotics match the podiatrists, a night of massage match the soft tissue therapists, ten days of acupuncture match the acupuncturists, a couple of days of diagnostic ultrasound match the radiologists, an hour of strapping match the sports trainers? Are we diluting ourselves to the point we

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Journal of Ethnopharmacology, Vol 89:2-3 p.277:283

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Lumbar spine injuries in cricket

AUSTRALIAN PHYSIOTHERAPY ASSOCIATION
Sports Physiotherapy Australia

By Angela Cadogan

Recently I attended the 3rd World Congress of Science and Medicine in Cricket, held in Barbados, from April 4 to 7. This Congress, held in conjunction with the Cricket World Cup every 4 years, was attended by delegates from most major cricket-playing nations. The Congress included a large number of presentations in a variety of sports science and sports medicine areas, including medicine, orthopaedic surgery, physiotherapy, exercise physiology, strength and conditioning, biomechanics, sports vision and sports psychology.

A high proportion of the sports medicine presentations this year came from Australia and England; a major focus was on the topic of lumbar spine injuries in cricket, with particular reference to the diagnosis, pathology, aetiology and risk factor analysis of lumbar spine injuries in fast bowlers (FB) in cricket. This article is a brief review of some of the latest research in this area presented at this conference.

It is no secret that lumbar spine injuries are common in cricket, particularly among FB. Recent Australian data place injury prevalence among FB at 14.8% compared with injury prevalence in non-bowlers of 2–5% (Orchard et al. 2007).

Aetiology of lumbar spine injuries

There has been much discussion in the past regarding impact forces of bowling, and these have been estimated to be between 4 and 8 BW at front foot impact (Elliot 2000). The compression loading through the spine combined with the ROM required during fast bowling has been postulated to be a factor in the development of lower back pain (LBP), and 'mixed-action' bowlers have been reported to be at increased risk of lumbar spine injury (Elliot 2000). Tim Barry from St Martin's College, Lancaster, presented a study on spinal shrinkage measured with a stadiometer during eight overs of fast bowling. The implication is that with increasing amounts of spinal shrinkage, the posterior bony elements of the lumbar spine are placed under more stress and this presents a possible aetiological mechanism for the development of bony injury to the lumbar spine in FB.

After eight overs, the bowlers had not yet reached maximal spinal shrinkage, there was no significant difference in spinal shrinkage between mixed-action and front or side-on bowlers, and there was also no relationship between the magnitude of ground reaction forces and the amount of spinal shrinkage (Barry 2007). This would suggest that spinal shrinkage due to loss of inter-vertebral disc (IVD) height continues beyond an eight-over spell, and that FB with mixed actions and higher front-foot ground reaction force (GRF) do not necessarily exhibit increased amounts of spinal shrinkage.

This study provided an interesting insight into the mechanics of the IVD during eight overs of bowling, and provides exciting scope for further research into how much bowling is required to reach maximal spinal shrinkage and what is the maximal amount of spinal shrinkage attained. The subsequent rate of recovery of disc height, how this differs in those with a history of LBP, and any methods that assist in speeding the rate of IVD height recovery are also interesting areas for further research, applicable not only to cricket, but to the LBP population in general.

Craig Ranson (lead Physiotherapist, English Cricket Board) presented the findings of his study into lumbar spine MRI abnormalities in professional and elite junior fast bowlers. This study found that compared with the professional FB, the junior FB group demonstrated a higher prevalence of bilateral L5 spondylolisthesis, as well as a higher prevalence of acute pars stress abnormalities in professional cricketers (Ranson et al. 2007). Among the professional FB group, IVD abnormalities were more common (69%) than in the junior elite bowlers (29%). The professional FB group also presented with a higher prevalence of chronic unilateral stress fractures (L4–5). Bilateral L5 spondylolisthesis, when observed in the senior group, was always accompanied by severe adjacent L5S1 IVD degeneration (Ranson et al 2007).

Chronic pars interarticularis stress changes on the non-dominant side were highly prevalent in both groups (professional cricketers 69%; junior FB 46%) with L4–5 the level most commonly affected (Ranson et al. 2007).

This indicates that chronic bony stress changes are highly prevalent in this population, and occur at an earlier stage of cricket development. IVD abnormalities appear to be age-related and fast-bowling dependent. Chronic stress fractures commonly involve severe adjacent IVD degeneration, which may support the above theory of increased loading on the posterior bony elements being one factor in the development of bony injury to the lumbar spine.

The implication of this study is that the importance of screening, conditioning and technique coaching at the junior level of cricket is essential as at present, junior levels of cricket are losing half their talent pool to injury each year, predominantly due to bony lumbar spine injuries which require lengthy periods of time off and intensive rehabilitation.

The results of the study certainly confirm what we as physiotherapists at New Zealand Cricket see frequently in the clinical situation. In New Zealand, elite FB who present with LBP commonly

present with a clinical scenario that is suggestive of multiple pathology. Clinical features frequently include pain location and behaviour that is suggestive of either multi-level disc pain or the classic extension-related pain, or often a combination of both. It has also been our experience where, in the process of investigating current episodes of LBP in FB, imaging identifies a chronic bony lesion that has been previously asymptomatic, at levels apparently removed from the site of the current source of symptoms.

The clinical dilemma we then face is that, once identified, what is the 'best practice' management of bony stress injuries in cricket FB if the current symptoms do not appear to relate to the level of the co-existing bony abnormality, and the lesion has been asymptomatic up to that point?

As it is generally pain that prevents bowlers continuing in their sport, the interesting clinical question arises as to whether bone or the chronic bony stress changes observed in these FB is a source of pain.

Injury predictors

Patrick Farhart (Cricket NSW) presented a prospective cohort study involving 64 FB, the results of which indicated that increased amounts of hip external rotation during a unilateral decline squat on their front bowling leg was associated with a significantly increased risk of injury (Farhart et al. 2007). These results were contrary to their expected findings, where hip internal rotation during a unilateral squat is generally believed to be more of a risk factor in injury development. They are continuing to investigate the possible reasons for this.

Significant increased risk of injury to FB was noted by Rebecca Dennis (University of Ballarat) to be associated with reduced ankle dorsiflexion ROM on the non-bowling side of the body (Dennis et al. 2007). At back foot contact, moderate amounts of ankle dorsiflexion are required, and restriction of this movement may have implications in the development of injury further up the kinetic chain. This provides a useful measure to include in pre-season screening assessments.

As always, the more research that is presented, the more questions are generated, and this Congress was no exception. What it did highlight though is the complexity of the problem of identifying the mechanical causes and relationships between risk factors for injuries to fast bowlers and methods of identifying the risk factors. This is the subject of ongoing research in a number of countries by a number of professionals who are passionate about cricket, and who dedicate a large amount of time to producing high-quality research in this area. Many of them are based in Australia and are making a profound contribution to the area of sports medicine in cricket.

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become undistinguishable and dumbing ourselves down to the point we are ineffective? Or is all this cross pollination building the therapist of the future? The super therapist? The practice model of future education,. perhaps?

And the consumer. Well, poor consumer.

SMA's Role?

How does SMA involve itself in a 'team' approach in this environment? Is it SMA's role to mediate an outcome? Or, to follow the happenings and support where necessary, report where necessary and hope for the best?

At this stage in my freeway of thoughts and questions, I saw the parking Gestapo approaching, and as much as I knew I was fine to continue sitting stagnant in my car, I felt the inherent need to,…..*move* on.

Oh yeh, my ribs a bit better...

Brad Hiskins is a soft tissue therapist who worked for a number of years at the AIS. He is currently the principal of Clinic 88 in Canberra and President of the SMA ACT Branch.

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Sport scientist and Educator (26/8/38 – 23/9/07)

By Joe La Forgia

Emeritus Professor Robert (Bob) Withers passed away on Sunday 23rd of September 2007 after a determined battle with a brain tumour. Bob held an associate editor position with JSMS from 1985 until early 2007. He was also an editorial board member for the International Journal of Sports Medicine from 1993.

In three decades of service to Flinders University Bob did what all academics hope to be able to do: he made a difference to the world via his research and the many students that he taught and inspired. He was also a loving husband of Pam, and a man who enjoyed the adrenaline rush of power lifting as much as the tranquillity of feeding magpies or watching transient koalas resting in his front yard.

Bob, the only child of Ada and Thomas Withers, was born in Birmingham, England. Growing up within ear shot of the roaring crowd at Villa Park probably stimulated Bob's life long passion for sport. He qualified as a physical education teacher from Alsager College of Education in 1961 and for the next 4 years taught physical education at Ullathorne Secondary Modern Boys' School, in Coventry. Bob completed a Masters of Science degree at Washington State University in 1967. And from there, he went on to lecture physical education at Dudley College of Education in the UK. However, Bob's increasing passion for research in the relatively new field of exercise physiology saw him returning to the United States during 1972 as a PhD candidate at the University of Maryland. It was there that he met is wife, Pam, whom he married in 1974.

During that same year, Bob and Pam migrated to Australia, in order to allow Bob to take up a lecturing appointment in Physical Education at Flinders University. Bob remained at Flinders University for the remainder of his career.

Bob and his colleagues established the Physical Education course at Flinders University from scratch; for instance the Exercise Physiology Laboratory initially contained just one exercise bicycle and a skeleton. Regardless, Bob enjoyed his teaching and was noted for delivering lucid lectures in the Birmingham accent of which he was so proud. Bob was highly respected as a teacher, and he made himself available to help those students who displayed effort and initiative. When the Bachelor of Physical Education program ceased in 1986, a total of 185 degrees had been awarded and many of these students became, and still are, highly effective PE teachers.

The winding down of the undergraduate Physical Education degree created an opportunity for Bob to concentrate fully on postgraduate students and therefore increase research output. Over three decades the output from his Exercise Physiology laboratory included 25 nationally-competitive research grants, over 106 papers/book chapters in the international literature, and 56 appreciative individuals completed Honours, Masters or PhD awards. It is notable that Bob's academic success was achieved while producing research and publications in the international literature spanning several areas that included; athletic performance, biochemistry of exercise, body composition, energy expenditure, methodology and instrumentation, and public health.

Bob's research success was not self indulgent he always attributed the research output to everyone who had contributed, and he tried to shun the limelight as much as possible. For instance, if a TV or newspaper person contacted him via telephone about his research, Bob had on at least a number of occasions pretended to be a cleaner who just happened by!

It would be remiss not to also mention the important role that Bob played in the history of the Australian Institute of Sport. He was a true and faithful supporter of the organisation and

assisted its activities in many different and very substantial ways. This was officially recognised in April 2007 when the AIS awarded him with the AIS' first ever Adjunct Fellowship.

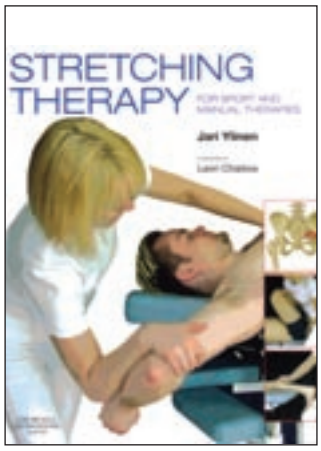
In keeping with his background as a Birmingham boy, Bob had a very endearing way of putting events in perspective. For most situations, he was able to come up with a pertinent limerick or one-liner. In fact, he would occasionally telephone a colleague or friend primarily for the purpose of telling them a limerick!

Bob was always grateful for the opportunities that his move to Australia afforded him, even in cases where it was clear to others that the opportunities had been primarily of his own making. For instance, he was so proud of being selected to represent Australia in the 2005 Oceania Bench Press competition in his age category. His joy was even greater when he won the gold medal for his adopted country. Remarkably, this feat was achieved after his second round of surgery to reduce a brain tumour. He was passionate about power lifting and won the South Australian and Australian age group titles on multiple occasions in the last 10 years of his life.

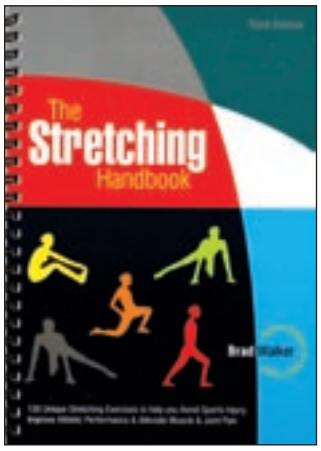
Unfortunately, Bob was less passionate about gardening and the credit for the beautiful garden of Australian native plants and a few prized cacti at his house must go to his wife, Pam. Indeed, on one occasion, when Pam was in the USA visiting her family, Bob decided he would have to take on the job of mowing their lawn – but later he gladly shared the story that he struggled to even start the lawnmower!.

Bob Withers was an iconic figure in the field of exercise and sports science and his enthusiasm for sport in general was palpable. He loved his work and pursued it with a quality that captured the attention of the broader scientific community and of his students, thereby opening doors for those who have come after him. He was a scholar with egalitarian views who dispensed with the formality of using his well earned academic titles when interacting with undergraduate or postgraduate students. However, this informality from the students' perspective was laced with an enormous amount of respect because they understood that Bob had depth of knowledge, integrity and humility. Bob Withers enormous influence will remain visible for a long time to come via the legacy of his students.

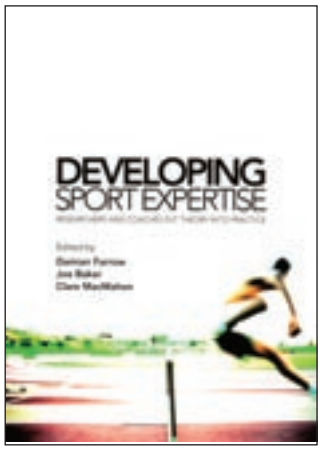
Summer Reading



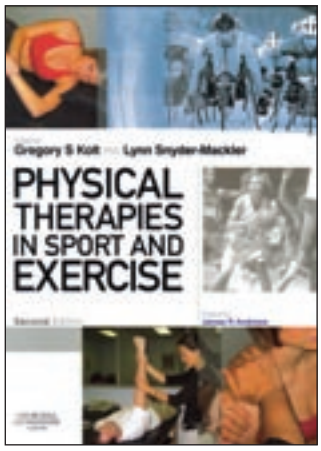
Stretching Therapy



The Stretching Handbook & DVD



Developing Sport Expertise



Physical Therapies in Sport & Exercise

Stretching Therapy

For Sport & Manual Therapies

By Jari Ylinen

A text book for all who use stretching in their work. This publication contains reviews of research into the effects of stretching and comparisons of different techniques.

Containing over 160 photographs and over 200 drawings.

Section 1 contains Stretching theory, covering factors effecting mobility and complications due to stretching therapy. Section two contains Stretching techniques involving dorsal muscles of neck, muscles of upper limb and back muscles.

For more information contact Elsevier – www.elsevierhealth.com

The Stretching Handbook & DVD

By Brad Walker

A quick reference book for everyone involved in health, fitness and sporting activities. This is the 3rd edition of the Stretching Handbook, with the 1st edition released in 1997. It contains 135 unique stretching exercises, with sections such as Arms and Chest, stomach, Back and Sides and Adductors, any stretch is easy to find in this back pocket handbook.

The DVD contains information to alleviate back pain, improving athletic ability, dealing with aching muscles and recovering quickly from injury.

For more information contact Brad Walker – www.ThestretchingInstitute.com

Developing Sport Expertise

Edited by Damian Farrow, Joe Baker & Clare MacMahon

Researchers and coaches put theory into practice by examining the science behind skill acquisition in sport and explores the application of science to optimal sports training and talent identification. 'Coach's Corner' includes discussion of new approaches and implications for training, decision making and cognitive training in sport, conscious and unconscious learning in sport and identifying and developing sporting experts, including coaches, athletes and officials.

For more information contact Taylor & Francis – www.tandf.co

Physical Therapies in Sport & Exercise

Edited by Gregory S Kolt & Lynn Snyder-Mackler

As the second edition of this publication, it has been thoroughly update and revised to provide the latest evidence-based approaches to the assessment, management, rehabilitation and prevention of injuries relating to sport and exercise.

The publication contains 5 sections including general issues related to sport and exercise injury management and prevention, looking in detail at injuries affecting different anatomical regions and injury management in different groups.

For more information contact Elsevier – www.elsevierhealth.com