

# Sport Health



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Circulation: 5000  
ISSN No. 1032-5662

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#### SUBSCRIPTION RATES 2007

Australia A\$35  
Overseas A\$50

SMA members receive Sport Health as part of their membership fee

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

PP No. 226480/00028

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## Contents

<b>GIVING THE RIGHT ADVICE</b> _____	<b>2</b>
Making guidelines fit the available evidence versus KISS (keep it simple stupid!) Gary Moorhead	
<b>WHEN THE WAR BECOMES A WITCH HUNT</b> _____	<b>4</b>
Athletes who take drugs are not as bad as terrorists Dr J	
<b>FEARLESS RESEARCH &amp; FRANK ADVICE ON ANTI-DOPING POLICY</b> _____	<b>8</b>
The lengths to not protect one version of sport over others Jason Mazanov, Dennis Hemphill & James Connor	
<b>CLICK GO THE SHEARS</b> _____	<b>12</b>
Sports Nutrition for Shearers Janelle Barnard & Ruth Logan	
<b>CRICKET AUSTRALIA 2007 INJURY REPORT</b> _____	<b>16</b>
Analysing nine years of injuries in Cricket at State and National levels John Orchard, Trefor James, Alex Kountouris & Marc Portus	
<b>JOURNAL OF SCIENCE AND MEDICINE IN SPORT</b> _____	<b>25</b>
<b>POWERLIFTING &amp; THE ART OF ELASTIC RESISTANCE TRAINING</b> _____	<b>26</b>
A Sport that tests the strength of an Athlete Tania Pizzari	
<b>THE RENDEVOUS II CONFERENCE IN LAS VEGAS</b> _____	<b>30</b>
We are privileged in Australia and New Zealand to have a cadre of high level clinicians trained in the ACSP programme Chris Milne	
<b>PROPOSED CHANGES TO THE STRUCTURE &amp; OPERATION OF SMA</b> _____	<b>32</b>
The Vision, the Mission, the Values and the "Tag" line Michael Kenihan	
<b>AUTUMN READINGS</b> _____	<b>35</b>

Cover photograph: xxxxxx

# Giving the right advice:

## Making guidelines fit the available evidence versus KISS (keep it simple stupid!)

By Gary Moorhead

**Sports Medicine Australia (SMA) has just reviewed and renewed the “tag” we use to provide a snapshot of the organisation’s activities. Previously we were the “team behind the team” – a tag that describes a support role to organised sport, but was felt to be less relevant to our wider community and member-support activities.**

The new tag is Sports Medicine Australia: “*safety \*prevention \*advice*”.

We hope that this new tag embraces a wider sweep of SMA’s and SMA’s members’ activities: a major focus on safety in sport; the prevention of injury in activity and the prevention of health problems associated with inactivity; the provision of advice on these topics to our members and the wider community. (For more detail about the new tag and a detailed review of Sports Medicine Australia activities, see the article by SMA President Michael Kenihan.)

SMA is not alone in rethinking the best and clearest way to convey a message or meaning. Struggling with precision in advice and guidelines has been a major preoccupation for health promoters in many areas – but particularly in the area of physical activity. And finding a way through the fog of competing/conflicting/confusing advice must make many people feel like having a ‘*Bex and a good lie down*’ rather than heading out to be more active.

### The current Australian physical activity guidelines say:

*Put together at least 30 minutes of moderate-intensity physical activity on most, preferably all, days.*

*If you can, also enjoy some regular, vigorous activity for extra health and fitness. (1)*

But that’s just for “normal” people. Children have a separate guideline:

*Children need at least 60 minutes (and up to several hours) of moderate to vigorous physical activity every day. Children should not spend more than two hours a day using electronic media for entertainment (e.g. computer games, TV, Internet), particularly during daylight hours. (But is it ok if they read a book?)*

Separate guidelines for older people are in the pipeline and of course, there are the usual caveats for people with any kind of medical condition: “*see your doctor before starting.*” It is to be hoped that the doctors know the guidelines and what they should be advising. (Watch this space for the results of the survey of health professionals’ knowledge of the p.a. guidelines undertaken at last year’s SMA national conference.)

Australia’s physical activity guidelines are based on the US guidelines which in turn were based on the US Surgeon General’s Report of 1996. It was this Report which first promoted the “*30 minutes a day*” recommendation. The problem for Australia is that the Americans have subsequently modified these guidelines.

### The American (US) guidelines

(as issued by the American College of Sports Medicine and the American Heart Association) now state:

*Guidelines for healthy adults under age 65*

*Do moderately intense cardio 30 minutes a day, five days a week*

*Or*

*Do vigorously intense cardio 20 minutes a day, 3 days a week*

*And*

*Do eight to 10 strength-training exercises, eight to 12 repetitions of each exercise twice a week.*

The updated Guidelines then required a detailed explanation and definition of what “cardio” meant.

In the USA, there are also different guidelines for adults over age 65 (or adults 50-64 with chronic conditions, such as arthritis) and the usual caveats for chronic disease sufferers. The full detail is at [http://www.acsm.org/AM/Template.cfm?Section=Home\\_Page&TEMPLATE=/CM/HTMLDisplay.cfm&CONTENTID=7764](http://www.acsm.org/AM/Template.cfm?Section=Home_Page&TEMPLATE=/CM/HTMLDisplay.cfm&CONTENTID=7764) 2.

Over the border in Canada, the situation is different again. They recommend 60 minutes a day as their minimum.

**The Canadian guidelines**, issued by the Public Health Agency of Canada and the Canadian Society of Exercise Physiology, can be found buried in a welter of detail on the Public Health Agency’s website at <http://www.phac-aspc.gc.ca/pau-uap/paguide/intro.html>

It should be obvious from all of this that it is difficult to get a consensus on what is a precise and appropriate guideline for physical activity.

And don’t forget, these are just the guidelines for physical activity necessary for health benefit – we haven’t touched on the issue of exercise or physical activity to prevent weight gain or obesity. (Although to be fair, the US Guidelines go on to say “*to lose weight or maintain weight loss, 60 to 90 minutes of physical activity may be necessary.*”)

Interestingly, as I reported in a previous edition of Sport Health, Australian researchers have made the situation even more difficult for guideline writers (and confusing for the general public) by disputing whether there are enough hours in the day for the average person to impact on their weight by increasing leisure time physical activity. These researchers make the point that extra activity must be won back from the times in the day where activity has been lost to sedentary living. (3)

In fact, research into the impact of sedentary behaviour – as opposed to failure to be active – is likely to cause guideline writers even more grief.

## The new paradigm

The new paradigm in physical activity research is to do with “sitting time.” It is becoming increasingly clear that our health is impacted adversely by excessive amounts of time spent sitting – as opposed to standing and moving about OR being physically active by deliberately exercising.

Sitting time as something different to “not exercising” and the adverse impact of lengthy periods of sitting (even in those considered active according to the guidelines) started to show up in Australian research earlier in this decade. A Brisbane study published in 2003 showed that workers who regularly attended the gym but who sat all day expended the same energy as “non-exercising” mothers who stayed at home caring for small children. (4) Research published from the 10,000 Steps Rockhampton program showed that sitting time was a predictor of BMI in men. (5) Investigation into data from the Long Study of Women’s Health showed that after adjusting for all other variables, sitting time was a direct predictor of weight gain. (6) At the 2007 American College of Sports Medicine (ACSM) Conference papers were presented showing that sitting time is an independent predictor of metabolic syndrome (7) and that the length of the bout of sitting may be more important than the total sitting time. (8) Makes you wonder what research the originators of programming in American baseball were using when they mandated the “Seventh Innings Stretch”!

At the recent 2nd International Congress on Physical Activity and Public Health an entire symposium was devoted to the subject with internationally renowned researchers such as our 2007 Conference Plenary Speaker, Steve Blair, declaring himself a convert to the new paradigm. In the same symposium Australian researcher David Dunstan presented research from the Australian AusDiab study (with a sample of around 11,000 Australian adults showing a positive association between TV viewing time and waist circumference, blood glucose and the metabolic syndrome. (9)

## Pushing the envelope

One presenter in the Symposium who was prepared to push the envelope of the paradigm was Marc Hamilton from the University of Missouri. Hamilton is a particularly dedicated researcher, alternating between laboratory rats and his own body as a subject for research. Anecdotally, he is reported to be a serial sampler of his own blood and body tissue.

Hamilton became interested in the topic when he was trying to find an exercise model to increase lipoprotein lipase (LPL) reproducibly (10). He found that even running 3.5 hours per day for weeks on end would not increase the amount of LPL mRNA (or functional enzyme activity) in any red muscle throughout the body. His interpretation of that was that the normal muscle use of red muscle just for postural activity causes the high LPL levels in the red muscle, and it was already at a maximal ceiling just because of normal standing and light activity.

In his studies, he had found that rats in a normal cage without running wheels just stand and when they ambulate, move very slowly and briefly. So he decided to minimise the amount rats could use their red muscles by limiting standing with a hindlimb unloading model. He was shocked to find that this “unloading” virtually wiped out the amount of functional LPL activity. The red muscles had substantially lost their capacity to vacuum fat out of the blood – in fact, there was a 10-fold reduction in LPL activity.

This was the moment that he “became an inactivity physiologist”. He suspected then that something very powerful was happening during ordinary standing and activity of daily living that does not happen when you exercise.

Hamilton and his co-researchers have since repeated those experiments many times and in both genders, using many different experimental conditions and various forms of physical inactivity. He is a passionate advocate for the paradigm of inactivity physiology (i.e. that sitting too much is a health hazard and not the same thing as exercising too little). Interestingly, he feels that the public

health researchers and epidemiologists have been more interested in the role of inactivity physiology in causing cardiovascular disease and other problems than the physiologists and molecular biologists, who still are focused on exercise. (11)

The key points that Hamilton and other “inactivity physiology” researchers want to stress are that:

- The biological effects of physical inactivity (sedentary/sitting behaviours) are not the same as lack of exercise (exercise deficiency).
- There are significant health benefits in maintaining normal intermittent non-exercise activity throughout much of the day (i.e. standing up and walking about). (12)

Where does all this leave the framer of physical activity guidelines for the general public?

Physical activity promotion in this sense must be the very pointy end of health promotion. How much easier it is to simply say: “stop smoking” or “wear seatbelts” and then follow up with laws and by-laws to give these affect. The general public – especially in Australia – is generally fairly cynical and this cynicism is fed by a media who make the greatest sin in public life the “Back Flip”! To have to constantly change, refine, redefine and generally muck about with the message is probably a massive turn-off to those targeted.

So should it be back to the drawing board to adapt our physical activity guidelines to overseas changes and to the new paradigm, or should we just leave it at: **“Move more and sit less!”**

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>> to Page 6

# When the war becomes a witch hunt

Dr J

**The 'war' on drugs in sport is like the 'war' on terrorism or 'war' on cancer in that it will never end, but it is one we must keep fighting. However, we need to sometimes remember (in the midst of media storms) that athletes who take drugs are not as bad as terrorists.**

They are more akin to rich company executives who don't pay tax or who are involved in insider trading. Something that many company executives might consider doing if they knew they could get away with it, just as many athletes might! Those who are caught deserve the full force of the law with whatever sanctions can be imposed. Those who are yet to be caught deserve the presumption of innocence. Most important is the expectation that laws will be framed with an equal regard to protecting the innocent as much as catching the guilty. An important principle of Western criminal law it is preferable to err on the side of presumption of innocence, allowing some of the guilty to escape as the lesser of two evils. It is not inconsistent for an Australian lawyer or policeman, for example, to remark that Schapelle Corby *probably did* put the marijuana into her luggage, but also that she *probably would* have and should have been let off if she was prosecuted under the Australian legal system because of the evidentiary doubts about her case. That the Indonesian legal system disregards these slight doubts may mean that they lock up more of both the guilty and more of the innocent, something we would prefer not to do in Australia.

## Are all equal to WADA?

By necessity, the WADA process and most of those before it enforce(d) a principle of "strict liability". This means that when a banned substance is found in an athlete's system, there is no onus for the doping body to prove intention to cheat. This is necessary to achieve prosecutions, as if this principle was not in place then virtually every athlete would claim to have 'no idea' how the substance in question entered their system, denying intention. Many countries, including the USA, have had a history of letting off their athletes after positive tests because they did not enforce strict liability. That WADA is forcing national bodies to adhere to strict liability has been a major step in levelling out the playing field of doping around the world. WADA has been an excellent process for bringing outlying sporting bodies (such as USA Track & Field) into the mainstream with standardisation of the burden of proof and penalties. The benefits of having a world standard for these sorts of issues (burden of proof and penalties) well outweigh the negatives, so WADA receives my hearty congratulations on this score.

I am far less convinced about the benefits of having virtually a single world list of banned substances which applies to all sports, particularly when not all sports are going to get equal representation at the bargaining table. Call me mad, but I have a sneaking suspicion that WADA is going to place more weight on a submission from the medical director of the Tour de France than on one from the President of the AFL Medical Officers Association. WADA is now the only body which can determine which substances are banned

in Australian football, rugby league and cricket, for example, sports which would be well down on the pecking order, beneath handball and luge, in the corridors of Europe.

## Things to get worse in 2008!

Is the WADA list of banned substances and methods appropriate for competitions like the AFL and the NRL? I used to think 'possibly not' but, as of January 1, 2008, my answer has been upgraded to 'definitely not'. It is now past time that we tried to reclaim the right to set the drug code for our own sporting competitions. The situation was already bad enough with asthma puffers and cortisone injections being on the banned list and requiring A-TUE forms in order for athletes to take them. Apparently asthma puffers get abused by cross country-skiers and cortisone gets abused by cyclists, hence their inclusion on the banned lists for the NRL and AFL. Neither of these categories of drugs has ever been abused by footballers in Australia to my knowledge, but our football codes pay the price for alleged abuse in totally different sports. Most team doctors can live, somewhat painfully, with these extra impositions. I live with them very uncomfortably because it pains me to think that it is a far greater likelihood that an innocent asthma sufferer will be punished for having a common disease than a non-existent salbutamol cheat will be rubbed out of football.

The revised 2008 list just made things a whole lot worse. It is now banned to EVER (in or out-of-competition) use intravenous fluids without a full TUE form being processed. The full TUE is not a rubber stamp form like the A-TUE and instead is a detailed application

process. The problem with intravenous fluids being on the banned list of methods is that no exceptions have been made for surgery, a time during which almost all patients receive IV fluids. This is not for performance-enhancement but to enable the anaesthetic to be delivered. It is sheer madness for it to be considered doping.

I think I can *just* understand the rationale why WADA have included intravenous fluids “out of competition” on the banned list. They would perhaps like the police to be able to break into a cyclist’s residence and find used intravenous fluid equipment and use this as *prima facie* evidence of doping. There may not be the smoking gun in the form of vials of EPO or HGH but in a cyclist the suspicion of needing to use an IV in one’s house or wherever is enough to have the WADA medicos frothing at the mouth!

### **Painful paperwork process**

The painful side is that a cyclist who needs legitimate surgery must get a full TUE to make sure that the anaesthetic being used isn’t considered cheating. For a cyclist who might need one operation over an entire career, this painful process of paperwork completion is now something that they will have to endure for the fact that so many cyclists are doping out of hours.

### **Dope cheats escape?**

In the football codes in Australia, the situation becomes farcical. Rugby league and Australian rules teams require an average of 15 operations per year, all of which are now considered by WADA to be episodes of doping, unless a full TUE form gets completed and approved. I believe that many of the suspected “drug-cheating” doctors who are administering these banned methods (known also in Australia as anaesthetists) would not even know of the existence of WADA, let alone know where to download a full TUE form. The odds of one of these operations going ahead without the necessary paperwork being completed come across to me as

being extremely high. Therefore, we have, in theory, a large pool of athletes in Australia who are now going to be ‘technically’ dope cheats under the 2008 rules.

### **Is all doping cheating?**

Those who love living with the status quo more than I do will rush to point out that none of these dope cheats are going to be prosecuted, because IV fluids don’t show up on a drug test, so who cares? Let me be one of the first to put up my hand as someone who does care! As soon as we start saying that such and such is ‘technically’ doping, but don’t worry about it because you won’t get caught, we have a big problem. If you accept this line of thinking, you could also say that taking HGH is technically doping, but you shouldn’t worry as you won’t get caught. We should be outraged at this type of mental gymnastics being used to justify the new WADA rules! Yet I’m sure that most team doctors in Australia are going to be pressured into this mentality. On the one side will be ASMAC saying that ‘technically’ getting IV fluids during an operation without a full TUE is doping (but just very quietly, “no one will get caught”). On the other side would be the anaesthetists who would laugh in our faces at the suggestion that they should complete paperwork and plead for the right to be able to use intravenous fluids during an operation.

‘Technically’ doping is a tautology. It means doping. What we need is a drug code where the vast majority of cases of doping represent episodes of actual cheating. The WADA code no longer does this for competitions like the AFL and NRL. It isn’t being unrealistically paranoid to suggest that a player might actually get prosecuted just because he has had surgery. In fact, it has already happened in Australia. Steven Kooops of the Fremantle Dockers was previously branded a drug cheat in 1999 for testing positive to Pethidine, administered to him by an anaesthetist in a hospital for post-operative pain within hours of knee surgery. He was found guilty

under the strict liability principle but not given a suspension because the doping was considered inadvertent. However, it no doubt was a horrific stress for him to be branded a drug cheat by the doping police and in fact he took many years to have his name cleared from the register of drug cheats, despite the fact that he was given no suspension. There is an alternate drugs in sport ‘Hall of Shame’, which consists of the many innocent athletes who have been branded drug cheats by a system which is often too eager to prosecute wherever it can. The inaugural inductee was Rick DeMont, who was stripped of a gold medal and kicked out of the Munich Olympics in 1972 for taking an asthma medication prescribed by US team doctors. It must have sickened him to go through this experience whilst watching steroid-riddled East Germans win many of the so-called legitimate gold medals. In the Sydney Olympics of 2000, Andreea Raducan of Romania was stripped of her gymnastics Gold medal for testing positive to Sudafed (pseudoephedrine), a drug which is no longer on the banned list and which would probably hinder rather than help in the sport of gymnastics. Like DeMont, she was also given the drug by her team doctor and then had to sit back and cop being vilified whilst watching *real* drug cheats (like Marion Jones) keep their Gold medals.

### **Using the funding gun**

With respect to checks and balances in the system, as soon as the AFL and NRL signed up to the WADA code, we signed away all local rights to ‘vary’ the list of banned substances and methods and to ‘soften’ suspensions. An appeal to Andrew Demetriou or David Gallop that it would be unjust and farcical to suspend a player for receiving an IV at the time of surgery would likely now, necessarily, be met with the response that “it is out of my control, as the WADA code does not allow any intervention in the doping process”.

It was not long ago that medical officers in the AFL and NRL were fighting

hard on the side of the AFL and NRL administrators to resist their codes signing up to the WADA code. That fight was lost because of John Howard's government holding the funding gun to the head of the football codes. The Howard government is now gone, but apparently so too has the will of medical officers to fight against rules that are just plain wrong.

## Dump WADA for Aussie Sports?

My personality gets me into trouble quite often for coming out and speaking my mind against the social convention. I made a faux pas on the day of my wedding recently when one of my groomsmen let me know that our wedding present, personally chosen by him away from the bridal registry, was a wine decanter. After an engagement party last year, my lovely fiancée (at the time) and I were lucky enough to be the proud owners of three decanters, enough to both service the largest of conceivable dinner parties and be at the absolute limit of our dining room shelf space. I foolishly let my groomsman know that I actually wouldn't be pleased to receive a fourth decanter, in fact I would find it a painful experience to work out what to do with it. A survey of most of our other friends found me to be in the 1% of the population who would have reported this fact to the groomsman. 99% of people would have done the socially correct thing and feigned great pleasure on opening the present, only to hide the offending decanter at the bottom of a cupboard only to ever be used in the event of the aforementioned groomsman attending a dinner party at the Orchard household. On occasions like this, my forthright behaviour in expressing my views gets me into social strife.

## Where WADA fails

On the issue of the WADA code and its appropriateness for the football codes in Australia, I think it is important that there is a 1% like me who will speak up when a mistake has been made. Perhaps I am

being sanctimonious thinking that I am in such a small minority, but the general attitude of other medicos I have spoken to about this WADA issue is that it is in the "too hard basket". The path of least resistance is to just turn a blind eye to intravenous use in hospital rather than publicly utter that the WADA banned list is a farce. Saying nothing and doing nothing means avoiding trouble. In 2008, it is IVs and hospital and maybe no one is going to get caught. In 2009 there are rumours that all asthma drugs will need a full-TUE, meaning that an asthmatic without a positive and documented exercise challenge may not legally be able to take Ventolin. It is a pity for those patients who only get asthma when they get the flu, so their exercise challenge done when healthy turns up negative. It is going to be a pity for asthmatics in Third World countries where there are no respiratory labs. It will move from pity to tragedy if someone gets rubbed out of sport simply for being an asthmatic. Or worse still, if someone dies of an asthma attack because they refuse drug treatment for fear of testing positive. And this is all for the benefit of what – can anyone recall ever hearing of an asthma-drug abusing drug cheat?

## Team docs gun shy

Where it is possible to do so, we need to not only catch drug cheats but also to prevent more incidents like the Rick DeMont and Steven Koops' ones. WADA is failing on this score and basically the non-Olympic sports in Australia should campaign now to get the WADA code overturned for their sports. The likelihood of actually changing WADA from the vantage point of Sydney or Melbourne is remote, so this campaign should include a request from the NRL and AFL medical officers to disconnect these competitions from WADA. As a compromise, we should agree to have a WADA-equivalent drug code, which essentially would be WADA minus the ridiculous anomalies which were included for the purposes of sports on the other side of the globe. Like Steven Koops, Rick DeMont also appealed his

decision which took until 2004 before it was upheld. His main complaint against the appeal process was that "It's really hard to get anywhere with the IOC. They're not in America, and I don't have the funds to go after them". When Steven Koops appealed his conviction as a drug cheat, at least the appeal process could be conducted in Australia. Now that all of the Australian sports are signed up to WADA, the sporting bodies themselves have reluctantly agreed to have their hands tied to the WADA process, which is governed in Europe.

Philosophically, this shouldn't be too hard a stance for the AFL and NRL medical officers who were opposed to signing up to WADA in the first place. In practice, team doctors in Australia have become gun shy against speaking out on any issue, as the usual process is for team and competition administrators to castigate any medical opinion that is publicly expressed, no matter how rational the opinion is. Right is right and wrong is wrong, and it is clear on the IV-use-in-surgery issue that WADA is wrong. The dilemma is whether we take the soft option and live with a flawed code or take the harder option and fight it, along with all of the flak that will be copped in doing so.

>> from Page 3

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# Fearless Research and Frank Advice on Anti-Doping Policy

Jason Mazanov, Dennis Hemphill, James Connor

**The Australian Sports Anti-Doping Authority (ASADA) has established itself as one of the world's leading National Anti-Doping Organisations (NADO) with its campaign to achieve what it calls "Pure Performance" in Australian sport. Sports Medicine Australia (SMA) has a central role in helping ASADA achieve Pure Performance by using its capacity to provide fearless research and frank advice as part of its anti-doping activities.**

Sports medicine, like any branch of medical or health science, is evidence based. That is, the truth of science and its ability to inform public policy depends on its ability to provide independent, empirically verifiable evidence. This is no less true in the case of drugs in sport. The search for empirical evidence to back up claims to support the prohibition certain performance substances in sport is one way that sports medicine can contribute to the debate on the role of drugs in sport.

However, taking an evidence-based view can lead to some uncomfortable conclusions when considering the grounds upon which current anti-doping policy is upheld. The aim of this article is to raise questions that challenge members of SMA, ASADA and the Minister for Sport to define and work towards evidence-based best practice management of drugs in sport. In effect, we are challenging the sport science and medicine establishment to live up to the promise of science to provide the empirical evidence to inform drugs management policy.

The first challenge deals with the evidence available to support the two key planks of the anti-doping position, namely health of the athlete and fairness in competition. The second challenge has to do with the political will to commit to the development of

cost effective drug epidemiology and anti-drug education, the "big" issues that need to be resolved at the policy level. The third challenge focuses on the professional readiness of SMA practitioners to deal with anti-doping, especially at ground level where drug use and anti-doping measures play themselves out in sport.

## Challenge 1: Evidence to support the Rationale for Anti-Doping

It is well known that athletes have used drugs to enhance their performance since ancient times, especially in the context of the Ancient Olympics. Indeed, anti-doping is a fairly recent policy, emerging in the 1960s after the televised death of several athletes. The International Olympic Committee (IOC) made a unilateral decision to ban all forms of performance enhancement from its events, including hypnosis (later removed on the basis it was impossible to detect). The framework used to justify the unilateral ban was and is centred on ensuring fair competition and protecting the health of athletes.

However, in terms of evidence, seeking to protect the integrity of sport in terms of fairness and health through anti-doping is questionable. Before we even begin to discuss the issue of fairness, it would seem prudent to substantiate the claim that performance enhancing drugs (PED) do in fact enhance performance. At a pharmacological level the capacity of many of the drugs to provide some kind of unfair performance enhancement is yet to be unambiguously demonstrated. Changes in the list of banned substances and methods such as caffeine demonstrates the ambiguity of what constitutes a PED; for example, where is the evidence that human growth hormone leads to improved

sports performance? Further, most PED have been shown to have a therapeutic effect, allowing athletes to recover from injuries more rapidly or improve training capacity. That is, these drugs may have a recuperative effect that allows athletes to train more intensely and more often. Whether these actually lead to improved performance in competition is yet to be established. Therefore, when an athlete uses PED it is unclear whether they have an advantage.

This leads to an unsettling view for the evidence-based practitioner: accepting public opinion as the truth. In other words, the prevailing view that PED yield some performance advantage may be a social rather than a scientific or medical reality. The echoes of Copernicus sound a clarion warning, reminding us that popular belief about a link between a doping and performance improvement is no substitute for evidence. It is incumbent upon sports medicine to respond to these beliefs by replacing conjecture with rigorously produced evidence. The Australian Government uses the publicly funded Anti-Doping Research Program to support such research.

## Fairness

Economics has established beyond doubt the inequity of Olympic and other international competitions; athletes from wealthier countries do better than athletes from poorer countries. This wealth means athletes can access better sport science through specialist support teams (e.g. physiotherapists, podiatrists, nutritionists and psychologists), access to innovative technology (e.g. the latest Australian swim suit) and access to training facilities (e.g. Eddie the Eel at the Sydney Olympics). Hence economic superiority provides athletes with an advantage that is unlikely to be surmounted by drug use.



While the ban on drugs is often upheld by an appeal to fairness, there is an inconsistency here. That is, there are a number of performance enhancers that some athletes have access to that others don't, but do not generate public calls for prohibition. If consistency is a standard by which we should construct drug control policy in sport, then we are faced with either universal prohibition (of all unfair performance enhancers) or universal access (to all performance enhancers). The former option would mean massive increases to already skyrocketing costs associated with surveillance, drug testing and prosecution.

While the prospect of universal access to PED is likely to generate vociferous objections in many quarters, it would seem reasonable to suggest that research should be undertaken to ascertain the cost-benefit ratios of existing versus alternative models of drug management, especially if the latter may involve a sporting resource redistribution scheme to achieve a 'level playing field'. This notion has precedent, as many professional sport leagues employ income distribution schemes among member clubs or franchises in order to provide some financial balance, which they hope will translate into sporting balance.

## Health

In terms of health, members of SMA are well versed in the health effects of sport on the body. Evidence indicates that participants in sport are more vulnerable to injury and illness. For example, the immune system of the elite athlete can be left in such a precarious state from training that the common cold can incapacitate them. Some of the latest research is starting to show that elite athletes can and do develop chronic, incapacitating illnesses and injuries as a result of training regimes that they would not otherwise develop; the incidence of competition onset asthma being one example. If one wanted to protect the health of the athlete, the evidence indicates medical practitioners should advise people to avoid sport and lobby for sport to be banned outright!

Obviously, this is an untenable position, but it begs the question as to what

notion of 'health' we are appealing to here. If the discourse has to do with reducing state funded health costs, then 'health' can be defined in terms of maintaining the strength, endurance and body mass index to prevent the onset of conditions such as osteoporosis, obesity, diabetes and heart disease. This minimalist 'freedom from disease' notion of health is a far cry from the type of specialised health required by the elite athlete to push the boundaries of human performance. The condemnation of drug use in sport appears to have more bite in the context of protecting the athletes' long-term health, but less in the context of elite, high-performance sport.

Moreover, if there is a concern about the potential harmful side effects of drug use, one way to allay this concern is to encourage and fund scientific investigation, including clinical trials, of chemical performance enhancers with an eye to discovering optimal type and dosage levels; that is, those substances most favourable to enhancing performance with minimal or no harmful side effects. From a harm minimisation perspective, this may be preferable to the harm athletes may inflict on themselves from self-administering drugs procured from dubious sources, informed only by anecdotal evidence as to their dosage, efficacy and side effects.

## Beyond Fairness and Health

The above arguments indicate that the current rationale for anti-doping, namely to protect the integrity of fair competition and the health of athletes, has no basis in evidence. The need for evidence-based justification of anti-doping can, and has been, thrust aside by a third reason, introduced in the World Anti-Doping Code: drugs are defined as against the rules. This begs the question as to why there is a rule against their use. We must acknowledge that anti-doping policy is a product of social forces rather than any defensible evidence-based process and move on with how best to implement the rules. This line of reasoning is in no way intended to diminish the significance of robust political or ethical argument; rather, it justifies a call for more scientific scrutiny of the premises upon which current anti-doping policy is based.

## Challenge 2: Some Big Issues – Epidemiology, Education and Economics

Working out a system to translate anti-doping from an idea on a piece of paper into everyday sporting practice has been a monumental human effort. Like any system, there are some aspects which evidence-based medicine might be able to inform and possibly improve upon. Three are chosen for consideration here as basic questions of interest to anti-doping, or indeed any system designed to manage the role of drugs in sport.

### Evidence on the Epidemiology of Drugs in Sport

One of the important questions confronting anti-doping is the question of actual PED use by athletes. As yet there is no epidemiology of PED use in sport. The main source of evidence comes from the published results of testing from NADOs like ASADA. If ASADA results truly reflect the Australian reality, then only about 0.31% of athletes use PED. This rate is derived from 2004-2005 (more recent data is unavailable from the ASADA web site) and includes PED, positives arising from illicit drugs (mainly marijuana) and non-compliance sanctions. Of course, there are questions about the reliability of this data due to testing and sampling concerns. Self or peer report mechanisms suggest a higher rate, but the data lacks the reliability required to form the basis for an epidemiology of drugs in sport. Without a meaningful dependent variable, it is difficult to see how we can assess whether ASADA is any closer to achieving the goal of 'purifying' sport.

The challenge posed to the Minister for Sport and SMA members is to direct effort towards developing the epidemiology of drugs in sport. One way this might happen is for SMA to lobby the Minister to fund a nominated special project through the Anti-Doping Research Program aimed at developing such an epidemiology. This might occur in two phases, the first scouting a methodology and the second implementation of that methodology.

## Evidence on Education of Drugs in Sport

Despite the wealth of anti-doping education programs conducted by NADOs, there is little evidence that they have any effect in terms of PED use behaviour. The main reason for this probably lies in the absence of a reliable epidemiology of drugs in sport that can be used to determine the outcome of the education program. There are, however, two programs that have been empirically assessed among adolescent athletes in the United States participating in team based sports at risk of steroid use: the ATLAS (for males) and ATHENA (for females) programs. These programs use a constructivist pedagogy to engage adolescent athletes to develop their own reasons for avoiding the use of drugs in sport. The research underpinning these programs demonstrates that the effect of reducing steroid use generalises to other drug use behaviours, such as marijuana and ecstasy. That is, these programs have been shown to reduce drug use among adolescents relative to their unexposed peers.

ATLAS and ATHENA are by no means perfect models, and there is still some effort needed towards understanding why and how they work, whether they could translate into an Australian context, and whether they can be adapted to cater to adult athletes. What these programs offer is a starting point to improving drug education among athletes, even if they have to be modified. SMA needs to lobby government and ASADA to work towards evidence-based best practice, either through implementation of ATLAS and ATHENA or supporting research to find better education strategies.

## Evidence on Cost-Effectiveness

If there were an unlimited supply of resources, implementing anti-doping would be easy. However, anti-doping is publicly funded in Australia, and as such has to compete with other priorities in the Sport portfolio (like junior development), the broader Health and Ageing portfolio (such as immunisation), and eventually the Budget as a whole (sports versus education). This leads to a very important question, “Just how important is anti-doping?”

One way of gauging its importance is to determine whether anti-doping is providing value for public money. For example, ASADA has proposed a facility to store samples for eight years after an Olympics in an effort to close the “Marion Jones Loophole”. What evidence is there that this will have an effect in terms of deterring athletes from using PED? If ASADA’s epidemiology is taken as a fair reflection of reality, only one or two Australian athletes will use PEDs at the Beijing Games (0.31% of the expected team size of 440). This suggests that the cost of the proposed storage facility may prevent up to two Australian athletes at the Olympics from using PED, assuming it does have the desired deterrent effect. Either ASADA thinks this is a good return on investment or it believes it is failing to identify the majority of athletes who use PED. This leads to the uncomfortable position of having to ask what evidence there is to support whether “The Tank” or ASADA’s current Pure Performance strategy represents good value for money.

In addition to the economic costs associated with drug control, there is also a need to ascertain the impact of other costs associated with the current drug management policy. While the impact may be difficult to quantify, the current tough stance against drug use results in the suspension of many civil liberties and safeguards we take for granted (e.g., due process, reasonable doubt, privacy). In addition, the recent efforts by ASADA to access medical records in an attempt to detect inappropriate steroid prescriptions may present a threat to time-honoured principles of doctor-patient confidentiality.

Clearly these are questions that can only be responded to by the Minister and ASADA. As Australia’s peak-sports medicine group, SMA can advise the Minister and ASADA on cost-effective ways forward using the scientific methods to gather evidence. Further, it is incumbent upon members of SMA to use their knowledge, skills and experience to better inform policy alternatives on the anti-doping issue. SMA is an untapped resource of internationally renowned sports administrators, academics and practitioners that can provide the leadership required to produce evidence-based best practice management of drugs in sport.

## Challenge 3: Anti-Doping on the Ground

The first two challenges look at anti-doping from the “big end of town” where large scale scientific and political decisions are considered and made. Talking about anti-doping at such a broad institutional level can obscure the reality of drug use and anti-doping procedures undertaken at the practical level where sport science and medical and professionals deal with athletes. Here too, there is more anecdotal than rigorous science based evidence about the experience of anti-doping on the ground. Therefore, this section talks about what SMA, ASADA and the Minister for Sport can do to improve the practicalities of administering day-to-day anti-doping policy.

ASADA have publicly acknowledged that they will be targeting support personnel as part of their investigations. This puts SMA members in the frame for investigation, interview and possible sanctioning. At the pragmatic level it will force SMA to consider what to do with members who are sanctioned. The simple answer is expulsion, although this just avoids treating the problem. Would SMA defend a member on the basis of that member was engaging in best-practice evidence-based medicine, even if it meant contravening doping control measures?

The way most SMA members earn a living is through helping semi-professional or amateur athletes, who are unable to access the elite or professional sport support juggernaut and for whom ASADA is a distant bureaucracy with no real power over their lives. When a semi-professional or amateur athlete asks a member of SMA about PEDs, it may be their only point of contact on this issue, and what they say may carry a lot of weight. Therefore, SMA plays a vital role in the anti-doping effort, which needs to be recognised by both the Minister for Sport and ASADA. This function of SMA may be somewhat less sexy than dealing with superstars of elite or professional sport, but it may have more impact than we realise.

[>> to Page 15](#)



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# Click go the shears: Sports Nutrition for shearers.

## An interview with Ruth Logan, Sports Dietitian

Ruth Logan, Janelle Barnard, and Helen O'Connor

While shearing is unlikely to be the type of sport you would see supported by the International Olympic Committee, thousands of Australians earn a living from shearing, and many of these enjoy formal competition. Sports dietitians have often been presented with unusual catering or dietetic challenges so when Ruth Logan presented her case study “2 Stand Wether World Shearing Record” at the recent AAESS/SDA Conference in Melbourne, it was a unique opportunity to gain insight on how she adapted her skills in sports dietetics to the unique circumstances presented by the record attempt.

### JB: Ruth, can you describe a bit about the record attempt and how it came about?

RL: The two shearers (LB and DG) were aged 37 and 36 and had been shearing since the 1980's throughout New Zealand and the Eastern states of Australia, and both were seasoned competitors. Both shearers recognised the challenge that this world record attempt provided for them and embraced an opportunity to do something that had never been attempted before.

Previous shearers have set world records shearing lambs but shearing wethers (fully grown male sheep) was a first. That is, it would be a world record as long as the rules of shearing competition were upheld. International judges and officials had to be onsite to ensure the strict quality ratings of shearing were met including a “maximum cut” limit (five cuts to the animal not sewn up by the shearer) for the day with a minimum fleece weight of 4kg per sheep shorn.

### JB: How did you come to be involved in this unique challenge?

RL: LB approached me during the 12 month lead-up to the world record attempt, hoping to lose weight and get fitter (increase endurance). At the initial consultation an eating plan was devised to support fat loss but maintain energy for the substantial occupational and additional training demands undertaken leading up to the event. LB kept food diaries and measured hydration over normal working conditions using pre/post weighing. As I consult from a multi-disciplinary centre LB used to opportunity to also consult the exercise scientists for a fitness program. He was aware of shearing records achieved in WA under the guidance of David Bishop so dedicated himself to the lifestyle modifications recommended by both the dietitian and exercise specialists.

During the year I was approached to provide support for both shearers on the day of competition. This was exciting but a little daunting as there are no text books or journals describing recommended strategies or outlining the challenges. It was a case of analysing the situation and devising an approach based on other sports and my clinical experience.

### JB: What was the brief in terms of the lead-up to the event, and on the day?

RL: I was to provide nutrition and hydration support for both shearers on the day within the bounds of competition schedule. I was able to draw on information about the intensity and duration of the event, as well as potential environmental conditions and opportunities for intervention to assist in developing a pre-competition diet and

Table 1: Environmental conditions inside the competition venue

Time	Temperature (°C)	Relative Humidity (%)	Wind Speed (km/hr)
7.15am	22.0	59.5	1.2
11.30am	29.8	32.7	1.0
2.20pm	28.3	42.8	1.6
4.00pm	29.7	33.0	0.9

hydration plan for each of the shearers. On the day I needed to organize the provision of appropriate food and fluids to meet their high energy needs and hydration.

### JB: Can you describe the event itself in terms of environment, duration, intensity and opportunity for breaks over the course of the effort?

RL: The event was held in October, 2007 in Hughenden, which is 4 hours drive west of Townsville. Temperatures can rise to over 40°C at that time of year. The event involved four two-hour shearing sessions over a day and was held in the local, air conditioned gymnasium. Despite the air conditioning, temperatures were above 28°C for most of the day (see Table 1).

The event was high pressure and intensity (both physical and mental) for the shearers. It requires good aerobic fitness and strength to maintain the pace over such long periods. The shearers were able to take a drink every 15-20 minutes as they changed the blades

Table 2: Sheep shorn

Run #	LB	DG
1	82	87
2	87	89
3	91	87
4	93	93
Total	353	356

on their shears. This had to be 'hands free' drinking which required assistance - more on that later! There were also the 30 minute breaks every two hours, which provided opportunity for food and fluids. This was a busy time because they also used this time to take a shower and change into fresh clothes, have a massage, and check their progress with the judges. It was also an "active" break, so the shearers stayed on an exercise bike for some of this time.

**JB: What were the main priorities for the shearers in terms of dietetic intervention and what "guidelines", if any, did you draw on?**

RL: Lapses in concentration and fatigue could be dangerous for shearers and sheep! Too many cuts to the sheep would jeopardise the record attempt due to strict rules to maintain shearing accuracy and the need to stitch more serious cuts which is time consuming. It was therefore important to ensure blood glucose and hydration levels were maintained via the regular consumption of adequate carbohydrate and fluids during the day, and especially important towards the end of the day.

One of the shearers was also prone to cramping, so adequate hydration and electrolytes were important. I referred to the sports dietitians manual HYDR8/ Know SweatTesting Kit' for guidelines on testing and procedures.

**JB: What were the specific dietetic challenges that you could identify for the event day?**

Hydration was a particular challenge. The shearers did not want to stop so the drinking had to be hands free. Camel backs were suggested but the locals had invented their own hands free drinking apparatus! This gave us an efficient way of providing Gatorade™ on the run as you can see in the photos! (see Figures 2 and 3).

During the breaks a selection of foods and fluids were available to each shearer based on their usual food preferences during a day of shearing. These included a mix of sweet and savoury carbohydrate rich, low fat snacks with 'familiar' foods being encouraged. Hot drinks, cordial, juice and water were also offered. All food consumed was measured to allow analysis of intake. Priority was given to foods rich in carbohydrate and

**Table 3: Hydration results for LB as indicated by urine specific gravity (USG) and body weight**

Run #	USG	Pre-exercise body weight (kg)	Post-exercise body weight (kg)
1	1.01	95.5	94.3
2		95.0	94.0
3		96.0	95.5
4	1.022	96.0	95.2

**Table 4: Hydration results for DG as indicated by urine specific gravity (USG) and body weight**

Run #	USG	Pre-exercise body weight (kg)	Post-exercise body weight (kg)
1	1.026	81.2	80.1
2		81.2	80.7
3		82.2	81.4
4	1.018	81.5	80.4

approximate energy consumed in the day was 16,000kJ per shearer. Much of the energy consumed came from the large volume of sports drink with only small meals and snacks.

Total Gatorade™ consumed during the day was approximately 11 litres per shearer. Total fluid including tea, coffee, juice, and water was approximately 13 litres. Both shearers added a Gatorlyte™ sachet to their drinks at each break. Extra Gatorlytes were added to the shearers' fluid when cramp became apparent. Average urine loss for the day was 700ml which indicates the high volume of sweat lost.

**JB: What were the results on the day?**

RL: The shearers were successful in achieving their world record, which was also enormously rewarding for their support team. Quality ratings were maintained within the strict competition limits, and the rate of sheep shorn actually went up over the course of the day which was previously unheard of in shearing circles (see Table 2)! Early shearing was difficult due to cold fleece - the sheep had been penned up in the shade prior to commencing the record attempt. Average time to shear a sheep was 81 seconds sustained over eight hours and the average fleece weight was 4.6kg.

**Figure 1: Ruth Logan with the shearers during a quiet time in a break**



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Figure 2: Hydration whilst changing clippers



Figure 3: The specialist hydration equipment locally designed for the challenge



We managed to keep the shearers adequately hydrated as indicated by weights and urine specific gravity (USG; see Tables 3 and 4). Maintaining concentration and minimizing fatigue were major requirements to keep their focus on the job at hand. One of the shearers started to cramp but with extra fluids and electrolytes this was quickly averted. The other shearer experienced a severe headache which added to his mental stress but with medication and extra fluid at the break this also was successfully treated. The addition of a caffeine boost during the final break may have contributed to their increased performance late in the day.

**JB: After many years of experience in sports dietetics, you must have thought you'd seen it all. Can you tell us a few things that you found especially valuable to learn from this experience?**

RL: The greatest lesson I learnt is to believe that we as sports dietitians have the special skill of adapting the science from research into practical solutions. The shearers themselves and others in their immediate circle had never used the support of a sports dietitian before - some of the ideas seemed a bit strange to them so they needed some persuasion. The project was a challenge due to so many unknown factors and 'experts' who were on hand giving well meaning but often inappropriate advice on the day. This conflicted with my procedures but as the 'expert' I stood up for my beliefs and they proved to work well. The message for us all is to research well and stand firm on what you believe to be right. In this case no one had any prior understanding of what I might be able to offer so I had to gain their confidence and trust. Believe in yourself and trust your knowledge!

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>> from Page 10

### What Does Happen with Anti-Doping on the Ground?

When we first mapped out this short paper on the role of SMA in getting to Pure Performance, we thought the easiest part to write would be the practical experience of SMA members on the ground. How wrong we were! Every time we thought of our own experiences, we wondered whether they reflected the experiences of others. For example, when the first author was helping out with a Level 2 Certificate course it became apparent the experience of the coaches and trainers was very different to that of a psychologist. To this end, we need to start getting a sense of what does happen on the ground. In terms of asking questions of SMA, this is perhaps the most important one: What does happen with anti-doping on the ground? Answering this question gives the Minister and ASADA a better sense of what is possible with anti-doping.

### Getting to Pure Performance

ASADA's campaign to achieve Pure Performance exposes the lengths to which sport authorities will go to not simply protect sport, but to protect one version of sport over others. It is no secret that government or corporate priorities can be advanced by a competitive grants system that favours certain types of research over others. This may be no less true in the case of scientific research on PED in sport. Good public policy requires good scientific research. It may be an opportune time for the sport medicine community, Minister for Sport and ASADA to work together and provide the necessary support to undertake the fearless research required to inform good policy. SMA is well placed to provide the much-needed evidence-based research, from which it can provide frank advice and lobby towards cost-effective management of anti-doping in Australia.

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# Cricket Australia Injury Report 2007

John Orchard, Trefor James, Alex Kountouris, Marc Portus

**This report analyses injuries occurring prospectively in Australian cricket at the state and national levels over nine years using recently published international definitions, updated for season 2006-07.**

Injury incidence, the number of injuries occurring per match or per season, has stayed at a fairly constant level over the nine year survey period, with incidence in 2006-07 (16.7 injuries per squad per season) close to the long-term average. Injury prevalence, the percentage of players missing through injury, has gradually increased over the nine year period in line with increases in scheduling. The average injury prevalence in 2006-07 was 10.3% of players missing through injury.

Fast bowlers have substantially higher injury prevalence than players in other positions. The typical injury prevalence (percentage of players missing through injury) for pace bowlers is 15%, comparable to the professional football codes, with other positions averaging around 5%.

Although only a limited amount of data is available at this stage, the indications are that Twenty/20 cricket will result in a 'narrowing of the gap' between the risk of injury for pace bowlers and other positions. That is, fast bowlers are less likely to be injured in Twenty/20 cricket due to reduced bowling workloads, whereas batsmen and fieldsmen are more likely to be injured due to the increased intensity of running.



## Introduction

Cricket is one of the world's major team sports played according to an international calendar. In 2005, cricket researchers published the first ever consensus international injury definitions for a sport<sup>1-4</sup>. This innovation was soon followed by football (soccer)<sup>5</sup> and rugby union<sup>6</sup>. Injuries in cricket are common with fast bowlers the players most susceptible to missing time through injury<sup>7-14</sup>. It is accepted for all sports that ongoing injury surveillance is the fundamental pillar of successful injury prevention<sup>15</sup>. Cricket researchers agree that we should aim to follow the Van Mechelen paradigm using injury surveillance being the basis for risk factor and interventional studies which can ultimately lead to injury prevention<sup>13,16</sup>.

With the establishment by Cricket Australia of the Sports Science Medicine Advisory Group (SSMAG), the annual injury survey is now an ongoing core component of cricket research in Australia. It will not only continue to provide a framework to highlight the most important areas which need further study, but also, in the long-term, injury surveillance can follow trends in injury rates to test the interventions which are recommended by other studies.<sup>15,17</sup>

## Methods

The recommended methods of injury surveillance internationally were published in detail in 2005<sup>1-4</sup>. The definitions are available free in full text format on the web at: <http://www.injuryupdate.com.au/images/research/JSMScricketdefinitions.pdf>

The definition of a cricket injury (or 'significant' injury for surveillance purposes) is: Any injury or other medical condition that either: (1) prevents a player from being fully available for selection in a major match or (2) during a major match, causes a player to be

unable to bat, bowl or keep wicket when required by either the rules or the team's captain.

The major injury rates presented are injury incidence and injury prevalence. **Injury incidence** analyses the number of injuries occurring over a given time period. *Injury match incidence* considers only those injuries occurring during major matches. *Injury seasonal incidence* considers the number of defined injuries occurring per squad per season. This can take into account gradual onset injuries, training injuries and match injuries in the one measurement. A 'squad' is defined as 25 players and a 'season' is defined as 60 days of scheduled match play.

**Injury prevalence** considers the average number of *squad members* not available for selection through injury for each match divided by the total number of *squad members*. Injury prevalence is expressed as a percentage, representing the *percentage* of players missing through injury on average for that team for the season in question. It is calculated using the numerator of 'missed player games', with a denominator of number of games multiplied by squad members. Player movement monitoring essentially requires that all players are defined in each match as either: (1) playing cricket (2) not playing cricket due to injury or illness (3) not playing cricket for another reason (e.g. non-selection with no lower grade game available).

The primary recorder of injuries has been the main team doctor at two states (Queensland, Victoria) and for the Australian team and the main team physiotherapist for four states (New South Wales, South Australia, Western Australia, Tasmania). Recorders have been encouraged to enter most injuries that have presented to medical staff into the database but to notify which ones qualified according to the survey definition (and by which criteria). The injury survey coordinator has kept records of all matches played by squad



members (in a spreadsheet) and ensured that each state provided an explanation to the survey whenever one of their players was not selected, in order to keep the spreadsheet data accurate. Insurance forms completed by medical officers have also been cross-checked to ensure all insurance information was also entered as part of the survey. Media and web site reports have been regularly checked by the injury survey coordinator as a way of prompting injury recorders to provide a diagnosis.

Some of the injury rates reported here for seasons prior to 2006-07 may vary slightly from those published in previous reports. If input errors were found or definitions of injury categories have been changed then the updated values for previous seasons are included in this report. Therefore this report reflects the most accurate data from past seasons and the values presented here supersede all previous publications.

As per the recommended international formula<sup>1-4</sup>, hours of player exposure in matches is calculated by multiplying the number of team days of exposure by 6.5 for the average number of players on the field and then multiplied by the number of designated hours in a day's play. For first class matches this is 6 hours per day and for one day matches this is 6.667 hours per day. This gives a designated exposure in terms of player hours which is used as the denominator for match incidence calculations. Player days per team per season are calculated by multiplying the size of the squads (for each match) by the number of days for matches. A vary minor variation from the international definition recommendations was that an uncontracted player was considered in 2005-06 to have become part of the squad if he was selected as 12th man in the team. This change was made in response to the rule in one day cricket for that season which allowed the 12th man to actively play as a substitute.

This report also presents further early injury data in Twenty/20 cricket, although the exposure is still small at this stage. At this stage it is likely that Twenty/20 cricket will expand to become a greater proportion of the cricket calendar, so it is worthwhile monitoring trends in this new form of the game.

The methods used for Cricket Australia injury surveillance conform to the Code of Ethics of the World Medical

Association (Declaration of Helsinki) and the latest National Health and Medical Research Council (NHMRC) guidelines for research. As injury surveillance is non-interventional and the methods preserve confidentiality of the players, it is characterised as 'low risk' (statement available at: [http://www.nhmrc.gov.au/publications/synopses/\\_files/e72.pdf](http://www.nhmrc.gov.au/publications/synopses/_files/e72.pdf), accessed June 4, 2007).

## Results

### Injury exposure calculations

Table 1 lists the number of players in each squad per season, whilst Table 2 lists the number of matches per team per season. Since 1998-99 the Australian team has contracted 25 players annually prior to the start of any winter tours (i.e. during late May or early June). The Australian squad for each subsequent season has been greater than 25 players, as it includes (from the date of their first match until the new round of contracts) any other player who tours with or plays in the Australian team. State teams can contract up to 20 other players on regular contracts (outside their Australian contracted players) and up to 5 players on 'rookie' contracts. As with the Australian team, any other player who plays with the team in a major match during the season is designated as a squad member from that time on.

The format of the Pura Cup (formerly Sheffield Shield) has consistently been that each of six teams plays ten matches each, one home and one away against each of the other teams (60 team matches), followed by a final (2 team matches) at the end of the season. The matches are all scheduled for 4 days, with the final being scheduled for 5 days. Since 2000-01, the domestic limited overs (one day) competition has followed the same home & away format as the Pura Cup. The domestic limited over series (currently Ford Ranger and formerly both ING and Mercantile Mutual Cup) format during 1998-99 and 1999-2000 seasons was a single round of matches, with a team from the ACT in the competition (although not included in injury surveillance). The domestic Twenty/20 competition (currently KFC Big Bash) commenced in season 2005-06 as a limited round of matches but was expanded in 2006-07.

As seen from Table 3, in limited overs (Ford Ranger Cup, One Day International (ODI) and Twenty/20) matches, the number of team days is generally the same as the number of team matches scheduled. In 1999-00, 2004-05 and 2005-06 there was a single ING match (two team matches) completely washed out and in 2001-02, there was one ODI match (one team match for Australia) completely washed

**Table 1 - Squad numbers per season**

Squad	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Australia	31	30	32	30	28	31	28	30	31
New South Wales	30	32	30	35	31	28	27	37	40
Queensland	20	23	26	28	27	30	30	31	32
South Australia	31	23	23	27	32	22	30	26	27
Tasmania	21	20	27	28	26	24	22	27	32
Victoria	26	23	27	31	30	29	26	36	31
Western Australia	23	26	30	30	29	30	30	37	34

**Table 2 - Team matches under survey from 1998-99 to 2006-07**

Team matches played	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Domestic Twenty/20								14	26
Domestic One Day	42	42	62	62	62	62	62	62	62
Domestic First Class	62	62	62	62	62	62	62	62	62
International Twenty/20							1	3	1
One Day International	23	34	22	22	32	32	26	35	36
Test match	12	13	8	14	8	15	14	17	5
ALL MATCHES	139	151	154	160	164	171	165	193	192

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out, so no days were played. In 2006-07, there was one domestic Twenty/20 match completely washed out. There was also one Pura Cup game in 2000-01 completely washed out.

As per the international definitions<sup>1-4</sup>, hours of player exposure in matches is calculated by multiplying the number of team days of exposure (Table 3) by 6.5 for the average number of players on the field and then multiplied by the number of designated hours in a day's play. For first class matches this is 6 hours per day and for one day matches this is 6.667 hours per day. This gives a designated exposure in terms of player hours (Table 4) which is used as the denominator for match incidence calculations. This exposure (in terms of match hours) has risen steadily over the period of the survey, with the highest level recorded in season 2005-06. Exposure was slightly reduced in season 2006-07 due to the smaller than usual number of Test matches (being a World Cup year). It is anticipated that in 2007-08, with a return to a full Test schedule, the exposure will again increase. As has been previously discussed, increased match exposure tends to increase injury prevalence, as when matches are scheduled closer together there is less recovery time between games.

Table 5 shows that workload in terms of number of overs bowled has stayed fairly steady in first class domestic cricket over the past ten years, but has increased in domestic one day cricket since 2000-01. Twenty/20 cricket will probably not contribute substantially to overall bowling workload despite the new fixtures being introduced. Overall workload in 2006-07 was down due to the reduced schedule of Test cricket being a World Cup year. The peak number of overs bowled by teams in the survey was actually in 2003-04, although it is projected from scheduling that this will be surpassed in 2007-08.

Player days per team per season are calculated by multiplying the size of the squads (for each match) by the number of days for matches (Table 6). A very minor variation from the international definition recommendations is that an uncontracted player was considered to have become part of the squad if he was selected as 12th man in the team during season 2005-06 only. This change was made because of the rule present in one day cricket during season 2005-06 only which allowed the 12th man to play as a substitute.

**Table 3 – Team days played under survey 1998-99 to 2006-07**

Competition	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Domestic Twenty/20								14	24
Domestic one day	42	40	62	62	62	62	60	60	62
First class domestic	222	232	228	228	220	242	234	228	232
International Twenty/20							1	3	1
One day international	23	34	22	21	32	32	24	35	36
Test cricket	53	53	33	61	32	69	58	78	22
TOTAL	340	359	345	372	346	405	377	418	377

**Table 4 – Designated player hours of exposure in matches each season**

Competition	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Domestic Twenty/20								242	415
Domestic one day	1819	1732	2685	2685	2685	2685	2598	2598	2685
First class domestic	8658	9048	8892	8892	8580	9438	9126	8892	9048
International Twenty/20							17	52	17
One day international	996	1472	953	909	1386	1386	1039	1515	1559
Test cricket	2067	2067	1287	2379	1248	2691	2262	3042	858
TOTAL	13539	14319	13816	14865	13898	16199	15042	16342	14582

**Table 5 – Overs bowled in matches each season**

Match type	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Domestic Twenty/20								241	470
Domestic one day	1874	1858	2690	2835	2697	2883	2729	2814	2877
First class domestic	9945	9729	9837	9833	9224	10311	9871	9645	9967
International Twenty/20							20	58	20
One day international	1061	1486	1052	980	1377	1417	1057	1577	1488
Test cricket	1910	1882	1347	2243	1271	2802	2159	2756	890
TOTAL	14791	14955	14926	15891	14569	17413	15835	17090	15711

**Table 6 – Player days of exposure available (for prevalence calculations)<sup>1</sup>**

Team	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Domestic Twenty/20								441	739
Domestic one day	990	916	1495	1739	1675	1651	1564	1842	1911
First class domestic	5160	5343	5586	6435	5936	6477	6157	7193	7265
International Twenty/20							27	82	27
One day international	678	964	631	608	865	881	640	960	1056
Test cricket	1517	1444	947	1707	820	1906	1562	2095	572
TOTAL	8345	8667	8659	10489	9296	10915	9950	12613	11570

<sup>1</sup> Seasonal incidence calculations use almost identical exposure data except that for prevalence calculations, a player who joins the squad mid-season is not considered to be exposed to missing his first game through injury. This is because an uncontracted player can only be considered to have joined a squad mid-season by playing a game, hence he cannot miss this first game through injury.

**Table 7 - Injury match incidence (injuries/10000 player hours)**

Match type	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	Average
Domestic Twenty/20								41.3	120.4	91.3
Domestic one day	55.0	34.6	48.4	22.3	37.2	67.0	42.3	65.4	48.4	46.9
First class domestic	32.3	24.3	22.5	45.0	24.5	23.3	24.1	14.6	28.7	26.6
International Twenty/20								0.0	192.7	0.0
One day international	80.3	61.1	52.5	33.0	72.2	57.7	67.4	19.8	44.9	53.5
Test cricket	24.2	62.9	23.3	29.4	24.0	44.6	8.8	23.0	11.7	29.6
ALL MATCHES	37.7	34.9	29.7	37.7	31.7	37.0	27.9	25.7	35.7	33.0

**Table 8 - Home versus away match incidence comparison for the Australian team (injuries/10000 player hours)**

Match type	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	Average
Home one day internationals	115.5	115.5	53.3	28.9	106.6	17.8	138.6	16.5	92.4	74.0
Away one day internationals	42.0	38.5	51.3	35.5	48.6	85.1	16.5	22.0	26.6	40.0
Home test cricket	38.5	88.8	25.6	18.3	24.4	64.1	8.8	23.3	11.7	34.9
Away test cricket	15.5	38.0	19.7	38.9	23.3	23.3	8.8	22.8		24.0
ALL MATCHES	42.4	62.2	35.7	30.4	49.4	49.1	27.3	21.9	33.1	38.8

**Table 9 - Bowling match incidence (injuries/1000 overs bowled)**

Match type	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	Average
Domestic Twenty/20								0.0	2.1	1.4
Domestic one day	3.2	2.2	3.7	1.1	1.9	2.1	1.5	1.1	1.0	1.9
First class domestic	1.9	0.9	0.9	1.5	1.5	0.9	1.0	0.2	1.0	1.1
International Twenty/20								0.0	0.0	0.0
One day international	2.8	2.0	1.0	0.0	1.5	0.7	1.9	0.6	1.3	1.3
Test cricket	1.0	3.2	2.2	1.8	2.4	2.5	0.0	0.7	0.0	1.6
ALL MATCHES	2.0	1.5	1.5	1.4	1.6	1.3	1.0	0.5	1.0	1.3

**Table 10 - Home versus away bowling match incidence comparison for the Australian team (injuries/1000 overs bowled)**

Match type	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	Average
Home one day internationals	3.6	4.4	1.6	0.0	3.2	0.0	4.3	0.0	4.3	2.3
Away one day internationals	2.0	1.0	0.0	0.0	0.0	1.1	0.0	1.1	1.0	0.7
Home test cricket	0.0	6.3	2.7	1.9	2.2	4.8	0.0	0.8	0.0	2.2
Away test cricket	1.8	0.0	1.6	1.7	2.8	0.0	0.0	0.6		0.9
ALL MATCHES	1.7	2.7	1.7	1.2	1.9	1.9	0.6	0.7	1.3	1.5

## Injury incidence

Injury incidence results are detailed in Tables 7-12. Injury match incidence is calculated in Table 7 using the total number of injuries (both new and recurrent) as the numerator and the number of player hours of exposure (Table 4) as the denominator.

Injury match incidence in the units of injuries per 10000 player hours is higher in ODIs than Test matches. There is also a small difference in injury match incidence between domestic One Day matches and first class matches, although not to the same extent as in international cricket. Because first class matches are played over a much longer duration than limited overs matches (at both domestic and international level), they produce a higher number of injuries per match, even though the hourly rate is lower.

Table 8 and Table 10 reveal that the higher rate of match injury overall and bowling injury specifically relate to *home*, rather than away, ODI matches. Away ODIs have not led to nearly as high injury rates as home ODIs for reasons that are explored later in this report.

Seasonal incidence (Table 11 and Table 12) is calculated by number of injuries multiplied by 1500 (for a squad of 25 players over 60 days), divided by the number of player days of exposure (Table 7).

Table 12 reveals that seasonal incidence by body part has generally been consistent over the past eight seasons. Some injury categories have fallen slightly in incidence in recent seasons including shoulder tendon injuries and wrist and hand fractures although most categories have stayed fairly constant.

**Table 11 - Injury seasonal incidence by team (injuries/team/season)**

Team	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Australia	18.4	15.5	18.0	15.5	22.2	18.3	14.8	16.2	22.6
New South Wales	14.2	11.7	16.3	18.5	9.2	19.9	5.8	8.1	14.3
Queensland	11.5	17.0	17.2	25.3	15.7	20.4	17.9	15.0	20.6
South Australia	24.3	13.5	23.1	17.6	17.9	20.3	9.7	17.3	12.7
Tasmania	17.7	13.9	18.4	16.9	20.5	13.2	19.7	21.7	13.9
Victoria	18.6	23.3	16.9	20.5	20.0	18.6	13.4	15.1	20.4
Western Australia	21.1	19.7	14.1	16.6	19.8	15.2	23.6	11.9	12.4
ALL TEAMS	18.2	16.2	17.5	18.3	17.8	18.1	15.0	14.8	16.7

**Table 12 - Injury seasonal incidence by body area & injury type**

Injury type	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Fractured facial bones	0.0	0.3	0.2	0.3	0.0	0.1	0.2	0.2	0.1
Other head and facial injuries	0.2	0.0	0.0	1.0	0.2	0.1	0.2	0.1	0.1
Neck injuries	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.2	0.4
Shoulder tendon injuries	1.2	1.4	0.5	0.9	1.1	0.0	0.2	0.8	0.6
Other shoulder injuries	0.0	0.0	0.5	0.7	0.3	0.4	0.9	0.8	0.5
Arm/forearm fractures	0.4	0.3	0.0	0.0	0.0	0.0	0.2	0.1	0.0
Other elbow/arm injuries	0.2	0.2	0.5	0.0	1.1	0.1	0.2	0.6	0.3
Wrist and hand fractures	1.1	0.7	1.7	1.7	1.1	1.0	1.2	0.8	0.5
Other wrist/hand injuries	0.5	0.7	0.5	0.1	0.6	0.7	1.2	0.4	0.5
Side and abdominal strains	1.6	1.0	2.1	1.8	0.5	1.1	1.4	0.6	1.6
Other trunk injuries	0.5	0.0	0.2	0.4	0.0	0.5	0.0	0.6	0.6
Lumbar stress fractures	0.2	0.5	0.5	0.7	1.4	1.0	0.2	0.4	1.0
Other lumbar injuries	1.8	1.0	1.4	0.9	1.9	1.8	1.1	1.7	1.0
Groin and hip injuries	2.0	0.7	1.0	0.9	2.2	2.2	0.8	1.1	1.4
Thigh and hamstring strains	3.2	1.6	2.6	2.6	1.9	2.9	2.6	1.3	2.1
Buttock and other thigh injuries	0.0	0.2	0.9	0.1	0.0	0.8	0.0	0.0	0.8
Knee cartilage injuries	0.7	0.9	1.5	1.4	0.6	0.4	0.9	1.8	0.9
Other knee injuries	1.6	1.4	0.9	0.6	0.3	0.4	0.0	0.6	0.4
Shin and foot stress fractures	0.2	0.2	0.3	0.3	0.8	0.3	0.6	0.1	0.5
Ankle and foot sprains	1.1	1.2	1.0	1.1	1.0	1.6	0.8	0.5	0.9
Other shin, foot and ankle injuries	0.9	1.2	0.5	2.0	1.6	1.8	1.8	0.6	1.3
Heat-related illness	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Medical illness	0.9	2.4	0.3	0.9	1.0	0.7	1.1	1.5	1.0
TOTAL	18.2	16.2	17.5	18.3	17.8	18.1	15.0	14.8	16.7

**Table 13 - Injury prevalence by player position**

Player type	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Batsman	3.9%	3.4%	5.2%	4.7%	3.0%	7.2%	9.8%	6.3%	5.5%
Keeper	2.8%	1.5%	0.9%	0.6%	0.9%	3.7%	3.2%	2.9%	0.5%
Pace Bowler	11.5%	14.0%	15.0%	19.4%	16.6%	18.0%	9.3%	14.4%	18.6%
Spinner	4.9%	1.4%	10.0%	1.1%	3.7%	6.9%	4.2%	8.8%	4.1%
TOTAL	7.2%	7.5%	9.5%	9.7%	8.6%	11.4%	8.1%	9.7%	10.3%

## Injury prevalence

Injury prevalence rates follow a similar pattern to injury incidence, although whereas incidence stayed constant over the past few seasons, prevalence has gradually increased. The disparity between the two can be attributed to the generally increased number of matches, with the 'average' injury artificially becoming more severe over recent years because there are more matches to miss (injury prevalence = injury incidence x average injury severity).

Injury prevalence rates (Tables 13-14) in season 2006-07 were generally close to the long-term average, which is a reasonable outcome given the steadily increasing amount of match exposure.

Pace bowlers remain the position most susceptible to missing time through injury (Table 13). In season 2006-07, 18.6% of fast bowlers were missing (on average) through injury at any given time. By contrast, all other positions were available more than 94% of the time in season 2006-07. It is pleasing to report that the early trend from Twenty/20 cricket that bowling injury risk may be lower (Table 9) will tend to redress this imbalance somewhat. However, as Twenty/20 cricket in the short-term is unlikely to expand to become a major part of the cricket calendar, it continues to be a priority to further research possible risk factors for pace bowlers in order to control their injury rates.

Injury prevalence by injury category (Table 14) revealed no outstanding trends for 2006-07. There was a return to 'average' injury prevalence due to side strains and lumbar stress fractures in season 2006-07 after one and two (respectively) seasons of below average prevalence for these major categories. Thigh and hamstring strains constituted a higher than normal injury prevalence in season 2006-07.

### 'Preventable' non-bowling injuries

It is again worth reporting that injuries from fielders sliding into the fence appear to have subsided, with none of these injuries having qualified as a survey injury since 2000-01. There are some occasional minor injuries suffered from collision with the rope itself and with the fence if it is an inadequate distance from the rope. For the most part, it is apparent that the new rules are working well. The moving in of the boundary has changed the nature of the game, in that games are higher and faster scoring because of the increased number of boundaries. However, most cricket commentators feel that these changes have been for the better.

In 2006-07 one player suffered a serious knee injury (ACL) from playing touch football at training, continuing the tradition of occasional injuries from these activities. Whilst football cross-training may always have some part in relieving the boredom from routine other drills, it is constantly worth mentioning that in cricketers this appears to be a high risk activity. One piece of advice worth considering is the use of lower traction boots during these activities (e.g. running shoes rather than spikes when playing on grass). Running shoes will increase the risk of slippage-type injuries but decrease the risk of traction-type injuries. The slipping injuries tend to fortunately be less severe, with the dreaded ACL being included in the latter category.

### Discussion & Recommendations

#### Injury definition

These injury definitions have been criticised on the basis that they are not a comprehensive survey of all incidences of 'tissue damage' sustained by players<sup>23,24</sup>. However, the major aim when creating definitions was to set a standard that would be followed

Table 14 – Comparison of injury prevalence by body area

Body region	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Fractured facial bones	0.0%	0.1%	0.2%	0.2%	0.0%	0.0%	0.1%	0.0%	0.0%
Other head and facial injuries	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%
Neck injuries	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
Shoulder tendon injuries	0.6%	0.4%	0.8%	1.4%	0.7%	0.1%	0.1%	0.8%	0.7%
Other shoulder injuries	0.4%	0.0%	0.3%	0.6%	0.2%	0.4%	0.8%	1.0%	0.5%
Arm/forearm fractures	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%	0.0%
Other elbow/arm injuries	0.0%	0.0%	0.7%	0.0%	0.6%	0.0%	0.1%	0.2%	0.0%
Wrist and hand fractures	0.1%	0.1%	0.9%	0.9%	0.3%	1.0%	0.7%	0.6%	0.2%
Other wrist/hand injuries	0.2%	0.3%	0.1%	0.0%	0.2%	0.1%	0.7%	0.1%	0.1%
Side and abdominal strains	0.4%	0.4%	0.4%	0.7%	0.2%	0.7%	0.8%	0.3%	0.6%
Other trunk injuries	0.4%	0.0%	0.1%	0.1%	0.0%	0.1%	0.0%	0.3%	0.1%
Lumbar stress fractures	0.1%	0.8%	0.6%	1.1%	1.7%	2.4%	0.2%	0.9%	1.6%
Other lumbar injuries	0.7%	1.3%	0.9%	0.3%	0.6%	0.7%	1.0%	1.1%	0.6%
Groin and hip injuries	1.1%	0.1%	0.3%	0.8%	0.6%	0.9%	0.3%	0.6%	1.0%
Thigh and hamstring strains	0.9%	0.7%	0.6%	0.7%	0.8%	0.7%	0.7%	0.3%	1.1%
Buttock and other thigh injuries	0.0%	0.0%	0.2%	0.0%	0.0%	0.3%	0.0%	0.0%	0.8%
Knee cartilage injuries	0.4%	0.6%	1.1%	1.2%	1.2%	0.4%	0.5%	1.7%	1.0%
Other knee injuries	0.9%	0.4%	1.4%	0.1%	0.1%	0.2%	0.0%	0.6%	0.3%
Shin and foot stress fractures	0.0%	0.1%	0.2%	0.2%	0.5%	0.0%	0.5%	0.2%	0.4%
Ankle and foot sprains	0.4%	0.4%	0.5%	0.5%	0.3%	1.4%	0.2%	0.5%	0.6%
Other shin, foot and ankle injuries	0.1%	1.1%	0.1%	0.8%	0.5%	1.3%	0.6%	0.2%	0.4%
Heat-related illness	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Medical illness	0.2%	0.6%	0.1%	0.2%	0.2%	0.5%	0.6%	0.3%	0.2%
TOTAL	7.2%	7.5%	9.5%	9.7%	8.6%	11.4%	8.1%	9.7%	10.3%

Table 15 - Key indicators for preventable non-bowling injuries over nine seasons

Mechanism	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Sliding into fence	2	2	1	0	0	0	0	0	0
Playing football	1	1	0	3	0	0	0	2	1

equally in all countries surveying cricket injuries<sup>25,26</sup>. The fact that there has been very slow recent progress in getting an international register of cricket injuries suggests that the choosing the path of lower difficulty was a sensible decision.

Previous and further recommendations with respect to injury surveillance should continue to be considered, as follows:

1. All countries should be encouraged to undertake injury surveillance and distribute reports to other countries. It is acknowledged that injury surveillance is expensive and is very unlikely to be successful in the long-term without adequate ongoing funding. It is perhaps

worth seeking international funding, either through the ICC or a major corporate sponsor, to assist with the payment for injury surveillance in the Test-playing countries where it not currently being undertaken.

2. Cricket Australia could help to encourage our Federal government to develop a national injury surveillance system for injuries in all sports<sup>27</sup><sup>28</sup>, which currently exists in New Zealand. This would assist with injury surveillance at amateur levels<sup>29</sup>.
3. That the numbers of back-to-back matches be kept to a minimum when



planning scheduling<sup>29</sup>. Where tradition and commercial factors preclude this from happening (e.g. Boxing Day Test followed by New Year's Test) consideration be given to selecting teams with a minimum of five regular bowlers to guard against the risk of overuse.

4. That the captain and coach should exercise consideration when enforcing the follow-on in Test cricket about the potential higher short-term workload on their bowlers<sup>29</sup>.
5. That the concept of substitutes for injured bowlers in first class cricket be debated further nationally and internationally.
6. That Twenty/20 cricket can provisionally be considered to be a relatively safe form of cricket for bowlers if it is implemented in the calendar as an alternative (as opposed to an additional) load.
7. That priority areas for injury risk factor studies in Australia continue to be: (1) Workload studies for fast bowlers (2) Biomechanical studies for fast bowlers

## Acknowledgements

The authors of the injury survey would like to acknowledge the contribution of the following people over the 2006-07 season:

### Team physiotherapists:

Alex Kountouris (Australia), Patrick Farhart (New South Wales), John Porter (South Australia), Michael Jamison and Laurie McGee (Tasmania), Peter Morton (Western Australia)

### Team medical officers:

Trefor James (Australia and Victoria), Simon Carter (Queensland), Terry Farquharson (South Australia), David Humphries and Peter Sexton (Tasmania), Damien McCann (Western Australia)

### CA administrative staff:

Geoff Allardice, Steve Bernard

Special recognition is deserved by Dr Simon Carter, who has recently retired after over a decade of service with the Queensland Cricket Association and who has been vigilant at keeping accurate injury records over that entire time period.

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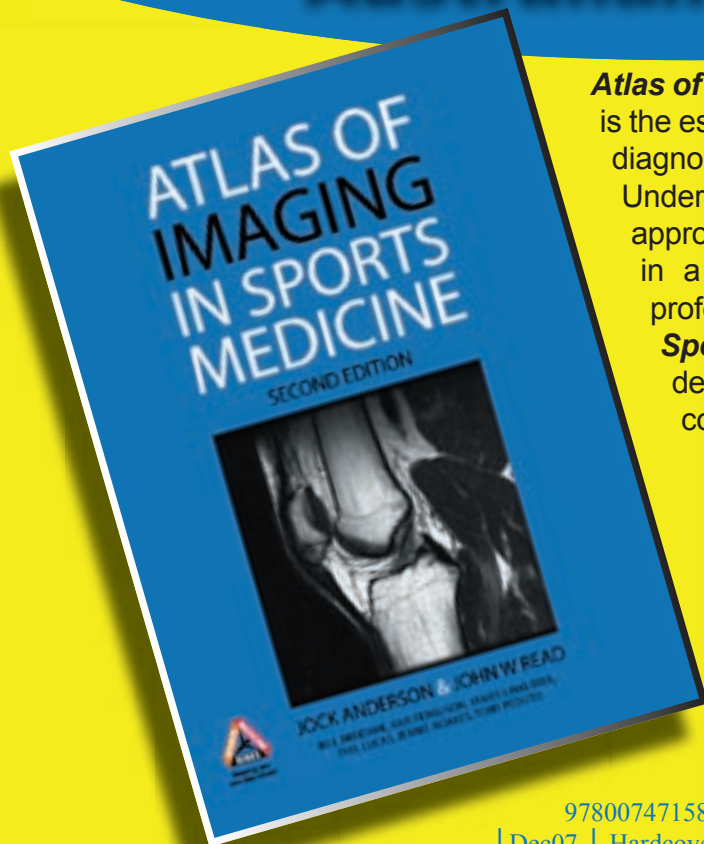
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Further details can be discussed with the current editor, Professor Caroline Finch (c.finch@ballarat.edu.au) or with the SMA CEO, Mr Gary Moorhead (gary.moorhead@sma.org.au). A more detailed job description is available from lesley.crompton@sma.org.au or from the SMA website (www.sma.org.au)

Applications should be sent to lesley.crompton@sma.org.au or mailed to Lesley Crompton, Sports Medicine Australia, PO Box 78, Mitchell ACT 2911 Australia.

# Powerlifting and the art of elastic resistance training

**The sport of competitive powerlifting is not as well recognised as that of the Olympic sport of weight lifting, but men and women in over 78 countries around the world (including Australia) participate in powerlifting.**

The two weight training sports are commonly confused, however the type of lifts and the requirements of each sport are entirely separate. Powerlifting consists of three events: the squat, bench press, and deadlift, in comparison to the 'snatch' and the 'clean and jerk' events included in weightlifting. The fundamental difference between the two sports is that powerlifting, as the name suggests, requires raw strength to produce a lift rather than the combination of strength, speed, flexibility, and momentum needed in weightlifting.

In competition the squat is performed first, followed by the bench press, and finally the deadlift. Athletes are

allowed three attempts at each lift and the maximum weight lifted in each event is added together for a final total. Three judges assess each attempt and a majority decision is needed for the lift to be passed. Powerlifting, like weightlifting, uses weight categories to ensure athletes are graded on relative strength. The use of supportive wraps for the joints and assistive clothing is commonly allowed depending on which of the many federations is hosting the competition.

In 2000 I was introduced to a style of powerlifting training based on the Westside Barbell Club method. The Westside System was developed in the USA by Louie Simmons and was adapted from the training methods used by Russian lifters from the Soviet era. The system differs from conventional powerlifting training mostly in the periodisation, as well as the use of maximal effort and dynamic effort training. There are only two gyms in

Australia that practice the methods based around the Westside Barbell Club. The training challenged many of my beliefs about the most acceptable dosage for strengthening and opened up a world of innovative exercises that I began to consider could be just as useful for rehabilitation purposes as they were for powerlifting. A number of the exercises defied all that I understood about 'safe lifting practices' and I wondered how it was that these athletes could place such repetitive, high-load stress on their joints (particularly their backs and knees) with relatively few injuries.

Given these anecdotal observations, I believe that physiotherapists could learn a significant amount in the area of exercise prescription and exercise variation by further examining powerlifting training and the Westside system in particular.

For the purpose of this article, I have focused on one aspect of the training that I feel physiotherapists can relate to and could potentially experiment within the clinical setting: the use of elastic resistance, or 'bands' as it is commonly referred.

## Elastic Resistance – The Physio Perspective

The use of elastic resistance in the form of theraband or theratubing for exercise and rehabilitation has increasingly been utilised by physiotherapists over the past decade. This type of resistance is inexpensive, portable and provides advantages such as resistance throughout an entire movement and ease when altering the line of pull and amount of resistance. In my clinical experience elastic resistance is commonly prescribed for open kinetic chain exercises particularly for shoulder rehabilitation. In

**Figure 1 features Daniel DiPasqua performing benchpress with bands.**



my own practice there is certainly scope to expand the use of elastic resistance to provide greater functional rehabilitation for more joints throughout the body.

## Elastic Resistance – Powerlifting

Martyn Girvan (B.ExSci, B.Psych) describes the use of bands in the powerlifting setting. Girvan is the owner and coach at Apollo's Gym in Melbourne and uses the principles of the Westside Barbell System. For the past year Girvan has also been working as strength coach at the Collingwood Football Club.

Girvan notes that 'the Westside training system has incorporated elastic resistance in the form of 'bands' since the early 1990s.' The bands used provide much greater resistance than the theraband used by physiotherapists. For example, black theraband provides 22 lbs of resistance when it is elongated to 300 per cent for its original length, whereas a larger band used by powerlifters can provide up to 200 lbs of resistance. The reasoning for the use of bands is common to both powerlifters and physiotherapists, as Girvan states:

'The principle behind elastic resistance is simple, the greater the range of motion, the more the bands stretch, and therefore the greater the elastic resistance. This can change the strength curve to accommodate the resistance throughout the entire range of motion rather than a specific point. This is beneficial in sports where athletes are required to overcome large external resistances and generate rapid force. The ability to generate high muscular strength within a short time period is of functional importance. It is well accepted that the basic quality in many sports disciplines utilise active stabilisation of joints which may be gained from band training.'

Figures 1-4 show how elastic resistance is commonly used to train the three competition lifts. Figure 1 shows the bands being used for bench press training. Figure 2 shows the bands during deadlift training and Figures 3 and 4 demonstrate squat training. Figure 4 shows a six-band squat developed

Figure 2 features Martin Girvan performing a deadlift with bands



by Girvan for lifters who are unable to hold a bar on their backs. Girvan explains that for this high level training the bands are combined with barbell weight to 'influence the force profile and lifting speeds to enhance the rate of force development. Bands alter the kinetic profile of the exercise by applying greater degrees of force later into the movement. This avoids the deceleration phase at the end of the concentric motion and, as is seen with similar ballistic type training, this results in improved functional performance of athletes.'

'Another advantage of using bands is that they may enhance the eccentric training stimulus. Greater force is

required to decelerate the load at the end of the eccentric phase of the lift due to the speed effect the bands provide. The amount of stored elastic energy increases with the speed of the eccentric action. Higher eccentric velocities are associated with the use of bands which may offer an effective means to enhance strength and functional performance,' describes Girvan.

Of particular interest with regard to rehabilitation, elastic resistance increases the stability requirements of an exercise. The bands challenge the muscles to maintain posture and form throughout the movements. This challenge increases as the band elongates. The band techniques used in powerlifting aim

**Figure 3 features Clint Greagen performing a squat with bands**



**Figure 4 features Daniel DiPasqua performing a squat with bands only**



to work the core stabilisers during the squat and deadlift exercises and the shoulder stabilisers in the bench press exercise. It is interesting to note that during a keynote presentation at the 5th World Congress on Low Back and Pelvic Pain in Melbourne in 2004, Professor Stuart McGill displayed a photograph of a Westside powerlifter performing a squat with barbell and bands. McGill suggested that the technique in the photo created the 'superstiffness' in the abdominal muscles required to enhance back stability. He promoted the Westside training system as a method that could hold some clues to ultimate back fitness.

For clinical practice the use of bands as displayed in Figures 1-3 will be inappropriate for many clients. However, for the rehabilitation and training of high level athletes and for the progression of exercise programs

these techniques could be well suited. For lower level rehabilitation programs these functional methods can still be utilised, commencing with minimal resistance and concentrating on correct motion pattern.

Powerlifting is a sport that tests the strength of an athlete. The current men's Australian records for each event in the higher weight classes (squat = 400kg, bench press = 300kg, deadlift = 366.5kg) demonstrate the huge potential for strength gains in athletes. Interestingly, Westside-trained lifters from Apollo's gym hold Australian records in the squat and benchpress events. Powerlifting training techniques involve repetitions of high load exercises that place substantial stress on all of the joints. Many physiotherapists would recoil (as I originally did) at the sight of a stiff-legged deadlift training exercise

where the athlete performs repetitive lumbar flexion with straight legs lifting 100kg or more. Nevertheless, these powerlifters are well trained to perform such feats. For this reason, a greater understanding of the training principles and exercises used by powerlifters could aid in the improvement, development, and progression of injury rehabilitation programs. Elastic resistance is just the tip of the iceberg.

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# Report on Rendezvous II Conference

Chris Milne

**In March I attended Rendezvous II, a conference in Las Vegas. This was the second joint conference of four participating organisations which included:**

- **Australasian College of Sports Physicians (ACSP)**
- **American Medical Society for Sports Medicine (AMSSM)**
- **Canadian Academy of Sports Medicine (CASM)**
- **American Osteopathic Academy of Sports Medicine (AOASM)**

There were about 1,000 delegates, of whom only 17 came from outside the US or Canada. I was the only New Zealander in attendance, and Karim Khan the only Australian.

The conference programme had been drawn up by a series of clinical experts and covered growing points and controversies within sport and exercise medicine. Listed below are the presentations that made the biggest impression on me.

1. The best paper overall came from Bennet Omalu, a forensic pathologist from California. He spoke on the link between the field and dementia. He performed autopsies on five professional gridiron players who had sustained multiple head injuries during their careers. Each of these players had a slippery slide into lives of increasing psychosocial problems, culminating in death by suicide in four of the cases at age 36 to 50 years. The bones of all five athletes were structurally normal but microscopic analysis of brain tissue revealed neurofibrillary tangles and tau, a microtubule associated protein seen in dementia. All athletes were positive for apolipoprotein E.

Dr Omalu has recently released a book entitled "Play Hard, Die Young", which is available online at [www.neoforenxis.com](http://www.neoforenxis.com). This book is bound to cause controversy in the world of pro football. One wonders if our "heavy hitters" in the game of rugby league are far off the same scenario. My neologism for the condition would be Dementia Gridironica, following on from the established Dementia Pugilistica.

2. The second presentation on Day 1 that caught my eye was entitled Turning Exercise Prescription into Tendon Repair, Mechanotherapy. This was delivered by Karim Khan, a sports physician from Australia who is now working in Vancouver.

He spoke about how cells within the tendon convert mechanical load into biochemical signals which, in turn, turns movement into repair. Tendon repair is similar to bone repair and cells communicate by sending calcium and IP3 to adjacent tissues. This was a talk which effectively linked research with clinical practice and was delivered with his trademark humour.

3. The third session that caught my eye was entitled Pre-Participation Physical Examination: what evidence is there to support the annual ritual? The short answer is not much. The pre-participation physical examination is a ritual that is conducted within North America on all athletes, even children, and evidence for its effectiveness appears to be scant.

At the discussion period after the main speakers had done their bit, I could not help myself and got up and explained that in New Zealand the pre-participation physical for young boys playing rugby entailed hopping on a set of scales to allocate them

to an appropriate weight category. Further selection of players into positions was done by the coach, who took due account of the player's physique and tried to match that with the demands of the position.

All in all, I believe it is a much more rational system than that pertaining in North America but they do have a legacy of medicolegal problems which overshadow the whole process. Yet another reason to live in Australasia rather than North America.

4. The fourth session that made a significant impression on me included a talk entitled The Immune System as an Indicator of Exercise Stress and Work Capacity given by Frank Mooren, a German doctor who has done heaps of research in the area.

His research has found that endurance training causes up-regulation of some genes in muscle and lymphocytes. He defines overtraining as an accumulation of physiological and psychological stressors which alters gene expression. Psychological stress may aggravate the stress load of an exercise stimulus. His research has found that there is a limited small pool of exercise related genes, numbering maybe 500 out of 50,000. White blood cell responses are highly variable, with the monocytes being highly sensitive and being responsible for the early phase response to exercise, whereas lymphocytes are less sensitive and are involved more with the later phase.

In summary, exercise leaves a fingerprint in immune cells and further research may well help coaches advise athletes more appropriately in the early phase of overreaching and prevent full-blown overtraining.

5. The Hough Memorial lecture was delivered by James G Garrick, an orthopaedic surgeon from San Francisco. It was entitled *The Child in Dance: the forgotten athlete*, and he drew on his experiences of many years with the San Francisco Ballet. He pointed out that with most young dancers, treating the parents is probably of more importance than treating the child, which is something that those of us who have seen young ballet dancers would attest to. He explained that there is a relatively small role for surgery and most conditions should be managed by activity modification. There are certain conditions, e.g. loss of dorsi flexion at the 1st MTP joint, that can be career threatening for professional dancers.
6. There was an interesting session on sleep and training in competition. Charles Samuels, a researcher from Calgary, talked about strategies to improve adaptation to competition in different time zones using a combination of light therapy and knowledge of the athlete's sleep-wake cycle garnered from detailed sleep logs. He tries to avoid medications if possible and aims for 70 hours of sleep per week in his adolescent athletes, i.e. ten hours per night on average. He tries to focus on the physical benefits of proper sleep and relates these back to performance. I came away thinking that the challenges faced by athletes in North America are chickenfeed compared with those faced by our Super 14 teams, for example, but there may be some wider application of the strategies he discussed.
7. The outcomes of the 2007 Exercise-Associated Hyponatremia Consensus Conference were presented by Winne Meeuwisse, a sports physician from Canada, who chaired the expert panel at the meeting in Queenstown last year. Hyponatremia is defined as a sodium concentration of less than 135 mmol/L. The big advance has been the widespread endorsement of the use of a bolus of 100ml of 3% sodium chloride in any athlete

with symptomatic hyponatremia. Previously there were concerns regarding osmotic dehydration but these have largely been laid to rest and the problems of hyponatremia are felt to be more significant.

There is a website entitled [www.overhydration.info](http://www.overhydration.info) that is a very useful resource containing the full consensus statement. Acknowledgement should go to ACSP Fellows Dale Speedy, Steve Reid and Paul Wharam who did a lot of the groundbreaking research in New Zealand.

8. I was a participant in one of the sessions on the final day entitled *How Sports Medicine is Practiced, Certified and Taught Around the World*. This was in combination with Professor Mark Batt from the UK and Renata Frankovich from Canada and Anne Boyd from the USA.

In general, there are more similarities than differences in the training of specialist clinicians in sport and exercise medicine but, in essence, we are in a very privileged position in New Zealand having had sport and exercise medicine accredited as a speciality in 1999 and reaccredited in 2007 by the Medical Council of New Zealand. In Australia SEM was finally recognised as a new medical speciality in 2007 and ACSP is currently seeking formal accreditation as the approved provider of training and assessment in this 'new' speciality across Australia and New Zealand, with a decision expected before the end of 2008. Other countries are still trying to achieve this aim and one of the initiatives that may come out of our session is a worldwide curriculum in sport and exercise medicine, which is being pursued actively by the Europeans later this year.

9. The final session of the conference was possibly the most enjoyable. It was entitled *Pardon the Sports Medicine Interruption – the take home messages*. This was chaired by Professor Doug McKeag and had as panellists Randy Eichner, who will be well-known to New Zealanders having spoken at the

SMNZ conference in Wellington about ten years ago. He was joined on the panel by Andrew Pipe from Canada plus Lee Rice, a sports physician from San Diego, and Brian Halpern from the Hospital for Special Surgery in New York.

Doug McKeag put a variety of scenarios to these experts and, in this particular instance, opinion trumped evidence and the session was all the more entertaining on account of that. About half an hour into the session beers were brought out for the panellists, but it took a South African expat living in Canada to prise the tops off the bottles without the need for a bottle opener.

The session finished amidst significant hilarity at about midday on the Saturday and I flew back on the Saturday evening.

I came away with the impression that Las Vegas represents a lot of what is best and worst about the USA but is a city that is worth visiting at least once in your life. Unfortunately, I did not get out to the Grand Canyon – about six hours' drive or one hour's flight away – but I understand this is a treat in store for a later visit.

All in all, I think we are relatively privileged in Australia and New Zealand to have a cadre of clinicians trained to a high level in the ACSP programme and available as resource people. The onus is on these people to show leadership in their respective communities and enhance the development of our discipline.

**Chris Milne**  
President, ACSP

**Chris Milne is a Sports Physician at the Anglesee Clinic, NZ**

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# Proposed changes to the national structure and operations of Sports Medicine Australia

Michael Kenihan

**In October 2007 the National Board directed the CEO to undertake a comprehensive review of all SMA operations affected by the National Office and how they might be re-organised to achieve greater efficiency and better long term outcomes for the Federation.**

This direction followed an extended period of consultation with members and other stakeholders in all states over the last 12 months and a keen observation of the functions, operation and structure of SMA. I with the other members of the SMA National Board Leadership team have sought the views of many of our stakeholders commencing with the Discipline Group heads in March 07. Since then, we have traveled the country, meeting with State members where we had “think tanks” about how best to position SMA for its role and function in the community in 2008. In fact we went back to basics to address what role we have, what we stand for and how we can best be relevant to our Members and the wider community.

These questions were asked of the attendees at the meeting of the ‘National Advisory Forum’ (NAF – a meeting of senior SMA members held every four years to provide long term advice and guidance). At that event past presidents, the Board and eminent members of SMA were invited to reflect on these questions and provide their own insights and responses.

While the organisation nationally has achieved considerable successes in recent years, with a much stronger national conference structure, greatly increased sponsorship revenue and new government and other corporate partnerships, there are still many challenges facing our organisation.

Some of the challenges are:

- clarifying a clear vision for the future
- ensuring continued strong leadership and direction
- providing appropriate structure to tackle many of the issues we face
- focusing on areas that should be our core business
- addressing a perception that we lack “one focus one voice”
- we have not outlined our value proposition clearly
- we have followed the directions of others rather than set our own direction.

It was agreed by the Board that we need to move forward in a new way.

This move forward has commenced!

Building on this consultation process and drawing on expertise from the National Board Business Advisers, your Leadership team and the Board have set a new Vision. We have refreshed the Mission and created Values that we think reflect how SMA will do what it does and recognize the work of those who are involved at the coal face of our actions. We have developed a “tag” line, we feel tells our stakeholders and our Community what we do.

To see the implementation of the above I believe it is time to review our structure and operations so we can move forward effectively, strongly and in a timely way that will secure our future and see us thrive over the next decade.

I will explain.

## **New Vision:**

Our Vision is now:

*“Sports Medicine Australia will build a vibrant community, including its members and other parties committed*

*to sharing knowledge, training and information to enhance the health of all Australians through facilitating their safe participation in sport and physical activity”*

The addition of community is saying that we will be more relevant to wider population that includes our Members plus others who share our commitment to the things that are important to SMA. The Vision now makes clear what we do *“enhance the health of all Australians through facilitating their safe participation in sports and physical activity”*.

## **The Mission:**

Little change has been made to the mission as it was seen that we still have the Mission our forefathers commenced with. We have made a couple of small changes by calling ourselves the “peak body” rather than “peak authority” and reinforcing elements of the Vision.

## **The Values:**

These reflect what we think is important and makes clear how we value the contributions of the many stakeholders, but also reinforces how we deal with those who are part of us, such as Sponsors, Government and other partners and stakeholders.

## **The “Tag” line:**

Our new tag line is:

Safety \* Prevention \* Advice

Why?

**Safety** reinforces that we have a commitment to the Safer Sports Program and Smartplay, we believe in making sure that all who participate in sport and physical activity are safe to do so and we assist them with strong policies and advocacy.



**Prevention** talks to our increasing role in the prevention of ill health in Australia via the encouragement of participation in Physical Activity. This also talks to the role our Members have in injury prevention.

**Advice** is important as it says we are there for whomever needs help in their pursuit of their participation of choice be it sports or other physical activities. The word “advice” also connects us with our members as we direct the wider community to them.

Our aim in making these changes is to clearly position SMA as the peak body for sport and physical activity safety, which includes both the preventative and treatment elements of the position, as well as an organisation promoting the health benefits of physical activity per se.

## Current problems with Structure and Operations

It also became clear to me during the consultation process that the current operations and structure of SMA could do with some changes and I will outline why:

- we are currently too dependant on the CEO who does not have a support structure that allows him to do his job effectively
- there is inadequate linkage between National and the States and it is tough for the States to achieve their local agenda and address the strategic issues of the organisation
- we operate as isolated silos and are not cohesive enough
- there is a distinct lack of opportunity for career development in the organisation
- we have focused on activities at times in the past that do not assist us to achieve our Vision and fulfill our Mission

## Moving Forward Now

The new Vision will lead us to focus on what is important to SMA. Presented opportunities will have to pass the filter of:

“Does this activity help us to achieve our new Vision, fulfill our Mission and reflect our Values?”

If not - then we will not focus on it.

The leadership team will inform stakeholders about the changes so far and outline the next steps we need to take to see structural and operational changes.

## Changes to Operations and Structure

The plan is to review our current operations and structure.

To do this we have decided to undertake a review of SMA structure and operations and evaluate their fit with desired long and short term outcomes. The review will recommend changes where considered necessary. The review will be conducted from 1st March 08 to 30th Jun 08 by our newly appointed General Manager, current SMA Victoria Executive Officer Mr. Nello Marino who will work halftime on this project.

Preliminary proposals to be evaluated by the review include:

1/ Relocate a number of the National Operational functions to the State Branches

The benefits:

- increased ownership and empowerment of the State Branches
- increased career opportunities
- operational portfolios/projects can be positioned where the expertise is
- stronger working relationships between National and States
- increased transparency and accountability for both
- potential cost savings

2/ Create a virtual National Office with physical needs met from State branches, certain portfolios placed in other state branches as appropriate and a beefed up executive capacity through the appointment of the General Manager.

Benefit:

- reduce duplication of operations
- share facilities will enable cost savings
- more money for programs
- better support of sponsors
- the selling and Public Relations of SMA is better accessed

3/ Renewed focus on what is very important to SMA such as selling our new vision, promoting the Safer Sports Program, Smartplay and other projects that need to be prioritised.

It is proposed that following the review, Nello Marino will be appointed to the position of National General Manager with direct responsibility for implementing this process and supervising the operation of the new structure. The appointment of Nello follows extensive advertising

for a General Manager widely in National Papers and internally within SMA. It is consistent with our new philosophy of hiring the best candidate for major national portfolios regardless of their location.

These plans do not come risk free. We could lose key staff at inconvenient times; the proposals may not be accepted by or receive the cooperation of all state branches; there will certainly be bureaucratic obstacles that may seem overly difficult; most importantly, the plans may not be financially sustainable in the long term. The General Manager has been asked to address all of these points in his review.

## Role of Reviewer (March – June 2008)

Outline all necessary details required to construct the new structure and ensure a smooth transition. The process will include:

- scoping of the current roles and activities located at national and State branches
- assess the capacity for States to absorb National projects, programs and portfolios
- identify State branches with the most suitable capacity to deliver National programs
- identify program personnel across the organisation to deliver programs
- identify requirements of decentralisation including relocation, IT, accommodation, storage, infrastructure and other associated logistical requirements
- identification of potential cost savings to be made
- develop suitable program management plans and associated agreements for all National programs and projects
- negotiate placement of programs and projects to most suited locations

The above, including the performance of the General Manager, will be reviewed by the Board and hopefully gain their assent before implementation commences in July 08.

We commend these plans to you and ask for your support of the process.

**Michael Kenihan is the President of Sports Medicine Australia**

Michael.kenihan@lifecare.com.au

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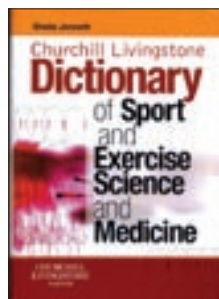
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# Autumn Readings



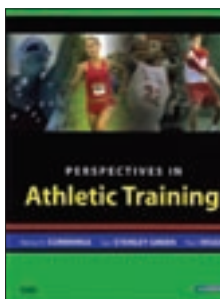
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For more information, to register, or to submit an abstract please visit [www.smaql.com.au](http://www.smaql.com.au), phone 07 3367 2700, or email [mbrown@sportsmedicine.com.au](mailto:mbrown@sportsmedicine.com.au)



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