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Publisher

Sports Medicine Australia
PO Box 78 Mitchell ACT 2911
sma.org.au

Circulation: 4000
ISSN No. 1032-5662

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SUBSCRIPTION RATES

Australia A\$40
Overseas A\$60

SMA members receive *Sport Health* as part of their membership fee

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

PP No. 226480/00028

For subscriptions contact
T (02) 8116 9815

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Cover photograph – www.istockphoto.com

Content photographs – www.istockphoto.com



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Your SMA MEMBERSHIP and PROFESSIONAL DEVELOPMENT

Expanding your sports medicine knowledge and your industry contacts are critical parts of building a successful and rewarding career in sports medicine.

SMA membership provides many opportunities to engage with other practitioners from a range of disciplines, build your networks, and expand your sports medicine skills and knowledge. Here are some of the upcoming SMA professional development opportunities:

Asics Conference of Science and Medicine in Sport

The latest in sports medicine, sports science, physical activity and injury prevention research and practice combined with the best professional development and networking opportunities all whilst you sip on a cocktail and enjoy the surrounds of Phuket, Thailand! This year will also celebrate Sports Medicine Australia turning 50. Dates are October 22-25, 2013. For more visit acsms.sma.org.au

State conferences, seminars, workshops, and evenings

All SMA state branches provide a diverse range of professional development and information sharing opportunities to suit the multidisciplinary nature of SMA members. All sessions are delivered by leaders in their field and provide a great opportunity to connect with a diverse range of practitioners and to share in the latest cutting edge research and clinical practice.



View SMA MEMBER PROFESSIONAL DEVELOPMENT OPPORTUNITIES at sma.org.au



The year ahead



Nello Marino is pictured with a Playsafe Mouthguard, recommended by Sports Medicine Australia. For more information on this product visit playsafemouthguards.com.au

If you have a worthy cause or issue related to sports medicine or physical activity that you would like promoted in *Sport Health* via a promotional item email nello.marino@sma.org.au

SMA CEO, Nello Marino welcomes us into what will be a memorable year for SMA.

Happy New Year and welcome to 2013. Many of you that are familiar with my previous articles would know that I love delving into the history of SMA to help me to understand how it has shaped us into what we are today. 2013 will see SMA celebrate 50 years and provide an opportunity for reflection on the mighty efforts of those that moulded our organisation in its formative years and beyond.

A number of special events have been planned for 2013 to celebrate the 50 year milestone beginning with a dinner arranged by the SMA ACT Branch which coincided with the ACT Conference of Science and Medicine in Sport. Additional celebratory and member events are in the pipeline and will be revealed as soon as they are finalised. Stay tuned.

It's rather serendipitous that it is the same year at which members will make a critical decision on the future of SMA when they cast their vote on OneSMA. As previously indicated, OneSMA is a proposal to streamline the governance structure of SMA.

“2013 will see SMA celebrate 50 years and provide an opportunity for reflection on the mighty efforts of those that moulded our organisation in its formative years and beyond.”

“A range of OneSMA documents and information is available at a specially formed blog www.onesmablog.com”

Members will be asked to vote on OneSMA at an extraordinary general meeting on June 26 of this year. The ballot will be managed by the Australian Electoral Commission to ensure it is conducted independently.

In the meantime a range of OneSMA documents and information is available at a specially formed blog (www.onesmablog.com) which has been developed as the key consultation forum for members on the proposal, which to date has been largely discussed at the National and State Board level. All members will receive summary information on the proposal and additional detail will be available online.

Naturally we encourage members to vote in favour of the new structure which the National Board believes will equip the organisation for the challenges of the future and we strongly encourage all members to read the available documents (or at the very least, the highlight documents) and to have their say via the blog or email. Whilst the blog is available for anyone to read, only current members' comments and suggestions will be published on the site. Anonymous comments and suggestions will not be published. Therefore, we encourage you to ensure you are a member if you want your voice to be heard.

Nello Marino

Chief Executive Officer
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Follow SMA CEO Nello Marino on Twitter @smaceo

As we go further into 2013, some may feel pressured about NYE resolutions that are not being achieved. Click for help! <http://bit.ly/10g6ayX> – January 22, 2013

Have you liked our SMA Facebook page and joined our ever expanding online community? Like, you won't be disappointed! <http://on.fb.me/ULOKE8> – January 10, 2013

It is good and bad news! Australians are living longer but diabetes and other diseases are taking a toll on our health. <http://bit.ly/RB1YpC> – December 18, 2012

Want to watch keynote presentations you missed at be active 2012, including Refshauge lecturer Karim Khan? Click here! <http://bit.ly/WHP7ON> – December 5, 2012

Member news for 2013

OneSMA – the vote

An SMA Member vote on OneSMA is to be scheduled via an extraordinary general meeting on June 26, 2013. Sports Medicine Australia has engaged the Australian Electoral Commission to assist with the mechanics of the vote.

SMA celebrates 50 years

2013 marks the year that Sports Medicine Australia celebrates its 50th birthday. Various state branches will be holding events to celebrate how far the organisation has come since 1963 with details to appear on sma.org.au.

British Journal of Sports Medicine

As part of SMA's new partnership with the *British Journal of Sports Medicine* (BJSM), SMA Full Professional Members will receive this publication online as part of their membership.

2013 ACT Science and Medicine in Sport Conference

The ACT Branch recently held a conference in Canberra to celebrate the Centenary of Canberra and SMA's 50th birthday. Guest speakers included Robert de Castella, Olympic Marathon Runner and Professor Karim Khan, *British Journal of Sports Medicine* Editor with sessions focusing on the future challenges in sports medicine, the evolution of ethics in sports medicine, current trends in physical therapy research, management of injury panel, dietary supplementation, and advancement in sports medicine and science, to name a few. Check out information, videos and photos from the conference at actconferenceblog.com



Journal of Science and Medicine in Sport freely available articles

Check out the following highlights from the January 2013 issue available freely at jsams.org

- The use of the dual-task paradigm in detecting gait performance deficits following a sports-related concussion: A systematic review and meta-analysis
Pages 2–7
Hopin Lee, S. John Sullivan, Anthony G. Schneiders
- Contribution to autonomic dysfunction to abnormal exercise blood pressure in type 2 diabetes mellitus
Pages 8–12
Kassia S. Weston, Julian W. Sacre, Christine L. Jellis, Jeff S. Coombes
- Tibiofemoral and patellofemoral mechanics are altered at small knee flexion angles in people with patellofemoral pain
Pages 13–17
Gretchen B. Salsich, William H. Perman

Social media channels

Stay engaged with the latest happenings of Sports Medicine Australia via the following social media channels:

Twitter: @smaceo

Facebook: search Sports Medicine Australia

LinkedIn: search Sports Medicine Australia

Asics Conference of Science and Medicine in Sport, October 22–25, 2013

Sun? Check. Tropical location? Check. Latest research? Check. Interesting keynote speakers? Check. Jam packed social program? Check. The Asics Conference of Science and Medicine in Sport is one conference you don't want to miss out on in 2013.

Held every year for professionals with an interest or involvement in sports medicine, sports science, physical activity promotion and sports injury prevention, this year's conference will offer the latest industry research and practice combined with the best professional development and networking opportunities, all whilst you sip on a cocktail and enjoy the surrounds of Phuket, Thailand!

This year will also celebrate Sports Medicine Australia turning 50 and what better way to celebrate this milestone than to be a guest at the Hilton Phuket Arcadia Resort and Spa and make the most of the local south-east Asian attractions and delicacies.

For more information about abstract submissions, speakers, the social program, trade and sponsorship opportunities, member professional educational points and to register your interest, visit acsms.sma.org.au



2012 SMA Research Foundation Grant Winners

Congratulations to the following successful recipients of the 2012 SMA Research Foundation Grants. These awards are designed to support research conducted by postgraduate students and postgraduate practitioners for the purpose of advancing research in sports medicine and its relationship with disease prevention:

- Llion Roberts (University of Queensland) – An investigation into the effects and mechanisms of cold water immersion on the recovery of muscle function after intense resistance training.
- Harvi Hart (University of Melbourne) – The effects of targeted brace in people with post-traumatic knee osteoarthritis (OA) after anterior cruciate ligament (ACL) reconstruction.
- Michael Kakanis (Bond University) – Mucosal immunity responses to prolonged heavy exercise and subsequent recovery.
- Christina Ekegren (Monash University) – Factors influencing uptake and use of an online injury surveillance system within community Australian football clubs.
- Mark Opar (La Trobe University) – Diagnosis and risk factors of exercise related pubic pain.
- Luke Vella (Deakin University) – Profiling the human eicosanoid response to acute resistance exercise in skeletal muscle tissue.

Applications for the 2013 SMA Research Foundation Grant Winners will be open at the end of May.

5 minutes with... Harvi Hart

2012 SMA Research Foundation Grant winner and 2012 Asics Ken Maguire Award for Best New Investigator – Clinical Sports Medicine



Harvi Hart receiving the 2012 Asics Ken Maguire Award for Best New Investigator – Clinical Sports Medicine from ASMF Fellows President, Tim Pain.

What is your profession?

I have been a full-time PhD student at The University of Melbourne for the past two years.

What does your typical day consist of?

My workload varies day to day, but it always starts with a large latte with one sugar. Some days I spend catching up on reading, while other days I am either testing participants or processing data. Currently, the focus is on participant recruitment so I answer a dozen of emails, spend a lot of time on the phone and brainstorm for possible participant recruitment strategies. Towards the end of the day I try to focus on writing for a few hours.

I also have a part-time job, but I always squeeze in some time for kickboxing.

What is your favourite aspect of your job?

The opportunities to keep learning new things and work with a fantastic research team (KOALA) who share a passion for conducting clinically relevant research. And of course, the opportunities to attend conferences in Thailand...

What has been the highlight of your career?

Winning the Asics Ken Maguire Award for Best New Investigator – Clinical Sports Medicine and the SMA Research Foundation Grant in 2012.

When, why and how did you become involved with SMA?

My supervisors Associate Kay Crossley and Dr Natalie Collins encouraged me to get involved with SMA. I attended my first SMA conference last year, and I had the opportunity to present two papers from my PhD research.

Can you give us an insight into the research that won you a 2012 Research Foundation Grant?

My PhD research is focusing on a group of individuals with post-traumatic knee osteoarthritis (OA) after anterior cruciate ligament (ACLR) who are largely under-researched. We have identified important psychosocial impairments, lack of knee confidence and kinesiophobia (fear of injury due to movement) in individuals with knee OA after ACLR. My research focus is now on interventions with the potential to restore knee kinematics, reduce pain, improve psychosocial impairments, and function in people with knee OA after ACLR. The research will reveal whether a targeted knee brace can modulate lower limb biomechanics in these individuals. If this unique brace can modulate knee biomechanics, it may have the capacity to reduce knee pain, improve function, and thus improve quality of life in young individuals with knee OA after ACLR.

What is the next step with this research?

We are currently evaluating the effect of targeted brace on knee biomechanics in individuals who have developed knee OA after ACLR. The next step is to conduct a randomised controlled trial to evaluate the effect of brace on pain, symptoms, psychosocial impairments and function in these younger individuals.

What are you passionate about?

I am passionate about knowledge. If I find something fascinating then I have to learn more about it.

What's the best piece of advice anyone has ever given you?

Come to accept challenges and not fear them.



Name four people, living or not, you would invite for a dinner party and why?

Oscar Wilde, *"I was working on the proof of one my poems all the morning, and took out a comma. In the afternoon I put it back again"*.

Sir Roger Penrose, it would be the most fascinating discussion of my life.

Bob Marley, *"Everything that I do shall be upful and right"*.

Morgan Freeman, to narrate the dinner party.

Favourites

Travel destination: Mauritius.

Sport to play/watch: Ice hockey.

Cuisine: Brinner... pancakes with bacon and ice cream for dinner.

Movie: The Dark Knight Rises.

Song: Heroes by David Bowie.

Book: The Name of Wind by Patrick Rothfuss.

Gadget: MacBook.

Have you had an ACL reconstruction 5 to 20 years ago?

If you are aged 23 to 50 years and had an ACL reconstruction 5 to 20 years ago, we are seeking volunteers for the knee brace study. For further information, please contact Harvi Hart (phone 03 8344 3910 or email h.hart@student.unimelb.edu.au).

Twitter is anything but trivial



Dr J draws on his experience in the realm of ‘new’ media and explains why this sphere offers public health an advantageous platform.

As an experienced conference attendee, I have come to realise that gems you pick up at these events are rare but highly worthwhile. You may as well hold a conference in a nice venue to ensure the overall experience is positive, as many of the sessions will come across as routine to the audience (although confirmation of what you thought you already knew is not always a bad thing). You only need a handful of jaw-dropping moments, though, at any conference to have made the trouble of visiting worthwhile. As the experienced know, these moments may be just as likely to occur during question time, at a conversation during a poster session, at dinner or even by the pool than they necessarily are during the podium presentations.

“When you open a Twitter account you are handing yourself a very sharp knife and if you have the urge to use it to stab yourself and others rather than slice food, then you shouldn’t be using the knife in the first place.”

At the recent *International Conference of Physical Activity and Public Health*, which happened to coincide with a very successful Sports Medicine Australia conference in Sydney, my biggest jaw-dropping moment didn’t involve anything that anyone actually said. It was simply the experience of being at the Social Media session and seeing people continue to pack into the room well after all of the seats were taken. None of the speakers (myself included) said anything particularly brilliant, but it was an occasion when you could feel a paradigm shift in the air, that sports medicine and public health practitioners were fascinated by the social media phenomenon on a professional

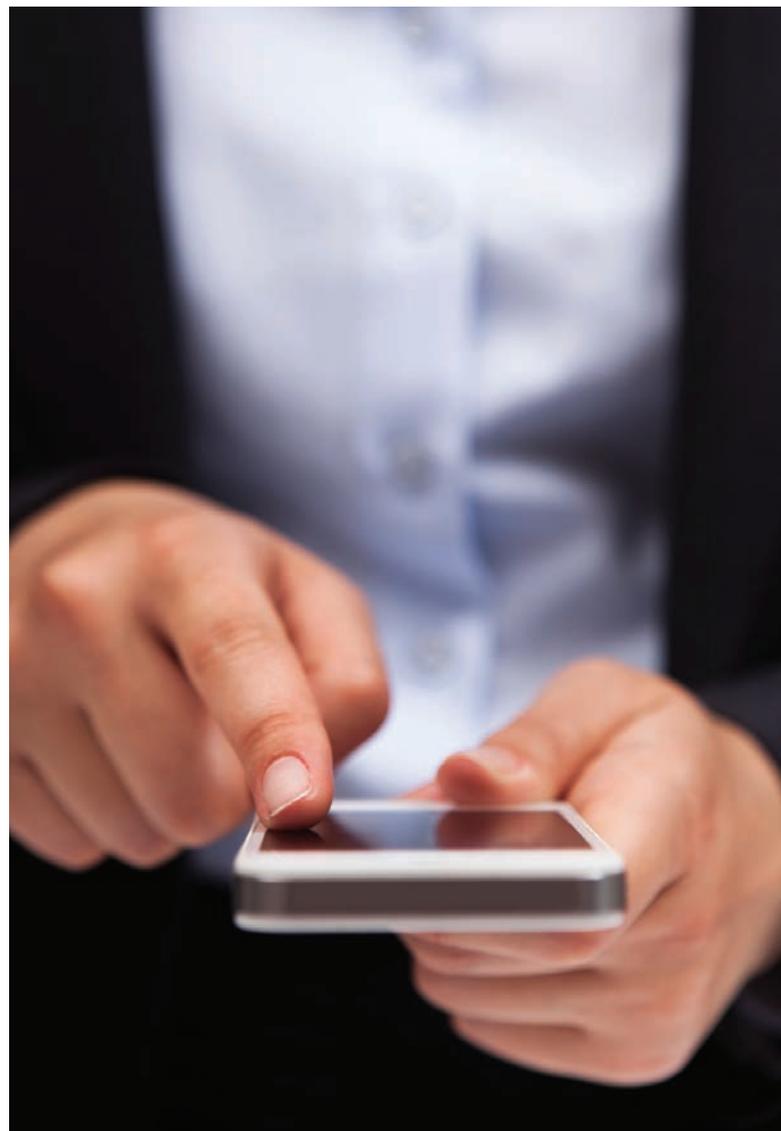
(as opposed to personal) level. It is amazing to think that when I wrote my first Dr J column (1993) no one was really using the internet. Since then we have seen the baton for the pre-eminent IT company being passed from Microsoft to Google to Apple to Facebook and, now, to Twitter. As sports medicos, we will soon view the word 'Twitter' in the same light as Tennis Elbow or Morton's Neuroma. That is, something that we need an equally good mastery of and, also, something that is a misnomer which belies the true underlying nature. Twitter is a self-deprecating name which suggests that it is a time-waster. It can be, but it can also be revolutionary. Enough people were starting to 'get it' to pack out the Social Media session at the recent conference.

“Social media is potentially a massive platform for public health and needs to be used, as those with opposing views will be using it.”

Sports medicine practitioners and team medical staff (in particular) have generally endured a love-hate relationship with the media throughout their careers. For many people, it has been more hate than love. Twitter is the platform that I believe will hopefully spin the balance around to being more love and less hate, which in turn will mean that sports medicine can use the power of all media (new and old) to much greater effect.

Everyone who has worked with a high-profile sporting team can tell their own horror story about the media. The most famous of mine (of which there are a few to choose from) was the so-called 'staple gun' incident, in which I stapled the head of a NSW State of Origin player on the field during a pause for a video referee decision. A decade later I can put my hand on my heart and swear that my primary motivation for using the staple gun on the field was (with the blessing of the coach) to prevent our team from having to use up a limited resource (interchanges) early in the match on an outside back who wasn't in need of a rest. However the story of course was painted in a different way. According to many in the media, the staple gun was used to 'get on TV' and, by implication, I was putting attention-seeking behaviour over optimal medical management. The problem with this accusation is that it is a self-fulfilling prophecy, in that it is either left unanswered (and implied as true) or I have to engage in more attention-seeking behaviour (speaking to journalists) in order to argue the case to the contrary. The rule under the old media is that in this circumstance you are likely to get shafted. If you speak to journalists, they are likely to ignore the convoluted explanation of wingers needing to stay on the field

so your forwards get a rest, and concentrate on making you look like an idiot by simply quoting you in the media saying *“I didn't do this for media exposure”*. Journalists will tend to buck-pass to editors (*“I tried to include more of your quotes, but the sub-editor cut out everything except the one which now appears as a back page headline, and you can't complain because I have you on tape saying it”*). Many experienced doctors and physios, having been trapped in such a fashion once, have vowed in the past to never speak to the media again. It is sensible self-preservation but it leads to sports medicine lacking the prominence it might otherwise have if we all felt we had the ability to freely express our opinions without them being twisted.



Facebook



Twitter



“Twitter is the platform that I believe will mean that sports medicine can use the power of all media (new and old) to much greater effect.”

Cue Twitter and the ‘new’ media. The revolution is that you control the context and you maintain a right of reply and clarification of your words at all times. You can still be hoisted by your own petard if you are silly enough, but with Twitter you’ll only have yourself to blame. You choose your 140 character ‘bite’ yourself rather than have it cut for you by a sub-editor from a full-length interview. If (as a team official) you call a specific referee or umpire a cheat because of a decision he just made against your football team, in public (which is what Twitter is), then prepare to live a few moments in the shoes of Alan Jones, David Campese or whoever was the latest fool (before you) to be held up for humiliation for saying something outrageously stupid. When you open a Twitter account you are handing yourself a very sharp knife and if you have the urge to use it to stab yourself and others rather than slice food, then you shouldn’t be using the knife in the first place. Many people will take this approach to Twitter and be too scared to ever tweet, but within a few years they may end up feeling like they don’t have a drivers licence when everyone else does.

“Given that new media is a publication, ‘publish or perish’ may be to sports medicine professionals in the future what it is to academics today.”

I think I was 30 when I first started using the internet, whereas my young boy first called me on Skype when he was 18 months old. As parents we have had concerns about him being addicted to certain iPad apps before the age of two. However, this addiction has led to him learning the alphabet, shapes, colours and animal noises at a much younger age than his parents did. His generation will grow up getting lessons in responsible use of social media from a very young age. As a member of the older generation, you either teach yourself to do so, or risk becoming a dinosaur by not engaging.

So how does the new media function for a team doctor or physio? This year the closest I have come to stabbing myself with the knife (but fortunately ended up, I think, with a sliced loaf of bread) was when I tweeted about an opposition NRL coach. The coach, who is one of the best in the business, was making typical coach comments about one of his players. The player had recently knocked an opponent unconscious

with a tackle deemed illegal (as those shoulders forcefully to the head tackles tended to be in the NRL in 2012) and he had failed in an appeal to have his one week suspension overturned. The coach gave a rant to the media about how unjust the decision was (which is what coaches do) and the journos gave the rant a good deal of column space (which is what the media does). My tweet (which I won’t quote verbatim since I deleted it) suggested that the coach (who doesn’t have a Twitter account himself) was fitting the stereotype of being far more concerned with winning than he was with player safety. Without expecting it, I soon received a phone call from a newspaper journalist commenting that I had made a big call publicly bagging an opposition coach for not being concerned about player safety. Yes it was a big call, but it actually was quite a reasonable thing for a doctor to say. Just as you might expect a coach to express public disappointment when one of his players is suspended, why shouldn’t you expect a doctor to publicly support the decision to declare that knocking an opponent unconscious with the shoulder was correctly determined to be an illegal tackle? With Twitter I was able to clarify why I said what I did (which included deleting the original tweet and replacing it with a comment that was more general than personal). The clarification was that I wasn’t implying that the coach had zero interest in safety but just that he had more interest in having his players available for selection (which makes sense as he is a coach, not a rule-maker). I soon spoke to the coach on the phone and reported back to the original journo that we had sorted out any misunderstanding about the original tweet (which included an apology/clarification from me), but that we did agree to disagree on whether a shoulder contacting the head should automatically be an illegal tackle. This exchange did make the newspapers the next day, but to my surprise I was quite happy with the eventual presentation of the story (whereas with ‘old media’ you expect more of a sense of dread thinking you’ll be quoted). The picture was one of a coach doing his job well (advocating for his player) clashing with a doctor doing his job well (advocating for player safety in general). What was unusual about the picture was that the coach is expected to be ranting in the papers, but the doctor isn’t. This has been the reality, but it is part of the reason why it has taken so long for shoulder charges to the head to be eliminated from rugby league (i.e. that the voice of coaches is 100x louder than the voice of doctors). New media allows doctors to have a knife (compared of course, metaphorically, to the nuclear bomb that coaches have) and if we use it we can have more of a positive influence. I would like to think I have helped make



rugby league a better sport in the longer-term by contributing to the demise of the shoulder charge, even though many players and fans used new media to express their views to the contrary. I can certainly see the valid argument of those who love the spectacle of a hard shoulder hit to the body and regret its demise. Some of the fans who particularly regret it have abused me directly on Twitter (something you also have to put up with if you want to be opinionated). Again you have the option here of deleting your Twitter account, blocking the account of the abuser, or (as I have done a few times) retweeting the abuse and offering a rational reply of why you believe that the shoulder charge needed to be banned.

“As sports medicos, we will soon view the word ‘Twitter’ in the same light as Tennis Elbow or Morton’s Neuroma.”

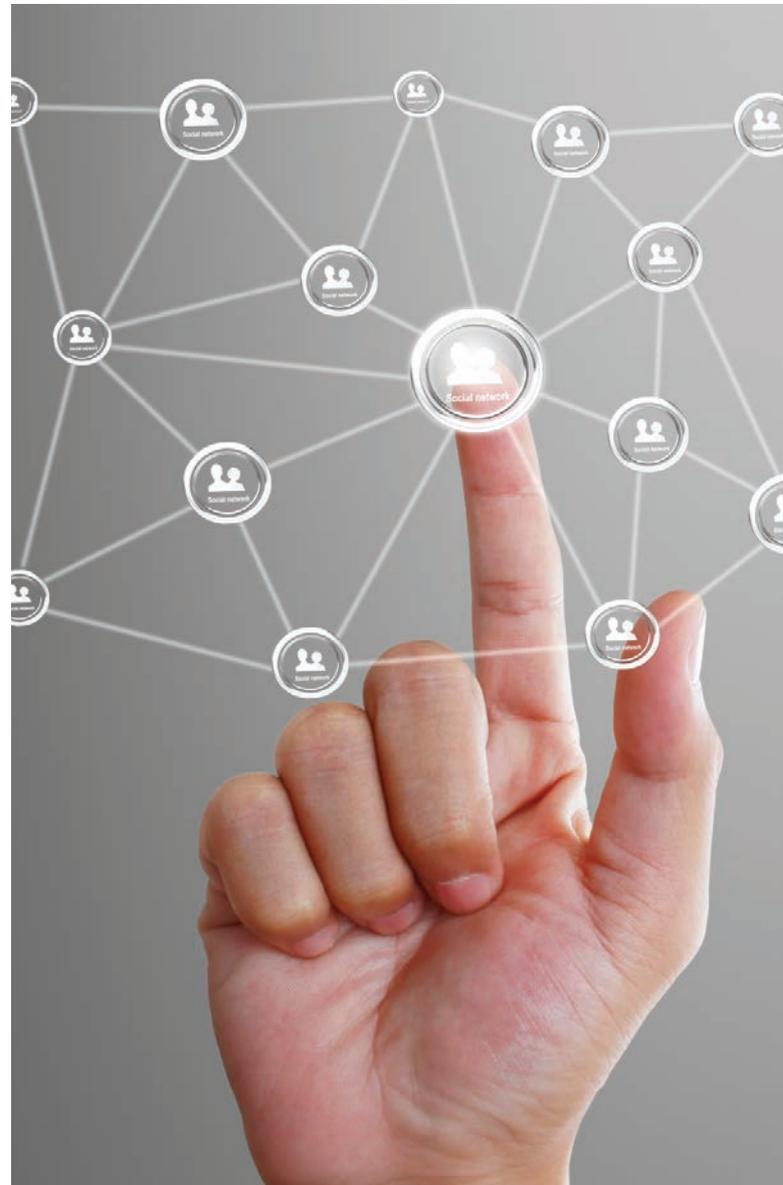
Like everything else, Twitter gets more publicity when things go pear-shaped than when they go well, but when you join and start making comments you notice the positive side on

a regular basis. I retweeted a story about the Cronulla Sharks being successful in a development application which will lead to a new funding stream that should ensure their long-term future. I also tweeted a congratulatory message to the Sharks chairman, Damian Irvine. The previous interaction I had with Damian was less positive. Before I was on Twitter, I had gatecrashed a press conference after a Roosters-Sharks game at their home ground, making a (very legitimate) complaint about the removal of the medical room in the away change rooms. We had a few serious injuries in that game that were not able to be treated optimally because of a lack of space and facilities, and I wanted to get the message through loud and clear that it wasn’t good enough. Being old media, the story was reported as being half about poor medical facilities and half about a doctor inappropriately speaking at a coaches’ post-match conference. It was the price I paid for getting attention to something that I felt warranted focus, although at the time Cronulla came across as being highly aggrieved by my method for doing so. Back to the land of

new media, and Damian Irvine retweeted my thanks and tweeted back to me to say *“you’ve seen first-hand how tough our club has been doing it without the necessary funding, thanks for your best wishes and support”*. If the original exchange about the lack of medical facilities had have been done via Twitter than through old media, I could have more clearly made the point that I wasn’t being anti-Cronulla with my opinion, but, again, simply pro-player safety.

“As a member of the older generation, you either teach yourself to do so, or risk becoming a dinosaur by not engaging.”

The issues of player safety versus entertainment, or player safety versus expediency are analogous to many others being played out in social media currently. Old media is occasionally putting up its hand and admitting that sometimes it misreads the public mood after seeing the reaction on social media. A famous example in 2012 was the Julia Gillard ‘sexism rant’ to Abbott in parliament, which the Canberra press gallery wrote up as merely a continuation of gutter politics. The rant however ‘went viral’ on social media and changed the momentum of the polls where Gillard was getting thrashed. Twitter and social media in general are contributing to gun control in the USA and fighting racism and sexism in Australia. Social media is potentially a massive platform for public health and needs to be used, as those with opposing views will be using it. To achieve public health benefits, it is often necessary to regulate in a fashion that may be unpopular or controversial at the time. We can look back on issues such as cigarette smoking indoors, random breath tests and seat belt laws as simply necessary social change, but fail to appreciate the huge amount of lobbying that was required to get these changes approved. Watching the gun control debate in the USA is an eye-opener (and if you are on Twitter you can get involved by commenting and/or retweeting). It makes you consider that the Port Arthur massacre in Australia actually has saved more lives than were lost by horrifying our politicians into radical safety reform, the benefits which we are still reaping today. We (sadly) know the names of the lives lost at Port Arthur, but we don’t know the names of those who would have died since had automatic weapons remained legal in Australia. Just as we don’t know the names of players who won’t get concussed in future NRL matches because there are fewer ‘shoulder charges gone wrong’. What has been lost may be more visible than what will be gained. Although there are many members of the public who hate the ‘nanny-state’ approach, I believe that most



public health changes represent progress towards a better society. This progress and change will potentially occur even more quickly in the era of ‘new media’, but so will the backlash against change. Sports medicine won’t be spared and being a ‘new’ health field itself, we will all probably need to get acquainted very quickly. Given that new media is a publication, ‘publish or perish’ may be to sports medicine professionals in the future what it is to academics today.

Dr J

The opinions expressed in Dr J are the personal opinions of the author.

Athletic groin pain: what the stars have taught us



Michael Drew, Senior Sports Physiotherapist explains how the stars have influenced our knowledge of athletic groin pain.

There has been increasing amounts of research into groin pain in the last three decades while astronomers have been studying the stars, planets and moons for thousands of years. On reflecting on some of these great astronomical discovers one can find similarities to the groin pain literature and its journey to present day. When researching the background for this article I consulted Dr Google, like many of us do, and searched 'Top 10 discoveries in Astronomy'. Close to two million results appeared. Searching 'groin pain athletes' will elucidate nearly the same amount. More pertinent to this article is highlighting the fact that there is a plethora of information about groin pain in athletes. On closer inspection, both searches exhibit disagreement and poor clarity of definitions for what is deemed as being important. This editorial will try to explain how the stars have influenced our knowledge of athletic groin pain.

Like all good stories I will start at the end. In 2005, a small lump of rock was found in the nether regions of our solar system; it was named Eris. Eris created quite a stir, not because it in itself was a great feat of discovery but more so because it prompted the scientific committee (called the International Astronomical Union) to define what a planet is. For the lay person, like me, this became a rude and confronting fact: that my favourite planet, Pluto, was no longer a planet but now, by definition, a dwarf planet of lesser importance. This however, is positive. Without defining this now demoted planet as less important through a strict criterion, researchers would have continued to waste time and money. This knowledge, along with the revelation of extra solar planets first found in 1985, has led to further discoveries of new planets which could someday be shown to hold life. I believe that we are at this point with our research into groin pain – we need to classify. We need to have consensus and we need to move on.

“By examining the work of Hubble and Einstein and relating this to groin pain in athletes we should challenge our beliefs and back our theories with hard data.”

This discovery and many others have been due to Edwin Hubble and the telescope that now endures his name. In the 1920's, he discovered that the distant nebulae were in fact other galaxies. It has been well established that remote pathology can be a driver of groin pain (such as the hip or lumbar region) and through innovations and advancement in technology we can now image distant structures that have impact on symptoms; much like Newton's laws state that all matter attracts every other piece of matter proportional to force and distance. Hubble's greatest discovery was that the universe was expanding; this was achieved by measuring the speeds of planets and found that the distant planets are accelerating away at a greater speed. Without accurate measurement and calculations this astonishing fact would remain unknown. Of recent years, several methods of hip dynamometry have been established to be reliable and of great clinical use in rehabilitation. Similar to many laws of physics, it seems that a ratio exists between agonist and antagonist in this region which also vary depending on the positioning and joint angle. Accurate measurement leads to accurate rehabilitation.

Prior to Hubble, a brilliant man, who unfortunately never had time for a haircut but would not have looked out of place in November, had successfully answered some questions that Newton's laws failed to answer. He introduced the two theories of relativity and in doing so, achieved two things. He made the world challenge beliefs once thought to be unchangeable

and constant. Time. Secondly, he showed the importance of relatives. Recent advances in genetics have shown that certain polymorphisms of the human genome have been linked to tendinopathies. However, this is yet to be established in athletes with groin pain. By examining the work of Hubble and Einstein and relating this to groin pain in athletes we should challenge our beliefs and back our theories with hard data. As Edward Deeming, Professor and Statistician, once said, *“In God we trust, all others [must] bring data”*

“I believe that we are at this point with our research into groin pain – we need to classify. We need to have consensus and we need to move on.”

Brother and sister duo, William and Carolyn Herschel were the first to map the gigantic disc of stars called the Milky Way. Several studies in the groin have attempted to map imaging findings however, inconsistent terminology and lack of correlation to clinical assessment findings and symptomology limit their use in daily practice. The siblings’ structure and consistency could be used in the groin literature. Furthermore, the duo showed that the galaxy is not merely a cluster of stars but an organised array of solar systems. While no meagre feat having mapped 90,000 stars, their finding of galactic proportions was that the sun is not central to the galaxy. A concept many stars have trouble with.

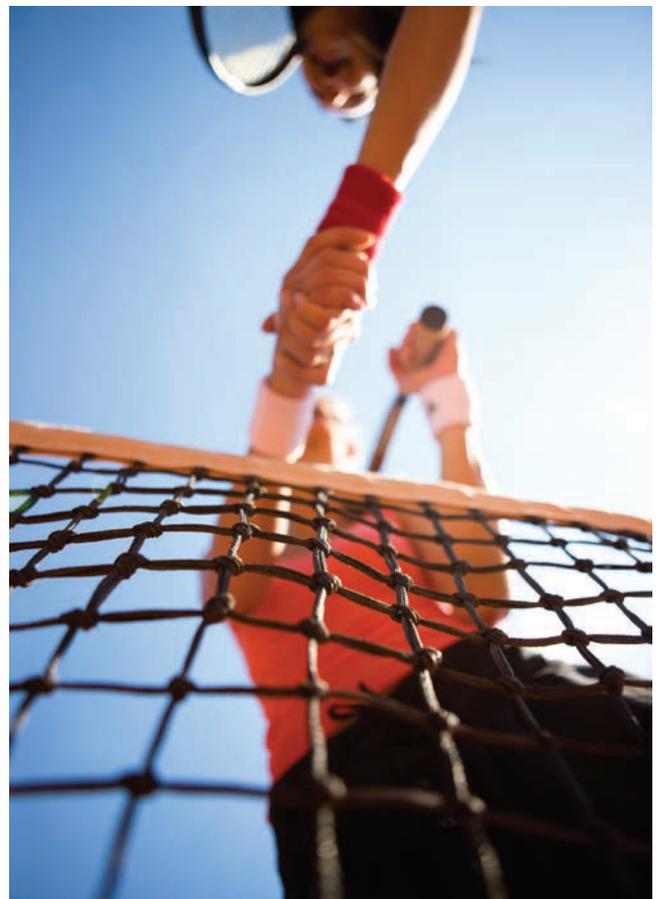
Halley’s Comet orbits the sun as does the planets. Edmund Halley was able to show that the comet observed in 1531 and 1607, is the same comet and thus predict its future arrival. Sadly, Halley did not survive long enough to see the comet again. Recent research has shown that previous injury is a major risk factor for subsequent injury; a common finding in other areas of the body. Galileo earlier had proven moons revolve around planets and thus planets revolve around the sun, forming the basis for Halley, there is much to be learnt about the groin region from the literature already proven elsewhere in the body. Early research into the anatomy and histology of the region are sparking debate through comparisons with the Achilles and patella tendinopathy literature, which at current far outweigh the groin literature.

Galileo also highlights one key point for rehabilitation of the groin injured athlete; the solar system revolves around the star. Holmich’s article in the Lancet shows clearly that exercise therapy is more effective than passive treatment. In other words, the star is central to the rehabilitation while the systems around them merely influence them relative to their distance and ability to pull (albeit equally and usually opposite).

And thus, we arrive at the beginning. Thousands of years of keen observation, patience, pattern recognition and a driving curiosity revealed that the stars that glide through the night are separate to our planet. We should reflect on this and note that that the stars at night are constant; as are injury rates in professional sports. We need to continue the path of discovery; building on what is known and trying to answer the known unknowns, while having the courage to challenge beliefs.

Where the comparisons stop is with the loads we place our athletes under. There is limited research into the area of load quantification and the onset of groin injury. One study has shown that lower pre-season training is associated with groin injury as is a decreased volume of training prior to entering an institute program and more than one game per week. Clinically, we see this in almost all cases or at least a rapid change of load, equipment, or the like.

The groin literature currently is in Galileo’s time; however, as attested by the astronomer’s story, there are discoveries of galactic size around the corner. Let’s just hope they take less time to be revealed.



Athletic groin pain:

Pubic origins, relationship to the hip joint, and associated risk factors



Physiotherapists Andrew Wallis, Joanne Kemp and Mark Opar highlight that hip and groin symptoms are intimately related when groin pain presents and both need to be assessed in athletes.

Hip and groin pain has been explored in greater depth over the last two decades. It appears athletes presenting with groin pain can be broadly grouped into two main categories, which in most cases overlap. This article explores exercise-related central pubic pain, hip morphology and its relationship in this population and the risk factors associated with developing groin pain.

“Groin pain can certainly exist without hip symptoms or pathology; however the hip joint is often implicated in athletes with groin pain.”

Exercise related central pubic pain, with Andrew Wallis

Traditionally over the last twenty years, chronic groin pathology has been attributed to three main diagnoses – osteitis pubis, adductor tendinopathy and Sportsman’s hernia. More recently literature has focused on the contribution of hip pathology to central groin pain. Groin pain has conventionally been linked to sports that involve running, agility and repetitive kicking. Multiple pathology is a common finding and consequently diagnosis is often difficult (1–3). Diagnosis may be further compounded by the chronic nature of many presenting complaints and complex anatomy of the region (4–6).

Although it is recognised that the source of groin pain may be the lumbar spine, inguinal canal, hip or various neuropathic presentations this article aims to classify musculoskeletal pathology of the pubic bone, pubic symphysis and surrounding attachments. The somewhat vague diagnosis of ‘osteitis pubis’ does little to provide clinicians with a specific pathoanatomical cause of the pain and hence no clear management plan. Instead it is proposed that central pubic pain be classified into the following sub-groups: pubic bone stress, abdominal tendinopathy, abdominal enthesopathy, adductor tendinopathy, adductor enthesopathy, antero-inferior pubic aponeurotic lesion, pubic symphysis irritation and pubic instability.

“In recent times the hip joint has been recognised as a significant cause of hip and groin pain in the athletic population, being the third most commonly reported injury in the Australian Football League...”

A brief introduction to the subgroups that form the basis for a pathoanatomical treatment model is presented. Specific clinical findings and treatment models for each subgroup is recommended, however this is outside the scope of this article.

Pubic bone stress is well described by numerous authors in the form of bone marrow oedema (7–11). The bone marrow oedema is associated with acuity (9) and appears to be

consistent with a bone stress injury as there is no evidence of inflammatory cells or osteonecrosis (12). Caution must be displayed with diagnosis as bone marrow oedema may be a normal finding in the athletic population that displays an increase in training load (7, 8, 13).

“Whilst FAI is not considered to be hip pathology, it may increase the risk of intra-articular hip pathology, including labral tears and chondropathy and contribute to the development of groin pain.”

Although there is no specific literature pertaining to rectus abdominis tendinopathy there is little doubt that supra-pubic pathology exists. Management should take into account the type of tendinopathy with reference to tensile, compressive or internal shear (14) and the stage of progression on the continuum of tendon pathology (15).

Rectus abdominis enthesopathy has been shown to be a distinct clinical entity on MRI at the insertional fibres of rectus abdominis on the anterolateral aspect of the pubic bone. There is a strong association with anteriorly located bone marrow oedema in the subcortical region of the pubic bone (10, 11).

Adductor tendinopathy appears to have first been described in an ultrasound, surgical and histopathological study that confirms the tendon findings (16). Anatomical findings confirm that only the anterior surface of adductor longus is tendinous (17, 18) and hence must be where the tendinopathy is located. The recalcitrant nature of this pathology may be partially explained by the finding that the vascularity of adductor longus and brevis is significantly decreased toward the enthesis (19).

Abnormal anterior pubis and enthesis enhancement on post-gadolinium MRI appears to correlate with the clinically symptomatic side in adductor enthesopathy (20). Complex attachment of the adductor longus and rectus abdominis aponeurosis into the pubic symphysis capsular tissues, fibrocartilagenous disc and hyaline cartilage (21) as well as the enthesis being fibrocartilagenous (19) may partly explain why pathology is recalcitrant in this subgroup.

An antero-inferior pubic aponeurotic lesion is perhaps a progression of adductor enthesopathy. It is indicated by a secondary cleft sign on MRI which may in turn be an indication of repetitive tractional load on the anterior aponeurosis (22, 23). Alternatively it may in fact be a tear in the arcuate ligament (24, 25) that is the main constraint to pubic symphysis motion.

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“Hip pain often commonly co-exists with other groin related pathology, including pubic and adductor symptoms, which can make definitive diagnosis and appropriate management difficult and often multi-factorial.”

Pubic symphysis irritation in the acute phase may be indicated by bone marrow oedema, fluid in the pubic symphysis and periarticular oedema (9). Radiological abnormality has been correlated with age and load (26, 27) and as the condition becomes more chronic it is associated with subchondral sclerosis, subchondral resorption, bony irregularities and osteophytes (9).

Pubic instability is classified by vertical pubic motion of greater than 2mm (28–31). Instability may result in increased shear loading of ligaments and impaction of articular surfaces.

Specific pathoanatomical diagnosis must be made on a patient's history, radiological findings and thorough objective examination that must include palpation. Clinical reasoning must then be utilised to provide a structured treatment plan that is specific to the pathology within each subgroup. Hence pathology relating to bone, joint, tendon or an enthesis must be treated appropriately, combining what we have learned from the literature and clinical experience.

Hip morphology, pathology and relationship to groin pain, with Joanne Kemp

In recent times the hip joint has been recognised as a significant cause of hip and groin pain in the athletic population, being the third most commonly reported injury in the Australian Football League (32), and commonly seen in many other sports, including tennis, other football codes, and ice hockey. Groin pain is frequently reported in those with hip pathology attending for arthroscopy, evidenced by 92 per cent of patients with labral tears (33), and 100 per cent of AFL footballers with femoro-acetabular impingement (FAI) complaining of groin pain (34). Hip pain often commonly co-exists with other groin related pathology, including pubic and adductor symptoms, which can make definitive diagnosis and appropriate management difficult and often multi-factorial (35). Recent studies have found that 94 per cent of athletes with adductor related groin pain have radiological signs of FAI (36, 37). In addition, Bradshaw et al. determined that over half of all patients with longstanding groin pain demonstrated hip pathology as the primary source of pain on physical and diagnostic examination (35). The most common site of pain referral in people with labral tears has been reported as the central groin region (38).

“While identifying risk factors is important, transient changes of strength and ROM may be vital in identifying athletes at risk of developing groin injury.”

FAI describes a morphological variant seen in approximately 20 per cent of the general population (39), and has been comprehensively described in recent years (40–42).

Three types of FAI are commonly described. The first type is a cam lesion which describes a reduced femoral head neck offset, resulting in additional bone most commonly seen on the anterior, superior or antero-superior aspect of the femoral head neck junction (42). The second type of FAI seen is referred to as pincer impingement. This refers to bony change seen in the acetabulum; and can either present as a deep acetabulum which is most commonly seen anteriorly (39, 43), or as a retroverted acetabulum, which leads to an apparent deeper anterior acetabular wall. The third type of FAI seen is the mixed presentation where both cam and pincer lesions are seen.

Whilst FAI is not considered to be hip pathology, it is recognised as an anatomical variant within a normal range (44, 45) that may increase the risk of intra-articular hip pathology, including labral tears and chondropathy (46–54), and contribute to the development of groin pain (39, 55). When the hip joint with FAI is placed into a position of impingement in a repetitive fashion during sporting activities, micro-trauma may occur in the hip. This may include damage to the labrum and the acetabular chondral rim, particularly in the anterior and superior aspect of the joint, leading to tissue breakdown and ultimately hip and groin pain.

“Caution must be displayed with diagnosis as bone marrow oedema may be a normal finding in the athletic population that displays an increase in training load.”

There is limited, but emerging evidence suggesting altered biomechanics of the hip and pelvis are present in people with FAI, which may partially explain the association between FAI and groin pain. Recent studies have demonstrated reduced pelvic (56) and hip (57) movement in the sagittal plane in people with FAI. In addition, a cadaveric study reported that rotational motion at the pubic symphysis is greater in hips with cam impingement, leading to increased opening of the anterior aspect of the pubic symphysis (58). Combined, these findings may indicate that an increased load through the anterior aspect of the pelvis may be present in those with FAI, with potential to contribute to the development of groin pain.



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Groin pain can certainly exist without hip symptoms or pathology; however the hip joint is often implicated in athletes with groin pain. A comprehensive physical examination, and if appropriate radiographic investigation of the hip joint, should therefore always be performed when assessing athletes presenting with groin pain. If positive findings are evident, rehabilitation of the athlete with groin pain should include appropriate measures to manage the hip joint.

Risk factors, with Mark Opar

Identifying athletes that are more susceptible to groin pain is important, given its recalcitrant nature and high recurrence rate (8). Awareness of at risk athletes allows for the implementation of targeted prevention programs, treatment aimed at altering modifiable factors and closer athlete monitoring. The non-modifiable and modifiable risk factors linked with groin pain are discussed below.

The predominant non-modifiable risk factors appear to be athlete age (59–61), previous injury history (59, 60, 62, 63) and male gender (64, 65). The balance of the literature suggests older athletes appear to be at greater risk of injury, although it has been reported that under age Australian football players are more prone to groin injury than senior players (66). While previous injury is non-modifiable, there may be a number of impairments that develop as a consequence of injury that can be modified.

The understanding of the role of the hip in the development of groin pain continues to evolve and is expanded on earlier in this article. While internal hip rotation is often implicated in the research, it is reduced total hip rotation range of motion (ROM) that is consistently linked with the development of groin pain (67–69). The significance of hip abduction and extension ROM as risk factors is inconclusive in the literature, however decreases are often observed clinically due to increased tone of hip adductors and flexors when patients present with groin pain.

Various ratios between hip adduction and abduction strength have been proposed as predictive of injury with one example indicating hip adduction strength of less than 80 per cent of hip abduction strength predisposes athletes to adductor strain (70). Due to different testing positions, the methods used to obtain measurements should be referenced before applying any ratio. Similar to low back, pain delayed transversus abdominus activation has been shown in groin pain patients (71), although it is unclear whether the delay is present prior to injury or a response to the development of pain.



“Specific pathoanatomical diagnosis must be made on a patient’s history, radiological findings and thorough objective examination that must include palpation.”

Athletic loading, namely kicking and change of direction running, is also proposed to increase the risk of groin pain (72). Rugby union data may provide some preliminary evidence of this in finding a higher incidence of adductor muscle injury in backline players compared to forwards (73, 74). Typically backs are linked with quick, sharp changes of direction and in most cases assume kicking roles. Consideration to shock absorption capacity should not be overlooked, including calf raise endurance, dorsi flexion ROM and single leg squat that can provide insight into biomechanical flaws that may result in overload of the groin region. It is also reported that soccer players and ice hockey players are at an increased risk due to a lack of training prior to pre-season training or during training camp (8, 75). This highlights the importance of optimising training loads due to the possibility of increasing injury risk when athlete loading is either excessive or insufficient.

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While identifying risk factors is important, transient changes of strength and ROM may be vital in identifying athletes at risk of developing groin injury. An example of this is provided where the development of groin pain was preceded by a drop in squeeze test strength (76). Weekly variation may also exist with hip ROM, and in some cases may change following single training sessions. Such monitoring may be difficult for clinicians working with sub-elite participants where time is limited and a more streamlined approach is required. Assessing groin pain risk factors should be included in pre-season screening, particular in sports with high rates of groin pain including Australian football, ice hockey, rugby codes and soccer (62). Identifying at risk athletes allows for a focus on those who would benefit from more regular load management and squeeze test monitoring when weekly tracking of an entire squad is not feasible.

“More recently literature has focused on the contribution of hip pathology to central groin pain.”

Current research has identified a number of these risk factors however some caution in interpreting these results is warranted. In particular measures of modifiable factors, including strength and range of motion, were included in several papers that did not report if participants were experiencing groin pain symptoms at the time. Ongoing research is required to further investigate risk factors in prospective studies that address some of these study design problems.

“Pubic instability is classified by vertical pubic motion of greater than 2mm.”

Identification of the at risk athletes is likely to allow clinicians to modify the daily training environment to minimise injuries. However, there is a need to classify what we are trying to prevent to guide management strategies that vary for different presentations. This article has outlined that hip and groin symptoms are intimately related and as such both entities need to be assessed when athletes with groin pain present to you in the clinic.

Michael Drew (editorial), Andrew Wallis, Joanne Kemp and Mark Opar

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References, as indicated within the article, are available at sma.org.au/publications/sport-health

Changing communities through play



At the recent be active 2012 conference, hosted by Sports Medicine Australia, a self-funded university group and their project highlighted the concept of changing communities through play.

About Team P.L.A.Y

Team P.L.A.Y is a group of students from the Department of Biokinetics, Sport and Leisure Sciences at the University of Pretoria dedicated to changing communities through play. They have facilitated an action learning community recreation program called 'Come and Play, it's Friday!' in the low socio-economic community of Elandspoor, Pretoria, South Africa. This community encompasses all ethnic groups, of all ages, a high rate of unemployment, a high crime rate and a high usage of alcohol. The project started in May 2011 and has been met with great success.

“The community’s mindset changed, they no longer viewed themselves as victims of crime and began to empower themselves and used the resources they had.”

Background

The idea of the project was born out of the lack of facilities in the community and the non-existent budget for the project. The idea was to empower the community through play in an action learning process. An open field (complete with rocks and glass) in the middle of the community was identified as a 'facility' and on May 15, 2011 Elandspoor's first recreation program was initiated.

From then the project developed into a full-scale community recreation program empowering both community members and students from the Department of Biokinetics, Sport and Leisure Sciences.



Team P.L.A.Y. in combination with community members have overcome several barriers since inception and the overwhelming response from the community drove their decision to submit an abstract for presentation to the be active 2012 conference in the hope of presenting the community's success on an international stage and to inspire and educate others on what can be achieved on passion alone.

The project

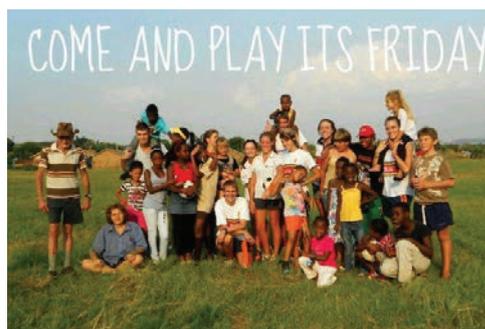
Sport and recreation plays an important role in the culture and daily lives of South Africans. Although it unites developing countries like South Africa, on a number of levels, it unfortunately also constructs and reinforces differences that disadvantage some whilst privileging others. Low socio-economic communities are often the target of interventions by well-meaning volunteers and non-profit organisations. Even though volunteers approach low socio-economic communities with good intentions they tend to react to 'feedback' from the community, maintaining the unending need for the provision of basic needs.

This community project utilised systems theory to analyse current community interventions and to direct a sustainable community intervention that will result in system change. In an attempt to move away from a first-order systems approach which would have inevitably contributed to the homeostasis of the community system in its current state, the study engaged in a second-order systems approach. A community recreation program framed in an action learning process was initiated as an illogical response to the needs of the community and the question was asked: *'How can community recreation contribute to positive behavioural change in a low socio-economic community?'*

“We want people to know that if you have a piece of chalk, you have a program. Lack of funding should not be a barrier. It is better to teach someone how to fish, then to catch the fish for them.”

From an investigation of a variety of community interventions it was found that interventions are often focused on a specific outcome, for example changing eating and exercise behaviours within a community to address obesity. It utilises a top-down, expert-driven approach to solving the 'problem'. A further analysis of these interventions found that it placed the lower socio-economic community in a double-bind situation from which sustainability becomes less viable.

“Our aim is to have people present our program when we are not there, and for us to act as facilitators. So far it is working. We are now visiting the community every second Friday and the Fridays when we are not there we see leaders from the community taking our place to encourage play.”



FEATURE: CHANGING COMMUNITIES THROUGH PLAY

The first few sessions of the project started with the P.L.A.Y group of students playing different ball games amongst themselves. On the first day they were joined by about 10 children. Since the initial session the group has grown and now several adults from the community take control of the intervention. Participation in the community-owned recreation program was sustained during the study period and is still ongoing. Participants in the project reported a higher perception of well-being as well as an awareness of being in control. Although not included in the research methodology, the community social worker reported a lower level of complaints from participants in the study.

Results of the project showed that recreation has the possibility to instigate systems change within a low socio-economic community when approached from a second-order systems position, and may therefore provide a successful alternative to current low socio-economic community interventions.

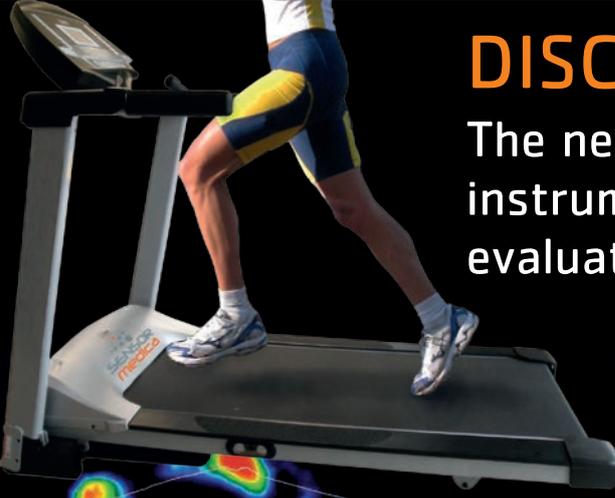
“With our non-existent budget the commitment has to be there. We have a love for the people and a love for what we are doing.”

P.L.A.Y team members

Project leader: Engela van der Klashorst

- Rethabile Sewe
- Genique Kriel
- Juan Theron
- Angelica Fischer
- Engela Booysen
- Analja Briel
- Sumayah Desai
- Naom Kgoahla
- Yente Oosthuysen
- Bathabile Sewe
- James Ross-Marsh
- Tarryn Dettmer
- Sean Finaughty

To contact any of the P.L.A.Y team members, email engela.vanderklashorst@up.ac.za



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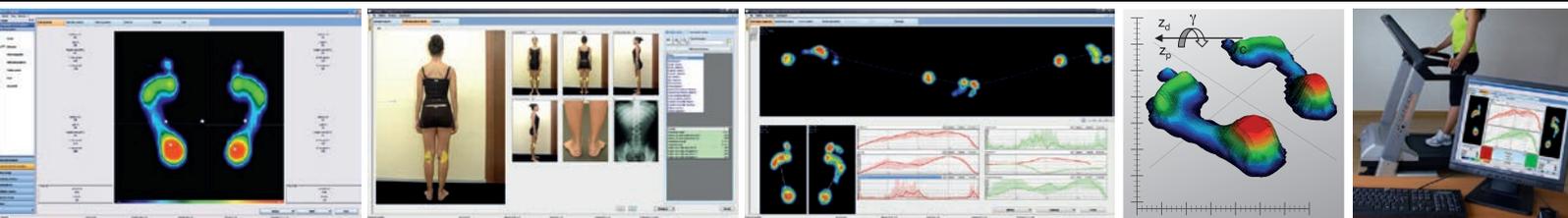
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Howzat! for medical treatment



An interview with Dr Justin Paoloni, sports physician, clinical researcher with a specific interest in the treatment of osteoarthritis, chronic muscle and tendon injury, and Cricket Australia's Chief Medical Officer.

What is your professional/educational background?

I work as a sports physician at a private practice in Kogarah, Sydney. I am involved in any musculoskeletal treatment and diagnosis that is non-surgical. Tendon injuries are one of my main areas of treatment (I have a PhD in treating tendon injuries). I have also just finished up as the NRL Bulldogs Chief Medical Officer so will now solely concentrate on private practice and my new appointment with Cricket Australia.

What are the profiles of the people you treat?

It can be anyone, ranging from young children aged four years old to the elderly who present with arthritis. We tend to find that 60 to 70 per cent of our clientele are either community sportspeople who have obtained injuries from social sport, or those who have suffered occupational or incidental injuries. We also see elite athletes through sporting teams and word-of-mouth.

“... regardless of how much of a fan you are of the sport or sportspeople around you, never act like a fan.”

Are there any injuries you specialise in the treatment of?

Tendon injuries. We do a lot of work with ultrasound, especially Doppler ultrasound which is quite good for picking up increased blood flow in tendons. These days there are a range of injection treatment modalities that can be used for tendons and the practice does most of these under either ultrasound or Doppler. Having said that, exercise rehabilitation is still the main treatment of tendons – it doesn't really matter what you inject, you have to be doing the right rehabilitation in order to get better!

How did you get involved in working with elite sport, in particular cricket players?

Cricket came a bit out of the blue as I haven't had much involvement with the sport at all. It was an advertised position through our specialist college which I went through the interview process for. With most other sports it is usually about who you know; it is very rare that a job is advertised!



I started my elite sporting career as a Club Doctor/Club Medical Officer with the West Tigers rugby league team back in 2002. At that stage I was a registrar doing my training and had a connection with the team which is how I secured the position (when the previous doctor left). Having said that I have been a soccer player all of my life and was a keen tennis player when I was younger. It's ironic that I haven't played rugby league and have only played the odd season of cricket.

What is your role at Cricket Australia?

Cricket Australia have not had a Chief Medical Officer (CMO) for some time (since Trefor James who was also a state doctor, and the position was not funded – it was a separate entity). My position therefore is relatively new in the fact that it is now a part time funded position. This is a stepping stone towards the future and replicates other sports that would employ a CMO on at least a part or full time basis.

Currently my role sees me go on one tour a year with the team, and hopefully this will increase as time goes on. I spend a lot of time organising staffing for the tours and also managing the injuries sometimes remotely (MRIs via an iphone/computer and speaking to the Cricket Australia physiotherapist daily during the tests). There isn't a huge match involvement at this stage as the current system sees state doctors looking after the test team depending on where they travel to/visit. This may change over time though as it is a slightly difficult system to work with as you have different doctors attending to the players each test match.

“When deciding a player’s return to play it is a collaborative process.”

What are your main duties?

My main aim is to look after the Cricket Australia contracted players, either remotely or having them come to Sydney. I usually travel to a test venue three days before the match to check players' fitness, monitor injuries and treat as needed. This is all done in conjunction with the Cricket Australia physiotherapist and with the state systems.

I also keep an eye on other players of national interest, i.e. liaise with state doctors and monitor their injuries, who may not be Cricket Australia contracted players but are likely to be selected in the near future.

We also look after women's cricket. Being new to the job I haven't had much involvement with the women in the test side yet but I have seen a few of the women with various injuries.

Are there other practitioners you work closely with in your role? Tell us a little about these working relationships in terms of handling the cricket players.

My main relationships are with the Cricket Australia physiotherapist and the state doctors.

Within each team they also have a physiotherapist, strength and conditioning trainer, masseuse and coaches, i.e. batting coach, bowling coach. When I am down on the ground I liaise with all of these positions, especially the strength and conditioning trainer as they are involved in monitoring bowling workload which has become an issue in recent times with trying to prevent fast bowler injuries through high workloads.

Outside of the Australian team you also deal with a wide structure of people, for example the Cricket Australia Centre of Excellence in Brisbane which houses physiotherapists, strength and conditioning trainers and sport scientists.

What are some of the more common medical/fitness issues cricket players have?

As cricket is a non-contact sport, we mainly deal with muscular type injuries. In fast bowlers, it is side strains which are almost exclusive to fast bowlers and not seen in many other sports (occasionally javelin), and stress fractures in the back, both due to overloading. This highlights the importance of monitoring

workloads, particularly in younger players who are not fully mature. In batsmen hamstring strains are becoming more common due to the explosiveness of one day and T20 cricket, possibly due to increased running and diving for the ball.

When deciding a player's return to play it is a collaborative process (unless it is a head/neck injury or life-threatening injury which is exceedingly rare, but where medically important that a player should not play). Most of the time when deciding return to play you are weighing up the risk or re-injury in consultation with the captain and coach. Some injuries are obvious (acute stress fracture) however a muscle injury requires determination of the grade of the injury, what the symptoms are, how to approach rehabilitation leading up to return and how to assess whether they are ok to return (examinations, scans, functional testing to see whether they can bowl/bat/run).

“In fast bowlers, it is side strains which are almost exclusive to fast bowlers and not seen in many other sports and stress fractures in the back, both due to overloading.”

What are the highlights and challenges with working with elite sportspeople?

The main highlight is seeing how hard these athletes work, training day in day out at high intensity, how physically demanding these sports are, and how they perform under extreme conditions. This is what makes them elite.

The challenges are to ensure they can perform in that environment. The sole aim of an elite sporting team's structure is geared toward maximising performance.

What advice would you give other sports medicine professionals looking to work within elite sport?

Firstly, make sure you have the education/training to feel comfortable in that environment. Secondly, being personable and having excellent communication skills is essential in the team environment regardless of your position. Adhering to the mantra that 'you are the boss' won't work in elite sport. And thirdly, regardless of how much of a fan you are of the sport or sportspeople around you, never act like a fan.

Peak performance requires more than skill alone

Developed specifically for endurance athletes, Endura Rehydration is an exclusive electrolyte formula to help athletes perform at their peak, promote endurance and optimise hydration.



The electrolyte ratio difference

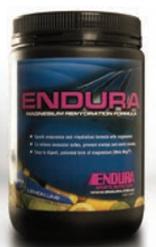
Endura Rehydration contains a full spectrum of electrolytes in ratios specifically chosen for sports rehydration. Electrolyte imbalance may contribute to intracellular muscle dehydration which can impair energy production. Endura Rehydration contains higher levels of intracellular electrolytes (magnesium and potassium) than many sports formulas to specifically target intracellular muscle hydration. Endura also provides the AIS recommended percentages of sodium and carbohydrates to assist rapid stomach emptying for fast hydration.¹

The importance of magnesium

Endura Rehydration provides a high concentration of Meta Mag[®], a highly absorbable patented form of magnesium to help shorten muscle recovery time and prevent muscular cramps and pains. Unlike many other forms of magnesium, Meta Mag[®] dissociates intracellularly, rather than in the digestive system.² This means higher absorption and maximum results for the athlete, without gastric discomfort; an imperative attribute for formulations taken before or during prolonged exercise.

Isotonic vs hypertonic prescribing

Endura Rehydration can be prescribed as an isotonic or hypertonic dose depending on the needs of the athlete. When prepared as a 350 mL isotonic drink, Endura Rehydration has an osmolarity in a similar range to an athlete's own body fluids. This enables rapid absorption for fast rehydration during exercise whilst supplying fast and slow release carbohydrates for energy. When prepared as a hypertonic dose, Endura Rehydration provides a higher carbohydrate load per 200 mL for glycogen replacement making it ideal for more frequent dosing during pre-event loading and recovery periods.



Key applications for sports health professionals

The following patients may benefit from using Endura Rehydration:

- Those who need to perform in peak condition and support their training and competing demands.
- Those who need to support their body's hydration requirements.
- Those who want to help shorten muscle recovery time.
- Those requiring relief from muscular pain and cramps.

1. http://www.ausport.gov.au/ais/nutrition/factsheets/hydration2/fluid_-_who_needs_it
 2. Schuette SA, Lashner BA, Janghorbani M. Bioavailability of magnesium diglycinate vs magnesium oxide in patients with ileal resection. JPEN J Parenter Enteral Nutr. 1994;18(5):430-435.

For more information call the Health World Technical Support team on 1800 777 648 or visit www.endura.com.au

The keys to business success

To help make the most of your business, *Sport Health* brings you the following business insights.

What is Visual Communication?

Brought to you by Papercut



Your Visual Communication is an essential tool in your brand identity toolkit. It is made up of all of the elements that supplement your logo, forming the graphic 'face' of your business and anchoring your brand identity.

Think of your logo as the 'boss' of your brand, and the Visual Communication elements as the 'employees'. In most of your communication materials, your logo won't appear by itself, it will have the help of all of these visual elements to accomplish its job of communicating and connecting with your target market.

Your Visual Communication can include design elements such as:

- **Font styles:** You should have a small collection of typefaces, font weights, and styles that you use regularly in your materials. Consider fonts for both print and web use, and specify styles for headlines, subheads, and body copy in each case.
- **Colours:** Creating a colour palette for your business can add flexibility to your marketing materials and give you an easy resource to go to when choosing colours for illustrations, graphics, or any other part of your Visual Communication. If you keep your colours consistent and limited, then you'll develop a more focused palette that will be easier for your audience to associate with your business.
- **Shapes:** The shape that you use for your bullets, break-out boxes, colour-blocked areas, and even borders in your materials can create a strong visual component that will contribute to your brand memorability.
- **Layout:** The layout of a marketing piece covers elements like the number of columns and the placement of all of the other Visual Communication elements. Remember that white space allows the eyes to rest, white space in any layout is crucial.
- **Backgrounds:** Using background screens or shapes, or even a specially designed watermark, can give your materials extra flair. You can also develop a special background that will make your materials stand out.



- **Photographs:** Photos can add a lot of personality to your materials and really help you to connect with your target audience. Stock photography is easily accessed; buy a few shots that are compelling and really match the rest of your Visual Communication. Make sure that you buy the highest resolution and the largest possible size to ensure you have images for both print and web.
- **Paper type:** Printing your materials on a special type of paper can make them look even more interesting. Papers come in different colours, textures, and thicknesses that can contribute to the uniqueness of your brand.

Crafting a tool kit for your Visual Communication and then using it consistently will define your business in the marketplace and create a strong brand.

Papercut offers a wide range of creative services including graphic design, web design and development, brand, concept and strategy development and print management.

Papercut are a Government preferred supplier and serve many small business clients locally and nationally. They are committed to their clients and offer exceptional quality, flexibility, and fast turnaround times from a small and friendly team. Papercut are strongly committed to the environment, and assist clients to reduce their carbon footprint by choosing environmentally responsible suppliers and products while operating business from a sustainable studio. For more information visit www.papercut.net.au

Keeping candidate confidentiality during the recruitment process

Brought to you by Angelique Lele,
Operations Manager, Sportspeople Pty Ltd



I was on a flight a while ago that was, fortunately, half empty. As I indulgently stretched out on the row I had all to myself, I thought, *'this will be a quiet, peaceful flight'*. That was until the gentlemen in the row in front of me decided to 'talk shop' the entire flight. A few minutes into their fairly loud conversation I realised they were from an organisation within our industry and were discussing what was in store for them in 2013. The conversation then turned to the recruitment process for a position I remembered recently being advertised at the Sportspeople Jobs Market. They were discussing candidates and, recognising some of the applicant names, I was pleased for them having reached interview stage. Then it hit me... I could have been ANYBODY.

I could have been a friend or family member of the candidate they were making fun of which, upon learning this could result in the candidate withdrawing from the process.

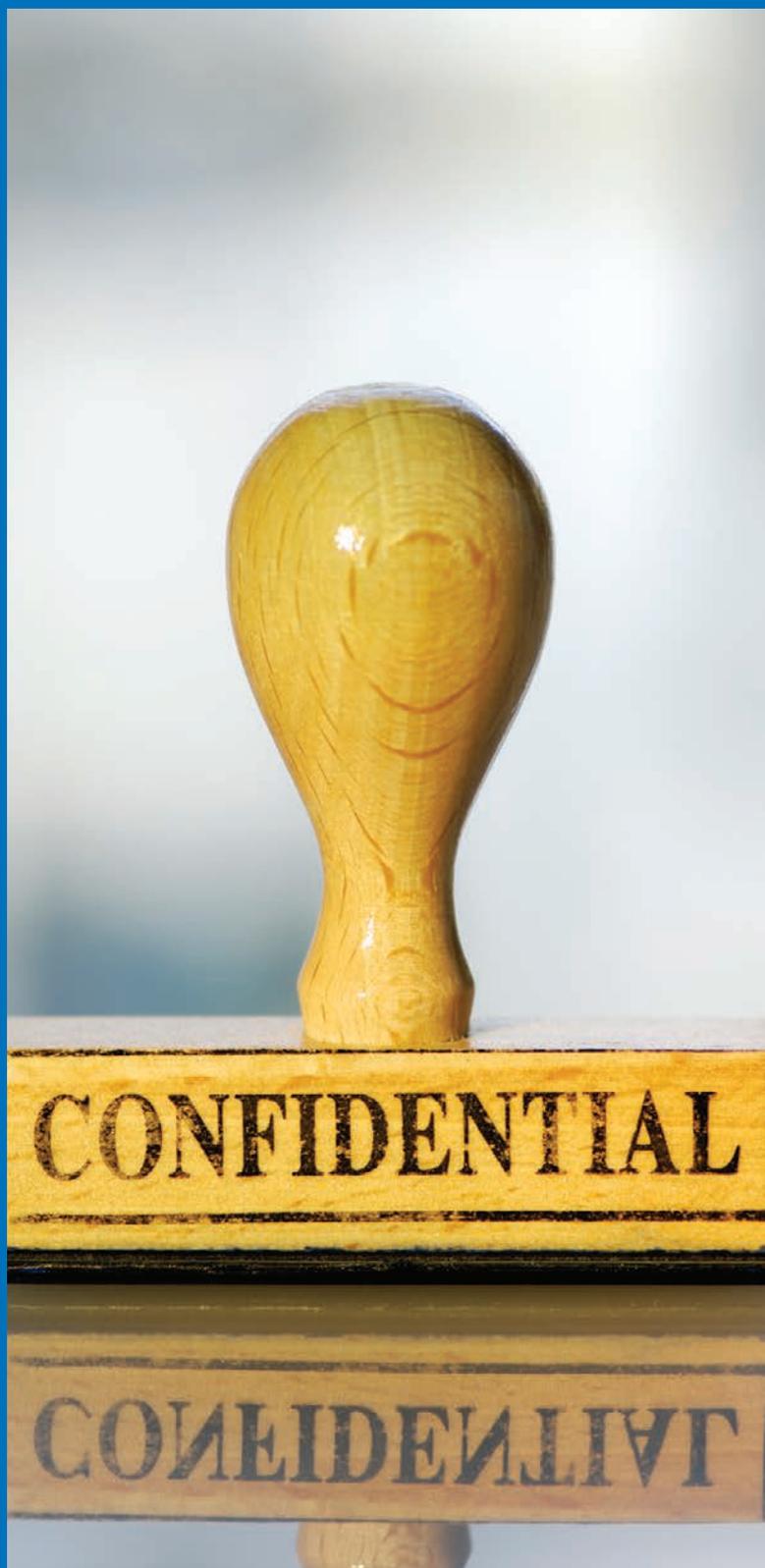
I could have been from a competitor or similar organisation who could then approach or poach the candidates mentioned for my own business (as well as now being savvy to the other 'insider' information discussed).

I could also have been an employee of a company one of the candidates currently works for, either putting their current employment at risk or providing the opportunity to make a counter-offer to stop the candidate from leaving.

So, when you are involved in any sort of recruitment process please remember candidates have provided their application to you in the strictest confidence.

Make it policy to keep the names and details of all candidates confidential and in particular, out of the public domain.

Sportspeople is a leading recruitment agency and job board operator in the sport, fitness and aquatic sector. For more information visit www.sportspeople.com.au



Self-Managed Superannuation Fund: Property still a popular option

Brought to you by Davidsons



The attraction to self-managed superannuation, to a large degree, is the ability and desire of Trustees to invest in assets that cannot otherwise be acquired through industry or retail superannuation.

Investing in direct property is a good example.

With the fluctuations and uncertainty in the share market, some Trustees feel more comfortable investing in property.

Trustees of Self-Managed Superannuation Funds generally feel more comfortable about investing when they are able to control and deal with the underlying investment asset directly. To them, direct property investments provide this.

The Self-Managed Superannuation Fund provides great flexibility for Trustees to invest in direct property. However, as with most things in life, there is not a 'one strategy fits all' solution. There are a number of options for Self-Managed Superannuation Funds to acquire direct property, each strategy depending on:

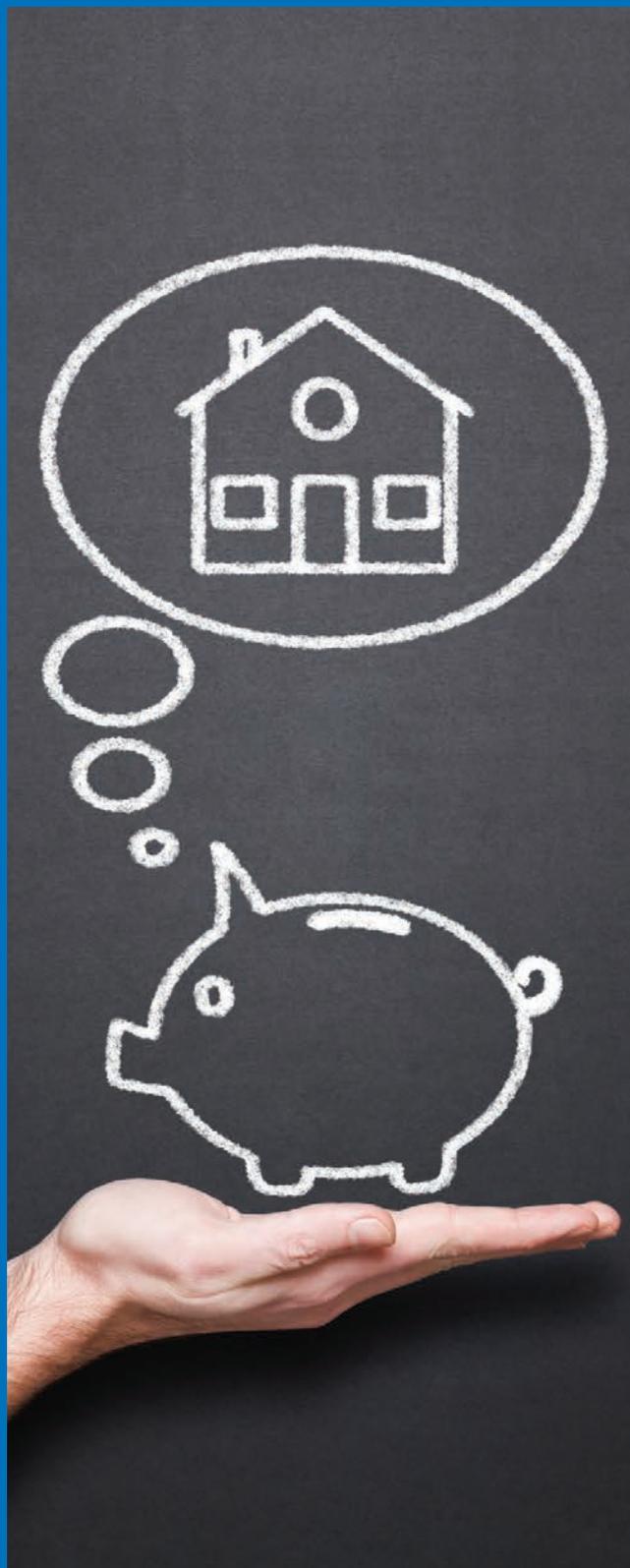
- The type of property
- The intended use of the property
- The amount of cash the Trustee can contribute to the acquisition.

There are various asset classes in the direct properties sector, being residential, commercial, industrial and retail properties, all with their own risk and yield considerations.

Further, property investment can range from receiving passive rental, building and construction, property development and land development. All activities are possible via a Self-Managed Superannuation Fund.

Accordingly, what type of property and how the Self-Managed Superannuation Fund would actually acquire and fund the property investment activity, varies significantly.

In many instances, the Self-Managed Superannuation Fund has insufficient cash reserves to acquire the property outright.



The ability for Superannuation Funds to borrow to acquire property has, therefore, significantly increased the interest in Self-Managed Superannuation Funds and direct property investment. Whilst heavily promoted in the market place, borrowing to acquire a property has its limitations and restrictions, highlighting the importance of proper advice from the outset.

For instance, a Self-Managed Superannuation Fund intending to acquire a property and undertake minor renovations could consider borrowing a portion of the funds under a limited recourse borrowing arrangement.

However, if the renovations were substantial or required the construction of additional dwellings, a borrowing arrangement may not be permitted.

In some instances, obtaining funding for specific types of properties may prove difficult under a borrowing arrangement. Petrol stations, hotel apartments, special purpose built factories are good examples of properties that are difficult to finance.

If a borrowing arrangement is not appropriate, the use of a Unit Trust structure may be an option, the unit holder (investor) being a combination of the superannuation fund, its members and associated entities.

The Unit Trust strategy may be a good option when two unrelated parties acquire a property jointly, such as, unrelated business partners acquiring the Business Premises.

Trustees need to consider risk and diversification.

In many instances a significant proportion of the Self-Managed Superannuation Fund's cash reserves are required to acquire the property. Therefore, a direct property investment can reduce investment diversification with a predominate investment being the property.

Accordingly, consideration must be given to the risk associated with purely holding property. The Self-Managed Superannuation Fund's investment strategy should take into account the risk profile of the members, the members' age, liquidity requirements and the ability to fund pensions.

Due to the popularity of direct property investment via a Self-Managed Superannuation Fund, we at Davidsons, have developed and implemented a variety of property investment strategies, each strategy tailored for the Trustee's individual circumstances.



Davidsons are not authorised to provide actual property investment recommendations. However, we can introduce Trustees to licensed property consultants.

For further information on property investments within a Self-Managed Superannuation Fund contact either Steven Skoglund 03 9268 6768 or Kylie McClure 03 5244 6890.

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Prefabricated versus customised foot orthoses



Podiatrists, Chris Bishop and John Arnold question the biomechanical and clinical superiority of prefabricated versus customised foot orthoses.

The management of foot and ankle disorders is a large part of any sports medicine practice. Conditions such as plantar heel pain, medial tibial stress syndrome (i.e. shin splints) and Achilles tendinopathy can result in significant time spent away from sport. Over the last 50 years, foot orthoses have often been used by podiatrists to treat such disorders. Numerous factors have increased the exposure of foot orthoses in recent years. These include increased knowledge, exposure to previously podiatry specific patients and assistance from private health insurance companies providing product rebates to non-podiatrist prescribers. Consequently, numerous health practitioners are now using foot orthoses to treat their patients.

“... many studies have demonstrated positive therapeutic benefit from foot orthoses for the treatment of foot pain.”

Guidelines developed by the Australian Podiatry Council define foot orthoses as *‘an appliance to support, align, correct deformity or motion of parts of the body’*. Foot orthoses come in a plethora of types and designs. The main distinction between ‘customised’ and ‘prefabricated’ foot orthoses is that customised devices

are made from an impression or cast of an individual’s feet. Although no consensus exists, customised foot orthoses have been defined as *‘contoured, in-shoe devices that [are] moulded or milled from an impression of the foot (for example a plaster cast or three-dimensional laser scan) and fabricated according to practitioner-prescribed specifications’*². Specific design features are incorporated into the foot orthoses at the time of manufacture according to the requirements of the patient resulting from the clinical examination. This differs to over the counter or ‘prefabricated’ foot orthoses which, although may be available with different design features, are manufactured on predetermined specifications. Prefabricated devices can be modified with different materials and a host of pre-made ‘add-ons’ (i.e. wedges) are available. More recently, this has clouded the distinction between prefabricated and customised foot orthoses. As a result, a continuum of foot orthoses exists, ranging from completely un-modified prefabricated devices to customised devices based on individual prescription and cast/impression of the feet.

Aside from manufacturing and design features, there are other important clinical considerations impacting upon the choice of either prefabricated or customised foot orthoses. These are both patient and clinician orientated. A summary of common considerations is presented in Table 1.

“By virtue of location, foot orthoses have the ability to alter the reaction forces experienced by the human body during foot-ground contact.”

Table 1 – Common advantages and disadvantages of prefabricated and customised foot orthoses

	Prefabricated	Customised
Pros	Lower cost	Custom made to individual’s feet
	Available immediately	Tailored prescription
	Easily modified	Easily modified
	Don’t require a cast	Improved durability in adults
Cons	Reduced life span	Higher cost
	Generic prescription	Typically a waiting period due to manufacture
	Less versatility for fitting	

How do foot orthoses work?

Despite widespread prescription of foot orthoses for an array of pathologies, the mechanisms by which they help reduce patient symptoms remain somewhat elusive. At present, the mechanisms by which foot orthoses are thought to work fall under three broad categories³:

- Changing the applied external forces to the foot and lower extremity as well as internal forces acting within the human body (kinetics).
- By altering motion of the foot and lower extremity (kinematics).
- Altering muscle activity (neuromotor).

Historically, it has been thought that foot orthoses exert their effect by the ‘control’ of abnormal motion of the foot, in particular pronation and supination of the subtalar joint. *nd inconsistent effects of foot orthoses on foot and lower extremity motion have led to reevaluation of this idea³. By virtue of location, foot orthoses have the ability to alter the reaction forces experienced by the human body during foot-ground contact. Research indicates foot orthoses have relatively large effects on the attenuation of reaction forces; however the differences between customised and prefabricated orthoses were minimal. Some practitioners believe foot orthoses change the external and internal joint moments acting within the foot and ankle. This seems a plausible mechanism of action for foot orthoses; perhaps commonly used design features of foot orthoses are actually altering the magnitude and direction of forces applied to a joint, and in turn these forces affect the motion. Due to current limitations in the methods to calculate joint moments within the foot, notably the accurate

measurement of ground reaction forces under discrete areas of the foot, it is too early to make judgment. Irrespective of design, foot orthoses also appear to impact upon lower limb muscle activity, particularly of tibialis anterior and peroneus longus⁴. Such widespread biomechanical effects and highly person specific responses to foot orthoses⁵ suggests a likely multi-faceted mechanism of action.

Clinical effects

Despite the obscurities underlying the mechanisms by which foot orthoses exert their clinical benefit, many studies have demonstrated positive therapeutic benefit from foot orthoses for the treatment of foot pain. Collectively, both prefabricated and customised devices share the notion that they appear to be effective, albeit with varying degrees of evidence to support their efficacy. Wherein the passionate debate has lied, along with the corresponding research, is over the superiority of either prefabricated or customised foot orthoses for the treatment of different foot conditions. The most recent systematic review demonstrated support for customised foot orthoses for the treatment of painful pes cavus, followed by foot pain in juvenile idiopathic arthritis, rheumatoid arthritis, plantar fasciitis and hallux valgus². However, few high quality clinical trials have directly compared the effects of customised and prefabricated foot orthoses, with a handful demonstrating parity in efficacy for plantar fasciitis and rheumatoid foot pain⁶⁻¹⁰. There is insufficient evidence to delineate the efficacy of either type of foot orthoses for the prevention or treatment of lower limb overuse conditions¹¹. Evidently, from a research standpoint it is too early to draw definitive conclusions regarding which type of foot orthoses appear most effective.

“Despite widespread prescription of foot orthoses for an array of pathologies, the mechanisms by which they help reduce patient symptoms remain somewhat elusive.”



“It is ironic that the conduct of much foot orthoses research must rely on standardising a process that by definition should be individualised. Evidence based guidelines for the prescription of customised foot orthoses are urgently required to serve as a platform for future research that is both scientifically rigorous and of clinical relevance.¹²”

The research

The general lack of demonstrated differences between prefabricated and customised foot orthoses, combined with the fact that both devices work clinically, means that future research will likely continue to compare their effects for different foot conditions. One common criticism of previous research is how representative the ‘customised’ foot orthoses and the associated prescription process are of that used in clinical practice.

As previously described, customised foot orthoses are (1) moulded or milled from an impression of the foot and (2) fabricated according to practitioner prescribed specifications. Many studies satisfy the first part of this definition; however, the second requirement is frequently unfulfilled. Although classified as ‘customised’ foot orthoses, the element of standardisation to increase methodological rigour often dominates, disregarding input from the clinician to tailor the intervention according to the unique requirements of the individual. This results in foot orthoses that are neither truly customised nor representative of the processes of clinical practice. However, the conduct of such research relies on a balancing act between the strength of the research methodology and the representativeness of the foot orthoses used in clinical practice. It is ironic that the conduct of much foot orthoses research must rely on standardising a process that by definition should be individualised. Evidence based guidelines for the prescription of customised foot orthoses are urgently required to serve as a platform for future research that is both scientifically rigorous and of clinical relevance.¹²

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Only shortlisted candidates will be notified.



The wrong debate?

With such a lack of clarity after much investigation, it may be timely to reflect on the relative merit of an argument regarding the biomechanical or clinical superiority of either prefabricated or customised foot orthoses. Given the plethora of materials and manufacturing techniques used to create foot orthoses it seems perplexing to use the impression or cast of an

individual's foot as the primary distinguishing feature between foot orthoses. Stripping away all other prejudices, it seems more logical to consider the selection of foot orthoses not as a choice of prefabricated or customised, but more rightly what design features are required in the foot orthoses for each individual patient. The design features (e.g. material selection, geometry) for each individual patient are determined and informed by a thorough clinical examination relevant to the patient's symptoms. Other factors (Table 1), as well as footwear, physical activity and sport specific demands are also considered during the prescription process.

At present, it may be appropriate to consider the following clinical reasoning approach to foot orthoses therapy as a part of a patient management plan using the 'tissue stress model' originally proposed by McPoil & Hunt (1995)¹³:

1. Identification of the symptomatic tissues being excessively stressed based on the history, symptoms and other subjective information provided by the patient.
2. Application of controlled stresses to tissue(s) identified in (1) through the application of weight-bearing and non-weight bearing tests, as well as palpation, range of motion and muscle function/strength assessment.
3. Based on the findings of the assessment, determine if the etiology of the patient's complaint is secondary to excessive mechanical loading.
4. Institute a management protocol that emphasises (a) reducing tissue stress to a tolerable level through rest, footwear and foot orthoses.

Evidently, adoption of this approach will require a reevaluation of the original definition of foot orthoses; with less emphasis on 'alignment and correction of deformity' (i.e. motion control). Rather, more respect is given to the ability of foot orthoses to alter the external and internal forces acting upon and within the body and subsequently decrease pathological stress within tissues of the lower extremity. From a mechanistic standpoint, it should be irrelevant how this is achieved with foot orthoses and subsequently whether questions related to the title of this article are worth pursuing.

Chris Bishop and John Arnold

Biomechanics and Neuromotor Labs
University of South Australia

References, as indicated within the article, are available at sma.org.au/publications/sport-health

Soccer: the unnatural selection



In light of the extreme professionalism currently evident in many junior soccer academies and developmental programs, former Socceroo physiotherapist Efreem Bunguric, APA Member, provides a thought-provoking precursor to his ongoing examination into training loads for younger players.

Soccer is one of the most popular team sports in the world and continues to provide healthy exercise for many young people (Koutures & Gregory 2010). Participation in soccer is an effective way for children to increase their level of physical activity and fitness, because it requires intensive physical effort over an extended period of time through training and games. A unique component of soccer training is that games can be played as training sessions, which means the intensity of training in soccer can be much higher than other sports, such as rugby, which can only simulate game situations.

“... these kids are participating in activities at levels well above what their musculoskeletal system is capable of supporting, resulting in progressive breakdown in soft tissues and chronic overload injuries.”

“How do they get to England? By doing as much training and development as possible and that is where the private soccer academy disease raises its ugly head.”

High exposure to training and competition at a time when the skeleton is immature and still developing can result in severe consequences for the individual, potentially affecting the chances of playing professionally in later life (Moore et al 2011). An English study involving former elite soccer players found 49 per cent had received a diagnosis of osteoarthritis in at least one joint, with many reporting polyarthritis (Turner et al 2000). This highlights the importance of appropriate management of soccer players of all ages, but especially adolescents. Finch and Cassell (2006) produced a paper studying the public health impact of injury during sport and found that the 15–39 year old group had the highest percentage of injuries, followed closely by the 5–14 year old group. The 5–14 year old group had the highest rate of injuries requiring treatment and injuries affecting performance or further participation. Injury is a known barrier to participation in sport and it is estimated that 50 per cent of children and youth sports injuries are preventable (Brukner & Khan 2012).

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Over the years I have been treating adolescent soccer players in my clinic and have found a trend that is becoming far too regular: players suffering chronic overload injuries such as pars defects within the lumbar spine, chronic adductor-related groin pain and its multiple sub groups (pubic bone marrow oedema, rectus abdominus tendinopathy/enthesopathy, adductor tendinopathy/enthesopathy, pubic symphysis irritation, pubic instability), recurring hamstring injuries, hamstring avulsion injuries, as well as the typical tractioning epiphyseal injuries such as Osgood Schlatters and Sever's disease. What concerns me is the frequency in which these serious injuries are presenting to private practice. Being involved in elite level soccer since the late '80s, I have seen a generation of soccer players evolve into soccer teachers in private elite soccer academies. Now the new generation of young players have emerged. Today, young players primarily aspire to play in Europe or England with little ambition to play in local competitions. How do they get to England? By doing as much training and development as possible and that is where the private soccer academy disease raises its ugly head.

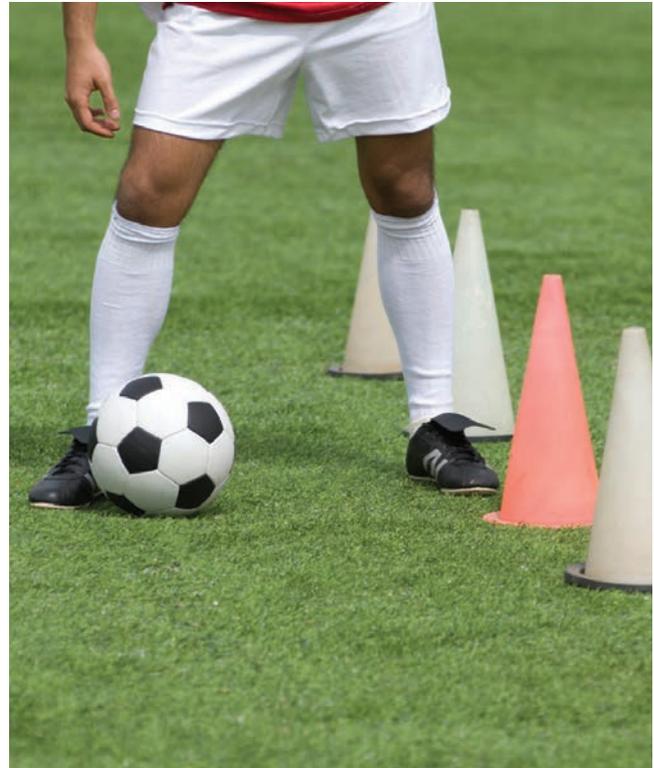
“High exposure to training and competition at a time when the skeleton is immature and still developing can result in severe consequences for the individual, potentially affecting the chances of playing professionally in later life...”

When I performed a basic Google search and entered the terms 'soccer', 'coaching', 'academy', and 'Sydney', I was amazed by what I found. The search engine produced more than 30 different private coaching academies within Sydney alone. One can add to that number by including the more established organisations such as the Football Federation Australia (FFA) and New South Wales Institute of Sport (NSWIS) development programs. These private academies push elitism and promote opportunities through their training programs that will get their players to trial for esteemed European teams. What kid would not want to participate in one of these programs? They target players from between the ages of five to seventeen. Most are run by trainers with minimal qualifications and not one website featured a single link to injury prevention pathways or information about training load monitoring. They pride themselves on creating a pathway for aspiring professional youth footballers through elite academy-based training, player mentoring and tours. It is clear why young soccer players can become obsessed with the dream of a professional career in sport; however,

the pathway to attaining this goal is poorly structured, monopolised by private academies who do not communicate with other sporting organisations like weekend soccer teams, school programs and personal trainers. It has been reported in the literature that in rugby, adolescent training loads sometimes exceed those typically prescribed to elite adult athletes (Hartwig 2009). Therefore, these kids are participating in activities at levels well above what their musculoskeletal system is capable of supporting, resulting in progressive breakdown in soft tissues and chronic overload injuries.

“A better understanding of successful training loads is required to implement systematic planning of training prescription or periodisation for adolescent athletes.”

There is a well-known process of ‘natural selection in sport’, where only those that survive the culling process are available for selection. But unfortunately, with the loads these athletes are subjected to, it makes it more of an ‘unnatural selection’ process. This prompted me to interview young soccer players in an attempt to quantify weekly training and game loading in adolescent soccer players within the inner west region of Sydney. Fifty individuals were randomly selected and filled out informed consent, as well as the necessary parental consent forms for participation in this survey. Players filled out a basic self-reporting questionnaire/diary that detailed the number of training sessions and games played each week, the duration of each session and gave an estimation of the intensity (based on the Borg rate of perceived exertion scale [RPE]), the different sporting organisations involved, and what they did during downtime. Load was calculated via the product of activity duration and RPE. The results were alarming. Most players (aged between 13–17 years of age) averaged more than 18 hours of soccer and physical performance-related training each week. A study by Hartwig et al 2008 on adolescent rugby players found that player exposure time might be the strongest predictor of injury occurrence. These authors found rugby players who participated at an elite level could be involved in as many as three different squads at any one time – with highlighted cases averaging 14–18 hours per week with some as high as 25 hours. This study also postulates that players with increased weekly training and game loads, or periods of intensified participation, are at greater risk of injury. The possible outcomes of high-volume, high-intensity training are not confined to injury and could include potentially harmful consequences, such as overtraining syndrome, sports burnout, increased susceptibility to illness, psychological disturbances, and performance decrements.



“... there is no way to adequately monitor the effectiveness of preventative programs, ‘quality control’ of training load, and subsequent monitoring of injury incidence, prevalence and recovery rates. It is for this reason that I am implementing a small scale injury surveillance program for three soccer associations in Sydney.”

Given the increasing number of young athletes participating in a variety of soccer programs, and the negative physical, financial and psychological consequences experienced by injured athletes and their families, injury surveillance studies and communication networks between different program organisers is of paramount importance. A better understanding of successful training loads is required to implement systematic planning of training prescription or periodisation for adolescent athletes. Better communication between school sport, weekend teams, development squad and elite training programs will maximise performance outcomes and minimise adverse effects such as fatigue, injury, and overtraining. Profiling adolescent participation in sports and physical activity (training quality control) might therefore contribute significantly to the development of talented athletes

and help nurture long-term and fulfilling sports participation (Hartwig et al 2008). Similarly, Hartwig (2009) also found that there may be psychological implications that have detrimental effects on adolescent rugby players – a concept that has relevance to all sports. Even in the absence of a full understanding of the impact of ‘high volume, high stress, and poor recovery’ among adolescent athletes, psychosocial markers may be precursors for more deleterious outcomes such as injury, performance decrements, compromised longevity, and overtraining (Hartwig 2009).

I believe five key issues need to be addressed:

1. Managers of different soccer organisations are not communicating training load.
2. There is no way of monitoring cumulative training and game load on players.
3. Training programs tend to focus on skill and fitness with little emphasis on proper core strength, lumbo-pelvic motor control and posture control training.
4. There is little published research on injury surveillance in adolescent soccer players at any level.
5. There is no way to monitor if preventative programs are being adhered to at club level.



“The possible outcomes of high-volume, high-intensity training are not confined to injury and could include potentially harmful consequences, such as overtraining syndrome, sports burnout, increased susceptibility to illness, psychological disturbances, and performance decrements.”

As a result of the above, there is no way to adequately monitor the effectiveness of preventative programs, ‘quality control’ of training load, and subsequent monitoring of injury incidence, prevalence and recovery rates. It is for this reason that I am implementing a small scale injury surveillance program for three soccer associations in Sydney. In collaboration with Michael Reynolds, APA Member, consultant physiotherapist for the Northern Eagles, it is our goal to initiate load monitoring and injury prevention.

So to conclude, currently the physical demands associated with popular sports such as soccer are poorly documented, and there are few evidence-based strategies to monitor participation loads, injury incidence and effectiveness of preventative programs. Adolescent athletes in Australia can participate in a number of sports without individual coaches being aware of the physical demands imposed by their participation elsewhere – with the result being training overload and an ‘unnatural selection’ process. It is the intention of this article to encourage physiotherapists, along with sports medicine professionals, associated with regional soccer associations in the Sydney Metropolitan area to unite in a collaborative effort to standardise training load monitoring, injury documentation, meaningful injury surveillance and implement preventative programs to reduce debilitating chronic injuries in our young soccer players of the future.

Efrem Bunguric

Efrem is an APA Sports Physiotherapist and an Associate Member of the Australian College of Physiotherapists who has worked extensively in private practice for more than 22 years. He has worked in the National Rugby League and National Soccer League, as well as with the under-19 NSW State of Origin rugby league team and national teams including the Socceroos and the Rugby League Junior and Invitational Kangaroos squads. Recently, Efrem was the team physiotherapist for the Australian Paralympic Soccer Team (Pararoos) at a pre-Olympic tournament in the Ukraine. He has also worked with international tennis and world title boxing athletes.

References, as indicated within the article, are available at sma.org.au/publications/sport-health

Breast cancer treatment needs a lesson in exercise



Dr Hamish Osborne, sports physician discusses how drugs are the go to choice for treatment of breast cancer, whilst physical activity is often overlooked despite its proven benefit.

It is more than a decade since the World Health Organisation (WHO) declared there was sufficient human evidence to say physical activity has a significant effect on the prevention of breast cancer. Large epidemiological studies also support this by showing that in women who exercise regularly (30 to 60 minutes of walking per day) or who have physically active jobs, breast cancer recurrence, breast cancer deaths and all-cause mortality in breast cancer survivors is reduced by up to 50 per cent [1].

There are at least 30 quality studies in the last 20 years that have shown that physical activity reduces the incidence of breast cancer by between 30 to 40 per cent [1] (without even discussing all the other benefits on colon cancer [2–4], or forms of dementia [3], cardiovascular disease [5], and so on).

One would expect that as result of this fairly significant WHO declaration, backed by sound epidemiological research, that all general practitioners would now be routinely prescribing

physical activity to all inactive women (and men). One would also expect a significant number of intervention studies to now be underway to determine whether actively intervening in someone's physical activity and cardiorespiratory fitness status alters their breast cancer risk. One would expect oncologists and breast cancer surgeons to be routinely advising and prescribing physical activity for their breast cancer patients. And not just for breast cancer, but also for colon cancer. Oncologists should be prescribing exercise to their post colon cancer resection patients as regular physical activity is as efficacious in prevention of recurrence as adjuvant chemotherapy. And, in a world where it is difficult to have your cake and eat it too, you can exercise and have adjuvant chemotherapy. One would expect researchers investigating treatment modalities (read 'pharmaceuticals') for breast cancer to control for physical activity status bias in their research. Perhaps all this will happen next year.

“... we have two hugely expensive anti breast cancer drugs, the benefits of which need to be reviewed in relation to physical activity levels to consider whether the benefits are real.”



“Breast cancer is non-discriminatory on how the physical activity is achieved – it doesn’t matter whether its recreational or vocational – the effect size is similar.”

The mechanism of action of physical activity in the prevention of breast cancer is probably multimodal. It assists with prevention of weight gain, helps protect against insulin resistance and directly lowers circulating oestradiol – all factors known to protect against development of breast cancer [4, 6, 7]. Tamoxifen is the only drug directly used to lower a woman’s risk of developing breast cancer and even then it is only used in women with a high risk of developing the disease [8]. Tamoxifen in this group reduces this risk by 44 per cent. However Tamoxifen in this

group has been shown to significantly increase other potentially life-threatening conditions. A study has shown endometrial cancer rates increase by 250 per cent, pulmonary embolus rates by 260 per cent and stroke rates by 40 per cent. So if the rates of all these conditions are summed up comparing Tamoxifen versus control there is only a 0.6 per cent reduction in life-threatening conditions in women taking Tamoxifen to prevent breast cancer (yes, this isn’t how statistics work; some poor women get all these things and some are lucky to get none). The study however did not control for physical activity status and given that the benefits of activity on the prevention of breast cancer are as great as 40 per cent it is plausible the benefits of Tamoxifen in this group are significantly less than published.

It is estimated that 1.25 million women in Australia would be considered high risk and eligible for Tamoxifen based on the published criteria [8]. The \$560 million it would cost to treat 80 per cent of these women for one year would also pay for 3.3 million sedentary women to be provided with guided exercise prescription. This would be potentially cost saving after five years measuring cardiovascular disease benefits alone [9] (adjusted for CPI and currency exchange).

“Should research groups exploring new interventions be allowed to publish outcomes if they don’t control for physical activity levels of those being studied?”

Herceptin which has no role in prevention of breast cancer is a powerful drug used to treat the disease. About one in five breast cancers have the HER-2 gene. However 70 per cent of HER-2 +ve tumors don’t respond to Herceptin and unfortunately you do not know the response until you try it. The relapse rate is reduced dramatically from 17 per cent to 9 per cent, however five out of six women with HER-2 +ve cancer don’t relapse and one in ten relapse despite Herceptin treatment. For each life saved due to Herceptin 1 in every 25 women treated (whether they respond or not) die of heart disease caused by the drug [10].

None of the Herceptin research reviewed controls for physical activity yet the effect is large. In women with stage III breast cancer doing at least a 30 minute brisk walk four to five times a week gives a relative risk of death at 0.36 (95% CI 0.19–0.71) compared with a sedentary woman [11] – this is a hugely powerful effect which could easily account for all the benefits supposedly seen from Herceptin without the heart disease risk (in fact a lowered cardiovascular risk profile). The estimated annual budget within Australia for Herceptin is \$105,000,000 (i.e. 21,000 patients [12]) – or in other terms 600,000 sedentary Australian women provided with exercise prescription.



“One would expect... that all general practitioners would now be routinely prescribing physical activity to all inactive women (and men).”

So this shows we have two hugely expensive anti breast cancer drugs, the benefits of which need to be reviewed in relation to physical activity levels to consider whether the benefits are real.

But surely someone is studying physical activity intervention and breast cancer. Irwin et al [13, 14] have done so and showed that women who increase physical activity post diagnosis have considerably improved chance of survival (45 per cent) and those who reduced activity considerably increased chance of death (four-fold). They recommend oncologists refer patients for exercise prescription. However in 2011 the same authors from the same patient database [7] concluded that those with lower C-peptide levels were much less likely to die of breast cancer. They collected physical activity data, considered using it as a co-variate, but didn't and failed to explain why. Given that physical activity has such a powerful effect on insulin metabolism one has to question why this was not published. The conclusion was that more drug research needs to be done.

“It is more than a decade since the World Health Organisation declared there was sufficient human evidence to say physical activity has a significant effect on the prevention of breast cancer.”

Breast cancer is non-discriminatory on how the physical activity is achieved – it doesn't matter whether its recreational or vocational – the effect size is similar [1, 15]. The benefits, however, are greatest from recreational physical activity (20 per cent risk reduction from just an hour a day) compared to occupation (14 per cent from 40 hours per week), transportation (14 per cent) and living (14 per cent).

“The \$560 million it would cost to treat 80 per cent of these women for one year would also pay for 3.3 million sedentary women to be provided with guided exercise prescription.”

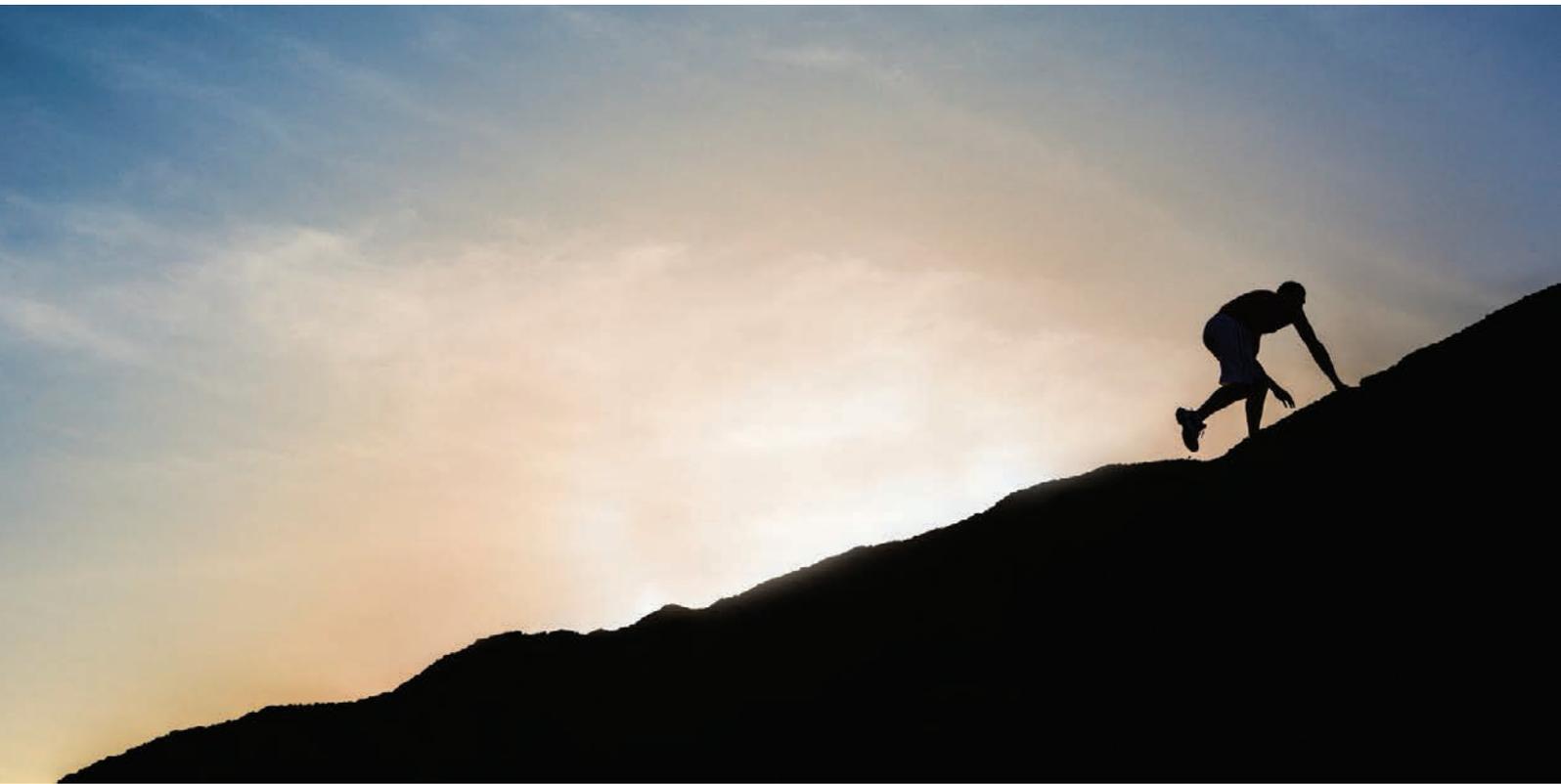
It is 60 years since modern medicine showed that physical activity improves the health of populations by a large margin. [5] Every week an article is published within scholarly literature showing exercise intervention provides improved health outcomes. Do we really need to keep doing this? Should research groups exploring new interventions be allowed to publish outcomes if they don't control for physical activity levels of those being studied? Should the government continue to pay millions of dollars for drugs when they don't pay the same amount to support physical activity intervention in the same groups, for at least the same improved disease outcome, not accounting for the added side effect of reduced all cause mortality? We need to work out how to make a daily walk sexy, 'fashionable' and socially unacceptable if not done. We need to work out how to get people to be less physically inactive. Why sit at a desk when you can stand? Why drive a car or take a bus if you can walk? Why take drugs when you can walk as well? Why rest to recover from illness if you can walk? A past study showed that patients undergoing adjuvant chemotherapy for breast cancer [16] found 35 different reasons not to comply with exercise prescription but still attended 70 per cent of the exercise sessions. Come on people, the bad effects of not enough physical activity and too much inactivity aren't new and trendy – get on and use physical activity as a powerful tool in your arsenal, get others to do so, reject research that doesn't control for this, and if all else fails get a dog (67 per cent of people who own a dog meet guidelines for physical activity for health [17]).

Dr Hamish Osborne

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References, as indicated within the article, are available at sma.org.au/publications/sport-health/

Does hypoxic and thermal stress enhance the training response of athletes and AFL footballers?



Accredited sports physiologist Dr Ian Gillam, discusses the evidence and best practice of hypoxic and thermal stress to enhance athlete training responses and asks if the expense required is justified.

Another Australian Football League (AFL) pre-season has been completed and the talking point in the AFL has again been the increasing exodus of AFL clubs travelling to high altitude training facilities in the American Rockies to undertake intensive early pre-season training camps. Many AFL clubs, coaches and sports science staff are asked their advice on whether to follow this trend and pressured to ensure that their club is not being 'left behind'. But what, if any, AFL-specific conditioning or psychological benefits are being achieved by the time the season starts in March, some three to four months later?

The goal of this article is to examine the evidence as to the potential benefit of altitude or 'thermal stress' training camps for AFL footballers, and to question if the expense involved in conducting overseas altitude training camps is justified. In addition, could the money spent on these training camps be better spent on other areas of a football department, such as developing football-related skills or coaches?

“The use of progressive thermal stress during pre-season training, by itself, may provide a relevant, convenient and economical approach to enhance the training response of AFL footballers.”

Which AFL clubs are using altitude training during pre-season training?

Collingwood began the trend to include an early pre-season altitude camp in 1995. On the advice of Sports Science Coordinator, Dr David Buttifant and with the support of Head Coach, Michael Malthouse, the playing squad completed a two-week live-in training block at Flagstaff (2130 m) in Arizona, which included a trek up to Humphreys Peak some 3800 m above sea level. The players were thus adopting the Live High-Train High (LHTH) model at altitude. Other AFL coaches have since followed this trend, including those who had been involved in the Collingwood initiative and had taken head coaching positions at the Kangaroos and the Gold Coast Suns. Other AFL clubs including Carlton, Essendon, Brisbane and Richmond have also conducted pre-season altitude camps in

Arizona or Park City (2100 m) in Utah¹. In 2011 Carlton took a different approach using an 'altitude house' in Qatar, adopting a contemporary Live High-Train Low (LHTL) training model, combined with exercise in the heat. Players trained in the heat at sea level for one week, while in the second week, one group lived and trained in the altitude house for 12 hours/day at 2500 to 3000 m, while the remainder lived and trained at sea level². However, at least one successful club, the Geelong Cats, have recently bucked the trend of overseas pre-season high altitude camps, preferring to hold a training camp at Falls Creek in the Victorian Alps, at the moderate altitude of 1700 m; an altitude that is too low to create the required hypoxic stress.

“... thermal stress combined with the adaptations provided by altitude training, may provide another independent mechanism to potentiate the aerobic training effect in athletes which requires less time and logistical support.”

In recent years at least two AFL clubs (Collingwood and Carlton) have also developed purpose-built altitude houses as a part of their training facilities. Geelong, despite its reservations about high altitude training camps is now planning to build its own altitude house as part of its new training facility. However, is the cost of conducting overseas pre-season altitude training camps (for up to 40 players and staff) or the cost of purpose built altitude houses worth the perceived performance benefit?

The history and development of altitude training models to enhance sea-level sports performance

The interest in the effect of altitude on athletic performance, and the role of altitude training to prepare athletes for competition at altitude began in the early 1960s. This was sparked by the awarding of the 1968 Olympics to Mexico City, which is at an altitude of 2250 m above sea level. Following the Mexico Olympics, interest then turned to whether the haematological and cardio-respiratory adaptations induced by altitude hypoxia may enhance aerobic exercise performance at sea level. Altitude research in the 1970s and 1980s convinced sports physiologist and AIS distance running coach, Dr Richard Telford to conduct summer altitude training at Falls Creek or Perisher (1700 to 1800 m) in the Australian Alps for his squad of distance runners, including Rob de Castella, Steve Moneghetti and later Craig Mottram, in the belief it might assist their sea level running performance. Despite the lack of evidence that altitude training at this moderate altitude enhanced sea-level performance, Craig Mottram believed that these camps allowed

him to undertake an uninterrupted block of quality training (*The Age*, June 24, 2012) while in a mildly hypoxic environment. The Australian Swimming Team also began to utilise altitude training camps in either Flagstaff or the Sierra Nevadas (2300 m) in Spain in the 1980's in the lead up to the World Championships and the Olympics. All of these altitude camps used the traditional Live High-Train High (LHTH) paradigm.

Altitude induced hypoxia and the physiological adaptations to high altitude

So what is the evidence and what are the potential mechanisms by which altitude induced hypoxia may induce a performance benefit at sea level? Increasing the altitude above sea level results in proportional reduction in both atmospheric pressure (P_{atm}) and the partial pressure of oxygen (pO_2) in the air. The relationship between the alveolar pO_2 in the lung and the haemoglobin (Hb) saturation (HbO_2) is sigmoidal in shape, and the alveolar pO_2 and percent saturation at various altitudes and at variable ventilation rates can be calculated using a useful online nomogram (http://www.altitude.org/oxygen_levels.php). Based on this nomogram at 1700 m the alveolar pO_2 at sea level to 1700 m decreases from 101 to 83 mm Hg with a small decrease in the percent saturation of HbO_2 from 98 per cent to 95 per cent at rest. Increasing the altitude to 2300 m the percent saturation of HbO_2 decreases significantly from 98 per cent to 91 per cent at rest providing a much greater hypoxic stress. However, it is important to note this nomogram is probably not applicable to elite athletes, who during maximal exercise achieve ventilation rates approaching 200 litres/minute, which may result in arterial hypoxia, even at simulated altitudes of 580 m³.



The hypoxia at 2300 m stimulates an immediate increase in respiratory ventilation, with the hyperventilation causing a decrease in the arterial pCO₂, inducing a respiratory alkalosis and a disturbance in the acid-base balance. This may cause some nausea, irritability and insomnia when first arriving at a higher altitude. The respiratory alkalosis increases the buffering capacity of the blood, which may provide a physical performance benefit. Within 24 to 48 hours, the hypoxic stimulus on 'oxygen sensitive receptors' in the renal tubules increases the synthesis of the hormone erythropoietin (EPO), increasing the production of red blood cells in the bone marrow over the next few weeks. The hypoxic environment, even after adaptation, reduces the exercise capacity and increases the perceived exertion to a given exercise intensity when compared to sea level. This means that the athlete is unable to train at the same speed or power output when compared to sea level. As training speeds must be decreased, a change in muscle recruitment patterns results in a loss in training specificity when translated back to physical performance at sea level⁴.

“It is important to emphasise that athletes need to have adequate iron stores to provide for the increase in haemoglobin synthesis with a high dose iron supplement, containing vitamin C being recommended prior to, and during an altitude exposure.”

The development of new models of altitude training: The Live High-Train Low (LHTL) paradigm

In 1997, Levine et al⁴ were the first to publish data on a new altitude training paradigm, termed 'Live High-Train Low' (LHTL), where athletes lived and slept at an altitude (2500 m), while only travelling down to 1250 m for brief periods of training. A goal of this protocol was to overcome the lack of training speed specificity that is a consequence of training in a hypoxic environment. In this study, 39 well-trained distance runners were matched by 5000 m running time and training history, then equally divided into 3 x 4 week training camps conducted under three different environmental conditions.

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- i. A Live High-Train Low (LHTL) group. Living at 2500 m and training at low altitude (1250 m).
- ii. A Live High-Train High (LHTH) group. Living and training at 2500 m.
- iii. A Live Low-Train Low (LLTL) group. A control group living and training at 150 m.

Following the camp, the results showed that both LHTL and LHTH groups increased VO₂ max by an average of five per cent which was shown to be significantly correlated with the mean, nine per cent increase in red cell mass, both of which were attributed to the hypoxia-induced increase in erythropoietin or EPO⁵. When the 5000 m running time at sea level was compared across the three groups, only the LHTL group improved significantly by 13.4 seconds (1.4 per cent) with no improvement in the LHTH group. The ventilatory threshold also only increased in the LHTL group. This provided some evidence that the decrease in training speed in the LHTH group meant that despite the observed increase in the red cell mass in LHTL group, this physiological adaptation did not translate into improvements in running performance.

“... could the money spent on these training camps be better spent on other areas of a football department, such as developing football-related skills or coaches?”

Research by Levine et al⁴ has led to numerous altitude studies based on the LHTL paradigm, using either ‘terrestrial’ or ‘natural’ (a hypobaric and hypoxic environment) or using ‘altitude houses’ which provide a normobaric, hypoxic environment⁶. Altitude houses are designed to vary the oxygen content of the air from between 17 per cent to 14 per cent, the latter of which is equivalent to a maximum altitude of 3500 m. Continuous monitoring of the pO₂ and the elimination of carbon dioxide provides stable environment conditions. National and state sports institutes, universities and AFL clubs are increasingly building altitude houses to conduct research and to allow athletes to live and sleep in a hypoxic environment while enabling them to train outside the chamber at lower altitudes. However, there is now considerable debate as to whether living in a normobaric altitude house provides different physiological adaptations and performance outcomes to terrestrial or hypobaric altitude conditions^{7,8,9,10}.

“Athletes were characterised as ‘responders’ or ‘non-responders’ based on their EPO response to hypoxia which was shown not to be dependent on an athlete’s iron status or the bone marrow’s responsiveness to EPO.”



Individual variability in the haematological response to hypoxia

Subsequent studies by Levine’s group using the LHTL protocol showed that the mean increase in red cell mass was characterised by a wide inter-individual variability in the EPO response to hypoxia and the resultant increase in red cell mass and VO₂max⁵. Athletes were characterised as ‘responders’ or ‘non-responders’ based on their EPO response to hypoxia which was shown not to be dependent on an athlete’s iron status or the bone marrow’s responsiveness to EPO. Recent evidence however has also shown that other hormones, including testosterone, human growth hormone, IGF1, all of which may be altered by intense physical training, can affect EPO secretion as can any impairment by renal function¹¹. In addition, increases in interleukins and cytokines, as a result of inflammation or infection, may affect the vascular endothelial cells, which in the kidney are the ‘O₂ sensors’, which increase EPO secretion¹². These factors may in part explain the variable response of EPO to altitude induced hypoxia and the physiological adaptations that occur in athletes. Wide inter-individuality has also been observed in response to altitude induced hypoxia in many studies including those with elite swimmers^{13,14} and cyclists¹⁵.



In contrast, Clark et al¹⁵ showed that despite an increase in Hbmass there was no corresponding increase in VO₂max in their cyclists and that as Hbmass was poorly correlated to VO₂max, this suggested other factors were at play in any performance improvements due to altitude¹⁵. Indeed, one study comparing two matched groups of elite swimmers using the LHTL and LHTH paradigms showed that despite a four per cent increase in Hbmass in both groups, both 100 m and 200 m swimming performance post altitude exposure at sea level were actually slower (worse) by 1.2 to 1.4 per cent¹³. Thus, despite the argument put forward by Levine's group that the improvement in VO₂max is primarily due to the increase in red cell mass¹⁶, other groups have been unable to demonstrate a significant correlation between an increase in red cell mass and VO₂max or performance^{10,13}. The alternative view is that any aerobic performance benefit due to altitude training is primarily due to non-haematological adaptations¹⁷. These adaptations include improved muscle and mechanical efficiency, increased muscle buffering capacity and improved lactic acid clearance¹⁸, including a placebo effect¹⁹ and 'training-camp' effects⁹.

“While the improvement in running performance was maintained for four weeks post altitude, it is unknown if any physiological or running performance benefits were maintained two to three months later, when the AFL competition season began.”

What are the minimum requirements to achieve a physiological adaptation to hypoxic stress and what is the endurance performance benefit at sea level?

Clark et al¹⁵ also attempted to quantify the parameters required to elicit the maximal increase Hbmass in a three week study in an elite group of road cyclists. Hbmass and serum EPO was assessed each week during a LHTL protocol in an altitude house, including one week post-intervention. The 12 elite cyclists 'lived and slept' at 3000 m simulated altitude (15.5 per cent O₂), for 14 hours each day and trained at low altitude in Canberra (600 m). During the study, Hbmass increased by a mean 3.3 per cent and serum EPO increased by 46 per cent peaking at 48 hours on altitude exposure. EPO stayed elevated above pre exposure levels for the three weeks. Hbmass increased by approximately one per cent per week over the three weeks, and with a minimum of 300 hours of continuous altitude exposure being proposed to elicit significant increases in Hbmass.

A recent review of well conducted altitude studies concluded that to achieve an optimum altitude induced physiological adaptation, the minimum altitude for haematological changes in LHTL studies was 2200 to 2500 m, with a minimum exposure of three to four weeks for 12 to 14 hours/day²⁰. However, to attain other non-haematological adaptations, a shorter period (12 days) and a higher altitude (3100 m) may be sufficient to produce physiological adaptations²⁰. It is important to emphasise that athletes need to have adequate iron stores to provide for the increase in haemoglobin synthesis with a high dose iron supplement, containing vitamin C (Ferrograd C) being recommended prior to, and during an altitude exposure^{15,21}. While the mean increase in red cell mass and VO₂max may vary from 3 to 8.6 per cent^{15,19} it is important to recognise that any endurance performance benefit from optimal LHTL protocols is likely to be limited to approximately one per cent^{9,20,22}. While there is considerable inter-individual variability in the increase in Hbmass, the response within individuals during repeated exposures is quite reproducible²².

Maintenance of the physiological adaptations and performance benefits after altitude training

Few studies have investigated the time course of the physiological adaptations and any performance improvements following LHTL altitude training. Levine et al⁴ did not assess if the increase in red cell mass and VO₂max observed with LHTL was maintained on return to low altitude. However, this group did show that the LHTL group maintained their improvement in 5000 m running performance at sea level for up to 21 days following altitude training. No improvement in 5000 m running performance was observed following altitude training in the LHTH group and this was unchanged on return to sea level. Others have shown that the mean increase Hbmass induced by LHTL was maintained for one week after returning to low altitude (600 m)^{15,22}, with the serum EPO decreasing immediately to below pre-altitude levels on return to low altitude. A recent pilot study showed that a three week LHTL intervention, Hbmass increased by a mean 5.5 per cent, but after 9 days on return to low altitude, the mean Hbmass had decreased to 2.5 per cent above the pre intervention level²³. In contrast to other findings, this study observed a mean increase in serum EPO levels on return to low altitude, although this was primarily due to an abnormally high EPO response in one of the five subjects in the study²³. The maintenance of any performance changes on return to low altitude was not assessed in these recent studies^{15,23,23}, and it is important that changes in sea level performance, as well as



other parameters such as ability to undertake a heavy training load or psychological benefits in the weeks following LHTL is included in future studies. This data is critical to assess any benefit of any altitude training camp and to determine if such a camp can be justified.

Pre-season altitude training camps for AFL footballers. Is there data to justify altitude training to enhance football performance?

Until recently no data had been published on the effect of pre-season altitude training camps on performance in team sports such as AFL football, which involve repeated, intermittent bursts of running activity over 100 minutes of competition and over a 22 week winter season. AFL clubs are keen to protect their 'intellectual property' from their competitors and experimental studies, which include a control group, are difficult to conduct with professional athletes. This is because if there is a perceived benefit of a particular intervention, it is difficult to deny this intervention to any player, both on a potential performance benefit and ethical consideration.

“National and state sports institutes, universities and AFL clubs are increasingly building altitude houses to conduct research and to allow athletes to live and sleep in a hypoxic environment while enabling them to train outside the chamber at lower altitudes.”



McLean et al²¹ are the first to publish data on the effect of a high altitude training camp conducted with an elite AFL squad (Collingwood Football Club), where the players lived and trained for 19 days in Flagstaff, Arizona (2130 m). It is important to emphasise that this altitude camp was conducted using the traditional terrestrial, Live High-Train High (LHTH) model, rather than the Live High-Train Low (LHTL) seen in the more contemporary altitude studies. A group of 21 elite AFL players were selected to participate in the altitude camp, while nine players (who acted as the control group), stayed and trained in Melbourne (30 m). Players were not randomised to each group and the paper does not specify why the 'control' group was not selected to participate in the altitude camp and were thus 'denied' access to this intervention. Hbmass, 2000 m running performance at sea level, and a measurement of intramuscular carnosine (muscle buffering capacity) using an MRS technique, were measured in all players before, three days and 30 days after the altitude camp. No assessment was made of $\dot{V}O_{2\max}$ in this study. Both groups undertook similar four week endurance and strength training blocks before and during the altitude intervention, however, the training stress in the altitude group was higher than the control group. 'Training stress' was calculated as training time x perceived exertion with the altitude group recording higher levels of training stress due to the increase in perceived exertion, as a result of the altitude induced hypoxia.

Following the altitude training camp in this study, there was a modest increase in Hbmass of 3.6 per cent and a trivial increase in Hbmass of 0.5 per cent in the control group. However when the difference in training stress was accounted for, the increase in Hbmass in the pre-high altitude group was reduced to 2.2 per cent. There was marked inter-player variability in the change in Hbmass for both groups of players. The increase in Hbmass observed in the altitude group had returned to pre-altitude levels four weeks after the altitude camp. No change in intramuscular carnosine or muscle buffering capacity was observed. Running performance at sea level following the intervention improved by 1.5 per cent (or 19 seconds over 2000 m) in the altitude group, with the control group also improving their 2000 m run time by 11 seconds. The inter-individual variation in 2000 m run time was assessed as being approximately half the performance improvement, with the improvement in 2000 m run performance due to altitude statistically assessed as being 'likely'. Interestingly, the improvement in 2000 m run time was maintained in the altitude group for four weeks after the altitude intervention. The reason for the ability of the altitude group to maintain their running performance time is unclear, although the

authors stated that this was due to the players being able to complete 'an improved quality of training post-altitude camp'. No evidence is presented in the current paper that might justify this statement, nor is evidence provided for this statement in the paper²⁴. This is clearly an area for future research.

The running performance improvement in this LHTH study may have been compromised by the non-specificity of the running training in the altitude group⁴ and it is suggested that 2000 m performance may have been further enhanced by undertaking the running training at lower altitude, thus adopting the LHTL model. While the improvement in running performance was maintained for four weeks post altitude, it is unknown if any physiological or running performance benefits were maintained two to three months later, when the AFL competition season began. If achieving the maximum performance benefit from altitude training was the major goal, then conducting the altitude training closer to the start of the AFL season might seem to be more desirable. However, it is acknowledged that as an AFL season draws closer, football specific skills, technical and tactical training become the major focus. Additional hypoxic exposure using an altitude house could potentially be used to maintain the haematologic and performance benefits of the pre-season altitude camp. However, given the data from experimental studies outlined above, to achieve the 12 hours per day hypoxic exposure required over a period of three weeks¹⁵ is generally seen to be not practical, due to the significant time commitment required by the players. As outlined above shorter hypoxic exposures may result in non-haematologic and performance benefits, so the use of an altitude house should be considered in the late pre-season, during the competition season and in the build up to finals for players identified to achieve these benefits with prior exposures. However, no AFL club currently has an altitude house that could accommodate the 22 plus players within an AFL playing group.

“... is the cost of conducting overseas pre-season altitude training camps (for up to 40 players and staff) or the cost of purpose built altitude houses worth the perceived performance benefit?”

One practical approach would be to identify the 'responders' to hypoxic stimuli and focus any supplementary hypoxic training on those players who show clear physiological and performance benefits. This may reduce the number of players and the costs associated with undertaking altitude training, and it might also identify players and opportunities where players could undertake live-in periods in altitude houses during the pre-season and in-season phase.

Collingwood Football Club has used this approach sending two players to altitude training during the 2012 season. A potential benefit of a pre-season altitude training camp is that it not only provides an opportunity for eliciting 'physiological benefits' but also provides for team building and 'mental gains'. This 'training camp effect' is important^{9,22} as it provides significant opportunities to induct new players into the playing group, providing a unique environment to work intensively with coaching and support staff away from other distractions of their daily lives¹.

Could thermal stress provide physiological adaptations that enhance training response and endurance performance?

The physiological adaptations to thermal stress are well known and have been extensively investigated and the benefit of these adaptations to sports performance in hot environments is well recognised²⁵. However, the effect of heat acclimatisation on maximal aerobic power and endurance performance in a cool environment has only recently been investigated²⁶. This hypothesis is seen as analogous to the effect of high altitude acclimatisation on endurance performance at sea level.

This recent paper²⁶ has shown that 10 days of sub-maximal exercise training (50 per cent VO₂max) in 40°C of heat significantly increased VO₂max, maximal cardiac output, plasma volume and maximal aerobic exercise performance of trained cyclists, in both cool (13°C, 30 per cent RH) and hot dry conditions (38°C, 30 per cent RH) of between five to six per cent in cool and 5 to 9.1 per cent respectively, when compared to a control group. This increase in cardiac capacity and performance was mediated mainly by a 6.5 per cent increase in the plasma volume. This increase in aerobic performance was maintained for one to two weeks post thermal intervention. This data suggested that thermal stress combined with the adaptations provided by altitude training, may provide another independent mechanism to potentiate the aerobic training effect in athletes which requires less time and logistical support.

“... shorter hypoxic exposures may result in non-haematologic and performance benefits, so the use of an altitude house should be considered in the late pre-season, during the competition season and in the build up to finals for players identified to achieve these benefits with prior exposures.”

Based on this hypothesis, Carlton Football Club, prior to the 2012 season, took 17 elite AFL players to the ASPIRE Academy of Sports Excellence in Qatar to participate in a two week 'Live High-Train Low in the heat' training camp². Over the two weeks all 17 players took part in 10 outdoor AFL skill-specific training sessions in the heat (32°C, 39 per cent RH) including eight indoor strength sessions (23°C, 57 per cent RH). One group (N=9) lived in a hypoxic, normobaric altitude house (2500-3000 m) for 14 hrs/day, and completed an additional seven indoor interval cycling sessions (total duration 4.3 hours/week), while the other group (N=8) completed the interval training sessions in normobaric normoxic air at sea level. Physiological and performance testing (Yo-Yo intermittent recovery test) was conducted 23°C, RH 57 per cent), pre-, immediately after and then three weeks after the camp. Both groups showed significant and similar improvements in the Yo-Yo test performance (44 per cent) immediately after the camp, however only the LHTH group maintained a six per cent performance improvement three weeks after the camp. Hbmass increased by three per cent and six per cent immediately and then three weeks after the camp in the altitude group. Blood volume increased in both groups (4 to 5 per cent) immediately after the camp, however the increase blood volume (7 per cent) was only maintained in the altitude group.



These results showed that a short two week exposure to a combination of heat and hypoxic stress produced significant, lasting (at least for three weeks), and independent physiological adaptations, providing an important environmental cocktail to enhance performance in AFL players.

Practical implications of the results that combine altitude and thermal adaptation for AFL footballers. What are the cost-benefit outcomes of these studies?

While Buchheit et al² combined thermal and hypoxic stresses for maximal adaptation and performance benefits, the group that only underwent thermal stresses during training also demonstrated some immediate performance benefits. Based on previous studies²⁷, the effect of heat acclimatisation lasts for one to two weeks, however the maintenance of endurance performance benefits were not investigated by Lorenzo et al²⁶. This is important to examine in future investigations.

“A potential benefit of a pre-season altitude training camp is that it not only provides an opportunity for eliciting ‘physiological benefits’ but also provides for team building and ‘mental gains’.”

The use of progressive thermal stress during pre-season training, by itself, may provide a relevant, convenient and economical approach to enhance the training response of AFL footballers. Pre-season training during the summer months in Australia is often conducted in hot conditions and if progressively introduced to allow for thermal adaptation while avoiding any adverse consequences of heat induced injury, this could provide an important additional environmental stress to elicit endurance performance benefits. Heat adaptation would also be extremely valuable when players are often required to play early season AFL games in hot and humid conditions. Hot conditions may also be experienced in the northern states of Australia during winter. While altitude training may provide independent physiological and performance benefits, the cost of conducting terrestrial altitude camps overseas, or the use of altitude houses is significant, especially for those clubs with limited resources. Training in progressively hotter conditions may provide a cost-effective method to enhance the training response in AFL footballers and the money saved (estimated at \$500,000) could be used for other purposes such as to employ additional coaching or support staff to improve the football performance of an AFL list and develop younger players. It is certainly worthy of consideration.



Dr Ian Gillam, PhD, ASP, AEP, ESSAF, FASMF

Dr Ian Gillam PhD is currently an industry development officer for Exercise & Sports Science Australia. He is an accredited exercise physiologist and an accredited sports physiologist. Prior to 2011 Ian worked as an exercise physiologist in clinical practice for 12 years and he has been a consultant to a number of elite sports teams including the AFL Melbourne Demons, Tennis Australia, Scotch College Rowing Team and the Drapac Professional Cycling Team. He is a Fellow of Sports Medicine Australia and a Fellow of Exercise & Sports Science Australia.

To find an accredited sports scientist go to Exercise & Sports Science Australia (www.essa.org.au).

References, as indicated within the article, are available at sma.org.au/publications/sport-health

Discipline group news and events

The Australasian Academy of Podiatric Sports Medicine (AAPSM)

News:

- 2013 signifies a new phase of education and development and as the year unfolds we will provide further information to members on how you will benefit.
- Each state will deliver four education evenings this year. Each state will release their timetable separately, with your best contact for this your state trustee. Please find following your list of state trustees, including four new appointments. These people are your main point of contact and we encourage members to keep in touch/provide suggestions/ideas to these persons.

President: Ray Harding

Vice President: Chris Bishop

QLD: Kent Sweeting

VIC/TAS: James Pope

WA: Dr Suresh Sivacolundhu

SA: Tom May

NSW/ACT: Hollie Parsons

We would also like to thank outgoing trustees Nicki Quigley, Darryn Sargant and Rachael Bradhurst for all their hard work during their time at the helm.

For more information visit www.aapsm.org.au

Exercise & Sports Science Australia (ESSA)

News:

- The landscape upon which we sit has changed dramatically since ESSA's inception 21 years ago. During our last strategic cycle (2010–2012) we have seen 19 per cent growth in membership numbers and 48 per cent growth in accredited exercise physiologists. The strategic plan provides clear direction and will help foster unity of everyone involved in the management of the association and the provision of services to our members. See the full document at www.essa.org.au/about-us

Upcoming events:

- **ESSA 2013 Business Forum**
May 18–19, 2013, Wollongong NSW
www.essa.org.au/business-forum
- **Webinars**
In 2013, ESSA will be launching a new webinar program, on various relevant topics. ESSA members can request topics via education@essa.org.au

For more information visit www.essa.org.au



Sports Dietitians Australia (SDA)

News:

- Come and see us at the Australian Fitness and Health Expo (FILEX) at stand number #M17 at the Sydney Convention Centre during April 19–21, 2013.
- We are on Twitter. Follow us @sportsdietaust

Upcoming events:

- Nutrition for Exercise & Sport
March 9, 2013, Perth
- Nutrition for Exercise & Sport
March 16, 2013, Adelaide
- Nutrition for Exercise & Sport
April 18, 2013, Cairns
- Sports Nutrition
May 3–6, 2013, Canberra
- Nutrition for Exercise & Sport
May 18, 2013, Sydney
- SDA Update
May 22, 2013, Canberra

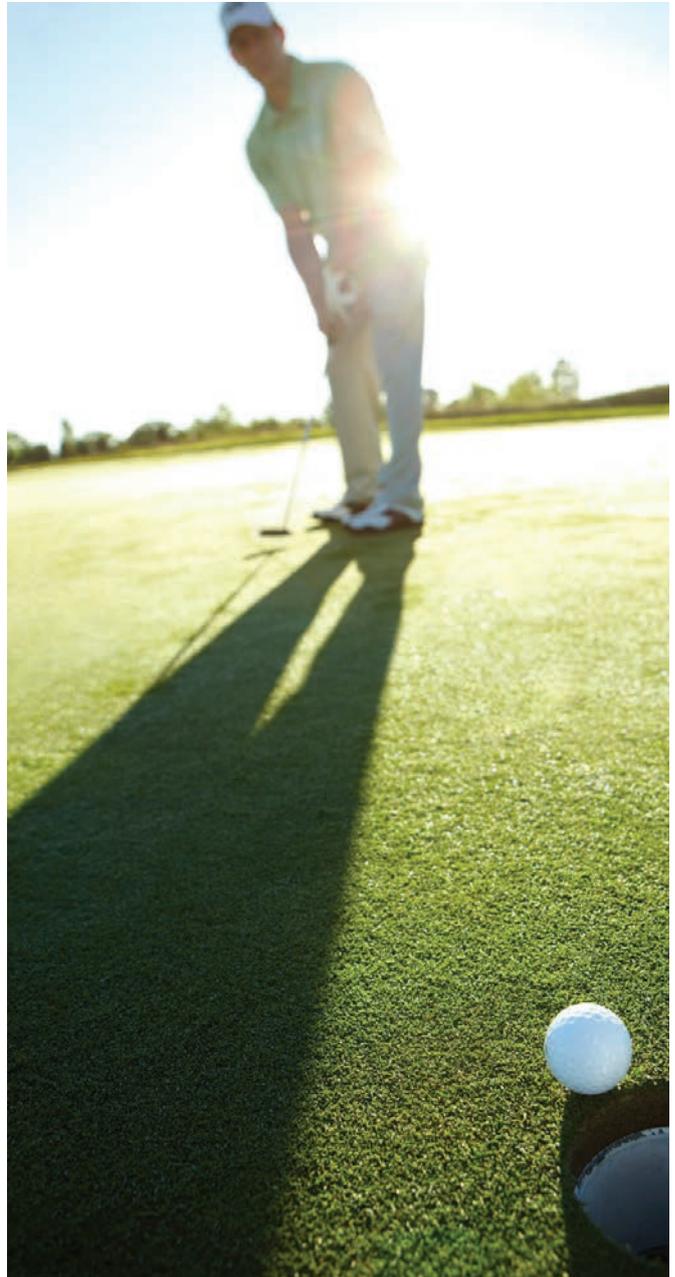
For more information visit www.sportsdietitians.com.au

Sports Doctors Australia (SDrA)

News:

- The SDrA Committee is very keen to continue to be involved with as much clinically oriented presentations as possible at this year's SMA's Conference in Phuket (October 22–25, 2013). The Committee encourages SDrA members to get involved in the conference. Check the conference website for details on abstract submissions.

For more information visit www.sportsdoctors.com.au



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The *Journal of Science and Medicine in Sport*

Australian football podcasts

Recently Sports Medicine Australia conducted two podcast interviews which focused on the sport of Australian football. First we spoke with Rebecca Braham of The School of Sport Science, Exercise and Health from The University of Western Australia regarding her study into the injury profile of past elite Australian football players. We also spoke to Samuel Chalmers from The School of Health Sciences at the University of South Australia on the relationship between pre-season fitness testing and injury in elite junior Australian football players.



Life after the game – Injury profile of past elite Australian football players

Rebecca Braham podcast

This study features in Volume 16 Number 1 January 2013 and investigates the long-term health and wellbeing of past elite AFL players with particular emphasis on the effect of playing injuries on current lifestyle.

Main findings

- A majority of past players experienced serious injuries (76 per cent) and concussion (73 per cent) throughout their career, both increasing significantly with the number of games played.
- Of those who received injuries, 60 per cent require ongoing treatment, yet only 6 per cent receive treatment costs covered by their club or the AFL Players' Association.
- A large proportion (64 per cent) of respondents are affected in daily life from previous AFL injuries.

The relationship between pre-season fitness testing and injury in elite junior Australian football players

Samuel Chalmers podcast

This study features in Volume 16 Number 1 January 2013 and examines the link between physical fitness qualities and injury in Australian football.

Main findings

- Lower aerobic endurance, faster five metre acceleration and greater planned agility were associated with an increased risk of various injury types in elite junior Australian football players.
- A higher left foot running vertical jumps and faster five metre acceleration were associated with injury severity.
- These results may largely relate to a greater work capacity placing a higher load upon the musculoskeletal system in contact and non-contact situations.

Listen to the podcasts or view the research papers at jsams.org