

SPORT



HEALTH

VOLUME 34 ISSUE 4 2016/17

THE ALTERNATIVE EDGE

Can doping in sport
really be prevented?

Cold-water immersion

Sleep and recovery

Nutritional ergogenic aids



- Winding guide
- Blood-flow restriction training
- Sport and exercise medicine in Turkey
- 5 minutes with Dr Peter Larkins





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FROM THE CHAIRMAN

ALTERNATIVE FACTS IN SPORTS MEDICINE



Andrew Jowett
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SMA CHAIRMAN, ANDREW JOWETT BORROWS A PROMINENT PHRASE IN 2017 TO OUTLINE THE IMPORTANCE OF EVIDENCE-BASED RESEARCH IN SPORTS MEDICINE.

"There are always alternative facts. What matters is how we decide which of those alternative facts are most likely to be true." Peter Neal Peregrine

This issue of Sport Health deals with alternative approaches in the field of sports medicine. As professionals, we use science to judge the facts and decide on the validity of these approaches. We should all have a framework for evaluation that enables us to test our observations against established scientific theory and logic.

The credibility of sports medicine has been under question lately largely due to a lack of adherence to evidence-based practices as well as unethical and illegal behaviour to gain an edge, as discussed by our CEO in his subsequent editorial. It is possible to gain an "alternative edge" using ethical, legal and evidence-based practices.

Sir David Brailsford made himself famous with the term "marginal gains" which he applied as the performance director of the successful British Cycling team. This had elements of coaching PR to it but it was seen as new or alternative. Apply yourself to the "one percenters", get the little things right and you'll gain an advantage. The reality however is there is nothing special or exciting about marginal gains – they are mostly obvious and boring. Eat well, train hard and get some sleep! (Sadly, this programme is currently under the microscope as so many in this sport have been.)

One area where sports seem to have ignored the science is in the field of neuromuscular training and injury prevention programmes. The Nordic hamstring programme and FIFA's 11+ have demonstrated efficacy in injury reduction and yet the majority of Champions League clubs have failed to implement them. An example of an alternative to current practice based on logic and science that should be explored.

We should all consider alternatives but make sound scientific and ethical decisions when we evaluate whether they are facts or alternative facts.



The credibility of sports medicine has been under question lately largely due to a lack of adherence to evidence-based practices as well as unethical and illegal behaviour to gain an edge

FINDING A LEGAL EDGE

FROM THE
CEO

SMA CEO, ANTHONY MERRILEES HIGHLIGHTS A HISTORY OF ILLEGAL DOPING IN WORLD SPORT AND HOW GAINING AN ADVANTAGE CAN BE WELL WITHIN THE RULES.

For as long as humans have played organised sport, they have searched for ways to find any little advantage they can get, both legally and unfortunately illegally.

It's hard to find a sport in 2017 which hasn't been rocked by performance enhancing drugs at some point throughout its history, many having to survive recent controversies from competitors attempting to gain unfair advantages.

Swimming, cycling and athletics are three pillars of Olympic sport which have constantly battled the scourge of PEDs. From the sophisticated drug programs in East Germany throughout the 1980's which stained swimming, to the Tour de France consistently being tainted by systemic doping, to more recent revelations of Institutionalised drug programs in Russia, rocking athletics and the 2016 Rio Olympics. Major drug scandals like those taint the entire sport and every competitor, forcing fans to question if the sport will ever be clean.

Australia certainly hasn't been spared from controversy surrounding performance enhancing drugs. The so called "Blackest day in sport" in February 2013 stunned the Australian sporting landscape, directly affecting the country's two biggest sporting leagues and seeing players from Essendon in the AFL and

Cronulla in the NRL, receiving suspensions and both clubs taking financial hits in drawn out court battles and hearings with ASADA.

So, like the history of sport, the future will continue to see a battle between anti-doping groups and those trying to beat the system and while that does all sound quite bleak, there's much more to gaining an "alternative edge" than illegal doping.

As you will see in this issue of *Sport Health*, there are various well-researched, contemporary, and most importantly legal ways that athletes can gain even the slightest advantage over their competition.

Some of these methods can be practiced by any local sportsperson or anyone participating in physical activity. Rest and recovery can make a huge difference on the sporting field, as can a good diet and proper nutrition. Different forms of training can help improve strength, endurance or speed and there are numerous alternatives to standard gym sessions to increase physical performance.

Illegal doping is one of the biggest issues hurting modern sport, however as this publication will demonstrate, gaining an edge can be simple and entirely within the rules.



Anthony Merrilees

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There's much more to gaining an "alternative edge" than illegal doping.

5 MINUTES WITH DR PETER LARKINS

5 MINUTES WITH... DR PETER LARKINS, SPORTS AND EXERCISE PHYSICIAN, EPWORTH SPORTS & EXERCISE MEDICINE GROUP



Tell me a little about your sports medicine background.

My life has been shaped by sport since age 6. As a young athlete in Geelong I met several doctors and physios who worked in sport so my interest was sparked by the potential of what they did. I joined SMA as a student member when I was in med school and that began my long journey into sports medicine as a doctor, SMA committee member and health promotion advocate.

What does a typical day consist of?

My days vary quite a lot but I consult almost every day as a specialist Sport & Exercise Physician in private practice at Epworth in Richmond. I also work alongside some of Melbourne's busiest sport surgeons in theatre once or twice a week. In winter, I add weekend media commentary work at AFL games covering all aspects of injury and fitness for professional athlete care. I also do corporate speaking on health issues.

What is your favourite aspect of your job?

I enjoy helping patients who have had problems for a long time to get back to quality activity and also enjoy educating the community on health and fitness topics.

What has been the highlight of your career?

I have attended several Olympic Games and had the chance to meet and work with some outstanding athletes.

How did you become involved with SMA?

I was a student member in med school then joined the State branch committee after returning from overseas. I was a member of several executive committees at State and National level culminating in becoming National President in 1995.

What do you think the benefits of being a SMA member provides especially within your field?

SMA membership allows for great opportunity to mix with all disciplines in sports medicine and provides great fellowship and educational interaction. SMA highlights that our field is multi-disciplinary!

Describe your role with Epworth Sports & Exercise Medicine Group.

I was a co-founder of the group and it is my private practice office where I see patients. I was approached by Epworth to develop their sports medicine profile and I was keen to establish a clinic with a highly-specialised sports medicine focus. We currently have six doctors working there and we are a training site for the Australasian College of Sport & Exercise Physicians. (ACSEP)

How did you come to be in this role?

See above.

Besides from sports medicine, what are you passionate about?

I enjoy running and cycling as well as good food with friends, some wine and planning my next holiday (too infrequent!)

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

Believe in yourself and set your goals high.

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

- Robin Williams – Eccentric genius.
- Cameron Diaz – For her cooking skills.
- Mark McCormack – Founder of IMG and sports marketing guru.
- Mark Doherty – Asics Australia - he wouldn't drink my cellar dry!

FAVOURITES

Travel destination: Noosa (local) and Italy (exotic).

Sport to play/watch: All sport, but AFL & track & field are my favourites.

Cuisine: Italian.

Movie: *A Beautiful Mind*.

TV program: Any travel show.

Song: *While My Guitar Gently Weeps* by Eric Clapton.

Book: *The Perfect Mile* (Neal Bascomb).

Gadget: Kitchen Knives/Pepper grinder.

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SLEEP

WHY ATHLETES
NEED TO PAY IT
THE ATTENTION
IT DESERVES.

RECOVERY PHYSIOLOGIST
SHONA HALSON EXPLAINS
THE IMPORTANCE OF SLEEP
AND RECOVERY FOR
PROFESSIONAL ATHLETES
WHILE ALSO PROVIDING A
GUIDE ON GETTING A GOOD
NIGHT'S SLEEP.

SLEEP

WHY ATHLETES NEED TO PAY IT THE ATTENTION IT DESERVES.

Sleep is often reported to be one of the best recovery techniques available to athletes. Indeed many athletes anecdotally report poor sleep without an understanding of why or what can be done to rectify the problem. Despite this, it has only been in the last 3-5 years that research has focussed on sleep and athlete performance and importantly *how* athletes sleep.

Although the function of sleep is not fully understood, it is generally accepted that it serves to recover from previous wakefulness and/or prepare for functioning in the subsequent wake period. Restricting sleep to less than 6 hours per night for four or more consecutive nights has been shown to impair cognitive performance and mood, disturb glucose metabolism, appetite regulation and immune function. From the available research on athletes it appears that sub-maximal prolonged tasks, such as tennis, may be more affected by sleep deprivation than maximal efforts, particularly after the first two nights of partial sleep deprivation. The mechanism behind the reduced performance following prolonged sustained sleep deprivation is not clear, however it has been suggested that an increased perception of effort is one potential cause.

Athletes often rank sleep as the most prominent cause of fatigue and tiredness. Thus, elite athletes and coaches often identify sleep as a vital component of the recovery process. Indeed, many athletes often have difficulties sleeping prior to important competitions. When 283 elite Australian athletes were questioned about their sleep, it was found that 64.0% of athletes indicated worse sleep on at least one occasion in the nights prior to an important competition over the past 12 months. The main sleep problem specified by athletes was problems falling

asleep (82.1%) with the main reasons responsible for poor sleep indicated as thoughts about the competition (83.5%) and nervousness (43.8%).

Results of recent research from the Australian Institute of Sport (AIS) examining the importance of sleep and sleep habits in elite athletes have demonstrated poor sleep quality and quantity in some elite athletes. Athletes' sleep/wake patterns were monitored using wrist activity monitors and sleep diaries. On average, participants across all sports obtained a total sleep time of $6:8 \pm 1.1$ h. This data also demonstrated that athletes from individual sports went to bed earlier, woke up earlier and obtained less sleep (individual vs team; 6.5 vs 7.0 h) than athletes from team sports. This suggests that athletes often get less sleep per night than the recommended 8 hours. Findings from this research reveal that elite athletes obtain less than the recommended 8 hours of sleep for the general population. Further, elite professional athletes who compete at night anecdotally report that sleep onset time (time taken to fall asleep) is often very high. These athletes often report that it may take 3-5 hours to fall asleep after major competition occurring in the evening.

WHAT FACTORS MAY CONTRIBUTE TO POOR SLEEP IN ATHLETES?

Numerous factors associated with lifestyles of elite athletes may influence sleep duration and/or quality. Altered routines from varying training and competition schedules (i.e. early morning training or night competition) can be detrimental to keeping regular sleep and wake times. A regular routine is regarded as one of the best way to ensure a good night sleep. Athletes may also regularly experience muscle soreness, pain or

injury that may impair their ability to sleep. Further, psychological stress and/or anxiety about competition or other lifestyle factors can be a significant factor. Many athletes anecdotally report being good sleepers, except during major competition.

As many Australian athletes are required to travel extensively, either domestically or internationally, travel stress and jetlag can be a major reason why athletes have restricted or interrupted sleep schedules. Travel also has implications for changes in sleeping environments and potentially the requirement to share rooms. Another factor that is often reported by athletes is the use of phones, computers and video games prior to sleep. These can have a stimulating effect and reduce sleep onset time. Finally, excess consumption of stimulants such as caffeine can interfere with sleep. Caffeine intake may be high during competition or before particularly intense training sessions. Based on the above information regarding potential barriers to sleep in athletes, included on the next page is a guide to methods that may enhance sleep in both athletes and the general population.

From what is currently known regarding athletes and sleep, it appears that sleep is important for almost all biological functions, especially those related to elite performance. These include immune function, injury risk, metabolism, mood, memory and learning. We also know that athletes appear, in general, to have poorer sleep than the general population. As outlined above, there are a number of factors imposed on athletes that may contribute to this poor sleep (such as competition times and travel). However, it also appears that many athletes may not appreciate the importance of sleep for recovery and well-being and engage in activities (such as use of mobile phones and social media) at times that are not

“

These athletes often report that it may take 3-5 hours to fall asleep after major competition occurring in the evening.

conducive to sleep. Therefore an important role of sport science and sport medicine practitioners is to gain an understanding of how athletes are sleeping and provide education and support to assist the athlete in obtaining enhanced sleep. Given that we spend (ideally) one third of every 24 hour period engaged in sleep, and we now have a greater understanding of the consequences that occur when this time is reduced, having an enhanced focus on sleep for athletes is important. Monitoring and education provide the foundation for this focus and the potential to enhance both health well-being as well as maximise performance in elite athletes.

HOW TO GET A GOOD NIGHT'S SLEEP:

Bedroom The bedroom should be cool (21°C is best), dark, quiet and comfortable. The bed and pillows used is important

Routine

- Create a good sleep routine by going to bed at the same time and waking up at the same time.
- Before bed routine can help the body prepare for sleep. The routine should start about 30min before bedtime. i.e. clean teeth, read a book etc.

SLEEP

WHY ATHLETES
NEED TO PAY IT
THE ATTENTION
IT DESERVES.

Electronics Avoid watching television in bed and using the computer in bed. These can steal sleep time and form bad habits.

Avoid watching the clock. Many people who struggle with sleep tend to watch the clock too much. Frequently checking the clock during the night can wake you up (especially if you turn on the light to read the time) and may reinforce negative thoughts.

Get up & try again If you haven't been able to get to sleep after about 20 minutes or more, get up and do something calming or boring until you feel sleepy, then return to bed and try again. Sit quietly on the couch with the lights off (bright light will tell your brain that it is time to wake up).

Food and Fluid

- Avoid the use of caffeinated food and fluids later in the day.
- Do not go to bed after consuming too much fluid, this may result in waking up to use the bathroom.

Be Organised Utilise a 'to-do' list or diary to ensure organisation and unnecessary over-thinking whilst trying to sleep.

Relax Investigate relaxation/breathing techniques.

ABOUT THE AUTHOR

Shona Halson is the senior Recovery Physiologist at the AIS in Canberra. She is also the Associate Editor of the *International Journal of Sports Physiology and Performance* and has extensive experience in the areas of fatigue and recovery.



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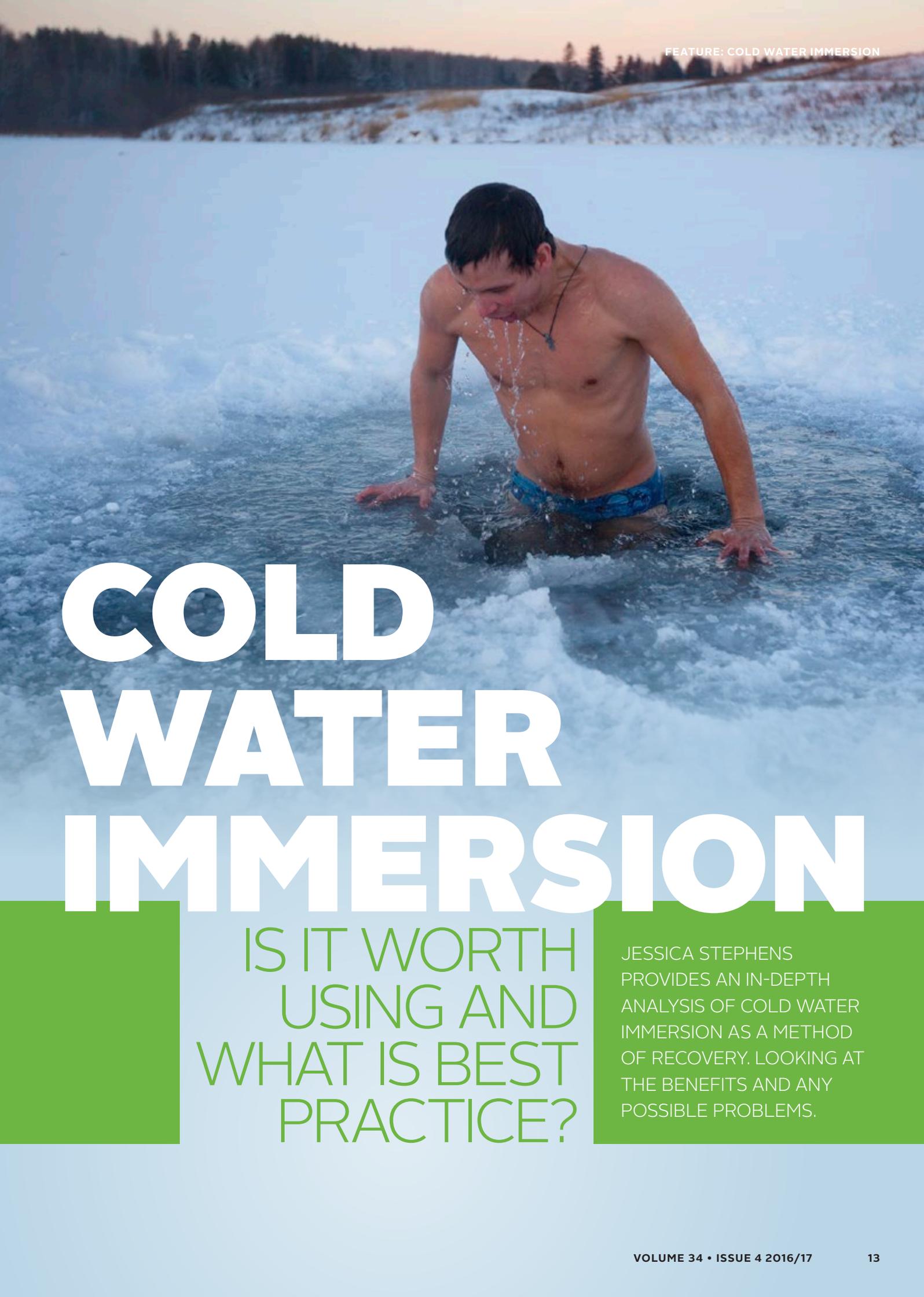
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COLD WATER IMMERSION

IS IT WORTH
USING AND
WHAT IS BEST
PRACTICE?

JESSICA STEPHENS PROVIDES AN IN-DEPTH ANALYSIS OF COLD WATER IMMERSION AS A METHOD OF RECOVERY. LOOKING AT THE BENEFITS AND ANY POSSIBLE PROBLEMS.

COLD WATER IMMERSION

IS IT WORTH
USING AND
WHAT IS BEST
PRACTICE?

INTRODUCTION

Cold water immersion (CWI) has become one of the most frequently used recovery methods, yet there is contention surrounding its benefits. Research to date has shown mixed results for the use of CWI around simulated competition scenarios and regular training, leading us to question whether or not it is really working taking the cold plunge. So, let's review the facts...

The purpose of using CWI for recovery is to enhance the athlete's ability to perform in subsequent training sessions or competition by decreasing fatigue, soreness and inflammation. CWI is used either acutely to enhance recovery between events/sessions or chronically to enhance recovery from day to day. Research examining the acute and chronic effects of CWI on subsequent performance has shown mixed results. While most acute studies have shown positive effects on performance, it should be acknowledged some have shown negligible or detrimental effects.¹ As for chronic use of CWI, in recent years

there has been a popular theory that by using CWI to reduce inflammation you are also reducing the training adaptations because an inflammatory response may be necessary to enable adaptations to occur.²

EFFECTS OF CWI ON ACUTE RECOVERY

When it comes to the acute use of CWI, the purpose is to acutely manage the fatigue associated with competing, as the athlete may have to back up for a repeat performance minutes to hours post their first bout. In these scenarios when deciding whether CWI will be of benefit to an athlete, you must examine the type of fatigue you are trying to manage, which will of course be impacted by the type of exercise they are undertaking. The two-main types of exercise which have been examined by current research are endurance performance and maximal efforts (strength, power or sprint).

For endurance performance, CWI is often utilised to manage thermoregulatory strain and can provide pre-cooling benefits to subsequent performance.

The findings of current research seem to suggest that CWI may be more effective for longer duration endurance efforts as the common factor between the studies which have found CWI to have no effect on the recovery of endurance performance is short 1km time trial efforts.¹ This is supported by a recent review where it was suggested that CWI is ineffective for high intensity exercise of short durations due to 1) the lack of thermal strain from the initial bout and 2) the enhanced parasympathetic re-activation which may impact muscular contractions by impacting upon oxygen consumption and glucose metabolism.³

For maximal efforts, fatigue is generally associated with muscle damage and metabolite build up, and CWI is utilised to reduce swelling, soreness and perceptions of fatigue. When you examine the research for this type of performance, it becomes evident that CWI may be more effective for the recovery of stretch-shortening cycle exercise (e.g. jump testing) rather than isolated isometric or concentric movements (e.g. maximal voluntary contractions).^{1,4} It is also evident that CWI



Different scenarios and different athletes will respond differently to both training and CWI so the level of athlete and the priorities of training should be considered.

may not be the best recovery modality for sprint performance, as the current literature is generally associated with negative effects. However, when you examine the research closely, most studies have re-assessed sprint performance between 5 and 35 minutes post-CWI. Therefore, it may be possible that the short time-frame led to participants being required to perform before muscle tissue had re-warmed. Muscle temperature is an important determinant of muscular power and sprint performance so it easy to understand why negative effects would be observed in these scenarios. The practicality of these research scenarios is also questionable because when would an athlete actually have time to do CWI between exercise bouts when they only have 5 to 35 minutes before they go again? Never!

EFFECTS OF CWI ON CHRONIC RECOVERY

As previously mentioned, the chronic use of CWI after training has come under fire in recent years for its potential negative effects on training adaptations. So far,

research has examined the effect of CWI on adaptations to both endurance and resistance training and across this research, varied responses are once again reported. Overall the research on training adaptations shows that regular CWI may have negative impacts on the recovery of performance following resistance training^{5,6} but positive effects on recovery following endurance training.^{2,7}

However, before generalising these results across all scenarios, it is important to look closely at the methods employed by these studies, for example the resistance training studies have utilised general population/healthy males who have performed 1-2 resistance training sessions per week with minimal other exercise performed. Their responses to a one-off training are going to be vastly different to an athlete who trains multiple times per day, most days of the week. So just because a research study has found a particular result, doesn't mean that it is always the result you will see, it just means that in the particular scenario they examined that was the outcome. This is not to say that you should always do CWI following every single session, rather it is

to highlight that different scenarios and different athletes will respond differently to both training and CWI so the level of athlete and the priorities of training should be considered.

CONSIDERATIONS FOR USING CWI

So far we know that CWI can have either positive or negative effects on acute and chronic performance recovery, so what factors should we be thinking about to avoid these negative effects? First and foremost is what is the athlete trying to recover from/for? From the research to date, it is easy to see that the specific type of fatigue and timeline for recovery are going to significantly impact on how the athlete will recover, so matching the protocol to the type of fatigue is key. Additionally, caution is necessary when dealing with short timelines.

Another factor known to influence responses to CWI is individual differences. The characteristics of the athlete will influence how they respond physiologically, so it is important to take into consideration their body

COLD WATER IMMERSION

IS IT WORTH USING AND WHAT IS BEST PRACTICE?

composition, age and gender.¹ For example, athletes with low body fat and/or high body surface area to mass ratios will cool at a faster rate than those with higher body and/or smaller body surface area to mass ratios. Youth and masters athletes as well as women will also cool faster than the average male adult and this is largely due to body composition differences. So the protocol you choose to use with a male rugby team compared to a women's gymnastics team should be different.

Finally, when considering whether or not to use CWI chronically, periodisation is important. While the theory behind needing some inflammatory response is sound, we are still yet to see research which conclusively proves that training adaptations in elite athletes are negatively impacted by routine use of CWI. However, that being said, the best approach is to err on the side of caution and avoid CWI recovery when the aim of training is to make adaptation gains. On the other hand, when the focus of training is maintenance of fitness, quality of training, skill development or if you are in season with regular competitions then CWI still can play an important role at keeping

athletes fresh. So ultimately it is vital to think about your aim and to periodise and individualise recovery interventions.

CONCLUSIONS

CWI can be an effective recovery modality when utilised correctly, however it is key that an individualised approach is taken when prescribing protocols. Although more research is required to be able to optimise and individualise protocols based on strong scientific rationale, we can now at least make better informed decisions about when and how to utilise CWI. So back to the original question, is cold water immersion worth using? Well, even though some studies have shown negative effects let's not throw the baby out with the cold water just yet.

ABOUT THE AUTHOR

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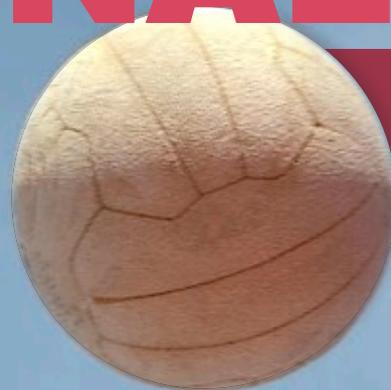
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NUTRITIONAL E

IN



ERGOGENIC AIDS

TEAM SPORTS

EXERCISE AND SPORT SCIENTIST BENJAMIN KOPEC DISCUSSES RESEARCH BEING CONDUCTED ON NUTRITIONAL ERGOGENIC AIDS AND THE ASSOCIATED BENEFITS BEING UNCOVERED.

It's a scenario that is regularly encountered in team sports; short sprints to beat your opposition to your target, interspersed with the endurance of continued movement on the field. As the game goes on, fatigue sets in, the ability to sprint is diminished, is there anything that could make that difference? Anything that could maintain performance across an entire game?

Many field-based team sports such as AFL, netball and soccer require athletes to perform short, high-intensity sprints, separated by periods of rest or lighter exercise, repeated over a period of 60 – 120 min. Therefore, an important component of team sports is repeated sprint ability.

Given the huge popularity of team sports and the continuous desire of coaches and athletes to improve performance, constant attention is being put towards gaining that extra edge. Further improvements in athlete performance could be the difference in gaining possession of a loose ball in AFL, being able to make a crucial lead run in netball or beating the opposition defender to tap in an open goal in soccer. These are common examples where a millisecond could make all the difference, and nutritional ergogenic aids can help make this happen.

Nutritional ergogenic aids generally refer to a dietary supplement ingested primarily to enhance exercise performance beyond a level achieved through training alone. Improved exercise performance is typically achieved via changes in energy metabolism and/or alterations to the central nervous system. The use of nutritional ergogenic aids in sport is on the rise with many athletes

experimenting with one or more nutritional supplements to improve performance. Two substances that are associated with improvements in exercise performance are sodium phosphate and caffeine. Importantly, both are safe and legal nutritional supplements providing positive effects in endurance performance, short-term high-intensity exercise and repeated sprint ability.

PROPOSED MECHANISMS

Sodium phosphate works by increasing 2,3-Diphosphoglycerate (2,3-DPG) concentrations within red blood cells, a molecule which promotes oxygen release from blood into muscle, increasing oxygen uptake and $\dot{V}O_{2max}$ and allowing the individual to exercise for longer periods without fatigue. Additionally, sodium phosphate improves energy production due to a larger energy (phosphate) pool replenishing ATP and PCr, the bodies main source of rapid energy.



NUTRITIONAL ERGOGENIC AIDS

IN TEAM SPORTS



While caffeine, the most commonly consumed psychoactive drug worldwide, has been found to reduce feelings of fatigue and pain and increase wakefulness and alertness through the effect of adenosine receptor antagonism in the central nervous system. Adenosine, which is usually produced when ATP is broken down during exercise, reduces alertness and arousal, slowing down the body. Caffeine's job is to prevent this, while additionally increasing $\dot{V}O_{2max}$ time to exhaustion and power output via activating more motor units and increasing neural firing. Sounds like that second coffee isn't a bad idea after all.

Both supplements have the ability to maintain performance over a team game while improving sprint times when fresh and fatigued, however, only recently have the two supplements been combined. As they are both thought to work via different mechanisms, combined supplementation has the ability to induce further enhancements than either supplement alone.

In our study we assessed the effects of sodium phosphate and caffeine, alone and in

combination, on repeated sprint ability over the course of a 60 min simulated team-game circuit in male athletes, replicating exercise performed in team sports. We demonstrated that although caffeine, sodium phosphate and combined supplementation resulted in faster sprint times than placebo, sodium phosphate alone resulted in the greatest improvements. The reason behind this is unknown, however this opens up an area for further research.

Additional research at the University of Western Australia has found similar benefits to be achievable in female team sport athletes. Studies assessing the same supplements in females found sodium phosphate alone and when combined with caffeine produced significantly faster sprint times when fresh and fatigued, further solidifying it as a performance enhancing supplement.

Caffeine has commonly been proven to benefit repeated sprint ability when used alone. It has the ability to improve sprint times throughout team sport exercise, with higher lactate concentrations supporting an increased anaerobic effort. Caffeine's effects are considerably noticeable with increased alertness and that "on-edge" feeling being obvious to most.

Overall, with the constant rise in competition in team sports, more athletes are searching for that last minute kick to increase performance and nutritional ergogenic aids, specifically sodium phosphate, caffeine and beetroot juice have the ability to do so.

Additionally, caffeine improves reaction times which can be crucial in making quick decisions during games.

Another supplement, which has been a big focus of research over the past couple of years, is beetroot juice. Not just a healthy vegetable but a beneficial ergogenic aid. High levels of inorganic nitrate found in the juice is transformed into nitric oxide in the body, a strong vasodilator, improving muscular blood flow and oxygen supply to the mitochondria (the energy producing organelles of each cell). Thus, concentrated beetroot juice has the ability to improve muscle efficiency and decrease fatigue. Moreover, it has been shown to improve high-intensity intermittent exercise in male athletes, such as that performed in team sports, specifically by allowing athletes to perform high-intensity sprints for longer, decreasing fatigue and minimising recovery times between sprints. However, no study has yet explored this effect in combination with other supplements in male athletes.



HOW TO TAKE THEM

In order to obtain the benefits from sodium phosphate, it must be loaded over a six-day period leading up to a game. It is ingested at a dose of 50mg/kg of fat free mass (body weight not including fat), split into four equal doses daily. Ideally, as it is a crystalline compound, it should be dissolved in a glass of sports drink (~300ml) such as Powerade to reduce side-effects.

Caffeine is best ingested as an anhydrous dose equivalent to 3-6mg/kg or 2-4g for the average 70kg male. Just grab a packet of No-Doz from your local supermarket. Be sure to take the required amount ~60-90mins before starting the game.

Beetroot juice is best consumed as a concentrated dose with ~4-6mmol of nitrate per 70ml of juice. Only concentrated juice will suffice as it has a higher concentration of inorganic nitrate. It can be loaded or taken as an acute dose on the morning of the game. The best results have been seen when athletes have started loading the day before exercise, consuming 2x70ml each in the morning and evening, and a further 3x70ml on the morning of exercise. With a taste that is not pleasing to most, I would suggest consuming it in combination with a more tastebud-satisfying juice.

Overall, with the constant rise in competition in team sports, more athletes are searching for that last minute kick to increase performance and nutritional ergogenic aids, specifically sodium phosphate, caffeine and beetroot juice have the ability to do so. With

improvements being found in repeated sprint ability and short-term high-intensity exercise, these supplements are able to significantly benefit both male and female's athletic performance in team sports. So if you're after that extra edge to help you push through those repetitive sprints or last that final quarter consider sodium phosphate, a shot of beetroot juice or even having that extra coffee.

ABOUT THE AUTHOR

Benjamin Kopec is an exercise and sports scientist who is currently a medical student at the University of Western Australia.

SMA MEMBER NEWS

ELASTOPLAST PARTNERSHIP

Sports Medicine Australia is excited to announce a renewing of our long-time partnership with Elastoplast Australia. SMA and Elastoplast have been partners for over 25-years and SMA is looking forward to continuing our long association. We're striving to be leaders in sports medicine and Elastoplast have similar goals in wound care and injury prevention. Their premium brand product line of sports tape and adhesives makes them market leaders and we're excited for the future together with Elastoplast.



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- Early bird registration closes Monday 31st July.

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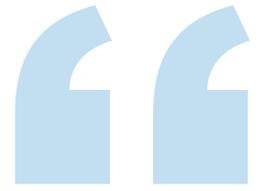


THE FOLLOWING IS A REPUBLISHED EDITORIAL WHICH FEATURES IN **THE JOURNAL OF SCIENCE AND MEDICINE IN SPORT** (VOLUME 20, ISSUE 1, JANUARY 2017) WRITTEN BY EDITOR-IN-CHIEF, GORDON S. WADDINGTON, PHD.

To kick off the first issue of the Journal of Science and Medicine in Sport for 2017 we have a focus on sport science and physical activity to get you moving from the seasonal break. We are also undertaking a number of improvements to the Journal from 2017 the aims of which are two-fold. The first being to increase the accessibility of the journal by progressing to a predominately online format, which will allow authors to see their work published more quickly, and is already the predominate form in which the journal is accessed. The second enhancement will be targeted towards continuing to increase the quality of articles published to ensure that the

journal continues to successfully achieve a high ranking for journals in its field.

This month's featured article in the physical activity section of the journal, Chen and co-workers report on work that aims to make the assessment of physical exertion in children easier to assess by means of images of facial expressions that anchor to a rating of perceived exertion. Ramos's group extend the fitness versus fatness argument in metabolic syndrome, suggesting pancreatic beta cell function is increased with exercise independent of fatness. The importance of promoting ball skills in preschool girls is described by Veldman



PRESSIONS

Kuenze and co-workers report that two weeks of quadriceps strengthening reduces the disparity between the injured and uninjured legs in response to fatiguing exercise.

and colleagues. van Loo's group, in a validation study of the SenseWear Mini activity model compared to indirect calorimetry, report that the activity monitor underestimates energy expenditure. Spartano and co-workers examine the relationship of physical activity to vascular reactivity to mental stress. In a large study of Brazilian schoolchildren da Costa and colleagues provide support for encouraging increased participation in school physical activity classes. Pavey's group examine the effectiveness of wrist worn accelerometer derived data to perform under free living conditions.

In this month's sport and exercise medicine section Kim and colleagues report on the reliability of the leg lateral reach test. Kuenze and co-workers report that two weeks of quadriceps strengthening reduces the disparity between the injured and uninjured legs in response to fatiguing exercise. Kelly's group report that Beta-alanine supplement use in Australian professional football players is inconsistent with therapeutic recommendations. In the concluding article of this section Coll and colleagues examine perceived barriers to leisure-time physical activity during pregnancy.

O'Brien, Young and Finch lead off this month's sports injury section by suggesting that tailoring of injury prevention interventions is necessary for professional youth soccer programs. Donnelly and co-workers in a report on a comparison of rear and fore foot

dynamics during unplanned side stepping find that modifying footfall pattern might reduce injury risk. Sobhani's group, with an experimental study examining changes in lower extremity running mechanics associated with rocker footwear indicate increased knee loads correlate with reduce loading about the ankle.

In the Sport and Exercise Science section Neiva and colleagues compare the effect of 10 and 20 min warm ups on 100 m freestyle performance. Girard's group report on the mechanical alterations seen in treadmill interval training in high level team sport players. Muggeridge and co-workers examine the effect of nitrate on three weeks of sprint interval training. In the final paper of the section, Miyamoto-Mikami and colleagues in a case control association study suggest that there is no association between genotype score and sprinting performance in Japanese athletes.

The January 2017 issue continues to support the Journal's readership with an excellent mix of articles across the spectrum of science and medicine in sport.

ABOUT THE AUTHOR

Gordon S. Waddington is the Editor-in-Chief of *The Journal of Science and Medicine in Sport*.

The *Journal of Science and Medicine in Sport*, published by Sports Medicine Australia (SMA), is the major refereed research publication on sports science and medicine in Australia. The Journal provides high quality, original research papers to keep members and subscribers informed of developments in sports science and medicine. Produced for SMA six times a year by Elsevier Australia, it reflects SMA's commitment to encouraging world-class research within the industry, and its commitment to the continuing education of its members. Journal articles can be found at jsams.org.

SPORT AND EXERCISE MEDICINE IN **TURKEY**

THIS ARTICLE, WRITTEN BY
PROF. EMIN ERGEN FORMS
PART OF A SERIES
PUBLISHED IN SPORT HEALTH
TO LOOK AT THE STRENGTHS
AND WEAKNESSES OF THE
SPORT AND EXERCISE
MEDICINE (SEM) SYSTEMS IN
VARIOUS COUNTRIES,
PROVIDING IDEAS AND
INSPIRATION FOR ALL
COUNTRIES ON HOW TO
IMPROVE INFRASTRUCTURE
IN THIS EMERGING
SPECIALITY.

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AROUND THE WORLD
EDITORIAL HERE](#)

Scientific approach to sport disciplines in Turkey was first introduced by Selim Sirri Tarcan who attended courses and congresses in Sweden (1908), Denmark (1908) and Germany (1910) in the beginning of 20th Century. Following the reforms in the Ottoman Empire, he was appointed as the General Inspector for Physical Education in Governmental Schools. After attending the Summer Olympic games in 1912 held in Stockholm, he founded the National Olympic Committee. Establishment of the National Olympic Committee then led to the institutionalisation of sport.

The founders of the Turkish Directorate of Sport Clubs, Ali Sami Yen and Burhan Felek, had decided to employ a medical doctor for the preparation of the newly founded Turkish Republic's sportsmen before the 1924 Paris Summer Olympic Games. Dr Sirri Alicli, a military doctor, had been appointed to take care of the Olympians. Dr. Alicli had ordered books and related scientific materials from abroad that did not exist in Turkey just after the

Independence War ended in 1920. Dr. Alicli is considered the founder of sports medical activities around the 1930s. He was appointed as the Head of Sports Health Section in General Directorate of Youth and Sport, according to the Law No: 3530. Unfortunately, he was disappointed after not being supported by the authorities. After Dr Alicli, Dr. Rasit Serdengeçti was appointed as the Head. Dr Serdengeçti was so effective that he promoted and spread sports medicine activities around the country. Dr Serdengeçti organised the first sports medicine course in 1947. He published two sports medicine books in Turkish, "*Physical Education and Sports Physiology*" and "*Sports Medicine*" within the scope of Health Minister educational activities. In fact, several other books have already been translated from German, by Dr. Ferit Gursan. During the General Sports Advisory Assembly held in Ankara in 1950, sports medical activities were handled and mentioned by Dr. Serdengeçti in the reports as possessing prime importance issues. However, all suggestions would take a long time to realise.



Dr. Serdengeçti had invited one of his students from the courses, Dr Necati Akgun, a physiologist from Ankara University Medical School, to give lectures in Gazi Education Institution Physical Education Department in Ankara. Dr Akgun started developing an interest in exercise physiology and sports health. In 1954 Dr Akgun wrote a book published by the Ministry of Education, "*Sport Physiology and Health Manual*". Dr Alicli, with his vast experience, published another book to point out the shortcomings in sports medicine services in Turkey, "*What is sports medicine, how it should serve and how it should be organized?*".

During the 1960s, several local sports medicine service groups were formed. These were organised under the umbrella of Turkish Sports Medicine Association (TSMA) in 1965. In the same year, TSMA was recognised by the International Sports Medicine Federation (FIMS). The Executive Committee of TSMA started publishing a quarterly peer reviewed journal in 1966. TSMA had organised an IOC supported sports medicine course in 1971 just before the Mediterranean Games held in Izmir for the doctors taking part in the events. Dr Akgun convinced the Ministry of Health on the recognition of sports medicine as a medical speciality in 1973 and founded the first chair in Aegean University Medical School. With his efforts for institutionalising the discipline in Turkey, Dr Akgun is considered as the "Father of Sports Medicine".

The 1960s are the years that sports medicine attracted a great interest in other cities too. Dr Ahmet Munir Sarpyener and Dr Selahattin Akel founded a sports medicine unit in Istanbul in a famous stadium in 1969.

In the meantime, the Turkish Medical Association developed an interest to form a sports medicine working group. This group organised team physician courses in order

to educate physicians since the number of sports medicine specialists was not enough to close the gap. Over the period between 1991-1994, some 700 medical doctors attended these basic courses.

Several Universities started establishing sports medicine departments after all these developments in sports and exercise sciences. Presently, eight universities are offering sports medicine as a speciality. The number of sports medicine specialists in Turkey is around 100 and most of them work at University hospitals. Over the past several years, the Ministry of Health employ sports medicine specialists in State Hospitals in order to provide public services. Football clubs also employ sports medicine physicians.

The speciality used to last two years and consisted of 11 courses relevant to sports medicine. Five specialists in sports medicine graduated from this programme between 1973 and 1981. Between 1981 and 1989 only orthopaedic surgeons, physiatrists, and physiologists were allowed to attend a sports medicine training programme. In 1989, the Turkish Ministry of Health accepted sports medicine as a medical specialty and increased the length of training to three years. The number of rotations was reduced to four (cardiology, traumatology, physical medicine and sports medicine). On completion of the three-year course and passing the examination, the graduates were awarded with the title of Specialist in Sports Medicine by the Ministry of Health. Furthermore, the opportunity to subspecialise for one year in sports medicine was given to orthopaedic surgeons and physiologists by this legislation.

The number of sports medicine departments at medical schools has increased to 15 over the last 10 years. However, only eight were entitled to offer speciality and other community services. Only these departments are allowed to give postgraduate education in sports medicine. 10-15 residency places are offered a year. The current curriculum aims to produce graduates who are proficient in the management of common

health problems and rehabilitation and to provide timely emergency interventions for injured athletes. Because of the general dissatisfaction with the curriculum, TSMA and the Coordination Council of Medical Specialty Societies prepared a draft curriculum, in which the training was increased to four years and newer courses relevant to sports medicine were added. The duration of fellowships for orthopaedic surgeons and physiatrists has been increased to two years.

The recent speciality program is as follows;

- 1 month Paediatric cardiology
- 1 month Endocrinology and metabolic diseases
- 4 months Orthopaedics and traumatology
- 2 months Radiology
- 2 months Emergency medicine
- 4 months Physical medicine and rehabilitation
- 1 month Physiology
- 3 months Cardiology
- 30 months at sports medicine clinic/ department

TSMA, together with the Turkish National Olympic Committee Sports Health Commission, is organising basic sports and health courses around the country to provide general information with regard to health, exercise and injuries for the benefit of primary care physicians. The number of physicians so far reached is about 1500.

TSMA organised the 6th European Sports Medicine Congress in Antalya in 2009 and held the 34th FIMS World Congress in 2016 in Istanbul. The 14th. National Sports Medicine Congress was held in Izmir (14-16 December 2013).

Despite all the efforts put forward to cope with the health-related problems of sports people, there are further issues to be handled in order to spread the services and increase the level of standards.

ABOUT THE AUTHOR

Prof. Emin Ergen, is currently a member of the Sports Sciences Department at Bashkent University School of Health Sciences in Ankara. He is a former President of the Turkish Sports Medicine Association.

DOPING IN SPORT “W WERE Y THINKIN



WHAT YOU SAYING?"



DR DENNIS HEMPHILL IDENTIFIES REASONS WHY ATHLETES CHOOSE TO DOPE AND HOW HARMFUL DOPING CAN BE TO ATHLETES AND THEIR SPORT.

“What were you thinking?” is usually a sarcastic expression of disbelief or disapproval. But it can be, quite literally, a call for reasons. The answers can give an insight into the mindset of athletes who are considering the use of banned performance enhancing substances or methods in sport.

Doping in sport is recognised as a crisis issue within government, academic, professional and media circles. It is thought to detrimentally affect the integrity of contests, the health of athletes, and the role model function of sport for society. However, it might also be the case that doping is considered normal practice, which might blind participants to its health risks and social harms.

The major response to the doping crisis has been to beef up policing, that is, by increasing surveillance, testing and penalties. This is part of the ‘zero tolerance’ approach, which is underpinned by the principle of ‘strict liability’. The latter means that the athlete is ultimately responsible for ensuring that any substances going into the body do not contravene anti-doping policies. This approach has been bolstered by more health education around the harmful short and long-term side effects of doping, not to mention the provision of more scientific resources to enhance performance or injury recovery in legitimate ways.

To complicate matters, though, doping is often linked to systemic pressure on athletes, support personnel, and sport organisations to maintain or continuously surpass peak performance. Propped up by society’s high expectations and social rewards, sport exemplifies high-performance culture where athletes are on the look-out for scientific and other advantages. In this context, the choice to use doping substances and methods

might be seen as simply one among many other available ‘high-tech’ performance enhancers along the long road to success.

Not surprisingly, seeking advantages can tempt athletes to bend or break rules. There is no doubt that doping is a rule violation, but in certain sport cultures doping may have been normalised, meaning that it is so widespread, and perhaps so in line with what it means to be the best in sport, that the ‘insiders’ do not consider doping to be cheating. Of course, this way of thinking by those in the sport tends to run at odds with that of anti-doping regulators and clean athletes. So, when we hear some claim that “everyone is doing it”, they might be offering up a lame excuse for cheating or expressing a sub-culture’s implicit acceptance of this type of rule violation.

While participation in sport has clear health benefits, pushing the boundaries to achieve sporting excellence carries with it the risk of acute injury or long-term health problems. In this context, it might be worth asking to what extent athletes weigh up the injury and health risks associated with doping. The window of opportunity for success in most sports is small, and the social rewards can be high. While this may fuel ambitious commitment, it might also create a susceptibility to the use of any performance enhancer, legal or otherwise. In other words, passion for success may be so strong that some athletes either ignore or simply accept unquestioningly the injury and health risks that go with performance enhancement in sport.

Gone are the days that sport is somehow separate from everyday life. Athletes, as well as support personnel and sport managers, now have to think about doping and other potentially dangerous practices as a workplace health and safety issue. Also going, albeit slowly, is

DOPING IN SPORT “WHAT WERE YOU THINKING?”

the heroic notion of ‘playing hurt’, reinforced by the recent developments around the prevention and treatment of concussions in sport. The AFL and WorkSafe charges in the Essendon Football Club supplements case makes it abundantly clear that all sport organisations have a duty of care to athlete health and safety. It is also clear in this culture shift that professional athletes cannot simply blindly trust that their managers have their welfare at heart.

In addition to tougher policing and more education around anti-doping and workplace safety, there are calls for more ethics education. But, what does it mean to think ethically about doping? Let’s start with an example of what ethical thinking is not. It might be expressed like this: “I had better not dope, because if I get caught, I could face a ban from my sport or I could lose my corporate sponsorship”. In other words, ethical thinking is not cost counting, that is, simply weighing up what’s in it for me if I comply with a rule, or what I stand to lose if I don’t.

Rather, ethical thinking tends to be more about behaving or not behaving in certain ways because of the potential beneficial or harmful impact on others. It is understandable how some athletes might regard sport, and doping, as simply a means to achieve their private goals of fame and fortune. But sport can also be seen as a communal practice, one that embodies certain shared standards of excellence (e.g., fairness) and core virtues (e.g., hard work, discipline).

For example, sports are set up with rules that apply equally to contestants, giving each competitor an equal opportunity to demonstrate their sporting prowess to determine the winner. In sport, much is often made of the ‘level playing field’, where conditions are created to match up relatively evenly skilled opponents to



There is no doubt that doping is a rule violation, but in certain sport cultures doping may have been normalised

produce unpredictability of outcome. On this account, doping can be thought of as harmful to others because it skews the outcome to those who have an unfair advantage. Moreover, it may be unjust to clean athletes for rewards to go to those who don’t deserve them.

Sport also embodies some long-standing virtues, the expression of which not only defines one’s membership in the sport community, but also what counts as success. For example, ‘tanking’ undermines the longstanding virtue of ‘trying to win’. On this account, doping is taking the easy way out or cutting corners. Moreover, athletes may think that if they dope, they are not only letting themselves down, but also those who support them.

So, when it comes to what else athletes might need to be thinking about, it should include ethical principles such as equality, rights, fairness, justice, virtues and common goods and how they play out in decision making around performance, health and doping. It is not simply awareness of the rules, the penalties for infractions and health consequences, but also giving athletes a more robust, ethical vocabulary to help them make sense of what it means to “do the right thing” or uphold the “good of the game”.



ABOUT THE AUTHOR

Dr Dennis Hemphill is an Associate Professor of Sports Ethics in the Institute of Sport, Exercise and Active Living at Victoria University in Melbourne.



CAN DOPING BE PREVENTED?



CAN DOPING REALLY BE PREVENTED?

STEPHEN MOSTON AND
TERRY ENGELBERG
QUESTION IF WE CAN EVER
TRULY ERADICATE DOPING
AND THE ROLE EDUCATION
CAN PLAY IN KEEPING
ATHLETES CLEAN.

Anti-doping authorities believe that prevention, rather than detection, is the best strategy for eliminating drug use in sport. For example, WADA believes that “a long-term solution to preventing doping is through effective values-based education programs that can foster anti-doping behaviours and create a strong anti-doping culture”. Similarly, the “road map” for the 2015 WADA Code was premised on,

.... the creation of what has been described as a ‘moral cosmology’ and an associated ‘moral community’ is central to the development of a sporting community in which doping practices are reduced to an absolute minimal level (accepting that there will always be those who succumb in sport, as elsewhere, to the temptation to cheat).

Many academics share the view that values-based education can promote a strong anti-doping culture and, consequently, anti-doping behaviours. This helps to explain the vast body of psychological research on doping attitudes and intentions. The core aims of such research are to (a) identify

those athletes most likely to dope (essentially an attempt at risk profiling), and (b) the design of anti-doping messages, which could be tailored to each of the identified risk profiles. Quite how the latter would be accomplished is, as yet, unclear. Presumably clubs will first psychologically screen their athletes and then choose the appropriate compelling message from a pool? The devil here really is in the detail (think: “I’m going to build a wall”).

Whilst our understanding of the psychological and situational determinants of doping has increased significantly in the last decade, there has been only limited success in translating this vast body of research into an appropriate educational curriculum. A 2014 survey of the literature conducted by the European Commission identified only 17 studies (about one a year) evaluating education programmes in relation to behavioural intentions and actions relating to the use of performance enhancing drug use. Furthermore, six of these studies predated the creation of WADA and were thus concerned with the use of performance enhancing drugs, rather

CAN DOPING REALLY BE PREVENTED?

than the offence of doping *per se*. In large part, the lack of research on anti-doping education is understandable as any such study presents considerable methodological difficulties, some of which are almost certainly impossible to overcome. Let us clarify why this is the case.

By definition, a successful anti-doping program will be one in which doping behaviours by athletes will be either reduced, or ideally eliminated (i.e., behavioural changes). However, there is no reliable or practical way to determine whether or not this has occurred. Failure of education might be inferred from detected cases of doping, but success is defined by the absence of any such detectable behaviour. It would be spurious to conclude that an intervention was effective because no athletes were subsequently detected as doping (e.g., the tests may have been ineffective, or conducted at the wrong time). This leaves investigators with a major methodological problem: how to determine whether an intervention has 'worked'? To further complicate matters, such a determination should be a short-term assessment (e.g., in the days, or months after training), rather than a long term (e.g., an entire career timeframe), so that ineffective training could be discarded and replaced with 'better' alternatives. However, as doping may occur at any stage of an athlete's career (potentially years after anti-doping training), there is a need to develop an intervention that will have a life-long impact. That's quite a tall order.

Instead of measuring actual doping behaviours, other indicators of success can be used. There are three distinct

proxies for behaviour that have been assessed in anti-doping work. These are:

1. Knowledge of doping rules and control systems.
2. Attitudes to doping (including intention to dope).
3. Cognitive mechanisms, such as moral reasoning, that have been linked to doping attitudes and behaviours.

Effectiveness of an intervention could be then demonstrated through changes in scores on measures of attitudes, cognitive mechanisms, or knowledge. This might be established by comparisons of pre/post-intervention, or through experimental manipulations, such as allocating athletes into control (no intervention) and experimental (intervention) groups. A successful intervention would thus be one that altered attitudes to doping (e.g., making athletes more anti-doping), changed a cognitive mechanism (e.g., increased morality), or increased knowledge (e.g., higher scores on a test of knowledge of doping rules).

Changing attitudes and cognitive mechanisms, requires a complex educational curriculum that acknowledges the many differences in the psychological dispositions, social environment, and sporting contexts of athletes. Only knowledge transfer (e.g., increased knowledge of doping rules), can be assessed in the absence of any understanding of individual or situational differences.

To date, there have been few attempts to develop anti-doping interventions and the results are often subject to limited generalisability. For example, in one study, sixty athletes who were doping were assigned to either a control group or an experimental group, with the latter

completing a self-affirmation task in which they elaborated on past acts of other-directed kindness. The study found that intention to dope was reduced in the self-affirmation group (a somewhat moot point, since all participants were already doping). Such findings offer clues as to the possible content of an intervention, but little in the way of compelling evidence to suggest that they will impact on doping behaviours.

The limitations of anti-doping education are perhaps best illustrated by making reference to WADA's own ALPHA program: *Athlete Learning Program about Health and Anti-Doping*, which is described as follows:

Based on the latest findings in Social Science Research and learning technology, the aim of this tool is to change attitudes and therefore have an impact on those who intend to dope. Therefore, if effective, the tool will potentially reduce doping behaviour amongst athletes who are already doping, or prevent other athletes from doing so at all. If the intention of the learner was not to dope, the tool provides all the necessary information for an athlete and reinforces the protective factors.

...

ALPHA's effectiveness can be measured through the provision of information, whereby knowledge is measured through pre- and post-tests, and pre- and post-tests that measure all predictions of doping intention. This includes self-efficacy, subjective norms, perceived control, beliefs and willingness. The measurement of effectiveness will allow for evaluation and, therefore, the program's continuous improvement.

There are several things to note in this



description. First, there is the tentative and somewhat hopeful tone (“*Therefore, if effective, the tool will potentially reduce doping...*”). In short, it might work, but then again, it might not. Second, the specified criteria for success are increases in knowledge and changed attitudes. The thorny issue of behaviour (i.e., actually doping) is conveniently side-stepped.

This core problem can be illustrated by the findings of the investigations into doping by Australian Football League Club (AFL), Essendon. The Australian Sports Anti-Doping Authority (ASADA) noted that,

The players had received anti-doping education through the AFL and ASADA, and were well aware that they are personally responsible for all substances that entered their body.

Unfortunately, despite their education, they agreed to be injected with a number of substances they had little knowledge of, made no enquiries about the substance and kept the injections from their team doctor and ASADA. Of 30 ASADA testing missions during the period in question, none of the 18 players tested declared the injections, despite being asked each time whether they had taken any supplements.

In this case, players who had completed anti-doping education clearly behaved in a manner that would strongly suggest that they were doping (the issue of whether the players *actually* doped is an ongoing matter of contention). Furthermore, as ASADA state, “At best, the players did not ask the questions, or the people, they should have. At worst, they were complicit in a culture of secrecy and concealment”. Evidently, in this case, education failed on a massive scale.

Overall, the idea that doping can be eradicated (or even reduced) by education is far from compelling. Little wonder then that anti-doping education has met with some scorn: as journalist Owen Gibson wrote, “The World Anti-Doping Agency itself must prove it is fit for purpose – tough regulator rather than purveyor of fluffy educational programmes and PR”. Given the rampant corruption in many of the world’s leading sporting organisations, asking athletes to ‘play true’ and pinning any hopes for real changes in doping on such efforts seems wildly unrealistic. Anti-doping authorities need to ponder the question: is education *really* the best possible solution?

Sounds unlikely doesn’t it, but fortunately, there are alternatives. Some, such as criminalisation, might even work. The evidence in favour of criminalising is quite compelling, but images of athletes in handcuffs is not something that WADA wants to encourage. As solutions go though, it might be worth considering. While doping may, or may not, cause harm to the individual doping athlete (surprisingly, it’s still a hotly contested issue), doping most definitely does cause indirect harm to athletes who are *not* doping (lost scholarships, prize money, endorsements, etc.). In short, doping is a form of fraud and there are victims. The speed with which match-fixing legislation has been introduced shows that innovative solutions to sporting problems are possible, provided there is a clear driver. Match-fixing threatened the betting industry, so swift action resulted: match-fixing was criminalised. Doping threatens the entire sports industry, so why then has similarly swift and decisive action not been implemented?

Correction, it has: we are going to have a moral cosmology. That’s bound to work.

ABOUT THE AUTHORS

Stephen Moston and **Terry Engelberg** are the authors of *Detecting Doping in Sport* (Routledge, 2017). Stephen is an Associate Professor in Psychology at Central Queensland University. Terry is an Associate Professor in Psychology and Sport and Exercise Science at the College of Healthcare Sciences, James Cook University.



BLOOD-FLOW RESTRICTION TRA

A LOW-LOAD ALTERNATIVE TO
HEAVY STRENGTH TRAINING

PHYSIOTHERAPIST **LACHLAN GILES** TAKES A DETAILED LOOK
AT BLOOD-FLOW RESTRICTION TRAINING, INCLUDING ITS
EFFECTIVENESS IN INJURY HEALING AND STRENGTH TRAINING.

TRAINING

THE INJURY HEALING VS STRENGTHENING PROBLEM

Muscles provide the stability and support to our bones, ligaments, tendons and joints that is required to prevent injury, and achieving normal muscle strength is almost a necessity before returning to activity from an injury. Improving strength in the injured athlete has long been a source of frustration for physiotherapists and strength & conditioning coaches, as the injury often impairs the ability of the athlete to perform the heavy resistance training required to increase muscle strength.

Strength training is typically performed at 70% of one repetition maximum (the maximum weight a person can lift once). In the majority of cases, the physiotherapist has to wait until sufficient healing has occurred before beginning strengthening the muscles. This can delay the time it takes to return to sport, as it takes a long time to use a strength training program to create high level muscle function. This is particularly apparent in ACL reconstruction, where the quadriceps (thigh) muscles waste away so much after surgery that it often takes over 12 months to return quadriceps strength to normal pre-injury levels. Blood-flow restriction training (BFR), also known as occlusion training, has a unique answer to this problem, as it can be used to strengthen muscles at 20-30% of 1 repetition maximum, and by doing so has brought traditional understanding on the mechanisms behind strength training into question.

BLOOD FLOW RESTRICTION TRAINING. WHAT IS IT AND HOW DOES IT WORK?

BFR originated out of Japan under the name Kaatsu training, with the first scientific paper published in 2000. BFR is essentially a method of strangling the muscle while doing strength training. A cuff (similar to a blood pressure cuff) is applied around the top of the limb, and inflated to a pressure that will limit but not completely stop blood flow to the muscle.

Limited blood flow starves the muscle of oxygen, and also causes a backlog of metabolic by-products. The result of this is that the muscle has to work hard, even if the weight that is being lifted is not particularly heavy. The reason why this improves strength is not exactly clear, and is likely to involve a number of factors. A prevailing theory for strength training was that heavy load “breaks down” the muscle, and causes it to adapt and strengthen as a healing response. However, only minimal break down would be expected with BFR as the load is too low, and therefore other mechanisms must be at play. The predominant theory is that the backlog of metabolites act as a signal to promote muscle growth.

BFR is notorious for creating the “burn” that is often associated with strength training, although with BFR it is typically more intense than with regular strength training, perhaps because of the aforementioned build-up of metabolites. Though the weight that is being lifted may not be heavy, once fatigue sets in it certainly feels heavy to the person doing the exercises. This leads to another likely mechanism for which BFR may have its effect: Enhanced neural drive.

Part of getting stronger is not related to the muscle itself, but how well you can activate the muscle. Nerves send electrical signals to the muscle to contract, and the more practice you get using the muscle near its maximum resistance, the better the nerves get at signalling the muscle. The perception that the weight is heavy with BFR will make the person doing the exercises attempt to use as much of the muscle as possible, and may result in similar neural adaptation to heavy strength training methods. This could explain some of the strength gains from this form of training.

There has been considerable amount of research conducted on the effects of BFR in the strength and conditioning field,

which has contributed greatly to our understanding of how BFR should be applied, and how effective BFR is at improving strength relative to standardised programs.

- Light load: resistance training vs resistance training with BFR.

Until recently it was thought that resistance training at low load was predominantly for endurance, and had little benefit for muscle strength and hypertrophy. However recent studies have shown that you can increase the size and strength of muscles using loads around 30% of one repetition maximum even without using BFR. Adding BFR to a load of 30% one repetition maximum does produce greater gains in strength and size than the same program without BFR. One study even found that 30 minutes of walking with BFR caused hypertrophy (increased size) of the leg muscles. Therefore, if light loads are recommended BFR is going to be the most effective option to increase muscle size.

- Light resistance training with BFR vs heavy resistance training vs heavy resistance training with BFR

Heavy resistance training at 70% of one repetition maximum or greater produces a greater increase in muscle size and strength than using BFR with loads around 30% of one repetition maximum. There is no added benefit of using BFR on top of a heavy resistance training program. Therefore, if there is no reason that heavy load should be avoided then heavy resistance training is the best option for muscle adaptation and there is no need for BFR.

BENEFITS OF BFR: INJURY REHABILITATION

As awareness of BFR grows it is likely to play a large role in injury rehabilitation. Despite great potential, there has been very little research published on the effects of BFR in the field of injury rehabilitation. Expect that to change over the next few years.

Strengthening exercises are essential in the rehabilitation of almost all lower and upper limb injuries. The majority of these injuries have a period of time where heavy strengthening should be avoided due to the risk of making the condition worse, and at this time BFR should be considered.

BLOOD-FLOW RESTRICTION TRAINING

A LOW-LOAD ALTERNATIVE TO HEAVY STRENGTH TRAINING



While BFR could be used for simple injuries such as an ankle sprain, it is probably most effective for post-operative rehabilitation and for chronic conditions such as osteoarthritis.

Knee, ankle, and hip surgery often result in a period of partial weight bearing, with slow progression towards heavy resistance training. BFR can be implemented much earlier in the rehabilitation process than heavy resistance training, which can minimise disuse atrophy and weakness, and facilitate a more rapid recovery of muscle function. It should be noted that for many acute injuries, the plan would be to ween off BFR and re-introduce heavy resistance training once the tissue is sufficiently healed.

Around 10% of the population over 60 years old suffer from knee osteoarthritis. Strengthening exercises can be risky as symptom flare can affect a person's ability to perform daily activities such as walking. BFR at low load may be a long-term solution to maintain muscle strength in the presence of knee osteoarthritis.

Physiotherapists from La Trobe University recently conducted a study comparing BFR at 30% of one repetition maximum to a heavy strength training

program at 70% one repetition maximum in people with patellofemoral (knee cap) pain. Patellofemoral pain is characterised by pain when using the quadriceps muscles, and therefore the quadriceps become weak, which may further place strain on the knee cap.

One solution to this is to strengthen the quadriceps muscles, which is known to be a somewhat effective treatment. However, the obvious risk is that if the load is too heavy, it could make the pain worse.

Results of the study suggest there may be some benefit in using BFR over the heavy strengthening program, particularly when people experienced considerable pain when trying to do heavy strengthening exercises, or if they had signs of wear and tear in the knee cap.

BENEFITS OF BFR: IN SEASON STRENGTH TRAINING

Many sporting teams perform heavy resistance training in the off season to maximise the benefits that stronger muscles can have on an athlete's strength, power, performance and injury risk during the season. In season strength training is a little more difficult to juggle. Load can accumulate from match time





The result of this is that the muscle has to work hard, even if the weight that is being lifted is not particularly heavy.

and training sessions, and it is often unwise to add extra load during this period with heavy resistance training. BFR at low load may be a unique in-season tool to maintain strength without overloading healthy tissue.

LIMITATIONS OF BFR

A limitation of BFR is that it can only be used on limb muscles. We have no current method of restricting blood flow to any muscles of the trunk, shoulder or hip. The majority of research has focused on the leg muscles, in particular the quadriceps. However, any limb muscle can be targeted with BFR, including the biceps, forearms, calf muscles and hamstrings.

IS IT SAFE?

Tourniquets used during medical procedures are often kept on for 2-3 hours, while BFR is typically less than 5 minutes, therefore you would expect less potential for side effects with BFR. However, BFR is not totally free of risk and medical screening should be applied before performing BFR with an experienced practitioner.

A google search will reveal many DIY methods of applying BFR, which often

involve wrapping bandages around the arms or legs. I strongly recommend against using these methods. There are many factors that influence how much pressure is required to partially occlude arterial blood flow (you do not want full arterial occlusion for BFR) and there is simply no way of knowing what pressure is being applied without using a pneumatic cuff.

Current research into the safety of BFR has suggested that it is safe to use in healthy populations. However, this method is relatively new and more research is required to understand which populations may experience an adverse response to BFR. There is potentially increased risk of side effects in people with cardiovascular conditions, particularly in the periphery. At present, BFR should be contraindicated for people with a history of deep venous thrombosis, vascular disease or any condition that may affect blood clotting. The risk of cardiovascular disease increases with age, and therefore the potential for side effects also increases.

HOW AND WHERE CAN I USE BFR?

BFR doesn't take much longer than doing a standard strength training program.

The pneumatic cuff is usually portable, which means once taught how to use it the exercises can be done at the gym as part of a normal routine, rather than at the therapists practice. Unfortunately, the world of rehabilitation is only recently becoming aware of the potential of BFR, and at present there are few clinical practices that are implementing it. As awareness increases I would expect it to become a common treatment option in clinical practice.

ABOUT THE AUTHOR

Lachlan Giles is a physiotherapist from Victoria who works predominantly with knee conditions and martial arts injuries. He recently completed his physiotherapy PhD at La Trobe University in Melbourne, investigating blood flow restriction training as a treatment option for patellofemoral pain.

SPORT
TRAINERS
GUIDE

WI



WINDING

SPORT HEALTH PROVIDES SPORTS TRAINERS WITH A GUIDE ON WINDING, INCLUDING ITS SYMPTOMS AND MANAGEMENT.

Athletes who have been winded from a knock to the chest or abdomen may require treatment, although this is rarely an emergency. Winding typically occurs after a blow to the stomach or the back around the solar plexus, which is a cluster of nerves behind the stomach that influences respiration. Winding can also occur with any impact that temporarily interferes with, or interrupts normal respiration.

SIGNS OF WINDING

- Difficulty breathing.
- Inability to speak.
- Vomiting.

SYMPTOMS OF WINDING

- Nausea.

MANAGEMENT OF WINDING

- Reassure the athlete.
- Help the athlete into a comfortable position.
- Encourage the athlete to take slow, deep breaths.
- Remain with the athlete until the breathing difficulty resolves.
- If the breathing difficulty does not improve in a few minutes, seek medical attention.
- Lay the unconscious athlete on their side in the lateral position, ensuring the airway remains clear, and continue to monitor the athlete's breathing.

When an athlete is winded, there is also potential for a rib fracture, lung damage or internal organ damage. This can be indicated by the signs listed in the relevant sections above.

The sports trainer should keep this in mind while observing the athlete over the next few hours. If any such signs occur, the athlete should not play contact sport until a doctor has assessed and cleared them to play.

Want to learn more on winding prevention and management? Sports Medicine Australia runs a range of courses. For the complete calendar of courses, visit sma.org.au.



PEOPLE WHO SHAPED SMA

KAREN IN

In 1979 it wasn't easy to gain full membership of Australasian Sports Medicine Federation (ASMF)/Sports Medicine Australia (SMA). As the first dietitian to apply for membership, the Board considered the most appropriate category was an Associate, as was offered to nurses. I refused to accept that Dietitians could not be full members so had to prove my case, not only for me but for other dietitians to follow. I gained full membership and in 1992 was the first dietitian to be awarded a Fellowship of ASMF/SMA in Sport Science.

The people who made up ASMF/SMA were more than my professional colleagues. They became my friends and we all helped each other. Many of the doctors, physios, and exercise scientists I met through ASMF/SMA created work opportunities for dietitians.

ASMF/SMA recognised the importance of working as a team and it was through ASMF/SMA that sports nutrition became better recognised by other members of the sports medicine team and this resulted in more referrals for work - everything from seeing individual athletes to giving talks and being part of research projects.

It was then, and still is, a unique organisation, one that understands and values the important contribution each of the disciplines can make. Even though we

have all formed our professional organisations now, if it wasn't for ASMF/SMA then I believe that Sports Dietitians Australia (SDA) would never have been created.

I think the main change during my time at ASMF/SMA was the increasing recognition that sports nutrition was a key part of athletic performance and the vital role that dietitians can play in the sports medicine team.

My initial involvement with ASMF/SMA was as a nutrition consultant - special projects - for 10 years for the National body. I was also a Member of the Education sub-committee & Council member of the Victorian branch from 1986-1989, Inaugural Chair of the AFL Grand Final Symposium 1988-1994, member of the working party for Women in Sport sub-committee for the National Body from 1990 to 1994 and Executive Member of the Sports Nutrition Special Interest Group for ASMF National, 1991-1996.

But what was the starting point? Why did I choose a career in sports nutrition? Well it certainly wasn't because I had any athletic prowess! Sports nutrition in the late '70s, early '80s was a relatively new area of sports science and medicine in Australia. And there was clearly an opportunity for dietitians to expand their professional horizons.

A few exercise physiologists were researching the role of nutrition, but there was a gap in the translation of this science into the foods athletes should be eating to maximise their performance. Dietitians were able to bridge this gap, to translate the science and help athletes.

Through my Bachelor of Science from Deakin University research project in 1980, which assessed the cardiovascular risk profile of football players at the Collingwood Football Club, my journey into sports nutrition started. The fact that Collingwood had just lost another Grand Final made the club more interested in innovative ways of improving performance. The Club Doctor at the time was ex-SMA president Dr Shane Conway and he was really one of the main supporters who gave me my start in sports nutrition.

But my earlier qualifications and training gave me a solid foundation. A Diploma of Nutrition and Food Science from Emily McPherson College (now RMIT) 1976, then a Post Graduate Diploma of Clinical Dietetics 1977 involving clinical training at St Vincent's Hospital and the Royal Melbourne Hospital and a short stint at the Royal Children's hospital for paediatrics. I also trained in Food Service because dietitians were responsible for food service in most hospitals and totally responsible for hospital special diets.



A MOMENT WITH KAREN



What has been your career highlight?

There have been so many, but Hawthorn FC winning back-to-back premierships in 1988/89 really impacted my career. I introduced hydration studies, recovery strategies, body composition monitoring, iron studies, weekly cooking classes and changed their diets from high fat to high carb. Although they were already a successful team before I arrived, the media attributed their success to the Hawthorn Diet, and with the team's success, my profile rose. This created numerous work opportunities for me in the media and working with many food producers and food companies. Hawthorn's belief in the importance of nutrition also helped pave the way for other dietitians to work in this area.

What do you believe is your most important contribution to your industry?

Being part of the founding group of SDA; to identify a new horizon for dietitians and be able to share the passion with so many others. When we started the organisation, there were about eight of us. We now have around 500 sports dietitians in Australia. Our text book is world-renowned and our training courses are conducted in Canada, New Zealand, Singapore and elsewhere. I'm very proud to have been one of the pioneers in this exciting field of nutrition and dietetics, but more importantly to see how the next generation has nurtured the organisation and taken it to greater heights.

What is your advice to those starting out in their career?

- Be opportunistic. Go where angels fear to tread. Don't keep looking in the same place for the same jobs. Identify a problem and find a solution.
- Be prepared to take a risk. Be prepared to fail. We are not too good at dealing with failure but out of the biggest disappointments come the greatest opportunities.
- Be a thought leader and a collaborator. Join committees, councils, boards, special interest groups, discussion groups - anywhere you can have a voice and influence.
- Be collegiate. Share your experiences, knowledge and time.

Do you have any career regrets?

After much deliberation, I deferred my PhD as my career took off in sports nutrition. I was newly married, life was very exciting. My mentors thought I was making a mistake and I would come to regret it as to get a PhD later would be much harder. While I listened, I decided that there was so much work to be done, speaking engagements, books and articles to write, plus working with athletes and expanding work opportunities for dietitians. This is perhaps my only career regret, but then again, what unfolded next may not have ever happened.

I was also classically trained in French cuisine. And then spent the rest of my professional life telling people not to eat that way.

I have been fortunate to have some fantastic nutrition consultancy positions over the years. After seven years as the Collingwood Football Club's dietitian, I was poached by Hawthorn as their nutrition advisor for eight years. I worked with Melbourne Magic basketball team for 10 years; Australian Ballet Company and School for eight years; was the Founding Head of Sports Nutrition at the Victorian Institute of Sport for 21 years as well as co-authoring books such as Food for Sport (endorsed by ASMF/SMA), and Food for Sport Cookbook. I worked with the Opals basketball team for three Olympic cycles and the Victorian Gymnastic program for 10 years. Being Sports Dietetics Co-ordinator for the Melbourne Commonwealth games in 2006 was a highlight.

As well as my busy private practice at McKinnon Sports Medicine and Olympic Park Sports medicine Centre, and consulting in the ASMF Sports Medicine Clinic, I wrote on nutrition for the Australian Women's Weekly for 17 years, appeared regularly on TV and radio, and consulted to major food companies like, MLA, Uncle Tobys and Rice Growers Cooperative, developing consumer

nutrition programs and resources relating to food for sport and fitness.

Today my focus has shifted towards culinary nutrition, combining my sports dietetic experience with the marketing skills earned through working with some

of Australia's leading food businesses, to create another exciting new career path as part owner of the healthy food company Dineamic and opening the Georgie Bass Café and Cookery in Flinders, Victoria.

COUNCIL OF DISCIPLINE NEWS AND EVENTS

Sports Physiotherapy Australia

Sports Physiotherapy Australia have continued to work on creating a progressive and rewarding career pathway for its members throughout 2016.

More courses (with competencies to meet at their completion) will mean better prepared Physios.

Holly Brasher has been nominated for a second term as the National SPA Chairperson.



Sports Dietitians Australia (SDA)

Save the Date! SDA is pleased to announce the 2017 SDA Conference – Propelling your Knowledge & Practice, to be held 20-21 October in Melbourne. This coincides with SDA's 21st birthday celebrations so join us! For more details regarding program and associated events, visit our website (www.sportsdietitians.com.au)

CALENDAR

MARCH 2017

- 4** Level 1 ASCA Strength and Conditioning Coaching Course, Mayfield, NSW
- 11-12** Sports Physiotherapy Level 1, Kalgoorlie, WA
- 11-12** An integrated and dynamic approach to the pelvic/hip region with Jennifer Hynes, Sydney, NSW
- 18-19** Sports Physiotherapy Level 1, Brisbane, QLD
- 24-26** Running Workshop Level 1, Kent Town, SA
- 25-26** Introduction to Shoulder Physiotherapy, Nedlands, WA
- 26** The Sporting Elbow, Wrist and Hand, North Ryde, NSW
- 31** Hunter Dinner: Load Management of the Everyday Athlete, New Lambton, NSW
- 31-1** Mastering Lower Limb Tendinopathy with Dr Peter Malliaras, North Ryde, NSW

CALENDAR

APRIL 2017

- 1** Level 1 ASCA Strength and Conditioning Coaching Course. Bruce, ACT
- 1-2** Sports Physiotherapy Level 1. Ballarat Central, VIC
- 2** The Sporting Hip and Groin with Andrew Wallis, Nedlands, WA
- 7-9** Sports Physiotherapy Level 2, Newcastle, NSW
- 21-23** Sports Physiotherapy Level 2, Camberwell, VIC
- 22-23** Sports Physiotherapy Level 1, North Ryde, NSW
- 29-30** Sports Physiotherapy Level 1, Whitsundays, QLD
- 29-30** Hip Differential and Prescriptive Diagnosis with Trish Wisbey-Roth, Camberwell, VIC
- 29-30** Sports Physiotherapy Level 1, Melbourne, VIC

MAY 2017

- 6-7** Assessment and Management of Pain in Clinical Practice, Nedlands, WA
- 7** Muscle Injury Management with Andrew Wallis, Camberwell, VIC
- 20** Level 1 ASCA Strength and Conditioning Coaching Course, Bruce, ACT
- 21** 3D Assessment and Treatment of the Pelvis with Trish Wisbey-Roth, Hobart, TAS
- 21** The Sporting Hip and Groin with Andrew Wallis, Camberwell, VIC
- 27-28** Acute Sporting Knee with Jane Rooney, Sydney, NSW
- 28** Advance Sports Taping with Andrew Wallis, Camberwell, VIC

JUNE 2017

- 3** Level 1 ASCA Strength and Conditioning Coaching Course, Bruce, ACT
- 3-4** Advanced Knee Diagnosis and Rehabilitation with Tim McGrath, Canberra, ACT

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