

scope

Contemporary Research Topics

health & wellbeing
activity I (I)
September 2017

Scope:Contemporary Research Topics (Health & Wellbeing) – there after known as Scope (Health & Wellbeing - is peer-reviewed and published annually by Otago Polytechnic/Te Kura Matatini ki Otago,Dunedin, New Zealand.

The Journal *Scope (Health & Wellbeing)* aims to engage in multidisciplinary discussion on contemporary research in the landscape of health. It is concerned with views and critical debates surrounding issues of practice, theory, education, history and their relationships as manifested through the written and visual activities, such as original research, commentary, critical debates and methodological considerations surrounding the concepts and theories of health and wellness. *Scope (Health & Wellbeing)* seeks to address the matters which concern contemporary researchers, industry, society and educators in their environments of national and international practice. *Scope's* focus is on building a sense of community amongst researchers from an array of New Zealand institutions with a goal of linking in, and stepping up to a wider international

community.

EBSCO Database: *Scope: Contemporary Research Topics (Health & Wellbeing)* is catalogued on the EBSCO Database in recognition of academic quality and alignment with international peer review processes.

An online version of the journal is available free at www.thescope.org; ISSN (for hardcopy version): 2537-8872; ISSN (for online version):2537-8880.

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Issue I

Scope:ContemporaryResearch Topics, Health & Wellbeing: Issue I Activity (September 2017)

The first issue of *Scope: Contemporary Research Topics, Health & Wellbeing: I, Activity* - there after referred to as *Scope (Health & Wellbeing) Activity* - is a showcase of work from our symposia entitled 'Future directions in Sport, Exercise & Health'. This event – held at the Institute of Sport & Adventure over two days in 2016, was focused on exploring the ways in which we – as students, teachers, researchers and practitioners - engage with a world that is, on the one hand highly technological and constantly evolving, but which has never been more convenient to remain sedentary and disengaged from physical activity. The work presented within this journal – drawn from the areas of sport, exercise, health, education and focuses on research and community projects which attempt to (re)build and (re)foster genuine connections with physical activity within our communities, including hands-on engagement with diverse populations that characterise New Zealand (including maori, women, and young people).

Scope:ContemporaryResearch Topics, Health & Wellbeing: Issue 2, Place will also be available in November 2017.

Submissions for *Scope (Health & Wellbeing) Activity* are invited from researchers, educators, industry, writers, theorists and historians. Submissions should be sent in electronic format for review and potential inclusion in the annual issue to Dr Simon Middlemas (Editor) at Otago Polytechnic/Te Kura Matatini Ki Otago, Private Bag 1910, Dunedin, New Zealand and simon.middlemas@op.ac.nz. Please consult the information for contributors below and hardcopy or online versions for examples. Peer review forms will be sent to all submitters in due course, with details concerning the possible reworking of documents where relevant. All submitters will be allowed up to two subsequent resubmissions of documents for peer approval. All final decisions concerning publication of submissions will reside with the Editors. Opinions published are those

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Formats include: editorials; articles; perspectives; essays; imagery and conference reports; reports on and reviews of projects, residencies and publications. Other suggested formats will also be considered; and special topics comprising submissions by various contributors may be tendered to the editors. All material will be published both in hardcopy and online. Submissions should engage with contemporary sport practices in ways which may contribute to critical debate and new understandings. High standards of writing, proofreading and adherence to consistency through the APA 6th edition referencing style are expected. For more information, please refer to the Chicago Manual of Style; and consult prior issues for examples. A short biography of no more than 50 words; as well as title; details concerning institutional position and affiliation (where relevant); and contact information (postal, email and telephone number) should be provided on a cover sheet, with all such information withheld from the body of the submission. Low resolution images with full captions should be inserted into texts to indicate where they would be preferred; while high resolution images should be sent separately. Enquiries about future submission can be directed to jo.morrison@op.ac.nz

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Copyediting: Paul Sorrell

Design & Typesetting: Jessie-Lee Robertson

Printing: Dunedin Print Ltd.

Cover: 'Glimpse', Kelsey Frost (2016).

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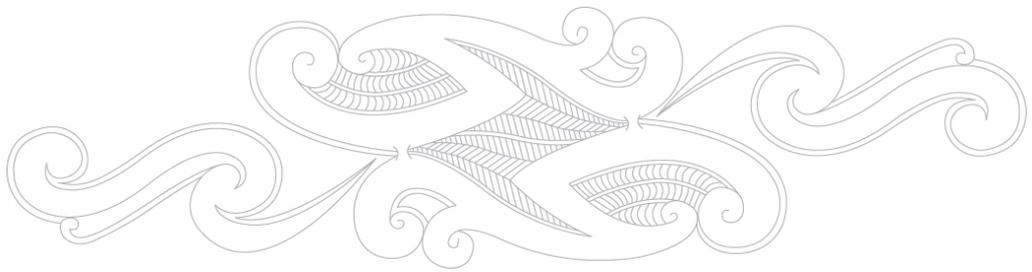
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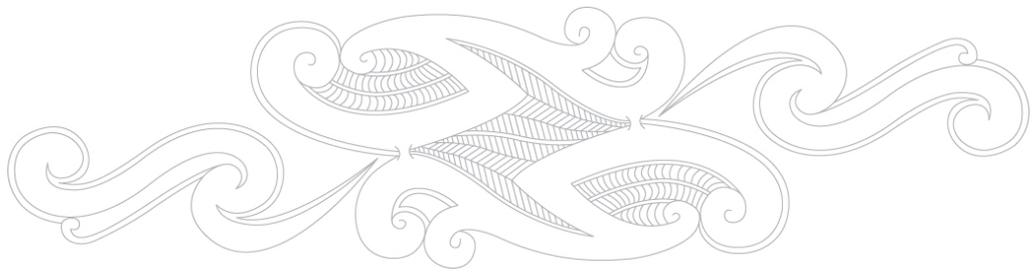
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“ALL THE WORLD’S A STAGE, AND ALL THE MEN AND WOMEN MERELY PLAYERS”

‘As you like it’ – William Shakespeare

DR Megan Gibbons

How we “play” can be seen in the research presented in this edition of *Scope (Health & Wellness) Activity*. The starting point was 2 days of symposia in 2016; the first on High Performance Sport and the second on Health and Wellness. Both of the symposia were designed to engage our local community with world class applied research.

Often, we are looking internationally for the evidence that we mould and shape to fit our local needs. In this edition of *Scope* we guide you through research that is in the main based on population groups in New Zealand. The range of physical activity is on a continuum, which at one end has elite sport and the needs of this group of athletes, at the other end; we have the general public trying to be active. In addition, we have the specific cultural, geographic, social, economic and environmental conditions to consider. The researchers presented in this journal have considered all of these conditions in the application of what they have found and have built a picture of physical activity for their population.

In the world of sport, we examine the development of players from junior level through to elite. Richard Young introduces us to learned personal excellence and how this manifests at the Olympics. Matt Blair discusses how the skills needed to achieve at the elite level come from understanding the physical metrics of players, and the training needs for specific sports. We can also video sport and provide specific feedback to athletes on their performance, the performance of the team and the performance of the other team, Hayden Croft guides us through how this creates integrated learning on the field by using sports analytics. In contrast Simon Middlemas suggests we need to consider the thoughts and feelings of the athletes who are being filmed, particularly when they are young, vulnerable and impressionable.

There are specific needs for our Māori population and a specific stream within the 2nd day of the symposium provided an opportunity for Terina Raureti and colleagues to highlight the role of integrating Te Reo with physical activity and the importance of use of tikaka for Māori. Samantha Jackson and Anne-Marie Jackson examine Māori physical education and health in the tertiary context, and Gary Barclay and colleagues look at the intersection of medical treatment and Māori cultural values in a serious head injury.

The communities we play in can have an impact based on geographical location, for example Vitamin D deficiency increases the further south you go and Stacey Poutasi and Will Payne examine this in Southland office workers. In comparison, Helen Jeffrey examines the role of the Occupational Therapist in Adventure Therapy and how the location and activity can create risk for the therapist if not well trained in Adventure.

This edition of *Scope* is all about the connection of play and how we can provide the opportunities for people to play at a level that suits their needs, and allows them to achieve at the highest level they wish to.

So, as you step onto the stage, take the time to consider the needs of the players.

Dr Megan Gibbons
Head of College – Te Ohu Ora

LEARNED PERSONAL EXCELLENCE: AN OLYMPIC EXAMPLE

Richard Young

This article is based on a keynote speech given to the ITP Sector Sport, Exercise & Health Symposium, 19 October 2017, Otago Polytechnic. Richard Young is head of Knowledge Edge for Tokyo at High Performance Sport New Zealand (HPSNZ). Correspondence: richard.young@hpsnz.org.nz

There's something powerful that New Zealand has, and that's what we want to talk [about] today – some of the power of discovering [the difference] between medallists and non-medallists and how we can use that power to improve the goals all of us are trying to achieve. This [is] about lessons in personal excellence, and it's come from New Zealand medallists since 2000. We have collected data for 12 years and now we've added the last cycle, so we've got 16. [We've] separated medallists from non-medallists and looked at how they did what they did, what the difference is and what can we learn about how hard is it to win. We need to know what we're walking into as a medallist – so today we're medallists, what are we walking into? How do medallists prepare, what do they believe, how do they learn and what does this mean for us?

Before I got to New Zealand, I'd been to four Olympic Games as a cyclist and as a coach with Canada. Then I was in Britain for two Olympics and now New Zealand for three. The British programme was around the wellbeing of technology and innovation programme, and that's why I arrived here, to set that programme off, and that's in great hands – in-house engineers, McLaren-based people. We spotted a competitive advantage after London, and that was the collaborative approach to preparing for a pinnacle event. It couldn't happen anywhere else because of size, because of logistics, but you can pick a phone up and find anybody in New Zealand.

It was called the Knowledge for Rio programme, so now it's the Knowledge for Tokyo ... is down the street, so it's right beside the Forsyth Barr Stadium. There's three of us – two analysts, Andrew Paul and David Donovan, who are from the University of Otago, and myself. Between the three of us, in a giant network within the sports of how they review and collect and share their information – the work that makes sense of the patterns and help[s] them learn and prepare for the next pinnacle event.

Let's start with the Rio Olympic team. They're not alone. Behind them is every team that came before, and so they're leveraging all the learning that's come before them. We don't always have a record of that learning, but if you look behind, it's there. If you kept a record ... how we got here is the steps you took, but in front is uncharted goals, so you have no idea what to take, what step to take next – unless how you got to here is clear, and that's kind of the gist of the programme.

Using a collaborative learning approach, we can keep a record and form the next step and learning from all the Olympians and all the athletes who came before.

There's a bit of polish in the top end. We can polish, but it's around the talent that exists in people, in coaches, but also in people who haven't realised their potential yet – and that's where the growth is, and that's where we can take this learning and apply it to younger people.

Performance

So first let's look at the performance. We have all the data from every athlete that's ever competed at a world championship and Olympic Games, so we have two and a half million performances across ... now it's over 400,000 athletes. We can track their exact pattern, individual by individual, every performance they've had [at a] world cup, and we can see how medals are produced in terms of their performance profile – they're not laid down here at top 16, and then paid a medal. There's a growth and there's a pattern that the medallists show – there's a pattern that the best athletes show.

So, what the data tells us is that it's getting harder. The Olympic athletes, they know that, but beginners may not know that. Since 1976 and John Walker, the majority of medallists came from the top 16. Prior to that, you could have people out of the blue you'd never heard of, and suddenly they make medals, and so there was a bit of a randomness before 1976. Science improved, systems improved, like the Australian Institute of Sport (AIS) in Australia. Systems started to kick in in the 1980s, and now it's the top 12 that win the medals. It's tightened now – these top 12 take the majority of the medals. Once you move to [the] top eight in 2000 and Rob Waddell, science has improved again, coaching has become more professional – now it's in the top eight and now it's the top five. Most Olympic medallists are taken from the top five in the world – so that's straight-line rowing-type sports, that's the unpredictable sports for strategy sports like yachting. There's very little room outside, so the focus for an athlete is to get good fast and stay good.

And that's the pattern over the last four Olympic Games, and what that means as you get closer to the Games. The percentage of your conversion is growing. It is a recency effect. If you're a medallist in 2017, but you have no top eight for the next world's and you're heading to Tokyo, your odds of a medal are slim. You're going to stay between 25 and 10%. If you are recent, now you're over 55% if you're in the top five the year before, so there's a recency effect as well. If you get better and you leave one group and move to the next group up, your chances of a medal improve. What that tells the athletes is that [they should] not only get better fast, but get better and continue to get better. The talent ID is [only] two cycles away now, so if you look at the record of medallists and they are top eight in the world [for] four years, people have heard of them, and you get to a world cup or world championship and there they are. One and two years out, they're in the top three, so the rate of progress for talent ID [is accelerating]. If they're not in the top eight, they are already under the gun. It's not impossible, but if you look at it across a collective globe population, this is how it looks.

Preparation

That's how hard it is at the top, and the success is like that. There is no-one involved in elite sport that doesn't get that, but that's the environment that we're walking into. So, let's look at preparation. That's how good I need to be, so now how do I get there, and how do I get there fast? Every country, it's a machine. The Olympics is about billions of dollars, billions and billions. There's some bad things to say about the infrastructure and the binning process and all of that, and that's another talk. You know the Olympics is – it's got its challenges, that's for sure – but it collaborates countries, it collaborates people, the competition's fantastic.

It's a multi-billion-dollar game. Sixteen million a year is what [New Zealand] put in. We also put in very tight controls, so that we're building systems that will grow a legacy as well as elite programmes. So, every country is looking for

an advantage. A lot of focus is on the stuff outside of the athletes and the coaches. What we're focusing on in New Zealand is the limitations in technology. However, we know that there is no limitation for ingenuity in people in New Zealand. If you look at the history of New Zealand, the number eight wire, all of the things that makes this culture unique. It often doesn't hold up in other cultures, so how do we leverage that and capitalise, how do we collect people's know-how? We are trying to maximise people, and maximising people must be within the rules. New Zealand wants to stay in the rules, that's a mantra for New Zealand – stay in the rules, we can do better; we can think better in the box.

And this goes back to ancient Olympia – the process of winning a medal was about the person and Olympia. I have been to a conference there, with the International Olympic Academy. It's a special place to go and special place to learn, where everybody talks about the social value of the Olympics – so the greater good of the Olympic Games and lessons on how medals are won, so for instance This is the entranceway to the stadium, and what those statues are is a statue of cheaters. It started in Olympia because the temples were there, so the learning god for Greece and the Olympics was a tribute to ... every four years to Zeus. And primarily they were warriors, and used to fighting each other, which is why there's an Olympic truce for the games.

Their goal was to win by showing the Greek god great character and great excellence. What they got at the end is an olive wreath, and that is the pinnacle of connection to the Greek god, and that was it – but no cheating. Except there were cheaters. So, what happens when you cheat is you're banned forever from the Olympics, your talent is banned forever. Your trainer, anyone associated with you, is banned forever, and you spend your life savings on a bronze statue of Zeus with your name on it. All of those are the cheaters' statues [that] are lined on the way in to the stadium – so as the athletes walk into the stadium, they look and say, "That's not what I think." The Olympics has this mana associated with it.

Recapturing and rebuilding that mana is important so [that] we stay within rules. We know high performers are not superhuman, so we've learnt that they need to master what they've got.

We come back to the Olympic team and how do they prepare; what can we learn from the Olympic team? When we add up the team, they're a system – so there's a lot of theory around systems, how do populations behave? We've learned a lot because we've taken the whole Olympic team, separated medallists from non-medallists, yachting from rugby, team from individuals, streamlined from tactics, coaches from scientists, and we've looked across cycles. We've got some history and some depth and, when we separate the medallists out, there's patterns that appear. The reason they appear is that we've got such a huge population of non-medallists and a small population of medallists, and [the] uniqueness of what they say, what they talk about, what they do and how they do what they do stands out.

There is a small formula in how medals are won. The medallists do it. This is an important concept for a lot of young athletes who fake the prep. All that will eventually get to there – it just keeps going like this, but there's a delivery at the end and the medallists have a special trait on how they deliver. Some of those actions lead to quality actions, but not every action needs to be done well. There are certain actions that count. We wanted to know what these habits were, which ones add up to good actions which lead to an event to be a success.

Beliefs + Habits + Actions = Medallists

There's a series of action – like good training with my coach, sport science, altitude camp, eating certain foods – so there's certain actions and those actions haven't happened once, they've happened over time. What do the medallists and the non-medallists show in that path, and under that, and what are their beliefs? We talked about each Olympia, we talked about the tech, beliefs [that] push medallists, any performer, towards performance. Performance doesn't pull but beliefs push, so if you get your beliefs, whatever they are, they don't judge them, they just try to figure them out. That's what the medallists do, just figure it out: "It's a belief I've got, I've got it, there it is, it's the truth, so is this helping me or not – and not all the affirmations [do] – and do I need this belief and this belief, and this? And then I'll just [keep] repeating it till I get it." This is about reality – so what do I believe and what beliefs are impacting these habits? Because those beliefs are going to impact the actions. There is your success. If you want to know what your beliefs are, pay attention to what you do and how you speak, and that's telling you a lot about how you see yourself and how you see life. And that's the form of medals, and we're going to dig into that.

The team

We've narrowed our review down to seven questions. Questions like: What's not going well? What are you worried about being the next pinnacle event? What surprised you with your last pinnacle event? Before there were hundreds, and we looked prior to London and we collected all the data which was just about the two Olympic Games and the data that no-one found useful. Once we got it, [we] added up the questions – 600 questions across 14 sports in 12 years. You need to know 1), what you're looking for, and 2), [if] you would recognise it if you found it.

So, we needed to restructure things, bring sports along with us, you know ... they've been hammering with all these questions so ... so now we narrow it down. Now, why would that be? That's right, fewer factors, and they've learned about those fewer factors so there's a combination of performing, helping to perform few factors and fewer to trial and error; which may have been talked about at the beginning. We've got people still learning and other people who are learning and the circle can still tighten – so what we wouldn't do is take the medal circle and say to the top 12-placed athletes, "Here you go and do that, you're in." It's around the learning – so how do we accelerate narrowing the circle, even for the medals that might not be ideal for the medallists.

It's the same for team sports, so we divide by caps. So that's how the analysis works for a team sport, for 15/15 or 40/40 overs, and so what they talk about, how they talk ... and we can talk a bit about what they talked about as well in the team sports, some of the differences between the team individuals.

When we look at it and we analyse it and take it apart, there were seven things, seven things, seven categories, seven themes of all those things that are important. Now it's just like a house. Every house looks different, but there's window themes and wall themes and roof themes and all that, so it's not a cookie-cutter: It's not like fast food where it looks like that, tastes like that, packaged like that, but there are categories and the categories over 16 years keep reinforcing themselves. What's in the categories?

The seven things that medallist do better than non-medallists

1. Stable environment

Medallists' environment is stable – it's not changing, it's not shifting, it's not complicated and they know what matters. They're not alone. So, in the language, non-medallists talk about "I and me."

2. Tight support team

Medallists always refer to team support, coaches, other people, and they've got a tight crew [that] then supports you – not “giving it a go” – they're on a mission, they know what to do and they're ... they've got history together.

3. Clear routines

All the medallists that have a handle on the routine know that the environment shifts. If you look at Rio and the food and the travel and the climate – and you can't know everything – and if you've got preparation routines ... the medallists rely on the preparation routines.

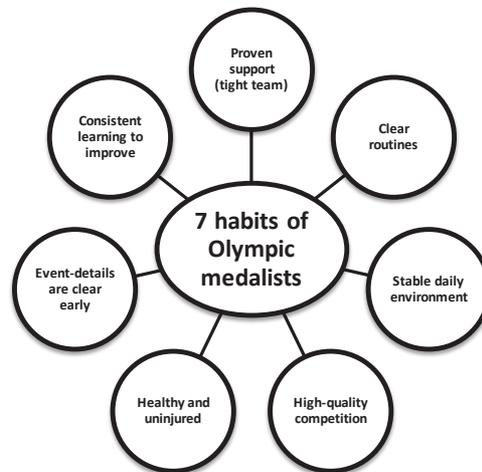


Figure 1. The Seven Habits of Olympic medallists

4. High-quality competition

High-quality competition is the difference between medallist and non-medallist, and so that's a frame of reference. What a non-medallist is ... they're building up their CV. They want to go places where they can win, but the medallists are finished with that – it's around tough competition, they want to know where the gap is, so they do this by competing against the best. “I'm not going to that world cup, it's only the top 16 in the world. I'm top eight, I want to go where the top four are and I want to learn, even if I get beaten, because I believe I can close the gap and I know the gap.”

5. Healthy and uninjured

Medallists are healthy and uninjured and have sound basics. Non-medallists are over-training. They don't know their bodies. Everyone is ... as you know as a coach, or if you've been an athlete, it's easy to over-do it, whatever new thing you're onto, it's easy to over-do it, that's the easiest way. When we look at the language in [use by] non-medallists, and we search for a word like “training intensity,” etc., the word they use most is “hard,” and the word

that medallists use most is “smarter.” They’re trying to polish, they’re trying to fix, they’re trying to improve; the non-medallist is still trying to learn, and they’re putting a massive effort in and that builds other capacities within them, but not forever. There needs to be a point where health, readiness and injury come into play in that balance. See what the medallist ... very few are injured; you look at non-medallists – lots of fractures, stress fractures, over-use.

6. Event planning

Event details are clear; so they’ve done their Reiki. Military-level Reiki is history in rowing, multiple repeat visits exploring the timing and the climate. When they realised there was an hour forty-five trip from the accommodation, the venue, [they] talked to Australia, sorted out a competition in Sydney, stayed an hour forty-five from the venue and Boston, competed against each other every day, just so both of, say, a combined effort could get used to sitting, and for a long period of time. Understanding what you’re walking into and preparing for it.

7. Learning

When I talk about the gap, the one and only gap, and they constantly polish, constantly reviewing, the non-medallists are ... were rare, but they’re learning routines.

It’s about these seven things, but also how you bring them together – the interaction with you, the athlete and the coach – so [that] the support people, my ... and my health, my body, my fitness and the environment, so [that] all the interactions, even social media, everything, all, everything adds up – new family, new house, all that is your eco-system and your environment and the event details over here, these are the pieces outside of these three. Am I clear on the event, do I have routines that work and are proven to me, and [do] I have quality competition? And then the link between those is the learning.

Beliefs drive success. They drive the process, and habits aren’t re-arranged by force. You can see that in life, where people try to do something different and every day they’re trying harder to do something different, but their belief is the same – and the belief changes habits. The easiest, smoothest downhill road is to figure out what the beliefs are that are driving the habits.

A learning belief can drive success in some, not the pinnacle of their success. For some, there’s a fear of learning and a fear of failure – so when I fail, I learn, when I fail, I’m no good – and you can see that in people and you can see that in athletes, the ones that have the belief and that power of that coaching to help lift an athlete out of that into, you know ... that’s just exposing a gap. Everything’s re-wired, there’s learning happening all the time and endless beliefs. It just shows the power of a sport belief.

Some of you recall the four-minute mile. There was a heavy belief that [run] 24km an hour and you would die, so you were just ... it’s physically impossible to run under four minutes, and so there was a systematic belief across sport this couldn’t be done. Roger Bannister breaks it. The next ... ten days later the Aussie – John Landy – breaks it, the next week at the Empire Games. Now we’ve got high-school athletes running this. This happens repeatedly now – the belief gone and sure, there’s a lot of science and there’s a lot of medicine, that’s improved, but training and coaching and ... but the belief, the fundamental belief has shifted.

A growth mindset asks: “How good could I be?”

For medallists, a concept that encapsulate a lot of this belief bubble is the ‘growth vs fixed’ mindset. The ‘growth and fixed’ mindset seems to encapsulate a lot around learning, approach and the sense of self. We’re finding things like the dialogue that the medallists and their coaches are having around effort and challenge (e.g., failing) being vital for

learning. Sport is full of wins and losses, lots of judgement, and this process is around learning. Athletes with a fixed mindset don't do so well in this programme, where we're sharing data and talking about patterns. Fixed mindsets have a lot of resistance to this, because learning from others requires an open mindset, and the question: "How good could I be?"

The process

We are looking to accelerate the learning, and how we do that is [by] clarifying the habits, beliefs, and improving the rate of acceleration into the centre of the circle. That's what we do with the sports and helping to prepare for pinnacle events. For example, with the pre-brief before the event – discussing what you expected to happen [during] the debrief (after the event), where we discuss what happened and the gap between the expectations and what happens – that is the learning. Why did it happen like that? And that's the conversation we have.

It's not a judgement, but its "Here's some insights." For three years, that's how 14 sports have participated. All the athletes and sports agreed – no more anonymity. Previously – London through to Sydney – everyone ticking an honest box: "I don't want anyone reading that." It's a problem there, but it's a fact that what I think of this programme, what I think of my performance. Now it's "Can I get some benefit by sharing that?" There is no anonymity and that means that we can track athletes. Our barrier for [the] past three years, it's been the same barrier, you've been trying new ways to work around this barrier ... Every pinnacle event for three years now is that, so we help them keep records and we help them on that edit process and what happened previously was this.

"In the absence of good measures, it is human nature to pay attention to the things that are wrong; they are even trivial."

Lord Kelvin

As you know, in sport we [have] got a lot of opinion in high performance sport. A lot of opinion and experience, but very little data, so very little happens. We are heavy on performance monitoring, but not on people and how people are moving through the system, until we've started collecting this. We started to shed some light on how these performance markers are happening, because they're happening through people. Our main focus is on the people. You may have been at meetings where the problems become emotions and people start doing stuff off the bat. We've got this Olympic review where some perform, some underperformed – heavy emotion here, heavy happy ending over here. The review is completely different, but what we can show is the past. We can say, "Well, it's emotional, but what you've got is this systematic process and it looks like a couple of points are right here." That's it.

Decisions can't be made on emotions. We need data to back up the emotion, and that's where we are. We're not leaving it to the chance, trivial things, or people trying to get problems to go away. That's exhausting. In most of our reviews, [the discussions] were around that – identifying what's an 'event' and trying to understand why it keeps repeating. "Well, the leadership in the group isn't good enough, and the athletes never talk to this person, so he's just on his own, he just thinks he's his own man." Well, what belief do we have in a team that's driving that, so [that] the beliefs shift the team and so we can help with a record? And that's where the learning's coming in. These are the processes we go through.

Summary

The same way [that] the sports are using the seven behaviours [outlined above] ... and we show what's the

difference for us, the athlete, the coach, the leadership – and we try and work out how it works on the ground. It can't be system forever. We just keep a record of the enablers (i.e., what's going well), barriers, worries, etc. To get the truth we ask, "What do you love? What are your worries? What's a distraction to performance?" "You get all sorts of things – e.g., "I'm constantly injured, and I really don't know how to monitor injuries, and I don't like the doc, etc." It's around writing it down and paying attention to what the habits are and what the weaknesses are. There's no advice from us. We never advise. All we do is relay the evidence – it's just what we're noticing and what does it mean.

It's not a cut and paste. We can't take the lessons from Olympic yachting over to Olympic rowing. Instead it's: "Here's what they do – what does this mean to you and is there any learning here?" When we add the whole system up, and all the system across the national network here, what does this mean for us? What does this mean for every single sport? Are there some things that we're not getting right and they could be polished? *Edit* – that's the mode we are in now as an organisation. We are interviewing everybody right now. We have another project called Rio 1-8. All sports have endorsed one-on-one interviews with everyone who finished one to eight in Rio – every athlete, every coach – and combining the data across the sports and events. There is more work to be done.

Part of Canada's Olympic cycling team at Seoul in 1988, **Richard Young** has a strong background in coaching as well as performance. He established the first National Cycling Training Centre in Canada (Calgary) and coached at the Olympics in Atlanta in 1996. After helping set up elite coaching programmes in the UK, he moved to New Zealand where he worked as a performance director with SPARC, then joined HPSNZ to develop the Knowledge Edge for Rio Programme (K4R). He has a BSc in human physiology, an MSc in biomedical engineering (both from McGill) and a PhD in medical science from Calgary.

INTEGRATED LEARNING IN SPORTS ANALYSIS

Hayden Croft

This article is based on a keynote speech given to the High Performance Sport Symposium, 20 October 2017, Otago Polytechnic. Hayden Croft is a Senior Lecturer and Consultant at Otago Polytechnic's Institute of Sport & Adventure. Correspondence: hayden.croft@op.ac.nz

INTRODUCTION: What is intergated learning?

The AKO Aotearoa website has this to say about work-integrated learning: "time spent in the workplace forms an integrated part of an academic program of study." Although this is a complex way to teach, it provides superior 'ecological validity' to a program compared with the traditional classroom-based lecture. In the past, it was more common to train in an apprenticeship scheme than it is today, with many professions now being taught in theory-based courses completely detached from practical skills-based learning. However, there are many benefits to an integrated learning approach, as Figure 1 illustrates. If properly managed by the lecturer, a placement can provide a place to learn, generate income, provide a platform for research and also engage industry in positive ways.



Figure 1. Integrated learning can have many benefits, not just per se.

Industry Engagement

Industry engagement is important as it builds the reputation of one's department, institution and staff, while giving the students an opportunity to impress employers, gain experience and learn the professional skills that can't be learned from a textbook, such as communication, time-lines and deadlines, and group dynamics. If we are preparing our students to work in industry, then how can we *not* have a strong working relationship with industry?

The sports analysis branch within the department of Physical Activity & Wellbeing at Otago Polytechnic

currently works closely with organisations such as Otago Rugby, Southern Steel Netball, Highlanders Rugby, Tonga Rugby, Football South and NZ Rugby, as well as equipment and software providers like HudITM, Tam GroupTM, SASTM and GPSportsTM. This keeps us up to date with what is new, what employers need, the skill that industry needs in our field and where the opportunities for employment lie.

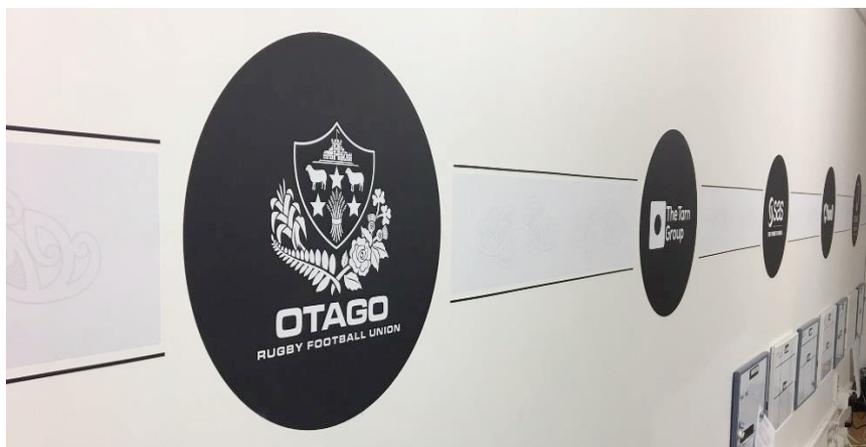


Figure 2. Industry partners' logos line the walls of a learning space at Otago Polytechnic
Photo Credit. Hayden Croft

Placement

In a sports analysis programme, it would be very easy to send the students to hold cameras and provide simple video reels for the team concerned. However, this type of placement lacks depth and the students very quickly feel as though they are being exploited as cheap labour. Rather, the types of placements we engage our students in comprise the main 'pillars' of sports analysis. These include various forms of video technology and techniques; other technologies such as GPS and accelerometers; and data analysis and game statistics, as well as broader performance profiling and technique analysis.

These skills sets are most evident in placements such as those involving the Southern Steel netball analysis team and the Otago Rugby Mitre10 Cup campaign. With the Southern Steel, a group of five students work filming and coding training sessions, producing opposition analysis reports and live game plan statistics and beaming them to the coaches' bench during the game. While this is happening, other students are capturing video and statistics which then are shared with the players post-match on a platform call HudITM. This helps both players and coaches reflect on the performance and speeds up the debrief process, enabling preparation for the next match to begin earlier in the week.

These placements accelerate the students' learning, as there are real outcomes from their work that contribute to winning and losing. This process is managed carefully by staff who communicate with the coaches, check the quality of work completed and ensure that deadlines are met, even if this means doing the work themselves. Effective, frequent communication and a supportive approach are crucial to making sure the team works well.

Every season teaching is very 'hands-on' from the outset, with the staff leading most aspects of the analysis process; as the season progresses, the students begin to lead and take over when they are confident and capable. This means that the learning involved tends to begin in a very explicit and technical manner and then transitions to become more implicit and professionally focused. Learning outcomes in the courses in which the same students are enrolled also follow this pattern.



Figure 3. Otago Polytechnic sports analysis staff and students with coaches from the Southern Steel netball team, post-match.
Photo Credit: Hayden Croft

The fee-for-service model

As staff and subsequently students have skills that are of value, I feel it's important to make sure that industry pays either in-kind or fiscally for them. Devaluing these services, by providing them for free, teaches industry that sports analysis is of little value and thus shouldn't be paid for. There are two scenarios that can be applied to our "fee-for-service" contracts. The first is that when a sports body or team has staff in place who can train, educate and guide the students during their placement, then this is considered in-kind payment and both the students and team benefit. The second scenario arises when the sports team or body involved lacks the skills to train, educate and mentor the students; in such cases a fee is negotiated that offsets the cost of lecturer time, equipment and facilities. The team then receives a high-quality service in which the lecturers and students work together to provide cutting-edge sports analysis.

A consequence of the fee-for-service approach is that some of the fees remitted contribute to the purchasing of new technologies, equipment and software that can in turn be used across a variety of fee-for-service contracts. This gives sports departments access to equipment that they could not normally afford within the sports analysis budget.



Figure 4. Students operating an expensive sports analysis video mast and computer software, during an Otago Rugby team training session at Forsyth Barr indoor stadium (Dunedin).
Photo Credit. Hayden Parsons- Otago Polytechnic

RESEARCH

While applied research is sometimes seen as difficult, it provides some of the most valid and information-rich findings for practitioners and students alike. Sports analysis staff at Otago Polytechnic are active in researching and publishing their work and in solving problems for industry. Studies conducted include observing and analysing rugby team environments and the application of analysis processes in team meetings (Middlemas & Croft, 2016). Another study has developed new camera technologies that allow first-person perspectives during training (Croft, Suwarganda & Omar, 2013). Two further studies have applied very technical data analysis techniques to compressing and analysing large rugby data sets (Croft, Lamb & Middlemas, 2015; Lamb & Croft, 2016) which can then be used by teams in preparing for matches. A study has also been published which helps netball teams visualise large data sets during games in a way that informs them how their game plan is progressing (Croft, Lamb & Wilcox, 2016).

For research to be effectively integrated into industry it needs to solve problems that currently face industry, does not adversely affect how the team functions, and is well planned so that any ethical issues involved can be attended to during the off-season. Publishing research results in a timely manner is also important, as it shows industry that their contribution is being utilised and is valuable.

Student research also works well in industry as the students can conduct small-scale and quickly completed research projects that can solve problem in-season for the team. The key is to make sure that the students follow an action research approach which is minimally constrained by process and methodologies.

Assessments and Qualifications

There are two methods used to integrate industry with the assessments and qualifications taught in our department. The first is to use assessments that are based on processes that are relevant to the role of the sports analyst, while the setting or topic should be flexible enough to let the student use their assessment learning in whatever placement they choose. We have found that coaches and athletes are always willing to be interviewed or give

students feedback about their work – this may be a product of their seeing value in what the students provide. Examples of assessments that align well with the sports analysis profession are: “Design an analysis environment” and “Problem-solving/needs analysis project.” Both of these topics were recommendations from industry during the curriculum development process.

The second way in which we align assessment and qualifications with industry is to align learning with accreditations such as ISPAS (International Society of Performance Analysis of Sport) levels 1 and 2. As the year progresses, students accumulate learning and evidence which enables them to achieve at least a level 1 ISPAS accreditation. This means that when they apply for employment they have external qualifications, in addition to their Otago Polytechnic graduate diploma, and they are also part of an institution which can support them with direction on further professional development. ISPAS also hold annual conferences and workshops that provide valuable updates on the latest research and practice in the sport analysis field.

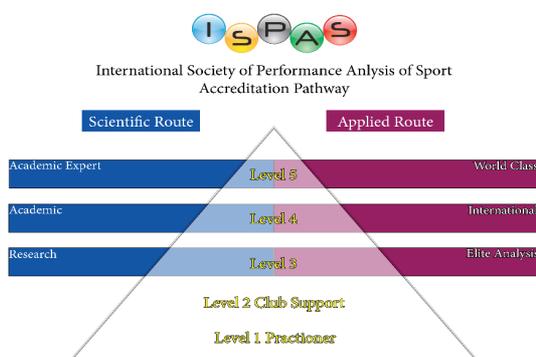


Figure 5. The ISPAS accreditation pathway which each student works towards while studying. Permission to reprint obtained from International Society of Performance Analysis of Sport

Graduate Outcomes

A colleague from another field once asked me: “Having cool stuff doesn’t get jobs for students – are there actually paying sports analysis jobs out there?” He was making a very good point. The only way we can be sure of this is to collect evidence from each year’s alumni. As of 2017, of all graduates who specialised in performance analysis 67% are in paid employment with either sports teams or companies which provide sports analysis, while a further 17% volunteer their time, doing analysis for age-group or club teams. The final 16% are in other employment or travelling the world. This said, all of these graduates are on the career ladder and, as the industry grows, like everything related to high-performance sport, they should be in influential positions in ten years from now. It is also hoped that some will carry on to higher level study and help grow the academic base in New Zealand and overseas for this exciting field of practice and research.



Figure 6. Students enjoying the scenery before a 2016 Mitre 10 Cup Rugby match.

Photo Credit: Hayden Croft

Hayden Croft is a senior lecturer at Otago Polytechnic and a performance analyst with Otago Rugby and Southern Steel Netball. His research interests include sports analysis, biomechanics and video technology. Croft has a Master of Physical Education (Biomechanics) from the University of Otago and is currently working toward his PhD at AUT in New Zealand.

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A SURVEY OF DUNEDIN TERTIARY STUDENTS' DRINKING BEHAVIOURS: A PILOT STUDY FOR A PROPOSED INTERACTIVE BOTTLE BIN

Richard Humphrey, Deirdre Roberts, Regan King and Penny Mee

INTRODUCTION

Alcohol is one of the most commonly used and socially acceptable recreational drugs in the world, available in bars, clubs, off-licences and supermarkets, with the largest hazardous drinking age group identified as 18 to 24-year-olds (Stefanogiannis, Mason & Yeh, 2007). One US study showed that 42% of university students had engaged in one or more heavy drinking episodes in the previous month (Hingson, Heeren, Zakocs, Kopstein & Wechsler, 2002). The drinking culture among university students is not just an issue in America; it is also a problem in Sweden, South Africa and Australia (Lindsay, 2005). Young people in Australia have been found to drink excessively; the government is concerned that through aggressive marketing and licencing deregulation this lifestyle is becoming culturally normalised (Lindsay, 2005). Results from surveys in New Zealand have shown that university students, compared to their non-student peers, also consume large amounts of alcohol [correct?] (McLean & Connor, 2009). This behaviour leads to students being more likely to drink hazardously, be involved in acts of violence, offending behaviour and risky sexual behaviours, and have academic problems.

Over recent years, disorderly events in Dunedin have focused attention on alcohol-related harm within the city and particularly on the student population. The population of Dunedin in 2017 is 123,000, with the student population comprising approximately 20% of this total, at 25,000 (<http://www.stats.govt.nz>). A Dunedin-based study (McLean & Connor, 2009) has investigated students with alcohol-related harm receiving treatment at a local hospital's emergency room. Their findings indicated that student flats and houses were the most prevalent location for last drinks to be consumed prior to their injury occurring. Alcohol stores and supermarkets are easily accessible on foot for Dunedin students, leading to increased pressure for alcohol to be purchased and consumed (Kypri, Bell, Hay & Baxter, 2008). Dunedin's notorious student drinking culture has led to Otago University gaining a reputation for anti-social student behaviour; often resulting in streets being littered with broken glass and debris (www.dunedin.govt.nz).

The researchers proposed investigating the relationship between students and alcohol consumption in Dunedin. It was proposed that data would be collected using a purpose-built interactive bottle bin inspired by the VW fun theory bottle bank (www.thefuntheory.com). The completed bottle bin (see Figure 1) would capture photographic data about the bottles deposited, enabling the researchers to calculate the units of alcohol consumed over a particular period. Students hosting social events would be offered free use of the bottle bin on the condition that they indicated the number of people who attended the event when the bin was collected. This would provide valuable data about the drinking habits of students studying in Dunedin.



Figure 1. The completed interactive bottle bin

Prior to the deployment of the bottle bin, a pilot study was conducted to obtain data by more traditional means in order to provide a basis for comparison and support the rationale for the utilisation of the bottle bin.

LITERATURE REVIEW

Numerous studies (Caudwell & Hagger, 2014; Hallett et al., 2012; Kypri, 2002; Kypri, Cronin & Wright, 2005; Kypri, Bell, Hay & Baxter, 2008; McLean & Connor, 2009; Zamboanga et al., 2010) have administered surveys to tertiary students studying at universities, polytechnics and colleges. However, there are concerns with many of these surveys regarding the potential for recall bias, especially when dealing with alcohol consumption and its consequences, such as blacking out and memory loss. Consequently, recall bias can limit such studies, particularly in terms of the volume of alcohol consumed – a factor that the deployment of the bottle bin aimed to address.

Perkins (2002) looked at the culture of American college students and the negative patterns established by their drinking habits and misuse of alcohol. This study analysed survey data trends and patterns of alcohol consumption over a 20-year period. It concluded that males suffered a higher rate of harm in public spaces (such as streets and parks), with more serious adverse consequences than females. Perkins highlighted the prevalence of adverse drinking behaviour in US sororities and fraternities, comparable to halls of residence and student flats in Dunedin. He found a modest correlation between a student's self-perception of being a problem drinker and their actually suffering negative consequences due to alcohol consumption.

Kypri (2002) aimed to determine the prevalence of hazardous drinking and the negative consequences of alcohol consumption among New Zealand tertiary students, as well as establish predictors of hazardous drinking across a six-month period. This study discussed the impact of social influence and peer pressure on an individual when making decisions about alcohol consumption and alcohol-influenced behaviours. The author sought to determine the prevalence of these behaviours in New Zealand tertiary education settings and the negative consequences on individuals and their community. The study was conducted in Dunedin, New Zealand, recruiting students living in halls of residence who had completed the Alcohol Use Disorders Identification Test (AUDIT), and recording their

drinking habits and alcohol consumption. The survey was repeated throughout a single year and data was compared between the different collection stages. The findings showed that 60% of male and 58.2% of female respondents drank more than the "sensible upper limits." This study provided a baseline of the drinking habits of students in Dunedin.

Kypri, Cronin and Wright (2005) used the same AUDIT survey utilised in the present study and administered it to two groups for direct comparison. One group was Otago University students studying in 2002 and the other comprised non-student youths. The findings showed that the student group exceeded their non-student counterparts in the AUDIT survey in relation to both excessive drinking and alcohol-related harm.

In a New Zealand-wide study, Kypri, Bell, Hay and Baxter (2008) demonstrated an increased incidence of alcohol outlets in student areas, potentially contributing to increased levels of alcohol-related harm among university students. Their findings suggested a positive link between alcohol outlet density and individual drinking behaviours, along with the problems associated with drinking. This study used international cross-sectional data to investigate the associations between the geographic density of alcohol outlets and the incidence of alcohol-related harm. The researchers noted several case studies including an increase in alcohol-related violence investigated by Norwegian police concurrent with an increase in alcohol outlets; and the prevalence of gonorrhoea in high-density outlet areas in California. They concluded that the promotion of alcohol in student-dense areas, due to the business competition between outlets in close proximity to each other, was leading to higher consumption of alcohol, hazardous drinking and alcohol-related harm.

Zamboanga et al. (2010) used the AUDIT self-report questionnaire to collect data from students at 30 universities across the United States. Data was collected about students' drinking attitudes, behaviours and their participation in drinking games. The respondents (n=2230) were categorised into four groups: low frequency/low consumption (n=1047); low frequency/high consumption (n=453); high frequency/low consumption (n=326); and high frequency/high consumption (n=404). Drinking games were defined as a social contest consisting of a set of rules or guidelines that facilitated heavy alcohol use. Involvement in drinking games could lead to a reversal of competence – that is, as players became more intoxicated, their skills diminished and they became more likely to cause harm to themselves and others. The results showed that the frequency and duration of consumption created negative outcomes including higher injury rates, adverse social consequences and the development of dependence on alcohol.

Hallett et al. (2012) used an online survey to investigate university student drinking behaviour. Invitations were sent randomly to 13,000 undergraduate students attending university in Australia. Responses were received from 7237 students, all of who were considered eligible to participate in the study. Ninety percent of the students who participated in this study confirmed they had drunk alcohol in the previous 12 months, 34% meeting the criteria for hazardous drinking. There has been considerable interest in hazardous drinking by tertiary students in the media. Another Australian study (Hallett et al., 2013) reported that 70-96% of university students regularly consumed alcohol, with 50% drinking to intoxication at least once per week. Half the male and a third of the female respondents reported hazardous levels of drinking, suggesting a need for interventions to reduce hazardous drinking at university.

Pengpid, Peltzer, Van der Heever and Skaal (2013) conducted a randomised controlled trial among university students in South Africa. This trial tested the effectiveness of the Screening and Brief Intervention for students with alcohol problems. Students registered their interest by attending public recruitment venues around their respective campuses. Students were screened for alcohol problems and those eligible (n=152) were randomised into either the intervention arm or control group. The intervention group received one brief counselling session on alcohol risk reduction, while the control received a health education leaflet. One hundred and forty-seven students attended the twelve-month follow up. Data gathered from the follow up indicated that depression scores decreased over the duration of the intervention and that the brief intervention made a realistic change when utilised with university students. The findings suggested potential benefits from running screening and brief interventions to reduce alcohol-

related harm among tertiary students.

An online survey was utilised by Caudwell and Hagger (2014) to investigate pre-drinking behaviour. Undergraduate students at an Australian university (n=144) completed an online survey that assessed pre-drinking motives, pre-drinking cost motives and "alcohol identity." The findings suggested that a dual-system approach, like that utilised by Pengpid, Peltzer, Van der Heever and Skaal (2013), had the ability to predict alcohol consumption and harm and showed that there was a need for interventions to reduce alcohol harm and excessive consumption. The research showed that pre-drinkers in the Australia were four times more likely to consume as much as five times the recommended safe drinking limit over an evening, and more than twice as likely to become involved in a confrontation in the night-time environment than non-pre drinkers (Caudwell & Hagger, 2014).

Hernandez, Leontini and Harley (2013) conducted interviews with six randomly selected participants between the ages of 18 and 21 at an Australian university. The interviews lasted an hour, each being conducted in private. The six students reflected on the "harm" associated with drinking; all shared the same belief that when drinking in their friendship groups they felt they would not be at risk. All indicated that they drank between two and 20 alcoholic beverages in a single session, and during the interview discussed sensitive topics such as drinking-associated violence, drink-driving, underage drinking, their family history of drinking and drug use. This study showed that there was a need for a campaign that would raise students' awareness of alcohol-related harm minimisation.

Mclean and Connor (2009) conducted a cross-sectional study in Dunedin, New Zealand, where patients (16 years and older) presented with an injury at one of three primary care facilities in the city. A consultation was conducted and an anonymous survey completed by participants. This included questions about sociodemographic factors, type of injury and whether participants had consumed alcohol within the last six hours, with a specific location named. A total of 317 participants completed the survey; 17% reported that they had consumed alcohol in the six hours prior to injury. The mean drinking age was 21 and women outnumbered men. Student flats and houses were identified as the most common location for respondents' last drink prior to injury. If participants were too intoxicated to provide consent, they were excluded.

METHODS

The purpose of the present study was to collect pilot data regarding students' drinking behaviours at a New Zealand tertiary education institution.

While it was acknowledged that concerns exist regarding the potential for recall bias with alcohol-related surveys, reliable baseline, comparative data was required. Therefore, a brief questionnaire was adopted using standardised questions from the Alcohol Use Disorders Identification Test (AUDIT) template. The AUDIT is recommended for use in primary care (WHO, 2017) and has been used widely in previous research (Kypri, 2002; Kypri, Cronin & Wright, 2005; Zamboanga et al., 2010). The questionnaire consisted of ten questions relating to alcohol consumption and hazardous alcohol-based behaviours. Questions 1 to 3 related to alcohol consumption, 4 to 6 to alcohol-related harm, and 7 to 10 to alcohol-reduced harm. Each question had five alternative answer responses except for the last two questions, which had three options.

The questionnaire was distributed using the Web-based platform Survey Monkey, and was accessible to university and polytechnic students based in Dunedin. Inclusion criteria required participants to be resident in Dunedin. All participants were volunteers recruited via open source methods such as researcher-created public Facebook pages linked to existing student pages. Potential participants were invited to private-message the researchers, who then contacted them to participate via private email. Students who responded and expressed interest in participating were emailed a Web-link to the survey, which included an information page, consent form and the survey itself. An exit button was provided and participants could leave at any point prior to submitting their responses. Potential

respondents were given 22 days to complete the survey. Security and other restrictions were put in place to ensure that each student could only complete the survey once and to maintain the anonymity of participants. No names or emails were collected for use in publications.

Ethics

Prior to applying for ethics approval, researchers undertook Māori consultation with Otago Polytechnic's Kaitohutohu Office. Once this was completed, ethics approval was applied for and granted by the Polytechnic's Research Ethics Committee. All guidelines and limitations were complied with during the completion of this research.

Data Analysis

The data collected was analysed and summarised for each question. Each participant's survey response was scored with a maximum of four points for each question and their scores were summed to create a total AUDIT score. If a participant scored seven or below, there was deemed to be no cause for concern around their drinking behaviour. Those scoring between eight and 15 were thought to require focussing on reducing their drinking. Scoring 16-19 indicated a need to monitor participants' drinking or receive limited counselling. For those scoring 20 or above, further diagnostic evaluation was warranted. Averages were calculated for all the participants' responses to the AUDIT questionnaire. The results were compared to previous AUDIT studies.

RESULTS

A total of 145 participants attempted the questionnaire and 141 (97.24%) completed it fully. Incomplete questionnaire responses were removed from the data set for analysis.

Participants' responses to the first question, "How often do you have a drink containing alcohol?", are summarised in Table 1.

	Never	Monthly or less	2 – 4 times per month	2 – 3 times per week	4 or more times per week
Question 1 – How often do you have a drink containing alcohol	2% (n = 3)	15% (n = 21)	51% (n = 72)	25% (n = 35)	7% (n = 10)

Table 1. Participants responses to questionnaire (question 1)

The number of drinks respondents consumed on a typical day when drinking are set out in Table 2.

	1 or 2	3 or 4	5 or 6	7 to 9	10 or more
Question 2 - How many drinks containing alcohol do you have on a typical day when you are drinking?	8.5% (n = 12)	11.5% (n = 16)	18.5% (n = 26)	27% (n = 38)	34.5% (n = 49)

Table 2. Participants responses to questionnaire (question 2)

Participants' responses to questions 3-8 in the AUDIT questionnaire are summarised in Table 3.

	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
Question 3 - How often do you have 6 or more drinks on one occasion?	7% (n = 10)	21% (n = 30)	25% (n = 35)	44% (n = 62)	3% (n = 4)
Question 4 - How often during the last year have you found you were not able to stop drinking once you started?	58% (n = 82)	15% (n = 21)	13% (n = 18)	12% (n = 17)	2% (n = 3)
Question 5 - How often during the last year have you failed to do what was normally expected of you because of drinking?	48% (n = 68)	35% (n = 49)	12% (n = 17)	4% (n = 6)	1% (n = 1)
Question 6 - How often during the last year have you needed a drink in the morning to get yourself going after a heavy drinking session?	87.5% (n = 123)	7.5% (n = 11)	1.5% (n = 2)	2% (n = 3)	1.5% (n = 2)
Question 7 - How often during the last year have you had a feeling of guilt or remorse after drinking?	31% (n = 44)	42% (n = 59)	17% (n = 24)	8.5% (n = 12)	1.5% (n = 2)
Question 8 - How often during the last year have you been unable to remember what happened the night before because of your drinking?	22.5% (n = 32)	41% (n = 58)	27.5% (n = 39)	7.5% (n = 10)	1.5% (n = 2)

Table 3. Participants response to questionnaire (questions 3 to 8)

For the two final questions in the AUDIT questionnaire, participants were able to choose one of three responses. Participants were asked whether they "or someone else had ever been injured due to their [own] drinking" and whether "anyone had ever shown concerns or suggested they cut down their drinking." Participants' responses are summarised in Table 4.

	No	Yes, but not in the last year	Yes, during the last year
Question 9 - Have you or someone else been injured because of your drinking?	47.5% (n = 67)	21.5% (n = 30)	31% (n = 44)
Question 10 - Has a relative, friend, doctor or other health care worker been concerned about your drinking or suggested you cut down?	78.5% (n = 111)	4% (n = 6)	17.5% (n = 24)

Table 4. Participant response to questionnaire (questions 9 & 10)

The highest proportion of respondents scored between 8 and 15. As Table 5 shows, 40.43% (n=57) of participants scored between 8 and 15. The second highest group scored 7 or below, with 21.99% (n=31) of respondents fitting this category. 19.86% (n=28) of respondents scored an average of 20 points or above. The last group represented those who scored between 16 and 19 points – 17.73% (n=25).

AUDIT Score	Participants	Percentage
7 or below	31	21.99%
8 to 15	57	40.43%
16 to 19	25	17.73%
20 plus	28	19.86%

Table 5. Participants AUDIT scores and percentage of sample

A total of 141 participants completed the survey in full and were scored according to their response to the AUDIT questionnaire: 0-7 = moderate levels of drinking; 8-15 = hazardous levels of drinking; 16-19 harmful levels of drinking; and 20 and above meant a dependence on alcohol. The largest group of participants (40%) scored between 8 and 15, indicating that they were hazardous drinkers. A major cause for concern were the 20% of participants who scored 20 or above, representing a high risk of alcohol dependence.

DISCUSSION

This study has demonstrated that the AUDIT survey can be a useful tool in identifying hazardous drinking and the drinking trends of tertiary students in Dunedin. All the participants who completed the questionnaire were current drinkers or had consumed alcohol within the last year. The results showed a high prevalence of hazardous drinking, with over 40% of participants scoring between eight and 15 points on the AUDIT survey. This result can be compared to the Australian-based undergraduate study by Hallett et al. (2012), which recorded a high prevalence

of hazardous drinking, with 48% of participants scoring between eight and 15 points.

The second question in the AUDIT questionnaire used in our study, relating to hazardous drinking levels, indicated that binge drinking in the Dunedin context was five standard drinks for men and four standard drinks for women (Kypri, Cronin & Wright, 2005). A total of 79.72% of participants in our study indicated that they had on occasion consumed more than five drinks in one night. Similar observations were made by Kypri, Cronin and Wright (2005), who found that college students in the US had heavier drinking periods consisting of five or more drinks for men and four or more drinks for women on a monthly basis, compared to their non-college counterparts.

Over half the number of participants (52.41%) in our study indicated that they had injured themselves or someone else while intoxicated at some time, and 31.03% had been injured during the previous year. This was consistent with another New Zealand study (McLean & Connor, 2009), which observed that 17% of participants who reported to Dunedin emergency services with injuries were intoxicated. They also noted that this group were younger than non-drinkers, having an average age of 21. The study revealed that 64% of the drinkers had exceeded the guidelines about the safe number of drinks to be consumed in one drinking occasion.

As with other similar studies, the present study may have been biased by recall validity, which as we have seen can compromise studies dealing with alcohol (hence the need to develop an objective, unbiased means of collecting data such as the bottle bin). It should also be noted that the age and gender of participants were not recorded, so the study was unable to consider the impact of these factors (e.g., gender-specific safe drinking recommendations).

CONCLUSION

The results of this study provide up-to-date data and a baseline for future studies to use for comparison when investigating alcohol consumption and its attendant behaviours in the lives of tertiary students in Dunedin. Our results add to the growing body of evidence that emphasises not only the need for effective alcohol interventions, but also effective ways of evaluating alcohol consumption and its effects on behaviour in a naturalistic social environment. In this study, it is cause for concern that within the tertiary setting only 21.99% of the participants achieved a score of 7 or less in the AUDIT questionnaire. Previous research (Pengpid, Peltzer, Van der Heever & Skaal, 2013) has suggested that the first stage in reducing alcohol-related harm among tertiary students is identifying the problem. The AUDIT survey used in this study indicated that a problem exists, and it is hoped that the bottle bin protocol will provide additional, more detailed data on the extent of the problem.

Richard Humphrey began his academic career at the University of Southampton (UK), where he taught sport studies and sport management and development. Following some postgraduate study at the University of Bristol, he emigrated to New Zealand in 2013 and took up a lecturing position at the Institute of Sport and Adventure at Otago Polytechnic. Richard teaches and supervises undergraduate research in the fields of exercise, health and research methods. His research interests include the therapeutic use of exercise and substance misuse, particularly in the case of people with coexisting mental health issues.

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AGGRESSION IN FOOTBALL: A COMPARATIVE STUDY

Thomas Wallis, Gary Barclay and Richard Humphrey

INTRODUCTION

There is a rising concern that aggression is becoming an accepted and even encouraged part of sport (Sacks, Petscher, Stanley & Tenenbaum, 2003; Stephens, 2001). A growing body of literature has delved into aggressive conduct in sport and the rationale behind this unwarranted behaviour (Stephens & Kavanagh, 2003; Stephens, Bredemeier & Shields, 1997; Stephens, 2000, 2001, 2004). As stated by the Fédération Internationale de Football Association (FIFA), fouls are inevitable in football. There are no foul-free football matches, due to the physicality and emotion generated by the game (Martin, 2012). During an athletic contest, the potential for frustrating situations is unlimited. Combine that with aggressive behaviour that is rewarded by team-mates, coaches and parents, or adopted by role models on television or during live contests, and the potential for aggression in sport only rises (Keeler, 2007).

Psychologists define aggression as a behaviour that is intended to harm another individual who does not wish to be harmed (Baron & Richardson, 1994). Aggression comprises four principles: it is a form of behaviour; it involves intent; it involves harm or injury; and it is directed toward a living organism (Gill, Williams, & Reifsteck, 2007). Aggression take the form of either physical or verbal behaviour and is distinguished by its intentional delivery (Gill & Williams). Anderson and Bushman (2002) acknowledge that the personality of a player can play a significant role in determining whether they will be aggressive or not in certain situations. For example, Roy Keane, a former professional footballer, was noted for his aggressive and competitive style of play: *"Aggression is what I do. I go to war. You don't contest football matches in a reasonable state of mind"* (Keane & Doyle, 2014).

The Influence of Age on Aggression Levels

Coulomb and Pfister (1998) recognise age as an important component in determining aggression levels. As a player gets older, they become increasingly motivated by competition and victory, and come to consider aggressive behaviours as legitimate in competitive sports (Duda, Olson & Templin, 1991). An age-related increase in aggression can be credited to players' development of moral reasoning, which is negatively influenced by sport competition and experience (Bredemeier, Weiss, Shields & Cooper, 1987). Coulomb and Pfister (1998) suggest that the higher the level of competition, the greater the frequency of instrumental aggression, while the incidence of hostile aggression occurs less frequently (Bredemeier et al.). Abdoli, Rezaie and Sani (2009) have determined the effect of emotional intelligence (for example, self-control and social skills) on aggression levels of professional football players. The results indicated that a negative correlation exists between emotional intelligence and aggression. High levels of emotional intelligence were positively linked with low levels of aggressive behaviour. The authors suggested educating football players through training programs designed to improve emotional intelligence, hopefully leading to enhanced social and interpersonal relationships. Aktop, Özçelik, Kaplan and Seferçülu (2015) assessed assertiveness and aggression levels of amateur football players across various age groups. This study found that with age, destructive aggression levels tend to decrease. Based on their findings, it is suggested that while destructive and passive aggression levels decrease with age, assertiveness levels positively increase with age.

Aggression in Relation to Playing Positions

Gümüşdağ, Yıldırım, Yamaner and Kartal (2011) have assessed the frequency, timing, zone and player category of fouls and of aggressive behaviour in professional football (Gümüşdağ et al.). They found that the majority of fouls were committed by players operating in their natural pitch zones (forwards in the attack zone and defenders in the defence zone). It was suggested that the players learn how to channel their aggressive behaviours in order to balance the cost (punishment) and profit (ball advantage, score) in the right place and at the most appropriate time. Mahrokh and Ayoub (2012) also found that aggressive behaviour occurred more often in the attacking and defensive zones (Mahrokh & Ayoub). They considered that this was associated with critical situations (such as conceding a goal) that could produce a catastrophic result, and was therefore associated with emotional responses such as expressions of anger and aggression (Vallance & Dunn, 2006).

Coaching Efficacy Beliefs in Relation to Aggression

Chow, Murray and Feltz (2009) examined personal and socioenvironmental factors relating to players' likelihood to aggress in youth football (Chow et al.). They found that coaching efficacy beliefs were a positive predictor of their players' likelihood to aggress. This study produced the novel finding that the team norm for aggression was the most likely predictor in determining levels of aggression.

The purpose of the present study is to examine the self-likelihood to aggress of amateur football players and coaches, and to identify the influence of coaching efficacy beliefs on aggression levels.

METHODS

Participants

The participants were male amateur football players ($n = 134$) belonging to 14 different amateur football teams, together with their coaches ($n = 7$). Five teams were drawn from the A division ($n = 51$), four teams were from the B division ($n = 26$) and five were from the C division ($n = 57$). Participants' ages ranged from 15 to 65. Total years of football experience ranged from 0.5 years to 55 years, and participants were primarily New Zealand European ($n = 105$). The numbers of players per team ranged from 3 to 14. Coaches ranged in age from 33 to 57. The majority of coaches had coached for 7-15 years. All of the coaches had played club-level football and had 3 to 50 years of playing experience. Coaches were primarily New Zealand European ($n = 6$).

The sample size of participants was chosen based on the number of teams playing in the leagues active in the geographical location where the study was carried out. Assuming that each of the 14 teams had 15 players and a coach, this gave a predicted sample size of 224. However, each team had different squad sizes, resulting in a sample size of 134 players and seven coaches ($n = 141$).

Procedure

Coaches were initially contacted via phone or email with a request that their teams participate in the study. At a training session, the coach would introduce the researcher to the players, who were then given a brief description of the nature and purpose of the study (with the exception of C division teams, where data was collected on match days before games, as these teams did not hold training sessions). Those who wished to participate in the study were given a hard copy of the anonymous survey and asked to complete it as honestly as possible. Participants completed the survey individually, but in the presence of their team-mates (most commonly in the club changing room). They were asked to complete the survey in silence, without discussion. This process took 15-30 minutes. The

data was collected between 2 April and 31 August 2016.

Measures

The questionnaire was broken down into three sections. All participants completed the demographic questionnaire. The players completed the 'Judgments About Moral Behaviour in Youth Sport' questionnaire, while coaches completed the 'Coaching Efficacy Scale.'

Demographic Questionnaires. Demographic data was gathered from both players and coaches. This included information on age, ethnic affiliation, team name, coach's name, division, years under this coach, total years' experience, primary playing position, highest level played, and total number of years coaching. Coaches were also asked to rate the overall ability of their team on an 11-point Likert Scale ranging from 0 (very poor) to 10 (excellent). This question was aimed at investigating coaches' belief in the overall ability of their team. This procedure was developed by Park (1992) and has been used in previous studies examining coaching efficacy (Feltz, Chase, Moritz & Sullivan, 1999; Myers et al., 2006).

Judgments About Moral Behaviour. The Judgments About Moral Behaviour in Youth Sport Questionnaire (JAMBYSQ; Stephens, 2004) was developed to measure players' self-described judgements about lying to an official, cheating by breaking a rule, or hurting an opponent in a game situation. The JAMBYSQ consists of three sections: (a) demographics, (b) individual participants responses to aggression scenario, and (c) perceived team norms regarding aggression. The JAMBYSQ aggression scenario depicts a hypothetical protagonist faced with a decision where his action could injure an opponent:

Bill has been caught out of position on defense and now John is dribbling quickly toward an open goal. Although Bill cannot get his foot on the ball, he could trip John thus preventing the shot. He knows that tripping is dangerous, and John will probably get hurt. Bill has to decide whether to trip John.

After reading the scenario, players were asked to imagine themselves in the situation and, being as honest as possible, answer a series of questions designed to assess their moral thinking and behaviour. The first item assessed the team norm for aggression, an aspect of the team's 'moral atmosphere.' Specifically, athletes were asked to report how many players on their team would trip 'John' if they were in this situation. Responses were made on a 5-point Likert scale ranging from 1 (none of the players) to 5 (everyone on the team). The next section assessed a player's stage of moral development by determining their primary motive for aggression. Players were presented with six statements, each adding a new level of complexity to the basic scenario, and were instructed to select the statement that was the most "tempting."

Three of these statements represented a preconventional stage of moral development (e.g., if the other team had gotten away with the same thing earlier in the game, then it seems only fair), and three statements represented a conventional stage of moral development (e.g., if you felt that your team trusted you to do all that you could to help the team). Based on their responses, players were categorised as adopting a preconventional (0) or conventional (1) moral reason for aggressive behaviour. The last question was designed to assess players' self-described likelihood to aggress. Specifically, athletes were asked to report how likely they would be to trip the opponent in the situation that they found most tempting. Responses were made on a 5-point Likert scale ranging from 1 (not at all likely) to 5 (very likely).

Coaching Efficacy. The Coaching Efficacy Scale (CES; Stephens, 2004) is a 24-item self-report measure used to assess coaches' confidence in their ability to influence the learning and performance of their athletes. Items are scored on a 10-point Likert Scale ranging from 0 (not at all confident) to 9 (extremely confident). The CES comprises four subscales, including character-building (e.g., instil a good moral character), game strategy (e.g., understand competitive strategies), motivation (e.g., motivate your athletes), and technique (e.g., teach the skills of the sport).

Data Analysis

Data was processed using simple descriptive analysis, and SPSS 19.0 was used to analyse the results. Descriptive analysis of variables was followed by reliability analysis, correlation analysis and linear regression analysis.

RESULTS

Player Demographic Questionnaire Results

Of the 134 participants, the youngest was 15 years old and the oldest was 65; the mean age was 30 ($M = 30.5$, $SD = 11.85$). The most common ethnic affiliation was New Zealand European ($n = 105$), followed by Other ($n = 20$), Maori ($n = 7$) and Pacific Island ($n = 2$). Of the three divisions represented, the C division was the most common ($n = 57$), followed by the A division ($n = 57$) and the B division ($n = 26$).

For the players, years on their respective teams ranged from 0.5 years to 20 years; the mean team representation was three years ($M = 3.2$, $SD = 3.81$). Years under the same coach ranged from 0.5 years to 11 years, and the mean figure was 1.7 years ($M = 1.7$, $SD = 1.86$). Total years' experience as players ranged from 0 years to 55 years, with the mean being 16 ($M = 16.3$, $SD = 11.74$). Primary playing positions were broken down into goalkeeper ($n = 10$), defender ($n = 41$), midfield ($n = 48$), forward ($n = 30$) and utility ($n = 5$).

Coach Demographic Questionnaire Results

Of the seven coaches, the most common ethnic affiliation was New Zealand European ($n = 5$), followed by Maori ($n = 1$) and Other ($n = 1$). The youngest age represented was 33 and the oldest was 57; the mean age was 48 ($M = 48.5$, $SD = 11.85$). The number of years played ranged from three years to 50 years. The highest level played by all of the coaches was club level ($n = 7$).

The total number of years in a coaching career ranged from four to 15 years, and the competition level of the current team represented included C division ($n = 4$), B division ($n = 2$) and A division ($n = 1$). Years in their present coaching position ranged from one to ten years. The estimated percentage of wins for the previous season ranged from 0% to 90%. Their rating of the overall ability (0 = very poor, 10 = excellent) of the athletes in their team ranged from 5/10 to 7/10.

Player Team Norm for Aggression Results

When asked how many of the players in their team would trip 'John', the mean answer was "a few players" ($n = 76$). The players were asked to answer a series of statements designed to assess which situation would have been most appealing; the two most common responses for each statement are presented in Table 1.

Aggression statement	Two most common participant responses (n)				
	1 Not at all tempted	2 Not very tempted	3 A little bit tempted	4 Somewhat tempted	5 Very tempted
a) If the other team had gotten away with the same thing earlier in the game, so it seems only fair.	40		36		
b) If you had seen your coach praise one of your teammates for similar behaviour in a previous game, and you want him or his to praise you.	73		24		
c) If your team needed to have their spirits lifted.	62	28			
d) If there were a tie score and this action would be necessary to keep the other team from winning the game.	44		27		
e) If you felt that your team trusted you to do all that you could to help the team.	56	26			
f) the officials hadn't been calling a very tight game, so it would be easy to take advantage of the situation.	54			23	

Table 1. Self-reported player responses for aggression statements (two most common responses).

Player Self-likelihood to Aggress

When asked which statement (a, b, c, d, e, f) the participants found most tempting, the two most common responses were statement d (n = 44) and statement a (n = 40). When asked to imagine themselves in the situation, and whether or not they would trip the opponent, the two most common responses were "not very tempted" (n = 42) and "a little bit tempted" (n = 37).

Coach Team Norm for Aggression Results

The coaches were also asked to list how many of the players on their team would trip 'John.' The mean answer was "a few players" (n = 5). When asked to respond to a similar series of statements, the two most common responses for each statement are recorded in Table 2.

Aggression statement	Two most common participant responses (n)				
	1 Not at all tempted	2 Not very tempted	3 A little bit tempted	4 Somewhat tempted	5 Very tempted
a) If the other team had gotten away with the same thing earlier in the game, so it seems only fair.			3	2	
b) If you had seen your coach praise one of your team-mates for similar behaviour in a previous game, and you want him or his to praise you.	2	3			
c) If your team needed to have their spirits lifted.	3	3			
d) If there were a tie score and this action would be necessary to keep the other team from winning the game.	2		3		
e) If you felt that your team trusted you to do all that you could to help the team.	3	2			
f) the officials hadn't been calling a very tight game, so it would be easy to take advantage of the situation.		4	2		

Table 2. Self-reported coach responses for aggression statements (two most common responses).

Coach Self-likelihood to Aggress

When asked which situation (a, b, c, d, e, f) the coaches found most tempting, the two most common responses were statement f (n = 4) and statement a (n = 3). When asked to imagine themselves in the situation, the two most common responses were "not very tempted" (n = 4) and "not at all tempted" (n = 2).

Team Norm Questionnaire (SF) Results

The six questions found in Table 3 assessed the team norm for aggression from the players' and coaches' perspective. The two most common responses to each statement are recorded in Table 3.

Aggression statements	Most frequent responses (n)	
	Player	Coach
1. In a close and important game, how many of your teammates would break a rule if it would help your team win?	'A Few' (60) 'Most' (21)	'A Few' (5)
2. In a close and important game, how many of your team-mates would try to injure an opponent if it would help your team win?	'None' (90) 'A Few' (33)	'None' (5) 'A Few' (2)
3. In your opinion, would your coach want you to break a rule if it would help your team win a close and important game?	'No' (60) 'Probably Not' (43)	'No' (5)
4. In your opinion, would your coach want you to injure an opponent if it would help your team win a close and important game?	No' (98) 'Probably Not' (27)	'No' (7)
5. If forced to choose, how many of your teammates would rather cheat than lose?	'None' (66) 'A Few' (48)	'None' (4) 'A Few' (2)
6. If forced to choose, how many of your teammates would rather hurt another player than lose?	'None' (95) 'A Few' (33)	'None' (5) 'A Few' (1)

Table 3. Player and coach self-reported responses of the team norm for aggression

DISCUSSION

The purpose of the present study is to examine amateur football players' and coaches' self-likelihood to aggress and to identify the influence of coaching efficacy beliefs on aggressive behaviour onfield. This included coaches' game strategy efficacy and the team norm for aggression from both a player and coach perspective. The novel finding of this study was that coaches' perception of the team norm for aggression was positively aligned with the players' team norm for aggression. In most cases, this showed a largely negative attitude to actions involving unsporting behaviour – for example, deliberately hurting an opponent, intentionally breaking a rule or cheating rather than losing.

Guivernau and Duda (2002) found that the coach is the most influential 'significant other' in determining players' views about aggression, and that athletes' moral decisions are strongly based on their perceptions of the coach's norms for cheating and aggression. The present study supports this finding, while also suggesting that coaches' personal efficacy beliefs are strongly tied to their athletes' judgements regarding moral behaviour:

A drawback of this finding was the low sample of coaches ($n = 7$) who participated in the study. Additional coach participants may have strengthened the novel finding relating to coaches' personal efficacy beliefs in relation to the perceived team norm for aggression. Furthermore, examining actual coaching behaviours may have provided a stronger link between coaches' norms for cheating and aggression. For example, coaches may unapologetically teach unfair tactics, positively reinforce athletes who use them, or choose to ignore instances where their team demonstrates aggressive behaviour:

A counter-argument weighing against the novel finding of this study is the use of the hypothetical scenario where athletes may show a higher tendency to foul or aggress in critical game situations. To support this argument, the Advanced Tribunal Report showed a total of 68 offences involving fouls and misconduct in the geographical location where our study was conducted (A division = 42 offences, B division = 9 offences, and C division = 17 offences). The range of offences included unsporting behaviour, secondary cautions, dissent, delaying the restart of the game, violent conduct, encroaching when play is restarted with a free kick, and acting in a manner that showed a lack of respect for the game.

These misconduct statistics cast doubt on the validity of the self-reported questionnaire results, and suggests that players may act with greater levels of aggression in an actual game situation. Some instances represented tactical aggression (for example, delaying the restart of the game, encroaching when play is restarted with a free kick), while others were examples of hostile aggression (for example, dissent, reckless tackles and violent conduct).

The scenario with the highest response rate was statement d ($n = 44$): "If there were a tie score and this action would be necessary to keep the other team from winning the game." This could be explained by the inherent attraction of instrumental aggression, a reasoned behaviour strategically used to gain advantage (Duda, Olson & Templin, 1991). In this case, cognitive processes are involved and the players learn to use instrumental aggression at the right time and the right place to turn the ratio between cost (e.g., risk of conceding a goal) and profit (e.g., preventing an almost certain goal) to their advantage. As a result, at the upper competition level, instrumental aggression tends to occur most frequently. Conversely, the second most common scenario, illustrated in statement a ($n = 38$) demonstrates eye-for-an-eye retaliation, a product of hostile aggression, where the primary goal is to inflict injury or psychological harm on another living being based on feelings of anger (Gosling, Rentfrow & Swann, 2003).

The "self-likelihood to aggress" responses stand in contrast to the responses of the team norm for aggression. This could be explained by a willingness to acknowledge one's own self-described response to a situation and avoiding identifying the team norm for aggression and thus placing the team, coach or team-mates at risk (e.g., promoting an overall aggressive perception of the team). Ohbuchi, Suzuki and Takaku (2003) acknowledge that extenuating circumstances may prompt athletes to attribute their reprehensible behaviour to external factors or judge it as justified. Stephens (2000) acknowledges that certain acts of hostile aggression are considered to be emotional responses, usually stemming from provocation, frustration and/or anger:

Limitations

One limitation is the design of the study. Previous studies (Park, 1992; Stephens & Shields, 1997) have focused on unisex youth sport, whereas this study focuses on senior mens' football. This creates a difficulty in comparing and contrasting results from previous studies. Another limitation of our study is the demographic characteristics of the participants. Most of the players ($n = 105$) and coaches ($n = 5$) in this study were New Zealand European, a

common bias which is also a limitation of previous studies focusing on athlete aggression (Park, 1992; Stephens & Bredemeier, 1997).

CONCLUSION

The findings of this study replicate and extend previous research examining athletic aggression in senior mens' football. The novel findings of this study were twofold. First, the team norm for aggression was positively reflected by both players and coaches. Second, self-likelihood to aggress was both positively associated with assertive behaviour and negatively associated with hostile aggression. The use of the fouls and misconduct statistics from the geographical location where the study was carried out provided a counter-argument challenging the legitimacy of the results of the self-reported surveys.

Thomas Wallis is a recent graduate of Otago Polytechnic, where he completed a Bachelor of Applied Science (Physical Activity, Health and Wellness). His research focuses on the reasoning behind displays of aggression in football. He drew inspiration for this work from his passion for football and his interest in making the game a safer environment for players, coaches, match officials and spectators alike.

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Richard Humphrey began his academic career at the University of Southampton (UK), where he taught sport studies and sport management and development. Following some postgraduate study at the University of Bristol, he emigrated to New Zealand in 2013 and took up a lecturing position at the Institute of Sport and Adventure at Otago Polytechnic. Richard teaches and supervises undergraduate research in the fields of exercise, health and research methods. His research interests include the therapeutic use of exercise and substance misuse, particularly in the case of people with coexisting mental health issues.

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THE EFFECT OF LIGHT ON THE HEALTH OF OLDER ADULTS WITH LOW VISION: A NARRATIVE REVIEW

Mary Butler

INTRODUCTION

In the history of medicine, there has always been interest in the interaction between light and health. However, recent developments in technology have led to a lighting revolution and it is now possible to have more light, more control, better aesthetics, and all at less cost than at any time in the recent past. Research exploring the association between light and health is increasing exponentially, and it is clear that good use of lighting can make a dramatic difference to people's lives and overall health. This paper aims to bring some of this literature into focus as a narrative literature review (Grant, 2009) about the effect of light on the health of older adults with low vision. It does not aim to be exhaustive, but rather to provide an overview of the visual and non-visual effects of light on health, particularly that of people with age-related vision loss (ARVL).

Light and the eye

Before starting to talk about the effect of lighting on health, it is necessary to first visit some basic facts about light and the eye in order to provide a context for the following material. For example, the fact that white light is made up of a spectrum including red, orange, yellow, green and blue light rays highlights the idea that light is made up of different wavelengths. There is an inverse relationship between the wavelength of light rays and the amount of energy they contain. Light rays that have relatively long wavelengths contain less energy, and those with short wavelengths have more energy. Rays on the red end of the visible light spectrum have longer wavelengths and, therefore, less energy. Rays on the blue end of the spectrum have shorter wavelengths and more energy (Melton, 2014).

It is possible to make some direct connections between these facts and the effect of light on visual health. For example, concerns about blue light have come to the fore recently (American Medical Association, 2016). As a rule of thumb, the cooler the white light is, the higher will be the proportion of blue light: compact fluorescents (CFLs) contain about 25% of blue light, whereas light-emitting diodes (LEDs) contain about 35% of blue light. Blue light is also part of the LED display on most screens, and this is an increasing source of exposure for many people. There is a narrow spectrum of blue light (between 415nm and 455nm) that has been found to be most harmful to the retina (Melton, 2014). In terms of direct damage to the front of the eye, long wavelengths such as ultraviolet (UV) light may be more significant in terms of cataract formation, whereas shorter wavelengths like blue light tend to cause more damage to the back of the eye (Melton, 2014). For people who have a propensity to macular degeneration (a retinal condition, described below), it is considered important to provide protection against blue light. This can be done using blue-blocking sunglasses (with yellow/amber lenses) (Melton, 2014).

Light makes its way through the eye and is converted into messages that the brain receives. At the first point of entry, the lens at the front of the eyeball focuses light onto the retina, which is a very thin, multi-layered tissue located at the back of the eyeball. Light then enters the optic (or nerve) fibre layer and the ganglion cell layer, under which most of the nourishing blood vessels of the retina are located. This is where the nerves begin picking up

the impulses from the retina and transmitting them to the brain. The light is received by photoreceptor cells called rods (responsible for peripheral and dim-light vision) and cones (providing central, bright-light, fine-detail, and color vision). The photoreceptors convert light into nerve impulses, which are then processed by the retina and sent through nerve fibres to the brain (Boyce, 2003).

Until recently, the rod and cone photoreceptor cells in the retina have been credited with total responsibility for light sensitivity. However, recent research has shown that there is a third type of photoreceptor called melanopsin, which is found in "intrinsically photosensitive retinal ganglion cells" (ipRGC). These sparsely situated cells are most sensitive to blue light and they seem to exist principally to help differentiate between day and night (thus modulating the 'sleep/wake' cycles, known as circadian rhythms) (Lucas, Peirson, Berson, Brown, Cooper, Czeisler & Brainard, 2014). It is this effect which gives rise to the non-visual properties of light.

The ageing eye

Optical changes affect the amount of light reaching the retina. Hardening of the crystalline lens capsule and atrophy of the ciliary muscles are primary causes of lost accommodation (the capacity to change focus). There are changes in the thickness and clarity of the lens, which also develops a yellowish tinge. The pupil also becomes smaller (Boyce, 2003). In fact, the visual system can be characterised as 'young' only until it reaches about 40 years of age (Lahti, Helén, Vuorinen & Väyrynen, 2008). In later years, various factors intrinsic to the ageing process decrease the amount of light that is available to the human visual system (Boyce, 2003). It is estimated that a typical 60-year-old only receives about one-third the retinal illuminance of a 20-year-old – i.e., they require 3-10 times as much light (Lahti, Helen, Vuorinen, Vayrynen, 2008).

In fact, ageing of eyes happens even earlier than this. For example, the lens of a 10-year-old transmits 75% of available UV light, but by the age of 25, UV transmission rate drops to 10%. This remarkable change means that 80% of all the damage created by UV light may well happen before age 18 (Karpecki, 2012). These changes happen to everyone as they age. However, there are also a number of common visual impairments (VI) to which older adults are particularly susceptible, and the conditions described here include cataract, macular degeneration, glaucoma and diabetic retinopathy.

Age-related macular degeneration (AMD) can be defined as ageing changes in the central area of the retina (the macula) occurring in people aged ≥ 55 years in the absence of any other obvious cause (Ferris, 2013). The current prevalence of AMD in countries like the US is 6.5% in people over 40 (Klein, Chou, Ahang, Meuer, 2011), and it is currently the leading cause of irreversible visual loss in high-income countries in people aged over 60 (Bunce, 2006). Interestingly, the rates of AMD have declined over the last two decades by about one third, possibly because of public health measures like diet, exercise and a reduction in smoking (Klein, 2011).

Age-related cataract is the most common form of cataracts (Royal College of Ophthalmologists, 2010). This condition involves loss of transparency of the crystalline lens, and a classic symptom is a slow, gradual, painless progressive reduction in the quality of vision (Pesudovs, Elliott, 2003). Prevalence in high-income countries for those over 65 is estimated at 30% (Reidy, Minassian, Vafidis, Joseph, Farrow & Wu, 1998). UV light also plays a key role in cataract genesis (Taylor, 1992), and people who live in high UV exposure areas, such as the equator, are more likely to have advanced cataract development.

Diabetic retinopathy is a chronic, progressive, potentially sight-threatening disease of the retinal microvasculature (Bowen, 2016). The prevalence of diabetic retinopathy is reported to be 25.3% in type 1 diabetes and 45.7% in type 2 diabetes (Younis, Broadbent, Harding & Vora, 2002), out of the total population where diabetes has a prevalence of 9.1% (Valdez, Yoon & Khoury, 2007).

Glaucoma is actually a group of eye diseases that have in common progressive structural damage to the optic nerve head, resulting in functional loss of the visual field, which can lead to blindness if left untreated. Current prevalence is estimated at 2.1% (Gupta, Zhao, Guallar, Ko, Boland & Friedman, 2016)

Of all these conditions, the one that is most likely to be helped by additional lighting is macular degeneration (Lahti, Helen, Vuorinen & Vayrynen, 2008). However, since most older people are likely to be affected by more than one type of visual impairment, it is always important to understand the impact of light at an individual level. Lighting is one of the simplest and most effective ways to improve overall well-being in people with low vision. There are both visual and non-visual mechanisms underpinning how light delivers these benefits: visual mechanisms are delivered in ways that are consciously seen, and benefits include an increase in productivity and a decrease in the potential for falls for people with low vision; non-visual mechanisms are not directly perceived, but still have a major impact on circadian rhythms and effect both mood and sleep.

Visual effects of light

Lighting has a major contribution to make in increasing the capacity of older adults to live safely and well in their own homes (Paul and Yuanlong, 2012). The two areas highlighted here describe the impact of light on overall function and on safety (particularly in terms of reducing the risk of falls).

Function

Any physical impairment, including visual impairment, can lead to disability which may adversely affect quality of life, particularly in older people (Wang, Chan & Chi, 2014). Visual impairment causes significant disability, and comes after arthritis and heart disease as a chronic condition which can affect the ability of older people to perform essential tasks (La Plante & Carlson, 1992). However, there is not a direct relationship between impairment and disability. Visual impairment is not the whole story, and it is important to realise that the visual ability of any individual is defined more by the task demand (and personal characteristics of the individual) than by a specific measure of visual impairment (West, Rubin, Broman, Muñoz, Bandeen-Roche & Turano, 2002).

Every task carries its own lighting demands: threading a needle requires more light than making toast. Yet we know that the lighting levels in the houses of older adults with low vision consistently fall below recommended levels for any specific task (Bakker, Lofel & Lachs, 2004; Bhorade et al., 2013; Chu, Kaldenberg & Huefner, 2009). There is also evidence that many rest home and residences have inadequate lighting (Bakker, 2004). Lighting is one way of adapting a task, and therefore one of the first things to do for people with low vision (alongside checking whether the refractive error has been corrected with glasses) is to provide them with good task lighting.

There are many reasons why older adults with low vision live in homes with inadequate lighting (De Lepeleire et al., 2007); these may be institutional in the case of rest homes, or they may be physical, personal (by choice), cognitive, emotional, or financial in origin. For example, the inability to physically change a light bulb is a very different type of demotivator than the desire to conserve electrical power for economic reasons. However, if people stop doing valued activities because they do not have adequate lighting, it can lead to depression and mood disorders, which are frequently associated with visual impairment (Pelletier, Thomas & Shaw, 2009). Conversely, for those who do have good lighting, there is a positive association with quality of life, and research indicates that older adults who live in well-lit buildings perceived their quality of life to be higher than their counterparts living in low-lit rooms and buildings (Shikder, Price & Mourshed, 2010; Sorensen & Bruunstorm, 1995).

There is some research indicating the direct effect of light on function. For example, according to Richter (1989),

increasing the light level from 500 to 1000 lux (lux is a measure of light intensity) raised the work productivity of older employees by 6%. Among people with macular degeneration, increased lighting can often result in the capacity to read without magnification (Sloan, Habel & Fejock, 1973) or to read much faster (Eldred, 1992). This is a major increase in overall ability, which is available even when the person has significant visual impairment.

Function will also be affected by the general distribution of the light, because the older eye generally struggles with adaptation from light to dark and vice versa. It is therefore important that the light from a task lamp is uniformly distributed so that shadows are not formed, and this helps with overall function for the person with ARVL (Boyce, 2003). It is similarly crucial that there should be a relatively equal distribution of ambient light, so that the individual does not move suddenly from light to dark. These rapid changes in light can be one of the causes of falls in adults with ARVL (Lahti et al., 2008).

Falls

In the UK, it is estimated that 30% of people aged > 65 and 50% of people aged > 80 fall at least once per year (NICE, 2013). Falls make up the largest percentage of accidents among older adults and are caused by complex interactions between human and environmental factors. Light is one part of the environment that is highly likely to impact on the mobility of adults with ARVL, since poor vision affects a person's ability to maneuver around obstacles in a low-lit environment (Paul & Yuanlong, 2012). Brown and Jacobs (2011) demonstrated that participants reporting inadequate natural light in their residences were 1.5 times as likely to report a fall when compared with those satisfied with the light levels in their homes. Many falls happen in the bathroom and bedroom, which are typically places with inadequate lighting (Carter, Campbell, Sanson-Fisher, Redman & Gillespie, 1997; Liu, Paul & Orchanian, 2003).

There is also an association between low light and changes in older people's gait, balance and reaction times which leads to falls, trips or slips (Buckley, Heasley, Twigg & Elliott, 2005). A simple test of postural sway (for example, standing on one leg) demonstrates that even adults with no problems with low vision will experience increased problems in conditions of low light (Brooke-Wavell, Perrett, Howarth & Haslam, 2002). This is intensified in adults who have low vision, and there is increased postural sway in adults with low vision in conditions of low light (Brooke-Wavell et al., 2002; Reed, Lowrey & Vallis, 2006). This finding implies that low light could lead to responses that increase the likelihood of falling.

Connell and Wolf (1997) identified other patterns of environmental and behavioural circumstances linked to falls and near-falls experienced by older adults. These included collisions in the dark, failing to avoid temporary hazards, preoccupation with temporary conditions, frictional variations between shoes and floor coverings, excessive environmental demands, habitual environmental use, and inappropriate environmental use. Many of these patterns are compounded by the failure to turn on the light, or to increase the light level in different areas of the home.

One thing that seems particularly important to note is the association between VI and other forms of impairment. For example, there is a high prevalence of visual impairment in all people living with dementia (Bowen et al., 2016). Both dementia and VI are risk factors for falls (Bowen, Edgar, Hancock, Haque, Shah, Buchanan & O'Leary, 2016), so it is always worth thinking about visual impairment whenever there is age-related impairment. One indirect, negative impact of sleep disturbances is the risk of falling, which is exacerbated by disrupted circadian rhythms (see below). Often these patients get out of bed, either to use the restroom or just wander around their room. Persons with dementia are about three times more likely to fall (Shaw, 1998) and their recovery is generally longer than that of healthy older adults (Allan, 2009). One creative way that light has been successfully used with people with ARVL and dementia is the use of lighting strips around doors and along corridors for the prevention of falls at night (Hanford & Figueiro, 2013).

Non-visual effects of light

The most obvious of the non-visual effects of light is on circadian rhythms, which feature in nearly every physiological, metabolic and behavioural system. This brings a wide array of biological processes under indirect retinal control. Non-visual effects of light refer to aspects of human physiology and behaviour that are influenced by retinal illumination, where the responses originate in the eye, but they are referred to as 'non-image-forming' or non-visual because they can be elicited even in some blind people. Since the discovery of melanopsin it has become obvious that any wavelength of light can, in principle, activate the non-visual response. However, generally non-visual responses are activated by the blue/green regions of the visible spectrum and, conversely, they tend not to be activated by the longer visible wavelength range (red end of the spectrum) (Lucas et al., 2014).

The term 'non-visual response' also encompasses a number of more acute effects of light. For example, light constricts the pupil, suppresses pineal melatonin production, increases heart rate and core body temperature, stimulates cortisol production and acts as a neurophysiological stimulant (increasing subjective and objective measures of alertness and psychomotor reaction time, and reducing lapses of attention) (Lucas et al., 2014). We also know that UV light can have non-visual effects, such as helping the body manufacture adequate amounts of vitamin D (Melton, 2014). Without vitamin D, calcium absorption and utilisation would not occur; which are needed to maintain healthy bones. Inadequate exposure to vitamin D results in weakened bones, which make the older adult with low vision vulnerable to breaks if they do happen to trip or slip.

The recent recognition of non-visual effects of light has led to the development of a number of new therapeutic applications and, in some cases, helped us to understand why some interventions have historically been effective. For example, light has been known for a long time to have anti-depressant properties, particularly in the treatment of seasonal affective disorder (SAD) (Lam, 1996). More recently, appropriately timed light exposure has been developed as therapy for circadian rhythm sleep disorders and circadian disruption associated with jetlag and shift work (CIE, 2015). In addition, light has been explored as a treatment for non-seasonal depression, menstrual-cycle-related problems, bulimia nervosa, and cognitive and fatigue problems associated with senile dementia, chemotherapy and traumatic brain injury (Lucas et al., 2014). In the following sections, the non-visual effects of light on mood and alertness/sleep for people with ARVL are particularly examined.

Mood

There is a strong association between visual impairment and negative feelings including frustration, anger and feeling low; the prevalence of depression in people with ARVL is approximately 30% (Margrain, 2012). These feelings may be part of the normal grieving process for the loss of vision. However, persons with ARVL are also susceptible to wintertime barriers to socialisation and physical activities, since wintertime darkness and icy outdoor areas pose significant hurdles to people with reduced vision.

Recent studies indicate that severe visual impairment or blindness can also increase the risk of Seasonal affective disorder (SAD) (Madsen, Dam & Hageman, 2016). Seasonal affective disorder occurs as a reaction to reduced sunlight and is an example of a non-visual response to lighting. Three quarters of those affected by SAD are women, and up to two thirds of these can experience depressive symptoms every winter (Magnusson & Boivin, 2003). The causes of SAD are complex and include both biological and psychological factors. Climatic factors such as global radiation, length of day, temperature and hours of sunshine seem to be important for the annual onset of the disease (Molin, 1996). The main biological factors include biological rhythms and/or neurotransmitter levels, genetic variations and retinal subsensitivity (Rohan, Roecklein & Haaga, 2009), in all of which light is involved. Light also plays a major role in the treatment of SAD, and the clinical effect of therapy with bright white light for SAD has been demonstrated to be equivalent to that of antidepressant pharmacotherapy (Golden, Gaynes, Ekstrom, Hamer, Jacobsen & Suppes, 2005; Nussbaumer, Kaminski-Hartenthaler, Forneris, Morgan, Sonis, G, Greenblatt, Wipplinger,

Lux, Winkler, Van Noord & Hofmann 2015).

Sleep

In addition to mood disorders, there are also indications that persons with visual impairment are at risk of sleep disturbances and circadian misalignment (Nyman, Gosney & Victor, 2010). Sleep disorders can include insomnia, early morning waking and inability to return to sleep. Prevalence rates of insomnia in people aged over 65 ranges from 12-40% (Paul & Dennis Jane, 2002). These prevalence rates are doubled with people who also have a visual impairment (Seixas, Ramos, Gordon-strachan, Aparecida, Fonseca, Zizi & Jean-louis, 2015). Once institutionalised, patients who suffer from the most sleep disturbances at night are likely to become aggressive during the day (Cohen-Mansfield, 1995). For these reasons, there is considerable interest in the use of light therapy in rest homes and other residential units for older people.

In recent years, it has been increasingly recognised that the removal of all blue (white) light in a person's environment for several hours before bedtime can significantly improve sleeping patterns (Wirz-Justice, 2005). A controlled study was carried out in a cardiology hospital (Philips, 2014) where the whole lighting system followed the pattern of natural daylight, and included a yellow/amber light in the evening. This study demonstrated that patients had longer sleep duration and fell asleep more rapidly (reduced sleep onset latency). As it can be seen from these effects, the circadian system is very sensitive to blue light. In 2016 the American Medical Association brought out a statement against the use of blue light for street lighting. Their argument against the effects of blue lighting at the non-visual level is that these white LED lights have five times greater impact on circadian sleep rhythms than conventional street lighting. Surveys found that this brighter residential nighttime lighting is associated with reduced sleep times, dissatisfaction with sleep quality, excessive sleepiness, impaired daytime function and obesity (American Medical Association, 2016).

DISCUSSION

The effects of light on physiology and behaviour have evolved over millennia, during which environmental illumination provided a reliable indicator of time of day. The advent of electrical lighting originally disrupted this relationship, with patterns of light exposure increasingly reflecting personal tastes and social pressures. However, the advent of new lighting technology means that the effect of light on health and wellbeing is increasingly recognised as an important public health topic. Research and technology in this area is evolving so quickly that it can be difficult to make an informed decision about the right kind of lighting for both visual and non-visual performance. In addition, what we know about eyes and visual impairment indicates that any advice will have to be individualised. Until the same level of understanding of the visual effects of light is achieved for the non-visual effects, this is likely to be an active and important area of research.

However, what we know already is that many people with ARVL can function more effectively and safely with access to increased lighting; and that there could be a concomitant potential improvement in their mood and sleeping patterns. These are gains worth pursuing. Many people with ARVL depend greatly on others to regulate their light exposures, and hopefully to provide timely daytime access to the outdoors. They also need good access to lighting for the visual benefits it confers in terms of performance and safety, and also for the non-visual effects on mood and sleep. It is important that these needs should not be overlooked or trivialised, and it is the intention of this narrative literature review to make the benefits of lighting more accessible to this population.

Mary Butler is an occupational therapist with a background in anthropology. A low-vision theme has informed her research, practice and teaching over recent years. Mary says: "Teaching and research have become the deepest expression of the kind of transformational change that I enjoy being part of. My research and practice is driven by a nexus of interests that has the students' experience at the core, but which draws on practice, research and enterprise as ways of informing their learning." Mary emigrated from Ireland a generation ago and says that she and her husband "have raised the next branch of our family as Kiwi kids."

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THE THINK-ALOUD PROTOCOL: CAPTURING ATHLETES' THOUGHTS AND FEELINGS DURING VIDEO FEEDBACK

Simon Middlemas

INTRODUCTION

For the latest generation of athletes, technology is commonplace. With rapid technological advances, falling costs, better quality analysis software and greater accessibility, it is easy to see why digital video appeals to coaches and practitioners working in sport (MacRae, Miller-Perrin & Tinberg, 2003). Digital video is frequently used, both pre-competition and post-competition, by coaches and athletes to enable them to reflect more accurately on aspects of performance and consider how they might be improved (Liebermann et al., 2002; Williams & Ford, 2008). It has been found that the effectiveness of these briefing and debriefing sessions is influenced heavily by coaches' ability to obtain, maintain and develop a level of trust and respect with athletes (Cushion & Jones, 2006; Potrác, Jones & Armour, 2002). When mutual respect and openness are present within the coach–athlete relationship, athletes report a more positive experience (Nelson et al., 2014).

Athletes' negative responses to video feedback (VFB) – such as anxiety, embarrassment and loss of self-confidence – can lead to players becoming reluctant to give and receive critical feedback during video sessions, resistance to feedback and a failure to learn. More generally, a lack of awareness of how athletes are responding to VFB may itself have negative consequences for player performance (Pensgaard & Duda, 2002). Sport psychology research has enumerated the positive benefits associated with delivering video as a psychological intervention (Ives, Straub & Shelley, 2002). These include an increase in confidence in pre-performance routines (e.g. Tracey, 2011); motivating players returning from injury (Feltz, Short & Sullivan, 2008); functioning as a reflective tool for athletes and coaches (e.g. MacKenzie & Cushion, 2014; Carson, 2008); and working in association with mental imagery (Holmes & Collins, 2001) and music (Bishop, Karageorghis & Loizou, 2007).

Middlemas & Harwood (2017) have identified a number of psychological factors associated with VFB delivery, including self-confidence, focus, motivation, emotional impact, reflection and self-regulation. In this study, coaches and players highlighted the role that critical reflection plays in influencing the effectiveness of VFB, by building players' confidence and ability to think positively. But as one coach noted, it was not an easy task to develop these qualities:

Talking about and helping educate [the players] about confidence is a good thing, but impacting upon this is a different matter. I don't feel I am able to make enough impact on their thoughts at times in the video sessions, especially with the less confident ones ... they get a bit lost in their own thoughts sometimes, and you can tell they will leave the sessions with negative thoughts and having lost confidence sometimes (Mark, international coach).

These studies underline the importance of coaches and practitioners being mindful of the way in which athletes are responding during VFB (Groom et al., 2011; Middlemas & Harwood, 2017; Taylor, Potrác, Nelson, Jones & Groom, 2015). Recent studies have significantly increased our understanding of the psychological variables associated with VFB. However, these studies are based primarily on retrospective, self-report methods. By contrast, some researchers have argued that concurrent methods provide a more comprehensive representation of current cognitive processes, thereby helping shape participants' practice as it is happening (Whyte, Cormier & Pickett-Hauber, 2010).

The think-aloud protocol

The 'think-aloud' protocol (TAP) was developed by Ericsson & Simon (1980) and provides researchers with a method of capturing thought processes *during* activity – in this case, viewing video footage. It is designed to generate direct information about the subject's ongoing thought processes during the period the athlete is engaged in a task (e.g., watching video feedback), and not the thoughts and feelings they were engaging in at the time of executing the skill performance (Jaspers, Steen, van den Bos & Geenen, 2004). A growing body of research has been amassed which has shown that when individuals are asked to simply "verbalise what is going on through their heads," without trying to explain or describe it, they are able to accurately capture their thought process without affecting performance (Jaspers, Steen, van den Bos & Geenen, 2004; Whitehead et al., 2016). However, researchers have highlighted the importance of following recommended methodological procedures (e.g., Ericsson & Simon, 1980) when employing the TAP within a research setting.

Few studies, however, have employed the think-aloud protocol in association with VFB research. In an exploratory study, Clark, Ste-Marie & Martini (2006) used the TAP to examine the thought processes that unfolded when children viewed a self-modelling video of their performance when learning to swim. The results showed that most of the children's verbalisations were self-evaluative in both a positive (Descriptive Positive) and negative (Descriptive Negative) direction, as well as related to future skill improvement (Prescriptive). Ram & McCullagh (2003) studied the effects of a video self-modeling (VSM) intervention on the performance of intermediate-level volleyball players, employing a think-aloud protocol to explore the participants' responses to the intervention. No consistent trends were found in the general content of verbalisations across participants, and the elements of the self-modelling tape to which the participants attended varied widely. However, the authors reported that all the participants verbalised surprise and shock when seeing themselves on video for the first time.

Given the paucity of research devoted to athletes' responses to VFB, and the limitations of retrospective approaches to capturing athletes' psychological responses, the present study aims to examine athletes' thought processes and emotions during video feedback using a think-aloud protocol.

METHODS

Participants

The ten participants in the study were recruited from one professional football academy in the English Championship League. They were all either first- or second-year full-time scholars (i.e., players who are also studying). A range of experience within the academy football system (years, $M = 6.4$, range 4-8) and playing positions were included. Five of the players had been part of a youth international squad (under 16-19 level), and two had made their senior professional debut at the time of the study.

Data Collection

A think-aloud protocol (Ericsson & Simon, 1984, 1993) was employed to capture the thought processes engaged in by the participants while they watched self-modelling videos. To ensure procedural replication, the TAP was employed once with all participants (using an unrelated skills video of an expert model of a tennis skill). Following the unrelated skills video (week one), the participants viewed two other videos – one containing raw video feedback of their football performance (in week 2), and the other a positive self-review video of their football performance (in week 3). These were developed for each player from data stored on their performance from the beginning of the competitive season (four games).

Video Self-Modelling (VSM) is a process whereby athletes learn from images of their own adaptive behaviour as seen on videotape. It allows individuals to view themselves being successful, acting appropriately, or performing new tasks. In a positive self-review (self-model) video, the athlete uses only positive images of the self as a model for improvement.

Video Feedback (VFB) essentially involves showing an athlete a video clip of his or her performance of a skill or behaviour. In this study, it involved the athlete watching raw, unedited footage of their on-field skills and behaviour, without adulteration or emphasis.

During replay, participants were instructed to "Verbalise what you notice on the videotape and how the videotape makes you feel." The instructions were purposefully vague so as not to bias the players' responses. The players were encouraged to continue verbalising throughout the duration of the video; prompts such as "Remember to keep talking" were given by the researcher if the players were quiet for ten seconds or more. In line with previous studies (Clark, et al., 2006), the TAP was employed on alternate clips so as to eliminate potential confounding by the verbalisations. In line with previous research (Clark, Ste-Marie & Martini, 2006), a verbalisation was defined as any statement that the player made that referred to a single idea (e.g., "I need to control the ball better with my right foot"). The players' verbalisations were captured using a digital dictaphone (an Olympus DS Digital Voice Recorder) and transcribed verbatim by the author:

Data Analysis

The results of the application of the TAP were transcribed verbatim, and a line-by-line analysis of the data was conducted to identify meaningful themes. Although, where possible, new themes were elicited from the data, the researchers were guided by findings reported in previous VFB research in this area (Clark et al., 2006; Ram & McCullagh, 2003).

RESULTS

The results for the think-aloud protocol are displayed in Table 1 and Figures 1 and 2 (below). The analysis revealed eight themes devised to categorise the thoughts and feelings that the participants experienced whilst watching the video interventions: (i) Description of self, others, or playing context; (ii) Evaluation of others; (iii) Positive evaluation of self; (iv) Negative evaluation of self; (v) Skill improvement; (vi) Positive psychological response; (vii) Negative psychological response; and (viii) Miscellaneous. Six of these themes focused on self-review, one on others (e.g., teammates and opponents), and one theme was marked as uncategorised. These are displayed in Table 1, along with an explanation of the theme and an example of each one. Overall, Table 1 shows that the greatest percentage of verbalisations fell into the Pos. Self-evaluation (17.7%), Self-observation (17.8%), Neg. Self-evaluation (13.8%), and Prescriptive (15%) themes, with these themes representing the majority (64.3%) of the verbalisations generated.

Focus of verbalisation	Description	Example	URV	VFB	PSR
1. Description	Descriptions of what they see themselves or others doing. Includes own movements, actions, state of the game (score, approx. time), conditions of the pitch, weather (no evaluative information)	"I'm running towards the touchline; the defender is tracking me"	36%	24.8%	18.7%
2. Evaluation (others)	Evaluation of what they see other doing; includes others' movement, tactics, mistakes	"The pitch is poor quality, so hard to control the ball"	32%	14.9%	4%
3. Positive evaluation (self)	A positive evaluation of their own football performance, focused on the executions of specific components being performed	"Good height on jump for the header"	0%	6%	13.5%
4. Negative evaluation (self)	A negative evaluation of their own football performance, focused on the executions of specific components being performed	"Poor first touch with left foot"	0%	15.6%	7.9%
5. Skill improvement	Statement regarding what they need to do to improve their football skill performance in future attempts (focused on the executions of specific components being performed)	"I need to drive my foot through the ball during that type of pass"	13%	17.4%	24.2%
6. Positive feelings	Statements indicating positive emotions experienced retrospectively	"Good focus on that header"	0%	2.5%	15.9%
7. Negative feelings	Statements indicating negative emotions experienced retrospectively	"That touch was embarrassing"	10%	10.9%	4%
8. Uncategorised	Unrelated statements: appearance, quality of video replay, unrelated questions	"The slow-motion replay helps me pick up small details"	10%	7.9%	11.9%

Table 1. Verbalisation Themes.
Key: URV= unrelated video. VFB= video feedback. PSR= positive self-review (self modelling)

The findings reveal that there were clear differences observed in the players' thought patterns in response to different types of video intervention (video feedback v self-modelling video). When verbalising their thoughts, the players spent more time *describing* their performance than anything else – e.g., "I'm running towards the touchline, the defender is tracking me" or "I am taking a corner on the far side of the pitch". There was a higher frequency of such descriptive thoughts when watching video feedback (10) as opposed to video self-modelling (4.7). When the players engaged in self-evaluation of their actions on video, it was generally more negative than positive in focus. This was particularly pronounced when the players were watching video feedback, which as noted above was unedited. The players' verbalisations were more positive in focus during positive self-review, but the frequency was low in both types of video feedback, suggesting that the players struggled to identify or verbalise positive thoughts regarding their performance. Skill improvement – statements of what players need to do to improve their football skill performance in future games – was a marked theme in both forms of video feedback. By identifying aspects of performance that can be changed to improve performance, this could be considered positive in focus.

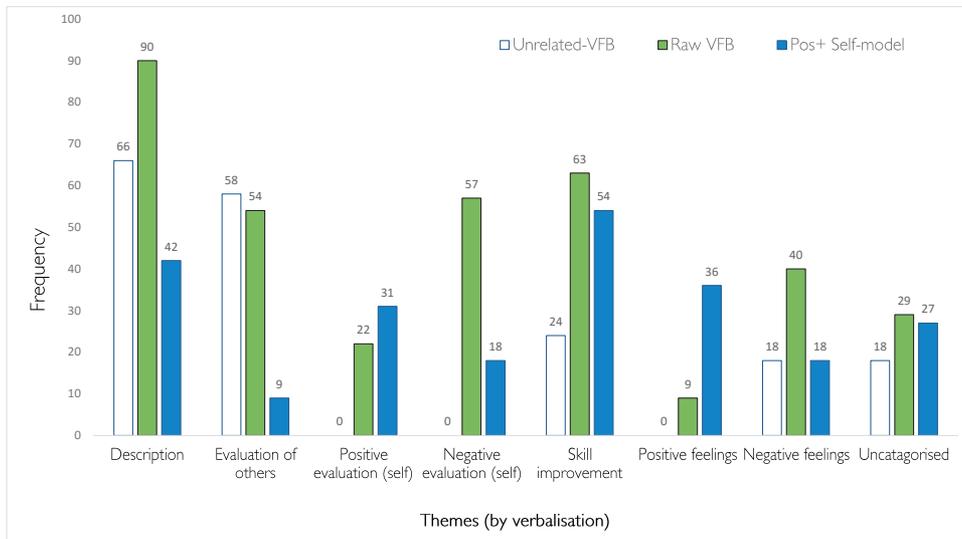


Figure 2. Total frequency of verbalisation for each of the video feedback themes

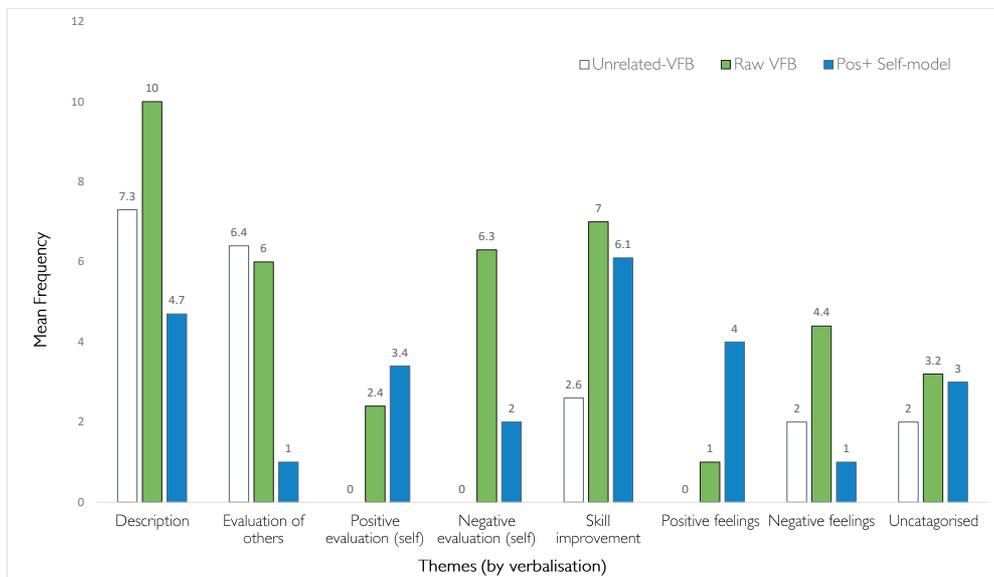


Figure 3. Mean frequency of verbalisation for each type of video feedback

DISCUSSION

A think-aloud protocol was employed in this study to tap into the thoughts and feelings of elite youth footballers during their viewing of their video intervention. The data analysis revealed a number of themes including description, skill-improvement, feelings, and self- and other-evaluation. Watching video replay of their performance encouraged the players to articulate what was happening on the field and to identify areas for skill improvement. In this, the video can be seen as a valuable tool for learning and performance evaluation (REF). Further analysis of the findings by video type revealed that there were differences in the way the players responded to video feedback as opposed to the self-modelling video. Although the players were more positive in their self-evaluation when performing during the self-modelling video than during the video feedback, they did not spend a great deal of time identifying positive aspects of their performance in either setting.

However, the players were highly critical of their performance during video feedback. This tendency for young elite players to be critical of their own performance has been reported elsewhere (Groom & Cushion, 2005; Groom et al., 2011; Middlemas & Harwood, 2014, 2017). In a study by Middlemas & Harwood, elite youth football coaches suggested that this negative self-evaluation (and in turn, their fear of being criticised by others) made players less receptive to video replay. For one coach, this was part of a wider issue with self-image and confidence in adolescent footballers, which video can help some players overcome:

You know the ones who struggle with esteem will also struggle with feedback, and will take things too personally, too emotionally, be too critical. The video can help them get past these issues ... it can be the difference between them coping in the pro's, and it's definitely a factor in how they respond within the academy (Youth international football coach).

Interestingly, during the self-modelling video the players spent less time evaluating their performance in a negative way than during video feedback. This is to be expected, as video feedback presents both positive and negative aspects of performance, rather than just the positive aspects of performance (in the self-modelling tape). However, this remains a valuable finding, given the challenges identified by coaches in developing the confidence levels of young athletes during video replay/ performance analysis (Groom & Cushion, 2005; Middlemas & Harwood, 2017). The findings suggest that the self-model may focus the athlete's attention on adaptive perceptions of behaviour. While this form of video did not encourage high levels of positive self-evaluation, neither did it encourage a high amount of negative evaluation. It could be argued that by over-focusing players' attention on error correction and detection, video feedback may have a more corrosive effect on their confidence levels. A more balanced approach – including time focused solely on adaptive behaviours – may help players to maintain or recover confidence prior to their next performance and longer-term.

In contrast to previous studies, the players did not experience the same 'shock' and 'surprise' as other participants when viewing themselves on video. This was probably due to the level of familiarity the players had reached in using video feedback to review their performance. In contrast to the participants in the Clark et al. (2006) study, they focused little on the shock and surprise of viewing themselves on videotape. The players recruited for the present study were experienced in receiving video feedback, and may have moved beyond the self-presentational issues (such as shock) that many people face when viewing themselves on video for the first time (Ram & McCullagh, 2003). The players also verbalised positive emotions more often when watching the self-modelling video than when watching video feedback. This focus on positive emotions during replay supports previous research in sport (e.g., Clark and Ste-Marie, 2007), which suggests that self-modelling videos increase levels of positive affect by enhancing learners' feelings of satisfaction with their performance. Researchers have long recognised that observational learning (of which self-modelling is a form) can have a positive effect on performance, through enhancement of psychological responses such as the motivation to change or perform a behaviour, better coping with fear and anxiety, and improvements in self-confidence and self-efficacy (Starek & McCullagh, 1999; Dowrick, 1999).

PRACTICAL RECOMMENDATIONS

The findings of this study suggest that coaches and practitioners should consider questions of context and purpose when choosing whether to use video with athletes. Video feedback – presenting both positive and negative aspects of performance – may be best suited to the post-performance debrief, where typically the player has time ahead of them to reflect on performance. In the debrief, emotions can be running high following performance success or failure, and the role of the video is to evaluate performance and identify areas where the athlete or team has achieved their goals or, conversely, to identify where they need to improve. By contrast, the self-modelling video is perhaps better suited to influencing pre-competition emotions and thoughts, helping the athletes achieve an ideal psychological state. Researchers have supported the use of video as a pre-competition preparation tool in elite football (Groom et al., 2011; Middlemas & Harwood, 2017). Given that pre-competitive emotions can persist and fluctuate over the course of a week (Hanton et al., 2004), the coach or practitioner needs to consider the right time to deliver this intervention – immediately prior to performance, or possibly earlier in the week to set the tone for training and preparation. A self-modelling video, set to music and accompanied by motivational messages, may provide a powerful means for achieving a performance-facilitating emotional state (Baumgartner, Lutz, Schmidt & Jäncke, 2006; Tracey, 2012). Thus, the best time to introduce this intervention may well be dependent on psychological factors, such as the individual's psychological needs following performance, his confidence levels and the optimum performance state of the team and individual; but also on practical factors, such as the time in-between games, the time available for video feedback/performance analysis work, and the support services available to the coach in preparing these interventions.

CONCLUSION

Given the exploratory nature of this study, caution is required when drawing generalisations from its findings. The results suggest that there may be differences in the way that athletes respond to different forms of video feedback. In line with previous studies in sport and education, the think-aloud protocol was seen as a valid tool for collecting representative and realistic cognitive thought processes as detailed by the participants (Fox et al., 2011; Whitehead et al., 2016). Future researchers may benefit from focusing on other participants in the video replay/performance analysis process, including a comparison between how coaches and athletes think and respond to video intervention. Future research directions include the comparison of coach and player verbalisations, and exploring how these verbalisations may differ within a post-match and pre-match context. A better understanding of how video influences thought processes can help practitioners to support coaches and athletes more effectively in their preparation for performance.

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MĀORI PHYSICAL EDUCATION AND HEALTH IN THE TERTIARY CONTEXT: APPROACHES FROM THE UNIVERSITY OF OTAGO, SCHOOL OF PHYSICAL EDUCATION, SPORT AND EXERCISE SCIENCES

Samantha Jackson, Hauiti Hakopa & Anne-Marie Jackson

TE KORONGA

Te Koronga is a programme of Māori research excellence within the University of Otago, School of Physical Education, Sport and Exercise Sciences (PESES). Spearheaded by Dr Anne-Marie Jackson and Dr Hauiti Hakopa, Te Koronga offers specialised Māori physical education and health papers at the undergraduate (100, 300, 400 level) and postgraduate levels (500 level), as well as teaching into other papers offered within the PESES for the Bachelor of Physical Education and across the University of Otago. Te Koronga was created in 2013 primarily as a graduate research programme and has now grown to incorporate a university and tribal research theme (Te Koronga: Indigenous Science), as well as student-led initiatives such as Te Koronga Korikori Tinana or Whānau Fit, Te Koronga tutorials for first-year students, and community initiatives and wānanga (intensive research meetings).

Te Koronga borrows its name from the opening stanza of an ancient karakia (incantation) used to induct students into whare wānanga (higher schools of learning). The logo represented in Figure 1 was designed by Keanu Townsend. Keanu describes the logo as follows:

This design embodies kaitiakitanga (ethic of guardianship), Matariki (constellation Pleiades), knowledge of the sky, astronomy and navigation. The mountaintops signify striving for success and reaching the summit, which also represent the three baskets of knowledge. The manaia (stylised figure) represents guardianship of the elements for next generations. The fish scales represent the ocean. The harakeke (flax) represents the land and the unity of different iwi (tribes). Pūhoro (symbol) represent the flow of life and connects all of the elements together (Keanu Townsend, personal communication, October 2016).



Te Koronga

Figure 1. Te Koronga logo design by Mr Keanu Townsend (Ngāti Whātua, Ngāti Kahu o Whangaroa, Ngāphui, Ngāti Wai, Te Roroa)

The Māori physical education and health curriculum at the University of Otago, School of physical education, sport, and exercise sciences

Māori physical education and health results from the application of the Māori worldview. Māori physical education and health is based on three components: the Māori worldview; te Tiriti o Waitangi (Treaty of Waitangi); and the theory and praxis of kaupapa Māori (Māori principles). A more comprehensive description of the undergraduate and postgraduate offerings within Te Koronga is offered elsewhere (Jackson et al., 2015).

A strong grounding in the Māori worldview is critical for any graduate working in a New Zealand, Māori and indigenous context. We will discuss some of the underlying philosophies of the Māori worldview that guide Māori curriculum development through tauira (examples). These are: relating the learning process to Māori philosophy; creation narratives and storytelling; and values. In this context, we will utilise the 300-level Māori physical education and health paper, which focuses on an introduction to Māori understandings of physical education and health. The course comprises four components: Māori worldview; Treaty of Waitangi; kaupapa Māori; and applications.

The Māori worldview

In the creation of a Māori curriculum within PESES, an obvious starting point was Māori philosophy and the Māori worldview. Samantha Jackson (one of the co-authors of this article) is a Māori philosopher. Anne-Marie Jackson was able to draw on Samantha's expertise in Māori philosophy in the context of curriculum development. Royal (1998) highlights the challenges involved in exploring mātauranga Māori (Māori knowledge) and the worldview that goes

with it:

Let me explain. Mātauranga Māori itself is not new: it has been created and maintained for centuries in this country. What is new is to see it in contrast to other disciplines of knowledge. Perhaps the best way to illustrate this is by telling you about a question I asked of Rev. Takiwairua Marsden of Te Tai Tokerau [Northland, New Zealand]. His father was raised in a deeply Māori context having been a graduate of the *whare wānanga* and later became an Anglican minister under a deeply Māori rationale. I asked Taki that if I was to ask his father what Mātauranga Māori was, would he know? Taki replied by saying that he was sure his father wouldn't have a clue what mātauranga Māori was. Taki went further; 'To ask my father what mātauranga Māori is, would be like asking a fish what water is. It remains invisible to them' (Royal, 1998, pp. 11-12).

Royal's (1998) reflections parallel the difficulties and tensions inherent in understanding the Māori worldview and Māori philosophy. For this reason, in this paper we will provide examples that we hope will be useful to others intending to create Māori curricula within their respective contexts. Marsden (2003b) describes worldview as "the central systematisation of conceptions of reality to which members of its culture assent and from which stems their value system. The worldview lies at the heart of the culture, touching, interacting with and strongly influencing every aspect of the culture" (Marsden, 2003b, p. 56).

Essential to a Māori worldview are Māori creation narratives. Māori creation and cosmogonic narratives encode central cultural beliefs and values and "form the central system on which their [Māori] holistic view of the universe is based" (Marsden, 2003b, p. 56). While there is diversity among *iwi* and *hapū* (sub-tribal) groups in relation to these creation narratives, there are key aspects which remain in common: the material world proceeds from the spiritual; the spiritual interpenetrates the physical world; and the *marae* (tribal meeting place) is the physical representation of the Māori worldview.

Māori oral narratives such as *mōteatea* (tribal chants), *karakia* (incantations), *tauparapara* (genealogical chants), *whakapapa* (genealogies) and *kōrero pūrākau* (stories) were used to instill Māori notions of the world into learners and to pass that knowledge forward to each successive generation. Embedded in these oral narratives were notions of place, which informed their concept of a cultural landscape – a landscape informed by narratives and the geography of those narratives.

Storytelling is a simple and timeless tool used widely around the world to engage and interact with all age groups within the community. Stories are used to describe the way we see and interact with the world; they are used to inform, to entertain, to inspire and to instruct. They are one of the best tools for the intergenerational transmission of cultural knowledge. Indigenous peoples, including Māori, "are traditionally oral based cultures wherein their knowledge base was maintained and passed on using oral narratives such as songs, genealogies, chants, theatre and storytelling" (Hakopa, 2011, p. ii).

The body of traditional narratives formed the corpus of extant archival and living (and growing) repositories that Māori drew upon to make sense of the world and to inform the ways in which they interacted with their environment. Stories are one of the primary ways that we as Māori describe our world, our worldview and our *tikanga* (customs).

One example of how we understand and teach our worldview is through the "three worldview" system described by Marsden (2003a), which includes the story of Rangiūi (Sky Father) and Papatūānuku (Earth Mother), our primeval parents and their progeny. The separation of these esoteric parents is the story of the organisation of the world we live in, known by Maori as the world of light. Their progeny (for example, the various deities who have authority over different realms, such as the ocean and the forests) were given responsibility over specific domains in the world of light; they were also responsible for the creation of humankind. Māori refer to the progeny of Rangiūi and Papatūānuku as gods. For example, Tāne is the god of the forest, Tāwhirimātea the god of the wind, and Tangaroa the god of the oceans and the fish therein.

In the beginning dwelt Io, alongside the seed bed of creation. There existed the starting points for all that we know and understand and for that which exists within the world that we currently roam. This is called Te Korekore (the world of potential being). Through the creation process, driven by mauri (essential life force, elemental energy), this world begins to change and enter into the second epoch of creation called Te Pō (the world of becoming). Within Te Pō exist the primeval parents, the deities Ranginui and Papatūānuku.

Like the ebb and flow of the tidal waters, with each tide there is an expansion of time and space, from great, to wide, to far-reaching, intense, and enveloping, for example. The children (each atua, gods of their domain) sprung forth were named as Tāne (god of forests, birds), Tangaroa (god of the sea and sea creatures), Rongo (god of vegetation), Tū-mata-uenga (god of man and war), Haumia-tiketike (god of uncultivated food), Ru-au-moko (god of earthquakes) and Tāwhiri-mā-tea (god of the elements). There are also many other gods. While all of the gods still lived within the firm embrace of their parents, there was discord amongst the siblings. This perhaps marks the emergence of the first wānanga (great discussion) (S. Jackson, 2013). Some of the siblings wanted to separate the parents, while others did not. In the tribal narratives of Te Taitokerau, Tāne was successful in separating their parents through thrusting his father away by placing his back on his mother and his legs on his father's shoulder and then casting his father heavenward.

During this process, however, one of the younger siblings, Tūmatauenga, stood up to his older siblings, Tangaroa, Tāne, Rongo and Haumia-tike-tike. In so doing, Tūmatauenga removed the tapu (restrictedness) from their offspring, meaning that man can now eat fish (children of Tangaroa), birds (children of Tāne), cultivated foods (children of Rongo) and uncultivated foods (children of Haumia-tike-tike). This highlights the important dynamic that operates between tuakana (elder sibling) and teina (younger sibling).

To return once again to the creation narrative, amid the 'chaos' it was Tāne who separated the parents and, following their separation, light burst into the world, Te Ao Mārama (the world of becoming). This is the world in which we now reside.

This is an abridged version, offering a Northern perspective on the traditional creation narrative, and told specifically for the purpose of drawing lessons in a tertiary curriculum context. In the following sections, we will highlight tauria (examples) drawn from these creation stories that can be applied to the tertiary curriculum in the following ways: relating the learning process to Māori philosophy; structuring teaching courses on Māori philosophy; storytelling; and values.

HETAUIRA: Relating the learning process to Māori philosophy

In our genealogical traditions, Te Korekore (the world of potential being) can be likened to a student's first explorations of a new topic, idea or subject. The seed bed of creation and the potential for learning already exist within the student prior to acquiring knowledge. Our role as educators is to nurture the growth of student learning. As the learner begins to grasp this knowledge and their experiences and learnings become deeper, the student enters into Te Pō (the world of becoming). The student may be growing their understanding, but still remain confused; at times there are moments of clarity, but at others their understanding still appears illogical and 'messy.' The student may have diverse and even conflicting views. This situation can be likened to when the children of Ranginui and Papatūānuku sought to separate their parents. The various gods presented their different approaches to the question of separating their parents, not always agreeing with one another. As the student begins to make sense of their learning and as their understanding moves from chaos into clarity, he or she enters into Te Ao Mārama (the world of being and understanding). The student may have an 'ahha' or 'Eureka' moment, where they understand and grasp the material in question. This is similar to the 'Eureka' moment at the separation of Ranginui and Papatūānuku, where at once light (mārama) and understanding (mārama) burst forth into the world.

HE TAUIRA: Structuring the course on Māori philosophy

Anne-Marie Jackson has structured her 300-level paper into three parts. The first part is Te Korekore, and the focus is on philosophically grounding learning within the context of the Māori worldview. This involves understanding values, the ancestral landscape and building on students' foundational knowledge of Durie's (1985) model of health – Te Whare Tapa Whā or hauora – which utilises the symbolism of a whareniui (tribal meeting house) to represent positive health. The four walls or the whareniui correspond to four key components of health: te taha whānau (relationships and family health); te taha wairua (spiritual health); te taha hinengaro (mental health); and te taha tinana (physical health). This model of health forms an underlying template in the Health and Physical Education secondary school curriculum, and students are familiar with the concepts involved.

The second part of Jackson's course is Te Pō, the world of becoming. This corresponds with the notion of 'chaos,' whereby the students will be challenged in their ways of thinking – they become overloaded with information and knowledge. Furthermore, they will have started to engage with each other in the classroom and in their groups as well, and will be beginning to form relationships with each other in this way as well as through wānanga. Jackson also encourages the students to "trust in the process," meaning that it is acceptable for them to not fully grasp the learnings. This corresponds to the content-laden second part of the course which focuses on Te Tiriti o Waitangi (Treaty of Waitangi), the impact of colonisation and kaupapa Māori theory and methodology.

The final section is Te Ao Mārama, the world of becoming. In this part of the course the focus is primarily on applications. Jackson encourages the students to start to think about how they can create solutions and initiatives related to their specific concerns in the area of Māori physical education and health. Students are encouraged to seek those 'ahha' moments, those moments of clarity or 'mārama' of understanding. Jackson also organises the noho marae (stay at a traditional Māori meeting house) during this section of the course. The core kaupapa (focus) of the noho marae is "the application of Māori physical education and health." As already noted, marae are the physical representation of the Māori worldview.

HE TAUIRA: Creation narratives and storytelling

Storytelling is a very effective tool for engaging both teachers and students, and draws both groups into the same learning space so that both groups can contribute and both groups learn from each other. Furthermore, storytelling allows teachers to connect with students (and vice versa) in a unique way and add their personal touches to the story in a way that maintains and builds the mana (integrity) of both student and teacher. One example is the story of Māui and his fish. The story of Māui and his fishing expedition with his brothers is well known throughout the length and breadth of Aotearoa (New Zealand) including Te Waipounamu (the South Island). If we re-imagine the elements of this story, we discover that this is a tale of endurance, of collegiality and collaboration, of innovation and inspiration to achieve a specific goal, of overcoming obstacles. It is also a story of vision.

To begin with, Maui's brothers did not want his presence on this fishing expedition – yet he came up with a scheme to be a part of the trip. All Maui had in his possession was the magical jawbone of his ancestor Murirangawhenua, from which he fashioned a fishing hook. When his brothers refused to give him any bait, he smashed his nose and used his own blood as bait. He recited incantations, then threw the jawbone-hook, smothered with his sacred blood, into the water. He let the line down out deep into the ocean and allowed the magic of the jawbone to do its work. Once it latched onto its prey, Māui tugged at the line and then began pulling his catch to the surface. But things weren't that simple. At first, his brothers sought to discourage him because the fish began to drag the waka (canoe) down and they feared for their lives; but Māui did not let go. Eventually he persuaded his brothers to help him secure the fish, so they helped him wear the fish out and finally brought it to the surface. It proved to be the largest fish ever known to mankind.

So what do we tell our children – or indeed our students – about the story of Māui and his fish? We tell them that it was no ordinary fish, that he recruited the ancient wisdom of Murirangawhenua to find that particular fish, and that it literally rose out of the water to meet him. But more than that, Maui fixed his mind on his vision and he never let go, despite the obstacles he faced, until he had secured his fish and taken his place in our storybooks.

HETAUIRA: Values

The pedagogies of this curriculum are kaupapa Māori. The pedagogical approach is underpinned by the Ngāpuhi creation whakapapa already described. The constructs and values that underpin our classroom practices are derived from Māori creation narratives. The values that are specifically utilised in this context are: ako (teaching and learning); wairuatanga (nurturing our spiritual aspects); rangatiratanga (self-determination, ability to unite people together for a common purpose); manaakitanga (uplifting of mana); whanaungatanga (family and positive relationships); and kaitiakitanga (spiritual guardianship).

We also draw on te Tiriti o Waitangi texts, in particular the concepts of kāwanatanga (governorship), rangatiratanga and tikanga (customs and protocols). These courses are wānanga-based, whereby students are encouraged to actively participate in the classes through discussion. There is also opportunity for noho marae (an overnight stay at a traditional Māori meeting house), which can be viewed as a uniquely Māori pedagogy. In fact, the noho marae is the aspect of the course that pulls it all together; something on which I will focus in more detail in another paper. We also utilise assessments that reflect a kaupapa Māori approach, in particular through the use of group work and the opportunity for oral assessments.

CONCLUSION

In our curriculum, we focus on the strengths that the student, their whānau (family, a core platform of Māori social structure) and their communities bring to an educational environment. As we have seen, many of our Māori stories describe our greatness as Māori, whether as educators, navigators, leaders, healers, negotiators or researchers, for example. We draw heavily on the Māori worldview through relating the learning process to Māori philosophy, structuring the course on Māori philosophy, exploring creation narratives and storytelling, and explicitly using values as pedagogies. One of the aims of the Māori curriculum at PESES is to produce graduates who can work competently with Māori communities. The benefits of this approach for our students are fourfold: being taught appropriate content; being provided with the context for Māori physical education and health; developing research and critical thinking skills; and applying their knowledge and skills to support Māori community needs.

Samantha Jackson is from Ngāti Whātua, Ngāpuhi, Ngāti Wai and Ngāti Kahu o Whangaroa. She is a Māori researcher who has examined Māori philosophy, Māori health and strengths based Māori community initiatives. She is currently a 4th year medical student at the University of Otago.

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University. After obtaining her Bachelor of Physical Education (Hons) and Master of Physical Education at Otago, she completed a doctorate in Māori studies and physical education which examined rangatiratanga and Māori health and wellbeing within a customary fisheries context. Anne-Marie is part of Te Koronga, a Māori research group that aims to strengthen Māori communities. One of Te Koronga's many strands is Te Koronga Korikori Tinana, better known as Whānau Fit.

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THE PHYSICAL METRICS OF WORLD SERIES SEVENS TOURNAMENT MATCHES

Matt Blair, Simon Body and Hayden Croft

INTRODUCTION

Rugby Sevens is a team sport that is characterised by contact and bouts of high-intensity intermittent exercise (HIIE) that is similar to the Fifteens version of the game. While both forms of rugby are played on the same field and essentially under the same rules, Sevens matches are shorter in length (14 minutes as opposed to 80 minutes) and involve fewer players (seven rather than 15). Fifteens also differs from Sevens in terms of the competition format used. Fifteens usually involves a once-weekly match, while Sevens most often uses a tournament format, with five to six games played over two to three days. HIIE involves unique physical requirements that engage a spectrum of aerobic and anaerobic conditioning abilities – for example, aerobic power and anaerobic power (speed–agility). This has been documented in the most recent review of Sevens rugby (Ross, Gill & Cronin, 2014). Unsurprisingly, the physical requirements when playing Sevens are significant, and there is a need for further research in this area (Ross et al.). By comparison, the investigation of Rugby Fifteens in this area is well documented (Ross et al.). Rugby Sevens is emerging as a new global sport, as seen by its inclusion for the first time in the 2016 Olympic Games held in Rio de Janeiro.

Rugby nations preparing for this world event focused their efforts on world-class support to enable optimal team performance. Increasingly, sport science support includes micro-sensor technology such as global positioning systems (GPS). GPS is now used extensively with team sports to provide descriptive detail of key physical metrics (PMs) engaged during competition and training (Ross, Gill & Cronin, 2015; Cahill, Lamb, Worsfold, Headey & Murray, 2013). PMs include physiological responses such as heart rate, and work rate demands such as locomotion speed. GPS PMs are classified as an external (objective) load measure; by comparison, the rate of perceived exertion (RPE) is considered an internal (subjective) load measure (Ritchie, Hopkins, Bucheit, Cordy & Bartlett, 2016). RPE has been well reported as a good indicator of internal training load (physical and psychological stress), for example, with youth soccer players (Rodriguez-Marroyo & Antonan, 2015). Despite this, there are some practical implications for utilising the measure effectively – for example, coach buy-in and human resource (Akenhead & Nassis, 2016). Considering these points, PMs and RPE can contribute to the development of effective training schedules that are specific to Sevens players and, if implemented correctly, can enhance match performance. Importantly, these measures can also highlight the difference between the physical requirements of Sevens and Fifteens matches, taking into account the differing competition formats.

The primary aim of this project was to describe the current PMs of athletes competing in World Series Sevens Tournament matches, as well as to explain the different physical requirements between Rugby Sevens and Fifteens. This information can then be used to enhance an evidence-based approach for the creation of Sevens-specific training schedules.

METHOD

Participants

The project was approved under the auspices of the Otago Polytechnic Research Ethics Committee. Eleven Fifteens players who participated in the 2012 Super Rugby competition and 100 Tier 2 Sevens players who participated in four 2013 World Series Sevens tournaments were included in the sample investigated. The Fifteens player sample included a range of playing positions from front row, second row, loose forward and inside–outside backs. 2012 was the first season that the Super Rugby team involved in this project used GPS; this impacted on the player buy-in and therefore on the sample number of matches recorded. By comparison, the Tier 2 Sevens teams were very enthusiastic about the opportunity to use GPS; as a result, player buy-in was enhanced and more matches were recorded from all playing positions.

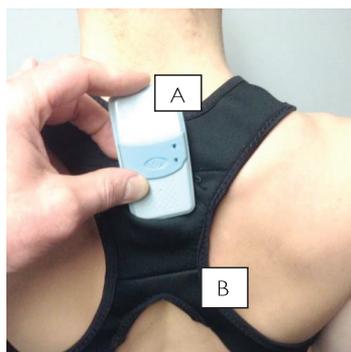


Figure 1: Global Positioning System equipment used to collect physiological responses and work rate demands during a Super Rugby competition and World Series Sevens tournament games, including: (a) GPS unit, (b) black vest, together with a pouch where the transmitter sits. Note. HR strap is built into the vest.

Procedures

All 100 Tier 2 Sevens players had their body composition measured (Kaminsky, 2010; Kaminsky, 2006; Whaley, 2006) at a suitable time during one of the tournament weeks, while all 11 Fifteens players were assessed at regular intervals throughout the competition. Match PMs (see Table 1) were assessed for all players by fitting players with a heart-rate (HR) strap (Polar Electro™, Kempele, Finland) and a GPS tracking device (SPI Pro 10, GPSports™, Canberra, Australia) 30 minutes prior to kick-off. The GPS device was positioned in the centre of the upper back area (see Figure 1) for the duration of the match. These units recorded movement at a sampling frequency of 10 Hz; the reliability and validity of this procedure has been reported elsewhere (Aughey, 2011). One hundred full-game Sevens GPS files and 47 Fifteens files were collected from 40 and 11 players respectively.

Measure	Definition
Total Distance (m)	Total distance travelled in metres
HIA Sp Distance (m)	HIA distance in metres travelled above 51% of maximal game speed (High speed running)
HIA Sp time (secs)	HIA time in minutes spent above 51% of maximal game speed
% Max Sp	Percentage of maximum speed reached
Freq Accel Hi Speed	Accelerations $\geq 2.5 - 3.6 \text{ ms}^2$ (High speed accelerations)
Freq Accel Lo Speed	Frequency of accelerations $1.5 - < 2.5 \text{ ms}^2$ (Low speed accelerations)
Freq Decel Hi Speed	Decelerations $\geq 2.5 - 3.6 \text{ ms}^2$ (High speed decelerations)
Freq Decel Lo Speed	Frequency of decelerations $1.5 - < 2.5 \text{ ms}^2$ (Low speed decelerations)
Surge (Sprint) max (m)	Largest distance covered in meters in a surge (sprint)
Surge (Sprint) min (m)	Smallest distance covered in meters in a surge (sprint)
Surge (Sprint) #	Frequency of surges (sprints)
Met Power	Metabolic Power: Force (W/kg) on the body from High speed accelerations, decelerations and HIA running; excluding collisions, kicking, jumps, up and down
%HIA HR time	Percentage of HIA time spent above 80% of maximal heart rate (%High intensity heart rate)
HIA HR time (secs)	HIA time in secs spent above 80% of maximal heart rate (High intensity heart rate time).

Table 1. Match Physical metrics (PMs)

Key: HIA, high intensity activity; Accel, Acceleration; Decel, Deceleration; Sp, Speed; %, Percentage; min, minimum; max, maximum; HR, Heart Rate

ANALYSIS

External Loading

External loading PMs were divided into two categories: physiological response and work-rate demands. Further, an RPE score was used to measure player internal loading. This allowed for comparison both between the PMs collected and between Sevens and Fifteens players using relative and cumulative loading.

Physiological response. Use of the percentage of time spent above 80% of maximal heart rate (% HIA HR time, hereafter referred to as % high-intensity heart rate) and time in seconds above 80% of maximal heart rate (HIA HR secs, hereafter referred to as high-intensity heart rate time) have both been described by a previous investigation into team sport athletes (Martin, Tolfrey, Smith & Jones, 2005).

Work-rate demands. Total distance covered in metres and high-speed running distance in metres travelled above 51% of maximal game speed (HIA Sp Distance (m), hereafter referred to as high-speed running) was used instead of defined locomotor categories, as these have been reported to limit individualised feedback on match movement behaviour (Weston, et al., 2012), illustrated in a previous investigation into team sports (Van Den Berg, 2013; Krstrup et al., 2009). The measurement of surges (sprints) and use of accelerometers to measure acceleration–

deceleration, which all contribute to metabolic power; has been highlighted in a recent review of GPS (Cummins, Orr, O'Connor & West, 2013).

Perceived Exertion

Players' physical intensity during games was recorded by using a ratings of perceived exertion (RPE) scale from 1-10+, with 0 being nothing and 10+ being supramaximal. Where possible, these ratings were obtained within five minutes of the game concluding and have been applied in another study with team sport athletes (Gabbett, 2010).

Relative and Cumulative Loads

Super 14 games in 2012 were typically longer than the Sevens games in 2013 by a factor of 5.5. For the purpose of this article, relative Sevens GPS game variables are determined by absolute values multiplied by a factor of 5.5 to allow a comparison to be made with a Fifteens game. Cumulative tournament load is determined when a player participates in a maximum of six games over a maximum of three days and remains on the field to within the two-minute period before full-time during each game. This method was devised to provide simple and effective comparisons between the PMs of the Sevens and Fifteens game. It is accepted that the comparison here is between a Super Rugby team from a Tier 1 rugby nation and Tier 2 Sevens teams, and that this will have some influence on the metrics recorded.

RESULTS

Body composition and dimension measures revealed understandable differences between Sevens and Fifteens players. Absolute Sevens PMs demonstrate the HIIE physical requirements, and there were clear differences between the two variations of rugby with regard to relative and cumulative match loading.

Body Composition and Dimension

The mean bodyweight values for 100 Sevens players was 92.3kg, which was less than the 105kg recorded for 11 Fifteens players (see Table 2). While measures for height were similar (1.8m), the Fifteens players' mean waist circumferences (Wc) of 90cm was greater than the 84.2cm for the Sevens players, as shown in Table 2.

Bodyweight (Kg)	92.3 (105)
Height (m)	1.8 (1.84)
BMI (Kg/m ²)	27.7 (31)
Sum 7 skinfolds (mm)	64.3
Waist circumference (cm)	84.2 (90)

Figure 3: Body composition and dimension values for 100 Sevens players participating in four 2013 World Series Sevens tournaments. Data in bold and brackets {} are mean values for eleven Fifteens players participating in the 2013 Super Rugby competition

Key: Kg, Kilograms; m, meter; BMI, body mass index

Absolute PMs and RPE

The absolute measures of both physiological response and work-rate demands for a Fifteens player are much higher than those of a Sevens player in a single game, as shown in Table 3. For work rate, the mean high-speed running distance during a Sevens game was 344m, which was less than the 459m measured for Fifteens. Relative distance reported here reveals that Sevens players commit to much larger running metres when expressed as metres per minute, compared to Fifteens players; 112 and 82 m/min respectively. Total distance travelled in metres (1574) was also less than the 6553m recorded for the Fifteens players. Sevens players undertook surges, with a range from 6m to 39m, with some players getting up to a distance of 111m. The mean number of high-speed accelerations during a Sevens game was 14, which was less than the mean number of high-speed decelerations (18). This was not observed for the Fifteens players. Metabolic power was the only exception, where a value of 10 was recorded for Sevens players, greater than the 6.4 W/kg recorded with the Fifteens players.

Physiological response. As measured by total high-intensity heart-rate time, was much higher for a Fifteens player (1hr 10mins 30secs) when compared with a single Sevens game (13mins 18secs). When this is expressed as a percentage of actual game time, then the stress for Sevens players was 73.4%, which was similar to the 75.0% recorded for Fifteens players. The rate of perceived exertion showed that the Sevens players usually rated the physical requirement at 7/10+ (very hard), which was not dissimilar to the Fifteens players at 8/10+ (very hard).

GPS variables	Total Distance (m)	HIA Sp Distance (m)	Freq Accel Hi Speed (ms ²)	Freq Decel Hi Speed (ms ²)	Surges (Sprints)			Metabolic Power (W/kg)	%HIA HR time	HIA HR time (hrs/mins/se cs)	RPE /10+
					Range (m) (min – max)	#					
Mean	1574.4	343.8									
	(112 m/min)	(22%)	14.3	18.6	5.7	38.8	7.5	10.1	73.4	13:18	7.0
	(6553)	(459)						(6.4)	(75)	(1:10:30)	(8.0)
	(82 m/min)	(7%)									
SD	267.4	115.2	5.2	6.1	3.3	19.5	4.6	2.6	21.2	4:06	1.5
Range	355.2	49.3	1	3.0	0.0	8	0.0	7.2	9.7	1:49	2.0
	2043.9	597.6	31.0	35.0	15.0	111.0	39.0	13.4	100	19:59	10.0

Table 3: Mean absolute Global Positioning System (GPS) Physical Metrics (PMs) for 40 Sevens players participating in 105 2013 World Series Sevens tournament games. Data in bold and brackets () are mean values for eleven Fifteens players participating in forty seven 2012 Super Rugby competition games

Key: HIA, High intensity activity; Accel, Acceleration; Decel, Deceleration; W/kg, Watts per kilogram; Sp, Speed; %, Percentage; ms², metres per second squared; min, minimum; max, maximum; HR, Heart Rate; RPE, rate of perceived exertion; ~22 and ~7% represents % of Total Distance travelled using HIA Sp for sevens and fifteens respectively; ~112 and ~82 m/min represents the relative distance travelled in meters per minute for sevens and fifteens players' respectively

Relative PMs

The relative amounts of both physiological response and work-rate demands for a player are much higher for a Sevens player when compared with a Fifteens player; especially when the Sevens game is projected out to an equivalent Fifteens game length played in a typical weekend (see Table 4). Most notably, there would be over four times the amount of high-speed running metres (1891 vs. 459).

Game type	HIA Sp Dist. (m)	Accel. Hi Sp (ms ²)	Decel. Hi Sp (ms ²)	Total Distance (m)	Metabolic Power (W/kg)	HIA HR (hrs/mins/secs)
Fifteens	459	NA	NA	6553	10.1	1:13:03
Sevens	1891	79	102	8659	6.4	1:13:09

Table 4: Comparison of relative estimated Global Positioning System (GPS) Physical Metrics (PMs) for 40 players participating in 105 2013 World Series Sevens tournament games and eleven Fifteens players participating in forty seven 2012 Super Rugby competition games

Key: HIA, High intensity activity; Accel, Acceleration; Decel, Deceleration; W/kg, Watts per kilogram; ms², metres per second squared; HR, Heart Rate

Game type	HIA Sp Dist. (m)	Accel. Hi Sp (ms ²)	Decel. Hi Sp (ms ²)	Total Dist.(m)	HIA HR (hrs/mins/secs)
Fifteens	459	NA	NA	6553	1:13:03
Sevens	2063	86	112	9446	1:19:48

Table 5: Comparison of cumulative estimated Global Positioning System (GPS) Physical Metrics (PMs) for 40 players participating in 105 2013 World Series Sevens tournament games and eleven Fifteens players participating in forty seven 2012 Super Rugby competition games

Key: HIA, High intensity activity; Accel, Acceleration; Decel, Deceleration; W/kg, Watts per kilogram; ms², metres per second squared; HR, Heart Rate

Cumulative PMs

The cumulative amounts of both physiological response and work-rate demands for a player are much higher for Sevens when compared with a Fifteens player; especially when participation in a three-day Sevens tournament is compared with a single Fifteens game played in a typical match weekend (see Table 5). Sevens players would travel over four times the amount of high-speed running metres (459 vs. 2063), and be subjected to an extra six minutes of high-intensity heart rate.

DISCUSSION

Body composition and dimension values clearly show that Sevens players typically have a lower body weight than their Fifteens counterparts. While it is accepted that there is a range of weight for both Sevens and Fifteens players due to their varied playing positions, the Fifteens game has more specialist positional requirements and, hence, a bigger range in body types (Ross, Gill & Cronin, 2014). It is likely that this reduced body weight is reflective of the nature of Sevens rugby. By comparison, Sevens players are required to run larger relative and cumulative total distances and, within this, achieve much higher levels of high-speed running. As a result, all Sevens players must be very mobile (Ross, Gill & Cronin, 2015).

The physical demands of a one-off Sevens game are, in absolute terms, lower than those a player may experience within a full game of Fifteens. This is not surprising, but there are some complexities to be aware of. For example, relative distance (m/minute) is greater for Sevens players, which is consistent with measures reported from domestic (sub-elite) Sevens (Suarez-Arrones, Nunez, Portillo & Mendez-Villanueva, 2012). Interestingly, % high-intensity heart rate and RPE tell a different story. Sevens players typically play with a heart in the high-intensity zone for 73% of match time, which is similar to the Fifteens players at 75%. We would expect Sevens players to have greater HR responses as they achieve much higher levels of relative high-speed running, but it is accepted that physiological response – as measured by heart rate – has its limitations. For example, HR response is delayed and doesn't synchronise well with changes in movement activities (Martin, Smith, Tolfrey & Jones, 2001). Further to this, Fifteens players, while working less in relative terms, engage in activities such as scrums and breakdown play (rucks and mauls), which involve large amounts of isometric contractions that increase HR response (Deutsch, Kearney & Rehrer, 2007).

In addition, the reported RPEs for Sevens and Fifteens players are similar (very hard), and this reveals limitations with the applied use of RPE. Sevens players, in this investigation, had no trial period to become familiar with the use of RPE, whereas the Fifteens players had ten weeks to get accustomed to it. This represents a previously acknowledged human resource limitation (Akenhead & Nassis, 2016). Formerly (Weston, Bird, Helsen, Nevill & Castagna, 2006), where a significant relationship has been reported between HR and RPE, the athletes investigated underwent a trial period. These types of HR and RPE findings could explain why strength and conditioning coaches have tended to focus more on GPS metrics such as high-speed running meters and accelerations–decelerations.

When PMs such as high-speed running are considered for Sevens and Fifteens players in relative terms, the differences are large. For example, a player in a game of Fifteens typically travels 459m of high-speed running; however, if a Sevens player kept going at the pace achieved in one game for the length of a Fifteens game, then over four times this distance would be travelled (1891m). Appreciating that it is very unlikely that a player could achieve this, it shows that the relative physical requirement of a Sevens game is higher than Fifteens. This is illustrated by the metabolic power measure, which was much greater for Sevens players (10.1 vs. 6.4 W/kg) and provides a clear indication that high-intensity work (high-speed accelerations and decelerations, surges (sprints) and high-speed running) was engaged more frequently in Sevens tournament matches. Again, this would be anticipated as there is far more space to run into in Sevens when compared with a Fifteens game, given the fewer players on the field; this leads to more emphasis on one-vs.-one combat and competition for possession (Ross, Gill & Cronin, 2014). These relative PMs clearly demonstrate that the physical preparation of rugby players for Sevens tournaments needs to be very different from Fifteens matches, which are usually played once a week only.

Further insight is gained into the level of physical requirement for Sevens when the cumulative physical values are considered. While these have been calculated to demonstrate what a player who participates in all six games through a three-day tournament would endure, it is accepted that this is a top-end requirement; but, when compared to the relative values, they have a more practical meaning. Put simply, a Sevens player would travel over four times the

amount of high-speed running metres (459 vs. 2063). This would reflect the smaller amount of stoppage time, larger distance covered and higher speed requirements. Combined with a greater demand for 360 degrees of movement (180 degrees is the norm for Fifteens), it is not surprising that Sevens has more running-related injuries (higher speed – higher forces – higher risk of contact injuries) (Ross, Gill & Cronin, 2014).

With this ever-present risk of injury, skill levels must be maintained under extreme levels of physical exhaustion and subsequent muscle fatigue. This emphasises the need for the development of Sevens-specific training schedules, which need to accommodate the unique physical requirements of a tournament format, as opposed to weekly matches. This raises further questions – for example:

1. How can GPS PMs provide some detail on Sevens technical tactical match requirements?

(Note. This study was not developed to investigate this important question, which is a worthy candidate for future research.)

2. While the use of GPS to measure a range of athlete variables has become widespread in recent years, the challenge remains: what can be done further with this data to enhance athlete performance?

SUMMARY

In summary, World Series Sevens Tournament matches involve significant physical work. These demands become more pronounced when cumulative loads over the matches in a three-day tournament are considered and become more practically meaningful. Compared to Fifteens, Sevens players are lighter and complete more work as represented by the metabolic power measure. These findings are reflective of the larger amount of high-speed running that is required in Sevens rugby, when compared with Fifteens.

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WHĀNAU FIT: PROMOTING TE REO MĀORI AND PHYSICAL ACTIVITY

Terina Raureti, Anne-Marie Jackson, Hauti Hakopa and Troy Ruhe

INTRODUCTION

Whānau Fit is an initiative whereby Te Reo Māori (Māori language) and Te Ao Māori (Māori world view) are incorporated into physical activity. Whānau Fit was established in 2016 by the School of Physical Education, Sport and Exercise Sciences (PESES) Te Koronga student Terina Raureti, with the help of fellow students Ngahuia Mita, Jordan Skipper, Tukohirangi Pini and Troy Ruhe. The journey began on the University of Otago campus during Te Wiki o Te Reo Māori (Māori language week) with the aim of creating a new, 'fun' space where Te Reo Māori is encouraged. We decided that would hold one session a week during the semester, with locations ranging from the PESES' Smithell's Gym to local maunga (mountains), marae (meeting house complexes) and field spaces around campus.

The initiative slowly became a popular space for people to gather, to make new friends, be active and enjoy being in a Māori environment. The common motivation for participation was the easy, fun and free environment provided to increase participants' physical activity levels throughout the year. Most of those who attended were university students and staff, giving the space further practical application by providing members with an active study break and a kai (snack) before returning to their mahi (work).

A core philosophy of Whānau Fit is "Whakatinana i te Hauora o Te Reo Māori: Physical Expression of the Health of Māori Language." Beginning each session with whakawhanaungatanga (the process of establishing relationships), Whānau Fit has become a space for us to gather as a whānau, encourage Te Reo Māori and embrace a new and innovative way of increasing physical activity levels.

The state of Te Reo Māori and the physical activity of New Zealand

The statistics for Te Reo Māori in New Zealand demonstrate a decline in the use of Te Reo. Fifty-five percent of Māori adults in New Zealand can speak some level of Te Reo Māori, with 67% of Te Reo speakers using the language outside of their own home (Statistics New Zealand, 2015). The reasons for the decline of Te Reo have not been reported, but one factor may well be the lack of spaces to practice, resulting in people spending a larger proportion of each day speaking Te Reo Pākehā (English).

Running parallel with this statistic, 53.1% of Māori living in New Zealand are physically active (Statistics New Zealand, 2015). This figure is greater than that for non-Māori in New Zealand. Importantly, these statistics provide a positive incentive for us as Māori to be physically active, as such activity helps to prevent, manage and lower the incidence of negative health conditions. In addition to being a tool to improve health, physical activity has been identified as a valuable tool with which to incorporate and encourage the use of Te Reo Māori outside the home.

As explained above, among other things Whānau Fit is a space where Māori physical education and health research is combined with physical activity. The primary objective of this initiative is to enhance our hauora (well-being) as a whānau (family). At Whānau Fit, we provide a fun exercise environment where Te Reo Māori is implemented to encourage participants to use or to learn the Māori language. Examples of incorporating Te Reo Māori include a whanaungatanga (a concept that describes relationships, working together and providing people with a sense of belonging) process where each member introduces themselves and says where they are from – “Ko wai, nō wai.” This ensures that people are acquainted with one another, while allowing an opportunity to acknowledge whakapapa (a concept that describes our history, family and connections back to our ancestors) and the journey that all attending have been on, leading to this point of change. Further, the whanaungatanga process demonstrates that individuals from all walks of life are now bonding to lead a new lifestyle, moving forward together with the same kaupapa (purpose).

To accommodate all levels of Te Reo Māori users, the minimum level of Te Reo incorporated refers to the movements included in the training circuit. In addition, each weekly session is guided by a “kīwaha o te rā” (Māori saying of encouragement), which is not exclusive to physical activity so that it can be utilised outside of the session as well. As Te Reo Māori is a central pillar of this initiative, increasing the amount of Te Reo used within a particular session is encouraged. Within the physical activity component of the session, members will split into groups using the same level of Te Reo Māori, creating the challenge of speaking as much Te Reo Māori as possible while encouraging each other to get through the exercise itself.

The richness of the language cannot exist without knowledge of the world view that underpins the language – so acknowledging Te Ao Māori is also included in the programme. Taonga takaaro (Māori games) are included in the warm-up process. These games draw on narratives of Māori ancestors and incorporate Māori knowledge and history. Whānau Fit is essentially a space where we as Māori can come together, embrace our identity and work collectively as a whānau to enhance and encourage members' health and well-being.

A Maori world view

As Māori, our world view is holistic and shaped by our history. We venture forward with our eyes on the past, placing emphasis on our ancestors and our whakapapa (Ka'Ai, 2004). Therefore, in order for us to develop and move forward as a culture, we must understand who we are and where we come from. We all descend from larger societal structures such as waka (canoe), iwi (tribe) and hapū (sub-tribe), providing our tribal identity (Broughton, 1993). Being Māori is a process of acknowledging a distinct cultural identity and being concerned with whānau, the whenua (land) and Te Reo Māori (Broughton, 1993).

“Ko te reo te mauri o te mana Māori: The language is a life force of the mana Māori” (New Zealand History Online, 2010). While the Crown has failed to protect Te Reo Māori, Māori culture is part of New Zealand history and identity, with Te Reo lying at the heart of our culture. Therefore, losing our language will mean that something unique will have been lost to the world (Waikarepuru, et al., 1993). An important step for promoters of Te Reo Māori is to work towards restoring the situation where Te Reo is the natural language of socialisation (Reedy, 2000).

Enhancing hauora Māori through Durie's Te Whare Tapa Whā model of health

Hauora Māori (Māori health and well-being) is seen as holistic. It is not simply a measure of numbers and physical ability; instead, it is shaped by many elements that together constitute what it means to be Māori. Te Whare Tapa Whā is a Māori health model that was developed from a hui (meeting) of Māori health workers in 1982 and later described by Dr Mason Durie (1994). The model depicts Māori health in terms of the four walls of a house. The

four walls each reflect an aspect of health that is desired to maintain stability and well-being within our community. These four aspects are taha wairua (spiritual), taha hinengaro (emotional), taha whānau (social) and taha tinana (physical) (Durie, 1994).

Within the environment of Whānau Fit, we acknowledge this health model and use it as a tool to implement and benefit hauora Māori in these areas. We acknowledge that our well-being is not only about being physically active, but it is also about improving our relationships with each other, our connections to our ancestors, to our environment and, most important of all, connecting to our identity on a physical and spiritual level.

Taha Wairua

Te taha wairua is a vital requirement of health and acknowledges the spiritual element of well-being. It acknowledges the need to humble oneself before the elements, reinforcing the importance of building relationships with our surrounding environments (Durie, 1985). At Whānau Fit we acknowledge te taha wairua by incorporating Te Reo Māori, whakapapa and our history as Māori. Through kēmu (games), commonly known as a "warm up," we are able to loosen muscles and take steps to prevent injuries during our session. However, we do this by including taonga takaaro, allowing us to translate our knowledge of our tūpuna (ancestors) into physical activity. This in turn inspires us to embrace our identity as Māori, and to experience the stories and journeys that our ancestors once embarked on, further connecting us back to a Māori world.

Our language is a vital part of our hauora as Māori. It is one of our strongest connections to our tūpuna and our identity. Our circuit exercises are signposted and referred to in Te Reo Māori, with some activities having a particular emphasis on Te Reo. As we acknowledge the physical journey, incorporating movements suitable for all, we also acknowledge the spiritual journey with Te Reo undertaken by each individual by creating a safe environment in which to freely practice Te Reo.

Whakapapa portrays relationships between groups of people, and places an emphasis on our connections to our environment. Relationships reach out beyond human interactions and include relationships between humans and the universe, underlining the reality that the whakapapa between the physical world and the spiritual world is what binds and strengthens the different elements of Māori culture (Ka'Ai, 2004). At Whānau Fit we acknowledge the relationship with both worlds by building relationships with atua (gods). For example, our relationship with Papatūānuku (Earth Mother) is acknowledged when our sessions are held at the local maunga, climbing them together and sharing stories about our surrounding environment. In addition to setting group tasks within each session, we encourage members to "get out there" in their own time, climb their maunga and embrace the journey that our ancestors once took as a means of keeping our stories and our culture alive.

Taha Hinengaro

Taha hinengaro highlights the importance of thoughts and feelings for well-being. As part of an holistic world view, health is seen as an inter-related phenomenon, emphasising that 'thinking' embraces a number of realms which include not only oneself, but also the whānau (Durie, 1985). Within the Whānau Fit environment, we are all on the same journey. We use the knowledge of our history, of our hauora and of our whānau to enhance our well-being. Knowledge is our greatest currency and forms a strong connection back to our tūpuna. Kaupapa Māori values such as whanaungatanga and manaakitanga (a concept that describes caring for and encouraging others) are our greatest influences. We incorporate these values by ensuring that everyone has introduced themselves and said where they are from before we begin each session. We also acknowledge that there is a distinct difference between exercise and physical activity, although people often use these terms interchangeably.

We make sure that everyone plays a positive role, not only for themselves but also for those around them, throughout the exercise session. Physical activity is never easy, so whether a person is a frequent exerciser or is new to physical activity, Whānau Fit offers a space for everyone to work together, incorporate manaakitanga and whanaungatanga and work together to finish the workout. In turn, this means that all participants are incorporating kaupapa Māori values as a means of supporting each other as a whānau. Using these concepts, we can learn, teach and grow our knowledge and understanding of a Māori world view together, through the vehicle of physical activity. This means that we will have knowledge to pass on to our tamariki (children), to our mokopuna (grandchildren) and to further generations of Māori.

Taha Whānau

Taha whānau emphasises the importance of relationships and support (Durie, 1985). Our whānau and our whakapapa are important for our well-being. Our whānau play a central role in our understanding of who we are, where we are from and our identity as Māori. Therefore, it is important that as tuakana (older/more experienced person), as parents and as a whānau, you can play your part in being a positive guide for our rangatahi (youth). The environment and the role models surrounding our rangatahi influence their identity – who they become and how they view well-being. Whānau Fit provides an opportunity to show leadership for whānau members and to work together to reach hauora goals.

The first kaupapa for every session is whanaungatanga. We make sure to acknowledge everyone who has joined our journey and gain an understanding of who we are and where we are from. If someone has moved away from their home town, this helps create a space to gather with others who share the same values, have similar journeys and share similar visions of the world. Having this time means that we can relate to each other and create a whānau atmosphere within the group. Essentially, we are combining to tautoko (support) and help each other get the most out of being physically active.

Taha Tinana

Taha tinana focuses on the physical element of being healthy – an element that is more familiar in Western perspectives on health. However, taha tinana is not only about being fit, but also about rituals and procedures, and the separation of tapū (restrictedness) and noa (unrestrictedness) (Durie, 1985). Physical activity is important for the health of our tinana (bodies). Our tinana are tapū and should be looked after properly. Increasing physical activity levels may decrease the incidence of obesity, heart-related diseases, diabetes, some cancers and many other health-related issues. Having an understanding of a Māori world view, it becomes evident that suffering from one of these conditions will not only affect you as an individual, but can create a pattern that your tamariki and your mokopuna will see, encouraging them to think that this is normal and creating consequences that will impact on everyone. At Whānau Fit, although we have a big focus on te taha tinana, all our activities are heavily influenced by the other three elements. However, te taha tinana is the driver for each session. Whānau Fit is about getting whānau active as a collective in an attempt to increase well-being under the auspices of a Māori world view.

Physical activity

The physical activity component of the sessions is the element that weaves together all aspects of Māori health. When we are located indoors, we will usually warm up the body by playing games. These games can range from sports such as basketball through to tāonga tākaro like poi toa (a Māori game). This is an important part of our

session as it warms up our muscles, encourages our love for sport and increases the whanaungatanga between the participants. The exercise movements that we perform can all be modified to suit the individual's own level, so it does not matter whether you are a master of the movements involved or just beginning – everyone works together to strive for collective goals. There are always people there to ensure that you are comfortable and understand the movements involved, as well as the support of your whānau group to make sure you are giving it your all and enjoying every minute of it.

Whānau Groups

The Whānau Fit roopū (groups) are broken into smaller whānau groups, which serve multiple purposes. Firstly, they provide support from others who can keep members accountable as well as mitigate the fear of physical activity. There is a great deal of evidence that group exercise classes increase participation rates and enjoyment (Bell, et al., 2001; Afele-Fa'amuli, Katirai & Dignan, 2009; Clark, et al., 2011; McNamara, Pavol & Gunter, 2013; Rowan, Riddell & Jamnik, 2013). Secondly, each of the roopū earn points for their effort and participation levels, which in turn creates incentives and competition between groups. For every member of your roopū that turns up to Whānau Fit, you get a point – so your whānau group is already waiting for you to help them. However, you can also gather your whānau and bring your own roopū to join the challenge. Not only will you get a point for turning up, but you can also accumulate points by extending your own hauora goals and the goals of your whānau as a collective. We use this competitive element to help initiate an individual's hauora pathway; it also creates a sense of excitement in the Whānau Fit atmosphere. However, everyone has their own challenges, so your whānau group will be there every day to encourage and help you on your journey to the greatest taonga (treasure) of all, hauora and Te Reo Māori.

CONCLUSION

Whānau Fit is a space where members combine their love of hauora Māori and physical activity to provide a safe and fun space to be active as a collective. While members all have different goals and different barriers to achievement, if we are able to focus on our whakapapa, our values and our identity as Māori we will be able to support and uplift each other as a culture and as whānau.

“Ko **Terina Raureti** tōku ingoa, no Otaki ahau. Ko Ngāti Raukawa, ko Ngāti Rangitīhi ōku iwi. My name is Terina Raureti and I am from Otaki. My genealogical links are to the tribes of Ngāti Raukawa and Ngāti Rangitīhi.” Terina is currently studying for his Masters of Physical Education, with a focus on Māori PE and health.

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aims to strengthen Māori communities. One of Te Koronga's many strands is Te Koronga Korikori Tinana, better known as Whānau Fit.

"Ko **Hauiti Hakopa** ahau. Nō Tūwharetoa ahau. My name is Hauiti Hakopa and I am currently a Ngā Pae o te Māramatanga postdoctoral Fellow, based within Te Koronga at the University of Otago, School of Physical Education, Sport and Exercise Sciences. I co-lead the research group Te Koronga, a Māori research group that aims to strengthen and inspire Māori communities through the quality of our work. One of Te Koronga's many strands is Te Koronga Korikori Tinana, better known as Whānau Fit."

"Ko **Troy Ruhe** ahau. Nō Ngāpuhi me Tūwharetoa ōku iwi. My name is Troy Ruhe. My genealogical links are to the tribes of Ngāpuhi and Tūwharetoa, as well as the island of Mauke in the Cook Islands. I am studying towards a Masters in Physical Education with a focus on clinical exercise physiology in Pacific populations."

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RESISTANCE TO PHYSICAL STRESS UNDER EXTREME CONDITIONS AND METHODOLOGICAL PRINCIPLES OF PARTICIPATION IN EXTREME RECREATION

Maria Malashenkova and Zina Romova

INTRODUCTION

Scientific and technological progress, as well as personal motives, dictate individuals' interest in performing under difficult conditions; some of the factors involved can cause adjustment disorders. The term "extreme conditions" is applied to such variables. The expression refers to extreme natural conditions (i.e., temperature, wind, altitude, speed, atmospheric pressure, hypoxia) as well as other situations affecting the human body to the brink of portability. The ability to resist physical stress under extreme conditions is an important factor in ensuring the safety of athletes. Extreme sports are individual rather than team-focused. Participants' core motives are the opportunity to test oneself and to meet personal challenges, usually through close engagement with the natural environment. Extreme sports have a strong counter-cultural element, with participants often snubbing authority and conventional sporting values (Chapman, Stickford, & Levine, 2010).

Winter events and extreme sports take place at low to moderate altitudes (1500-2400m); all Winter Olympic Games incorporate at least one venue at an altitude higher than 1000m. Both the acute and chronic impacts of altitude can have a substantial effect on performance outcomes.

The magnitude and scale of the body's response to altitude become particularly notable when elite athletes compete. The impact of altitude on major sporting events was infamously highlighted during the 1968 Summer Olympic Games in Mexico City (Chapman et al). At an altitude of 2240m, the partial pressure of oxygen in the air was almost 25% less than at sea level. At the time, the International Olympic Committee considered that this was unlikely to significantly affect athletic performance, and that a period of 3-4 days at the venue would provide adequate physiological acclimatisation (Chapman et al; Kasperowski, 2009). Despite complaints from athletes, trainers and scientists, the Games went ahead. Athletes who normally lived at low altitudes fared poorly in endurance events, and the winning time for the 5000m track event was the slowest in 16 years. The Australian long-distance runner Ron Clarke, who set 17 world records during his lifetime, collapsed unconscious at the end of the 10,000m race (Chapman et al; Martin, Levett, Grocott & Montgomery, 2009).

Ascent to altitude is associated with a fall in barometric pressure, and with it a decline in the partial pressure of atmospheric (and thus alveolar) oxygen. As a result, a variety of adaptive physiological processes are engaged to mitigate the fall in tissue-convective oxygen delivery which might otherwise occur (Martin et al)

The major challenge in undertaking any type of extreme sports at altitude is directly related to the hypoxic environment. Of the variety of acute compensatory responses to hypobaric hypoxia at altitude, hyperventilation is usually considered the most critical for adequate acclimatisation. Hypocapnia-induced cerebral arteriolar vasoconstriction, as well as the left-shifted oxygen dissociation curve, may reduce oxygen availability to the brain.

Since a constant supply of oxygen is essential to sustain life, organisms have evolved multiple defence mechanisms to ensure maintenance of the delicate balance between oxygen supply and demand. However, this homeostatic balance is perturbed in response to a severe impairment of oxygen supply, thereby activating maladaptive signalling cascades that result in cardiac damage (Essop, 2007).

Our understanding of the human response to exercise at altitude is largely derived from field-based research at altitudes above 3000m, in addition to laboratory studies which employ normobaric hypoxia (Moore, Niermeyer, & Zamudio, 1998).

According to a number of studies (Camm, et al., 1996; Malashenkova, 2009; Parin, Baevsky & Gazenko, 1965), the sustainability of an organism under extreme conditions is determined by the reserve capacity of its functional systems. However, in recent years (Kasperowski; Malashenkova & Nagornev, 2009; Mazzeo et al, 1991) the scientific evidence has indicated that there is a very high variability in individual human resilience to various environmental factors. The latest studies in this area have predominately focused on the morphological and functional conditions of separate systems. This gap in the research reinforces the need to study adaptation reactions in various groups of people and in different types of recreational activities. Currently, there are no scientifically proven systems that focus on the regulation of cardiovascular and respiratory adaptation to extreme conditions. Therefore, there is a need to develop a system that unifies the organisational and methodological principles of extreme recreation. By formulating and validating organisational and methodological principles of training for extreme recreation, this study supports a focus on increasing compensatory and adaptive opportunities and the functional reserves of the body while endorsing maximum safety and the need for a healthy lifestyle.

The purpose of the present study is to investigate the adaptability factors that influence the body's reserve opportunities to undertake a variety of extreme sports and recreation activities, and the major predictors of efficiency in extreme recreation, by implementing experimental procedures with a particular focus on high-altitude areas (< 2500m). The study has also developed some key organisational and methodological principles for undertaking extreme recreation.

METHODS

Participants

A total of 966 healthy people volunteered to participate in the project. The study was conducted in compliance with the Helsinki Declaration and approved by Institution ethics. The participants were instructed not to perform any additional training two hours prior to data collection.

Design

Over a period of five years, the same investigative procedures were applied to the participants at each of the seven different stages in the project. These involved recording concrete influences; noting the features of exchange processes and their neuroendocrine regulations; determining participants' psycho-physiological status; and determining the level of functioning of the cardiorespiratory system. A summary of the trials implemented within the participants is provided in Table 1.

Investigation types at each of the seven stages of the study	Number of participants at each stage (n)	Total number of investigations per stage
Investigation of physiological reactions and functional reserves of the body when conducting extreme recreational activities	483	2457
Dynamics of functional reserves under high-altitude conditions	77	462
Physiological reactions and functional reserves of the body when alpine skiing and snowboarding	70	560
Physiological reactions and functional reserves of the body when diving	34	170
Basic physiological effects of paragliding	117	936
Physiological reactions and functional reserves of the body during extreme triathlon	24	168
Physiological reactions and functional reserves of the body for identification of organisational and methodological principles for carrying out extreme kinds of recreation	161	161

Table 1: Number of participants and trials implemented with participants.

Most of these study fields followed the typical regimen of physiological measurements at sea level, at various time points at high altitude, and sometimes following descent to sea level (stages 1, 2, 3 and 6).

At one stage, depending on private tasks, the applied methods were subject to change due to the environmental variables (stage 4). The applied methods included computer spirometry; electrocardiography including Holter's monitoring (Holter, 1961); research into variability of cardiac rhythm (Baevsky et al., 1992); echocardiography; the functional condition of the cardiorespiratory system; microcirculatory, biochemical, haematological, immunologic and endocrinology research techniques; and psycho-physiological research techniques.

Variability of Cardiac Rhythm: Essential Methods of HRV Analysis

Dynamic series of cardio intervals can be obtained from analysis of any type of cartographical record (electrical, mechanical, ultrasound, etc.). However, the present study focused on the results of electrocardiogram signals. Analysis of the variability of cardiac rhythms included three stages: 1) measurement of the length of R-R intervals and presentation of the dynamic series of cardio intervals in a form of cardiointervalogramm; 2) analysis of the dynamic series of cardio intervals (the length of R-R intervals); and 3) evaluation of the results of VHR analysis. Measurement of the length of R-R intervals was executed with the use of software with an accuracy of up to 1mc. Due to differences in software recognition of R-picks from electrocardiography in different software systems, manual data recordings were implemented. The data was recorded and analysed using both statistical and geometric methods.

Bayevsky's (1992) statistical method was used to process the data on HRV at the time of investigation in order to obtain the average cardiointerval length. During its use, the cardio-intervalogram was inspected as a collection of successive time intervals, namely intervals R-R. Statistical characteristics of the dynamic row of cardio intervals includes the following: NN50 is the number of pairs of successive NN intervals, which were received over the whole of the recorded period and which have a difference of more than 50 milliseconds between them; PNN50 (%) is the percentage that NN50 make up from the total number of successive pairs of intervals which were received over the whole of the recorded period, and which have a difference of more than 50 milliseconds between them; CV is coefficient of variation.

The geometric methods (variable pulsometry) were used to analyse a variable curved line (the curved line of allocation of cardio intervals is its histogram). Its main characteristics are defined by Mo (Mode), Amo (Model's amplitude) and MxDMn (variable range).

The MODE is the most frequently encountered type of cardio interval in this dynamic row. Mo differs a little from mathematic expectation (M) in the case of normal allocation and high stationarity. Amo (Model's amplitude) is the number of cardio intervals appropriated to the quantity of MODE in percent to the capacity of selection. Variable range (MxDMn) reflects the grade of variability of cardio intervals' meanings in the researched dynamic row. It is calculated by the difference between maximal (Mx) and minimal (Mn) meanings of cardio intervals. When lining up histograms (or variable pulsograms), the chosen method of gathering data is of major importance. The stress index was calculated using the formula $SI = \frac{AMo}{2Mo} * MxDMn$ (Essop).

The recording was made on the software complex "Varicard" (Institute of implementation of new medical technologies, Ryazan); the computer systems "Vita-Rhythm," "VNS-Rhythm," "VNS-Vita," and "VNS-Spectrum" were used (firm "Neurosoft," Ivanovo).

Biochemical, Haematological, Immunological and Endocrinological Research Techniques

Standardised haematological techniques were applied on the project. Additionally, serum proteins, metabolites, lipids, enzymes and electrolytes, as well as lysozyme, and myeloperoxidase activities and other antioxidant system components, the concentration of glucose, creatinine, triglycerides, and total cholesterol in the blood plasma were also measured. The content of haemoglobin in the blood lysate was measured with the haemoglobin cyanide method, using Medix test kits (Finland). The content of cortisol, insulin, triiodothyronine, thyroxine, methanephalin, prolactin and testosterone in the blood serum was revealed using the method of radioimmune analysis of the gamma counter developed by the "Multigamma-1261" company LKB (Sweden). The level of beta-adrenergic receptors of erythrocyte cell membranes (β -ECM) was detected through the use of the original technique for assessing the activity of the sympatho-adrenal system.

Computer Spirometry

To investigate the impact of extreme conditions on the respiratory system, the basic forced volume vital capacity (FVC) test was used. The participant was asked to take the deepest breath they could, then exhale into the sensor as hard as possible, for as long as possible, preferably for six seconds. Spirometry provides several numeric values: the forced vital capacity (FVC) and forced expiratory volume measured over 1 second (FEV1); tidal volume (TV); peak expiratory flow (PEF); and airways obstruction, which was characterised by a decrease in the FEV1/FVC ratio and forced inspiratory flow of 25-75% or 25-50%.

Laser Doppler Measures of the Microcirculatory Blood Perfusion

Laser Doppler measures the total local microcirculatory blood perfusion including the perfusion in capillaries (nutritive flow), arterioles, venules and shunting vessels. The technique is based on the emission of a beam of laser light carried by a fibre-optic probe. It is a non-invasive ultrasonic technique that measures local blood flow velocity and direction in the proximal portions of large intracranial arteries. Two hours prior to the study, food and liquid intake were halted; additionally, participants were given 20 minutes to adapt to the conditions of the room where the tests were done. The initial record of the LDF was taken with the patient lying on their back, with arms stretched alongside their torso. The sensor was positioned close to the skin; however, at the same time, it was not possible to squeeze the surrounding tissues and reduce mobility. The local air temperature at the time of taking measurements was 20-24°C. The recording of the LDF was carried out at the 3, 5 and 10-minute mark, after which the average parameters were calculated.

Functional Condition of Cardiorespiratory System

The functional condition of the cardiovascular system was assessed using a VO2Max test, conducted on a computerised "Ergo-line 900" ergometer. Before the test, during the activity and in the recovery period (1, 2, 4, 6, 8, 10 min of the experiment), all of the patients' ECG data was taken using the thoracic leads (V1-V5) with heart-rate calculation.

Echocardiography

Ultrasound was performed on the RT-4000 (Russia) in the M-mode in line with the standard method, with the determination of the parameters of the heart structures (aorta, cavity, valve apparatus), central hemodynamic parameters (SV, Q, systolic BP, diastolic BP, HR), the contractile function of the myocardium (the rate of circular shortening of the myocardial fibres) and the ejection fraction (EF).

Statistical Analysis

Validity of testing was partly confirmed by discriminating between the same groups before and after the high-altitude appliance. CV% was categorised as poor ($\geq 10\%$), moderate (5–10%) or good ($\leq 5\%$), based on values used in previous research. The strength of the ICC scores was based on Pearson's correlation coefficients and regarded as trivial (0.0), small (0.1), moderate (0.3), large (0.5), very large (0.7), nearly perfect (0.9), and perfect (1.0) (Hopkins, 2008).

RESULTS AND DISCUSSION

The analysis of physiological reactions during diving activity establishes that immersion under water causes adaptive reorganisation of the human body. The functions of the cardiovascular system are directed to economise O₂ expenditure and, in addition, the creation of a metabolic advantage in the supply of nutrients and oxygen to the vital organs. Under these conditions, the influence of stress on the centralisation of cardio activity strengthens the correlation between the depth of a given dive and the significance of the immersion stress reaction. It is maximal at a depth of 20m.

The current activity between sympathetic and parasympathetic divisions is a result of the reaction of multi-contour and multi-circle blood system regulations changing its parameters for the achievement of an optimal adaptive response, an indication of the adaptive reaction of the whole organism. Further analysis of individual results demonstrates that the best stress tolerance was shown by individuals who were vagotonic and normotonic. Data from these individuals covered the maximum range of the compensatory or adaptive mechanisms of the cardiovascular regulation system.

Research to date suggests that the theory of adaptation is one of the fundamental themes of modern biology and physiology. The adaptive activities of the human and animal organisms provide not only survival and evolutionary development, but also daily adaptation to changes in the environment. Selye's theory (1936) of the common adaptation syndrome describes the phase nature of adaptive reactions and the leading role of consumption regulatory systems, under both acute and chronic stress, in the development of the majority of pathological conditions and diseases. Blood circulation can be regarded as the sensing indicator of the adaptive reactions of the organism as a whole (Parin, Baevsky & Gazenko, 1965). Variability of cardiac rhythm represents the degree of regulatory systems strain, accompanied by both the activation of the pituitary gland adrenal system and a reaction of the sympathoadrenal system arising in response to any stress effects.

A detailed study of HRV with the use of methods of auto-correlated and spectral analysis was conducted during the next stage of our research, which dealt with the extreme influence of paragliding on two groups of participants: professional pilots and first-time participants (passengers). The study focused on the function of the cardiorespiratory system in both groups. It was statistically ($p < 0.5$) demonstrated that normal reference values of MODE in the pilot group were high following the flight and landing because of the greater physical load and the condition of fatigue. The passenger group reacted differently; the high stress and reference values/MODE at the beginning of the event were a consequence of the emotional stress caused by the expectation of the event. Reliable differences in the dynamics of HR and the activity of various components of the autonomic nervous system were also recorded. The passengers' stress index reached maximum levels before take-off, and decreased during the flight, whereas with the pilots, it increased at the most difficult stage of the flight – the descent and landing. Our findings confirmed that, in the paragliding scenario, the expressed reorganisation of the main physiological systems of an organism dictate the importance of pre-flight medical control. It is also important to inform the passengers of any potential psycho-physiological reactions during the flight.

The purpose of the second stage of the project was to investigate the influence of regular training in extreme triathlon (greater than 24-hour races) participants. The results showed the positive influence of regular training on the cardiovascular and respiratory systems, against the background of the increasing range of regulatory opportunities of an organism. Implementing this type of sport regime, that takes into account the impact of complex extreme factors (i.e., moderate hypoxia, long physical activity, sleep deprivation), allows the body to estimate its functional reserves.

The primary physiological stress-limiting factor is the dynamic equilibrium between the amount of the compensatory mechanism of sports activities and the expressiveness of stress-forming reactions and distress reactions in the human body.

Data from the study has formed the basis for the development of a system of organisational and methodological principles including: maximum safety when pursuing extreme recreation; medical monitoring and medical admissions; advanced screening tests of psycho-emotional tension; dosage influence on extreme types of recreation; attention to the functional state of an individual; the dynamic equilibrium of opportunities of regulatory and compensatory mechanisms and reaction to stress-related changes in the human body; and information on possible psycho-physiological reactions of individuals. The use of these recommendations in practical recreational activities is aimed at creating conditions of maximum safety and at increasing the compensatory and adaptive reactions, and the functional reserves of the body.

The extreme nature of the effects of this type of recreation dictates the need to observe the maximum safety principle. This principle is directed at prevention and exclusion of unacceptable risk of injury, trauma or qualitative physical or intellectual damage to health.

Medical monitoring and medical admission are the most important safety-related actions prior to embarking on an extreme recreation activity. Specifically, the results of many experiments (in paragliding, diving, high-altitude mountain climbing and extreme triathlon) show that extreme factors can be distressing and harmful. Research into cardio-rhythm variability is enabling the formulation of criteria identifying stress index and numerically captured safety zone levels.

For some people, the 'price paid' by the body to adapt to extreme influences goes beyond the bio-social budget of the organism. As a result, they become the risk group and, for them, failure of adaptation and development of disadaptation states are the most probable results of involvement in extreme types of recreation. For example, studies into the effects of high-altitude mountain climbing have shown that the high initial (background) level of anxiety contributes to the formation of a syndrome of psycho-emotional tension which leads in turn to psychological disadaptation. Thus, an assessment of the initial psychological status of the participant is critical.

The data obtained from this project validates the critical requirement to conduct advanced screening tests for psycho-emotional tension.

Existing studies of high-altitude mountain climbing have reported a correlation between the length of stress and the reaction of the body. Moderated, repeated influence of extreme types of recreation will cause adaptive reorganisation of regulatory mechanisms of the human body and increase its functional reserves. As a result of our research, it has become clear that an individual approach is very important in preparing for extreme recreation. Different reactions to the same extreme conditions depend on the initial physiological and psychological condition of the body. According to a number of studies (Dobson & Markham, 1992; Malashenkova), the sustainability of an organism under extreme conditions is determined by the reserve capacity of its functional systems. However, in recent years, the scientific evidence indicates a very high variability in individual human resilience to various environmental factors. According to the physiological and psychological criteria established by existing studies, higher stress tolerance is recorded by vagotonic and normotonic participants. In these studies, these participants exhibited a maximum functional range of compensatory and adaptive mechanisms involved in the regulation of the cardiovascular system. These results allowed us to formulate the principle of accounting for a reference functional state of an individual.

Our study demonstrates that carrying out extreme types of recreation involving a complex of extreme factors (moderate hypoxia, sleep deprivation and prolonged physical activity) allowed for the evaluation of the functional reserves of the body. At the same time, it is necessary to find the safety threshold of the stress influence. Such detailed information allows scientists to establish the importance of the principle of a dynamic equilibrium of opportunities of regulatory and compensatory mechanisms and reaction to stress-related changes in the human body.

Finally, the principle of informing individuals of the possible psycho-physiological reactions involved in extreme recreation is crucial. This approach will lower the impact of the stress of pre-starting expectations and promote optimum performance from the vital organs and systems during recreational activities.

CONCLUSION

Comparison of data collected before and after the extreme sports and recreation activities offered to each individual participant, as well as the acquisition of long-term data and statistical analysis of that data, indicates the formation of

a long-term adaptive reorganisation body mechanism, expressed in a significant increase in the functional reserves of the organism, i.e., by 36% ($p > 0.5$). Metabolic improvements in the supply of vitals with nutrients and oxygen increased in energy potential by 24%. The main outcome of the study is the recommendation of a system of organisational and methodological principles for the preparation stage, ensuring maximum safety for the athlete or person undertaking sport and recreation activities under extreme conditions.

Maria Malashenkova is an associate professor at Unitec and has specialist teaching experience in human physiology, sport physiology, human ecology and anatomy, with a total of ten years' experience supervising undergraduate students. Her qualifications include Doctor of Biological Science, PhD (physiology) and Specialist in Physical Training and Sport. Her doctorate dissertation was entitled "System of mass sports promotion and use of alpine climatic resorts' recreational potential." Her PhD dissertation dealt with "Comparative characteristics of the human organism's physiological response to extreme tourism activity." She has 45 published scientific works including a monograph, 13 articles in leading journals, and abstracts of reports in scientific digests.

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PLAYING IT SAFE – ADVENTURE THERAPY IN NEW ZEALAND: IMPLICATIONS FOR OCCUPATIONAL THERAPISTS

Helen Jeffery

INTRODUCTION

Adventure therapy is an emerging field in New Zealand, increasingly used by occupational therapists. As with many new and emerging roles in occupational therapy, there is little guidance or research available in the literature. This paper follows up the author's research into New Zealand occupational therapists' use of adventure therapy (Jeffery, 2014), and presents a way of situating adventure therapy in the New Zealand context. Strengths and vulnerabilities for occupational therapists who are using adventure therapy are discussed and recommendations for safe practice provided.

What is adventure therapy?

There is no agreed definition of adventure therapy or of who an adventure therapist is; rather, a number of definitions that depend on the qualifications of the provider and the population they are working with have emerged (Alvarez & Stauffer, 2001; Mossman, 2005; Itin, 1998). With adventure therapy, there is "potential for a socio-ecological stream of health and wellbeing interventions that are effective, affordable and accessible" (Pryor, Carpenter & Townsend, 2005), and it reflects a growing interest in the use of outdoor environments and activities for health gains (Reed, 2002; Newes & Bandoroff, 2004; Russell, 2001). There are similarities in how adventure activities are facilitated between services, generally with the involvement of adventurous activities with small groups in nature (Pryor, Carpenter & Townsend, 2005; Tucker & Norton, 2012). Desired outcomes include the facilitation of personal growth; development of intra-personal and inter-personal skills; an increase in self-esteem, resilience and confidence; and a stronger sense of self-identity (Newes and Bandoroff, 2004; Itin, 1998). The diverse array of services that help young people by utilising adventure and the outdoor environment in New Zealand can be viewed as a continuum, from mainstream schools through to specialist mental health services.

Outdoor education aims to help school students develop personal and social skills, to learn about safely using the outdoors for recreation and adventure, and to learn to care for the environment. Outdoor education in New Zealand uses adventure activities to foster personal and social development, through experiences involving "co-operation, trust, problem solving, decision making, goal setting, communication, leadership, responsibility, and reflection" (Ministry of Education, 1999). Practitioners are teachers and outdoor specialists; schools often utilise specialist outdoor education centres to provide the adventure experiences.

The education focus shifts to the intentional development of resilience skills in programmes that include the *therapeutic use of adventure* in their work with 'youth at risk'. The therapeutic use of adventure is a term used in some literature from the US, referring to the use of adventure with populations that are not in clinical settings and not necessarily being conducted by qualified therapists (Becker, 2010; Itin, 2001). While the term 'youth at risk' is ambiguous, it generally refers to youth who have had contact with social services, justice services or who have

disengaged from education. These young people often engage in multiple problem behaviours such as drug and alcohol abuse, crime and unprotected sex, with the risk of lifelong adverse consequences in terms of health and social outcomes (Mossman, 2005). The therapeutic use of adventure in New Zealand is commonly provided by youth workers, outdoor educators and specialists, therapists and counsellors in services provided by government, community groups and non-government organisations. Many of these programmes focus on providing support, fostering resilience and enhancing protective factors in an individual's life to prevent the development of mental illness and other adverse consequences of their behaviour and situation.

Youth who present with mental health challenges or have a diagnosed mental illness may participate in *adventure therapy*, with a focus on both developing resilience and attaining recovery. Adventure therapy services in New Zealand are often incorporated into services funded by the Ministry of Health. They may be directly linked to a District Health Board system, or situated in the community. There is a growing trend for community-based services, and for the recovery philosophy to be integrated into all services. Recovery is defined by the NZ Mental Health Foundation as "achieving the life we want in the presence or absence of mental distress. The right conditions for recovery are the strength and interrelationships of our self-determination, personal resources, supports, therapies, and our social and economic opportunities" (Mental Health Advocacy Coalition, 2008, p. 19).

Situating adventure therapy at this end of the continuum is in line with contemporary literature from the US, and provides clarity on who an adventure therapist should be a qualified mental health clinician who incorporates adventure therapy into their work. Ames (2014) defines adventure therapy as "the prescriptive use of adventure experiences provided by mental health professionals" (p. 1); and Itin (2001) states that "Adventure therapy... appears not to be a profession but rather a set of techniques or tools used by a variety of professions" (p. 82). The definition provided by Gass, Gillis and Russell (2012) probably best summarises how adventure therapy is used in New Zealand for services provided through Ministry of Health funding: "Adventure therapy is the prescriptive use of adventure experiences provided by mental health professionals, often conducted in natural settings that kinesthetically engage clients on cognitive, affective, and behavioral levels" (p. 1).

In this context, an adventure therapist requires a specific health or therapy qualification, combined with skills in safe and effective adventure activity facilitation. This set of expertise in both therapy and adventure skills in one person is often difficult to find, and many services utilise staff from both therapy and adventure specialist areas (Crisp, 1996; Fletcher & Hinkle, 2002; Gillen & Balkin, 2006). The health professionals most commonly found in adventure therapy are from psychotherapy, social work and counselling backgrounds (Crisp, 1996; Reed, 2003). Crisp (1996) found that some occupational therapists are using adventure therapy, and that the emphasis on the therapeutic use of activity in adventure therapy positions occupational therapy as an ideal profession to work in this field.

What is occupational therapy?

Occupational therapy is a health profession which focuses on enhancing and maintaining a person's capacity to participate in everyday occupations and engage with communities. Occupational therapy views occupation as both a determinant of health and a therapeutic agent for health (Wilcock, 2005; Kielhofner, 2009; Molineux, 2004). Occupational therapists focus on the occupations people need to engage with in their lives – often referred to as "occupation as end" – and on activities designed to help individuals maintain or enhance health and reach occupation goals, or "occupation as means" (Trombly, 1995). The focus of intervention may be on assisting the person to change aspects of themselves, their environment or how they occupy themselves in order to enhance occupational engagement and participation in communities.

Occupational therapists in mental health settings utilise a recovery- and strengths-based philosophy in order to assist individuals who are restricted in their ability to engage and participate in occupations and communities due to mental health challenges. Participation in meaningful occupation is a key determinant of health and wellbeing

(Law, 2002). Occupational therapists use strategies designed to enhance a client's motivation to undertake activity, competence in performing activities, and sense of identity through engagement in activity (Mee & Sumsion, 2001; Mee, Sumsion & Craik, 2004; Findlay, 2004).

References to or descriptions of the use of adventure therapy are sparse in the occupational therapy literature, and the number of occupational therapists who use adventure therapy is unknown. Levack (2003) explored the concept of adventure therapy in occupational therapy and linked its practice to spirituality, concluding that "Involvement in adventure activities can restore motivation, raise self-esteem, and has a positive impact on client's ability to live a more satisfying life by impacting on the spiritual aspect of a person" (Levack, 2003, p. 27). Jeffery's (2017) qualitative descriptive study explored seven New Zealand occupational therapists' use of adventure therapy in mental health. In particular, the similarities and differences between adventure therapy and occupational therapy were investigated, and the theory that therapists drew from identified. Her findings indicated that although there are some philosophical and practice differences between adventure therapy and occupational therapy, adventure therapy can legitimately be utilised as an approach to intervention within overall occupational therapy practice (Jeffery, 2017).

Occupational therapy and adventure therapy – THE FIT

Alvarez and Stauffer (2001) identify theoretical concepts present in adventure therapy and frame them as tools or techniques that the adventure therapist may choose to use. These techniques include:

- A solution-focused approach
- Small-group work
- The active and facilitative role of the therapist
- Reality-based outcomes
- Use of perceived risk
- Metaphoric connection
- The positive use of stress (eustress)
- Use of an unfamiliar environment

Of these concepts, occupational therapists are familiar with and skilled in the first four listed. Small-group work and utilising a solution-focused approach is common occupational therapy practice, particularly in mental health. Occupational therapists are skilled at facilitating activity with individuals and in groups, and often engage in the activity alongside their client/s. The outcomes for clients engaging in occupational therapy are natural and based in fundamental realities, as the focus is on everyday activities in everyday environments. Because of these and other transferrable skills, occupational therapists are well positioned to use adventure therapy.

The remaining elements identified by Alvarez and Stauffer (2001) are not only unfamiliar to occupational therapists, but conflict with fundamental occupational therapy philosophy. Adventure therapy intentionally uses a high level of perceived risk in many activities, in order to create challenge and stress for the clients and enhance the adventure experience. This, in combination with being immersed in a novel environment, creates the level of dissonance and disequilibrium required for individuals to be forced into a process of adaptation. This adaptation and the associated feelings of success can be very powerful and, if used in conjunction with the conscious use of metaphors, can enhance an individual's ability to relate their experience to home life (Adams & Sveen, 2000; Newes & Bandoroff, 2004). This process (commonly termed the adventure therapy process) is summed up by Nadler (1993): "The client experiences a state of disequilibrium by being placed in a novel setting and a cooperative environment while being presented with unique problem-solving situations that lead to feelings of accomplishment which are augmented by processing the experience which promotes generalisation and transfer to future endeavours." (p. 60).

The use of eustress and intentional high levels of perceived risk differs from occupational therapy's usual focus on working within the client's comfort zone. Also different is adventure therapy's intentional selection of novel activities in a novel environment, compared with occupational therapy's usual practice of working with people in their habitual environments, and with everyday activities. However, when used in a discrete episode of intervention, adventure therapy can be viewed as the utilisation of adventurous activity as a means to an occupational end.

While there is no one way of using adventurous activities therapeutically, the literature describes an underpinning experiential learning theory. This is founded on beliefs that people learn best from experience, particularly where there are multiple senses involved in the activity (Kraft & Sakofs, 1985; Newes & Bandoroff, 2004). Experiential learning deliberately involves learners in activities or experiences that have real-life consequences. The process involves active and conscious reflection following the experience to enhance the learning potential and ensure that meaning or knowledge is constructed from the experience (Kolb, 1984). New Zealand occupational therapists are familiar with experiential learning theory through their undergraduate training and engagement with the continuing competence framework (Occupational Therapy Board of New Zealand). Although not commonly used in occupational therapy practice, there is potential for experiential learning theory to be incorporated into other practice areas in addition to adventure therapy (Jeffery, 2017b).

ADVENTURE THERAPY IN NEW ZEALAND – PLAYING IT SAFE

Adventure Safety

Occupational therapists do not have the skills or knowledge required to safely facilitate adventure-based activities. Occupational therapy training does not include training in the technical skills required to perform the activities that are commonly used in adventure therapy – for example, kayaking, rock climbing, tramping, and high-ropes courses. In order to utilise these activities, therapists need to learn the skills and gain an appropriate qualification (for example, through the New Zealand Outdoor Instructors Association (NZOIA)); or work alongside an outdoor specialist. While both paths are appropriate, maintaining ongoing competence in both the therapy skills and the technical skills required is demanding in terms of time and cost. There are facilities in New Zealand that provide adventure specialist personnel who can work alongside the therapist; working collaboratively with such services enables the safe facilitation of adventure therapy. Occupational therapists are encouraged to partner with such services, and to check that the outdoor specialists involved have additional knowledge and skill in working with vulnerable people who have mental health challenges.

As well as the technical activity skills required, there are a number of areas of skill and knowledge essential in adventure therapy that fall outside traditional occupational therapy training. Generic skills needed when working with adventure activities include good personal fitness; comfort in and knowledge of the natural environment; knowledge of weather systems; competence in outdoor risk assessment; and management and first aid training. Most of these areas of skill and knowledge fall outside traditional occupational therapy education; however, they are skills that are relatively easy to acquire through training courses and through personal involvement in outdoor activities.

In order to use adventure therapy as an approach to intervention, occupational therapists need to understand the theory that underpins adventure therapy. The field includes concepts that are important and powerful, but that will not come naturally to an occupational therapist. Understanding the adventure therapy process and how and why it works will enable the therapist to use it effectively and prevent the potential blurring of the boundaries with conventional occupational therapy. Exploring the adventure therapy literature and integrating knowledge of the adventure therapy process into clinical reasoning will enhance the therapist's ability to modify a given process or activity in order to maintain the client's emotional safety – for example, with clients for whom stress is contraindicated.

An important aspect of adventure therapy is the healing and restorative power of simply being in nature (Beringer & Martin, 2003; Hoyer, 2012; Kaplan, 1995; Pryor, Carpenter & Townsend, 2005). Fieldhouse and Sempik (2014) describe this as “green care,” and identify a number of interventions selected primarily for facilitating or enhancing a “human relationship with the natural world” (p. 313). Examples of green care they give include horticulture, animal-assisted therapy and wilderness or adventure therapy. Becoming familiar with green care philosophy will assist occupational therapists in appreciating adventure therapy’s principles regarding the role of nature in healing. There is potential for the use of non-adventurous activities in outdoor environments that fit with green therapy concepts, many of which occupational therapists have traditionally engaged with, such as horticulture therapy. The use of non-adventurous activities in the outdoors is likely more manageable for therapists in terms of acquiring the necessary skills and knowledge, and may make elements of adventure therapy more accessible to them.

Cultural Safety

Cultural safety begins with cultural competency – knowledge of the meaning of culture, insight into one’s own culture and its impact on relationships, and an awareness of and sensitivity to the culture of others (Ramsden, 1992; Gray & McPherson, 2005). Culturally safe practice in New Zealand includes the therapist’s ability to “recognize, respect and nurture the unique cultural identity of tangata whenua and safely meet their needs, expectations and rights” (Hill, P. & Whanau Kawa Whakaruruahu, 1991, p. 7). While occupational therapists understand the concept of culture and the importance of culturally safe practice when working with Maori, there remains a gap between ideal and current practice. This is compounded by the differences between the Maori and non-Maori world views, the inappropriateness of some health and social systems for Maori, and the limited number of Maori occupational therapists (Hopkirk & Wilson, 2014).

Practised appropriately, adventure therapy is an approach that will likely resonate with Maori. The connection with the natural environment; shared experiences in a collaborative and supportive natural setting; the use of metaphor; and the importance placed on relating and relationship that is integral to many adventure therapy programmes are all compatible with elements of Maori culture. There are ways adventure therapy programmes could be developed specifically for Maori that would further enhance their cultural appropriateness and therefore their effectiveness. These include partnerships with tangata whaiora (consumer advisors); inclusion of whanau/extended family in the adventure therapy process; accessing cultural supervision; nurturing the growth of Maori adventure practitioners; face-to-face interventions pre and post the adventure experience that are situated in the client’s community; and tikanga Maori practices, particularly as a part of multi-day adventure experiences.

Professional Safety

All occupational therapists in New Zealand are required to be registered with the Occupational Therapy Board of New Zealand (OTBNZ). Occupational therapy has a general scope of practice which defines the parameters of practice. The scope of practice involves enabling occupation in the everyday-life domains of “learning and applying knowledge; general tasks and demands; communication; mobility; self-care; domestic life; interpersonal interaction and relationships; major life areas; and community, social and civic life” (Occupational Therapy Board of New Zealand, 2004).

Occupational therapists are required to ensure that they work within this scope of practice and maintain ongoing competence to practice. Evidence of maintaining competence to practice is provided through goal-setting and engagement in learning activities linked to the five competencies required for registration. These competencies are outlined in Table 1 below, and include suggestions as to how occupational therapists using adventure therapy could meet them.

In order to maintain safe practice within the defined scope of practice, occupational therapists would be wise to ensure that they use adventure therapy as only one approach to their overall professional engagement in occupational therapy, and not as their entire practice. As an intervention, adventure therapy offers occupational therapists a powerful way of using activity as a means to overall occupational ends. Occupational therapists' knowledge of and engagement with clients in their lived environment places them in a position of strength in facilitating the transference of newly learned skills and behaviours following the adventure experience. It is the transfer of learning from the adventure experience to everyday life that defines the outcomes in occupational therapy terms. However, adventurous activity undertaken in isolation from the broader therapeutic context cannot be considered occupational therapy.

Competency	Meeting competency using adventure therapy
Applying occupational therapy knowledge, skills and values	<ul style="list-style-type: none"> • Use adventure therapy as an approach to intervention within overall occupational therapy practice • Utilise evidence from occupational therapy and adventure therapy to inform practice • Ensure that communication (verbal and written) with service users, families and team members identifies that the intervention is within occupational therapy practice
Practising appropriately for bicultural Aotearoa/ New Zealand	<ul style="list-style-type: none"> • Adapt adventure therapy and occupational therapy processes as necessary to ensure culturally safe practice • Include whanau • Find and work alongside Maori service providers or supports when working with Maori clients; access cultural supervision • Identify and utilise models of practice that encompass Maori world views • Consider and build on the elements of adventure therapy that likely resonate with Maori e.g., connection with nature, use of metaphor
Building partnerships and collaborating	<ul style="list-style-type: none"> • Collaborate with adventure specialists to co-facilitate adventurous activities • Develop and maintain partnerships with clients and utilise principles of client-centred practice despite the prescriptive nature of some adventure therapy practices • Maintain networks with occupational therapists and adventure therapists • Collaborate with Maori/tangata whaiora
Practising in a safe, legal, ethical and culturally competent way	<ul style="list-style-type: none"> • Upskill to ensure generic adventure therapy knowledge and skills are current • Integrate adventure therapy theory into adventure interventions • Maintain occupational therapy specialist approach when working in multidisciplinary teams • Work in partnership with adventure specialists for risk assessment and management, and technical activity facilitation
Engaging with and being responsible for your profession	<ul style="list-style-type: none"> • Share adventure therapy knowledge and skills with occupational therapy colleagues • Add to the literature on occupational therapy and adventure therapy

Table 1. Meeting competencies for registration and continuing practice in adventure therapy

CONCLUSION

Adventure therapy can be legitimately used by occupational therapists as one approach to conventional occupational therapy intervention. Occupational therapists should feel heartened by the compatibility between adventure therapy and occupational therapy, and confident in using it as a means to an occupational end, despite the differences in how activity and environment are utilised by the two disciplines.

Adventure therapy may provide an effective approach to working with at-risk Maori youth. Occupational therapists who are not Maori should develop relationships with appropriate Maori and adventure specialists in order to work towards developing adventure therapy programmes that are culturally appropriate for Maori.

Occupational therapists do not usually have the skills to facilitate the adventurous activities commonly used in adventure therapy. They should seek appropriate training in the generic outdoor skills, and collaborate with adventure specialists to ensure safe facilitation of these activities.

Helen Jeffery is a mental health occupational therapist with a personal and professional interest in adventurous activities. She has researched New Zealand occupational therapists' use of adventure therapy, and is interested in advancing this field in New Zealand. Helen is a senior lecturer with the School of Occupational Therapy, Otago Polytechnic.

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INCORPORATING SUSTAINABILITY INTO OVERSEAS TRAVEL FOR PHYSICAL ACTIVITY STUDENTS

Sarah Sellar and Simon Middlemas

INTRODUCTION

There is a widespread belief that if the world carries on with current levels of economic growth, it will be to the detriment of environmental systems and resources that we need to survive, and at the expense of quality of life, human health and equality for society. While there are many ways in which sustainability has been defined over the years, there is a consensus that education is an essential tool for achieving sustainability (ESD toolkit, n.d.). Educating about sustainability for youth (16 to 30-year-olds) – those who are best placed to take action and make change – can help make local communities more enjoyable places to live, while preserving natural ecosystems and processes. With educators increasingly looking to place greater emphasis on experiential or active learning pedagogies, programmes which place emphasis on travel, such as study abroad, field trips and internships abroad, are becoming more important. Education can enhance the travel experience for the student traveller by making them feel more connected to the local people and culture in the countries through which they travel. Some would argue that there is an acknowledged conflict at the heart of 'sustainable travel' (for example, carbon emissions from flights). However, today travel is extremely popular, particularly among students wanting to broaden their horizons (CN Staff, 2014). In order to manage the environmental and social impacts of students travelling overseas, implementing sustainable frameworks becomes imperative. As a result, higher education institutes across New Zealand and globally are recognising the value of educating about sustainability and are being called to step up in leading the movement, a challenge that these institutions are struggling to conceptualise (Packard, 2010).

The focus of this research is on educating youth about sustainability through an overseas travel programme. This paper explores effective ways of educating for sustainability before, during and after the travel experience.

Factors influencing sustainability education

Sustainability, and sustainable travel, is not a new area for academic enquiry. Researchers have explored ways of educating youth, particularly higher education students, during overseas travel experiences (Liang, Caton & Hill, 2015; Moscardo & Murphy, 2014) and, separately, have discussed how best to educate youth about sustainability issues (Rohweder & Virtanen, 2009; Boyle, Wilson & Dimmock, 2015; Barth, 2014). Researchers have identified several factors that educators should consider when developing effective sustainability education programmes – such as the pedagogy employed, student values and beliefs, and the educators themselves.

The pedagogy behind sustainable travel education is based in *transformative learning theory*, a term coined by Jack Mezirow in 1978 in his paper "Perspective Transformation," which placed emphasis on individual empowerment and transformation (Teachers College – Columbia University, n.d.). This approach recognises the student as an adult learner and encourages a constructivist style of teaching – students construct their own individual sense of the world through exploration and discovery, rather than being told information (Honeyfield & Fraser, 2013). Participating in decision-making, planning and learning, as well as driving partnerships, all show that the student has ownership and direction over how they learn. Liang et al. (2015) have also identified many critical factors which help

facilitate transformational learning and empowerment among students. These include motivation, stepping outside one's 'comfort zone,' reflection and sharing, and keeping a traveller's diary or biography.

The literature shows that sustainable travel is a complex concept, and often contradictory in nature. Moscardo and Murphy (2014) critique the term *sustainable tourism* on the basis of the underlying assumption that some aspects of travel are routinely considered sustainable and very rarely is 'no tourism' accepted as a viable alternative. They argue that in some destinations, this latter course is necessary. Boley (2015) proposed an impact travel model that could be used to help ascertain whether travel is *net* positive or *net* negative. Not only does this model consider the host community's triple bottom line, but it also takes into account the greenhouse gas emissions that would have been used at home in comparison to those used while away. Perhaps other expended resources could be calculated in here as well.

Overall, researchers agree that sustainable tourism needs to address the "wider, cumulative, long-term" impacts of actions associated with it (Moscardo & Murphy, 2014). Moscardo and Murphy argue for a *quality of life* approach to assessing tourism sustainably, where the impact of tourism is measured by the quality of life achieved for the host country. They see tourism as part of a much wider system affecting the main types of capital (natural, social, human, cultural, political, built and financial) and consider impacts created well outside the travel experience as conventionally understood. This approach is particularly interesting in terms of the long-lasting behavioural changes – "sustainability beyond tourism and the destination region" – that would be a likely outcome of an educational programme focused on teaching sustainability.

Aim of the study

There is very little consensus on the most effective way to educate youth about sustainability issues. Furthermore, few researchers or practitioners have asked whether participation in an overseas travel programme has led to sustainable behavioural changes in the life of the student traveller – that is, were they more sustainable practitioners post-travel? While researchers have identified the factors important for student travellers' growth and change, they have shown little interest in determining the learning derived from the experience of travel itself, or from the input of the educator or programme concerned. As a result of these deficits, this study addresses two questions regarding sustainable student travel. Firstly, what is the best way to educate about sustainability, including pedagogy and theory? And secondly, how can this be done most effectively in an overseas travel context in relation to physical activity students?

METHODS

A qualitative focus group was employed in this study. The focus group was identified as the most effective way of bringing multiple groups of people (students, outdoor educators, high school and tertiary teachers, researchers and youth expedition employees) together to engage in dialogue on this subject.

Participants

Participants were recruited to participate in the focus group (age, $m = 34$, range 20-56). Recruitment focused on three groups: (i) practitioners with knowledge of sustainable tourism; (ii) educators involved in sustainability; and (iii) students who were interested in sustainability and/or travel. Participants were recruited by email, face-to-face and via phone. They were invited to a focus group, and food and drinks were provided. Six participants attended the focus

group, representing a range of genders (male (n=1); female (n=5)), experience levels (practitioner (n=1); educator (n=4); student (n=1)) and ethnicity (NZ European (n=4); European (n=2)). There was a range of academic levels. The student was currently studying in a health and wellness degree programme. The other participants had all studied to undergraduate level, with two participants studying at postgraduate level.

Data Collection

An interview guide was developed using the existing sustainability literature, through discussions with practitioners in the field, and by drawing on the personal experiences and reflections of the first author. The interview guide was divided into six parts: (1) Welcome and introduction; (2) What is sustainability? (3) What does a sustainable practitioner look like? (4) What is the role of education in fostering sustainability? (5) What could a sustainable education programme look like? (6) Closing remarks. The role of the first author was to lead the interviews, keep the discussion flowing and include all the participants equally in the discussion. Probing questions (such as “What are some examples of this?” “Does anyone else share that view?”) and prompts (“Show interest,” “Share own thoughts,” “Listen, don’t interrupt”) were used to guide the interviewer. The second author took notes, managed the audio-recording equipment and was available to support the interviewer as needed. Following the focus group, informal communication continued via email with a number participant on the themes discussed.

Data Analysis

Immediately following the focus group, the first author reflected on the material generated by the group and, using her notes and the audio-recording, drew together some initial conclusions and themes from the discussion. The discussion was transcribed verbatim by a professional transcription service. The first author then read and re-read the transcript, drawing out themes and points of interest. Through this process, and in consultation with the initial perceptions, key themes began to emerge from the data. In a series of meetings, the first and second author – who also sat in on the focus group – discussed and defined these key themes more clearly. The role of the second author was to act as critical friend, challenging the interpretations and conclusions of the first author, until there was consensus on the interpretation of the data.

RESULTS

Our study found that there are many concepts that could be applied to existing youth travel programmes that would result in greater levels of sustainability, and that a new overseas programme could be justified if it operated within set parameters that include defined outcomes and structure. Six key themes emerged from the data analysis process: (i) What does it mean to be a sustainable practitioner? (ii) The complexity and contradictory nature of travel overseas and teaching sustainability; (iii) Instilling sustainable practice by starting with self or others; (iv) Mutual empowerment between the travellers and host communities; (v) Structure of the programme; and (vi) Outcomes of the programme. These six themes are discussed below, accompanied by direct quotes from the participants.

I. What does it Mean to be a Sustainable Practitioner?

The direction of the focus group was steered by the question: “How should people be educated regarding sustainability?” The opening questions looked at definitions of sustainability and the sustainable practitioner (a term coined by Otago Polytechnic members to define someone who embodies sustainable practice). Although the focus group members defined sustainability largely in environmental terms, they agreed that the concept is multifaceted:

“There’s lots of different ways of looking at sustainability ... but unless we focus on the environment first and make sure we have that right, then actually there isn’t gonna be a future” (outdoor and tertiary educator). It was more difficult to find agreement on what a sustainable practitioner does: “I think part of the power of the concept of sustainable practitioners is that it can mean so many different things depending on the field that you’re working in” (tertiary educator). A consensus emerged that role-modelling, demonstrating sustainable actions and being a conscious decision-maker were characteristics of a sustainable practitioner. It was asked whether this role required one having roots in a place and if and how it could be “fun.” It was also asked what was the best starting point in developing an identity as a sustainable practitioner: One strategy would be to narrow the approach and focus on a single area of a student’s life, whether their vocational path or another area. This was seen as an effective approach and one that might flow over into other areas of students’ lives.

2. The Complexity and Contradictory Nature of Travel Overseas and Teaching Sustainability

The first half of the focus group saw a major theme emerging – complexity and contradiction. Considering the question of what is sustainability, an educationalist in outdoor education noted that “you can’t not have any impact,” and that therefore it’s impossible to be completely sustainable. In considering how to educate students about sustainability through a travel experience, a contradiction was found in burning fossil fuels while trying to achieve a low impact on the environment. This was identified by one participant as a values conflict:

The point is that there’s a real values conflict there around what you’re trying to create, but also the impact that you’re having by jumping in a plane, and I have that conflict all the time, every time I go on a mission to go anywhere, it’s like, well, I’m going ... you know, like, but the other aspect as well. I enjoy many adventures and I enjoy travelling (outdoor and tertiary educator).

A further values conflict arose when the group attempted to decide between social and environmental sustainability. While everyone agreed that there is a values conflict between environmental sustainability and travel, a high value was also placed on social sustainability within travel (for example, celebrating diversity, promoting social justice).

Conventional	Green	Sustainable	Restorative	Regenerative
‘Business as usual,’ where all decisions are based on price, availability and/or comfort.	Mainly ‘business as usual,’ but with some concessions to sustainable travel, where considerations of price and convenience are not dramatically challenged.	“Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry [sic], the environment and host communities” (United Nations World Tourism Organisation, 2005).	Following sustainable practice and pre-trip, doing appropriate research; during trip, learning to meet the needs of locals; and post trip, implementing new ways of living and giving back to one’s own community.	All travel practice positively enhances all systems and contributes to global equality. Dreaming the unthinkable.

Table 1. The stages of sustainable travel

3. Instilling Sustainable Practice by Starting with Self or Others

The question of where to start the education process was addressed in a number of ways. The group discussed whether the most effective place to start is by encouraging thinking about oneself or others first. It was noted that travel is a hedonistic activity that is designed for the wealthier, privileged minority and that can exploit people in poorer parts of the world. People can be motivated to travel in order to 'find themselves,' and this attitude can contribute to greater social sustainability later in life. People who want to change the way they travel need to be intrinsically motivated and be convinced of the benefits of changing: "What [researchers] found was there wasn't enough structure with it [the programme], so people didn't look after the environment or the places that they went; they didn't have intrinsic motivation to be able to look after it – they just went back into their old lives and did the same old thing, so" (outdoor and tertiary educator).

To encourage this attitude further as a facilitator, ensuring that students are achieving small, manageable actions is important, as is using positive psychology to build students' resilience, so that "when things hit them ... they've got the ability to pick themselves back up and actually start to look beyond themselves" (outdoor and tertiary educator). If the driving motivation for people to change the way they travel was through others, this would come about through exposure to new cultures and connecting with local people, hopefully leading to greater social sustainability. The consensus was that students would have to be first driven by their own wants and needs and then by interacting with others, thereby reinforcing positive change: "If you want them [students] to have co-environmental behaviours ... they've got to have the resilience and the resources to look beyond themselves and not be self-centred, and that in itself is not an easy thing" (outdoor and tertiary educator).

4. Mutual Empowerment Between the Travellers and Host Communities

The focus group agreed that if students are motivated and driven to travel and behave more sustainably, this would result in mutual empowerment between student travellers and host communities, leading to greater social sustainability. This discussion also highlighted the importance of making connection with local people. Dual interactions would be driven by respect. The desire to create long-lasting relationships could lead to "building bridges" (tertiary educator at Otago Polytechnic), maintaining links and seeking to extend opportunities back to local people in the host country. Travel doesn't have to exploit the Third World through First World privilege, but can also involve developing connections among First World nations and/or with Third World nations: "See how (First World cities) have implemented all this sustainability into their city and bring it back here, and see what we could do differently in Dunedin and start making change happen, and that could be part of the programme" (student).

While there was some consensus that a programme aimed at educating students about sustainability while overseas could be effective, there were clear conditions that would need to be followed regarding outcomes and structure. Another important question raised was whether a new programme needed to be created, or whether it would be more useful to improve existing youth expedition programmes by educating staff and students on sustainability and providing resources:

Interviewer: "Maybe it's better to look at existing programmes as opposed to begin a new programme and, with that type of programme [a new one], is it possible to justify the benefit or; you know, the contradiction of going overseas – is a net positive outcome justifiable?"

Participant F: "Until you run it, you wouldn't really know." [people nod]

Participant C: "And it would probably depend on who you obviously send over there and what prep you'd done before – depending what their background was and their knowledge and their interest ..."

Participant G: "... [and] how do you measure or not whether it's been successful?"

Suggestions for a programme included having an element based in nature, encouraging students to share their stories from the trip, and recognition that it is important but difficult to measure outcomes.

5. Structure of an Education Programme for Sustainability

There was a lot of discussion around the structure of such a programme. It was thought that a good starting platform might be created by offering students sound preparation and learning in advance of travel, and by having high entry criteria. It was suggested that "an educationalist" (an outdoor and tertiary educator) should facilitate such a programme. Academic leaders should integrate reflective practice into any programme, offering support and tools for students to adopt this approach with themselves and others. The location of the programme could be either in a developing or developed country, local or overseas – the choice of location would be driven by the agreed outcomes of the programme (the purpose for traveling). Travelling to a place in order to "be there," rather than just passing through, would be an important result of travelling with a purpose. After the programme, it was seen as crucial to transfer the learning gained into everyday life; this could be achieved through follow-up sessions and/or mentoring: "Yeah, but most of the issue with most of those [outdoor education] programmes, and I think most of education, is the lack of follow-up; most things fall down because what we do is we run programmes and we run courses, and then we say goodbye, and then expect people to be able to transfer stuff over" (tertiary educator).

It was also noted that programmes designed for education, as opposed to profit, would best allow sustainability-focused learning outcomes to be met.

6. Outcomes of Such a Programme

Lastly, positive outcomes were seen as the driving force behind such a programme. There was general agreement that students should have a purpose for travel, rather than just travelling for the sake of it. Students should drive this process, and their 'purpose' could relate to a problem that they wanted to fix in their own community. This would further develop connections with their own place and community and help stimulate intrinsic motivation: "I think it's, um, really good to get people involved in their local community, especially if you're gonna be sending younger people over there [overseas], 'cause more people need to be involved or know about what's going on in their area" (tertiary educator).

It was agreed that having achievable, measurable outcomes was important, and could involve such diverse results as completing a project or driving legislative change. The goal of the facilitator is to inform the students. As one of the educators noted, "I'm an educationalist and my job is to lead people out of ignorance."

DISCUSSION

The aim of this study was to explore the views of educators, practitioners and students about sustainable student travel. The richness of the participants' responses in the focus group justifies the decision to use this methodology to answer our research question. Despite the complexity of the topic, and its obvious contradictions, some clear ideas emerged about ways of educating students about sustainability through an overseas travel experience. Four key points were agreed. First, these ventures wouldn't necessarily have to be new programmes, but could be adapted versions of existing ones. Second, such programmes wouldn't necessarily have to be carried out overseas. Third, the destinations involved need not involve travel between First World and Third World nations, but could happen between nations on the same socio-economic scale. And, fourth, such programmes should be student-led and driven by student-oriented outcomes.

The findings of this study support the existing sustainable travel literature, which offers practitioners a very complex system to work within as well as ambiguities in terminology and various definitions and understandings

of sustainability. In regard to defining sustainability, the group agreed that environmental considerations are often added as an afterthought in planning travel. This echoes Rohweder and Virtanen (2009), who took an integrated and interconnected approach to sustainability and emphasise that ecological questions are not separate from economic, social and cultural issues. Like much of the literature, the focus group also stressed the importance of students having intrinsic motivation and purpose. An outdoor and tertiary educator from the group asserted that "if they're not intrinsically motivated, they'll do it [sustainable action], but there'll be no follow through afterwards," echoing Liang et al. (2015), who found that students' motivation was a key element in effective education about sustainability. The importance of purpose was also supported by Rohweder and Virtanen (2009), who refer to students having the ability for "envisioning a better future" as essential to actioning sustainability principles. If the purpose of travel is for physical activity, a more holistic approach can be communicated to students through questions such as: How does physical activity make a social and financial contribution to local communities? What would need to happen for your trip to have a positive impact on the environment? The focus group identified a positive purpose for travel as a non-negotiable structural element in justifying an overseas travel experience.

Resilience was another theme identified. According to McCool (2015), redefining sustainable tourism should involve an emphasis on creating greater resilience within communities. In the focus group, the subject of resilience was brought up several times:

How do you educate people to become less self-centred and have more positive resilience, and to be able to be in a position where they can think more outwards? And it doesn't mean that you become the martyr and that you look after everybody else in the world – what it means is that you are actually open to other points of view and that you are open to what's going on around you (outdoor and tertiary educator).

As we have seen, the contradictory nature of overseas travel and sustainability was also highlighted within this study. Hall & Kinnaird (1994) believe that travel to destinations "undertaken in fuel-hungry aeroplanes is in itself incompatible with sustainability" (quoted in Hunter & Shaw, 2007, p. 54, as cited in Boley, 2015). However, recent research has suggested that this is a narrowly focused approach that fails to consider a given destination's triple bottom line (environmental, economic and socio-cultural; Boley, 2015). Recognising that international travel is engrained in our society gives us an incentive to try and make it more sustainable. During the focus group, an outdoor and tertiary educator addressed this issue: "So it's about getting some balance ... if you're looking at an overseas experience which happens throughout the world, then maybe it's taking the best of the worst and saying, well, how can we [be more sustainable] if these trips are going to run [anyway]." Tourism is only projected to increase in terms of profits generated, numbers of people travelling and jobs created (World Travel and Tourism Council, 2015).

Education for sustainable travel: a new model

Educators who accompany students on their travel experience are in a strong position to offer support, facilitate reflective practice and "direct their awareness towards ways their learning may be turned in the service of social transformation" (Liang et al., 2015). This can help students build an "empowerment bridge," transferring their personal change into impacts for the greater good of society (Liang et al., 2015). Approaching students as adult learners and applying teaching techniques such as allowing time to reflect and share; analysis of values; motivation for travel, linked to envisioning a better future; feeling challenged; and repeat travel as part of a student's biography have all been proven to deliver effective learning for students. Having a passionate, open and competent educator guide the students is an important element in fostering student growth and behavioural change. To help educators actively incorporate sustainability into an overseas travel experience, we offer the following recommendations: (i) Build a sustainability purpose into the travel experience, linked to the student's own vision of a better world; (ii) Attend to the sustainable and restorative purposes of travel (see Figure 2); and (iii) Implement a sound pedagogy before,

during and after the travel experience. Students should be encouraged to action sustainable practice behaviours and develop a mindset based on sustainability principles. This can be done by focusing on the 'sustainable' and 'restorative' pathways for travel summarised in Figure 2. This model has been adapted from Bill Reed's "Trajectory of Environmental Design" (2006), and defines and exemplifies the various 'stages' of travel, working from 'conventional' (poor examples of sustainable practice) through to 'regenerative' (best practice).

Developing a sustainable purpose

When taking a group of students overseas, there should be a sustainability purpose attached to the journey – that is, it must be clear that the travel experience is not only about the physical activity planned, and is part of a greater purpose. Facilitating a reflective session for students, with leading questions to help them identify and agree on their sustainability purpose, is an important task. The pedagogy that should be applied for effective sustainability education pre, during and post trip needs to be deeply rooted in constructivist theory, experiential learning and transformational learning, and borrow ideas from education for sustainability. Students should be encouraged to work on long-term partnerships, either local or overseas, and to "build bridges" between different locations or physical activity institutions. This will also allow them to build "empowerment bridges," the ability to transform the personal change they have undergone into impacts for the greater good of society (Liang et al., 2015).

Pre-trip education

This might involve learning about the culture and dominant religion (if any) of the host country, the political and social situation (past and present), and learning some elements of the language. This will prepare students for what they should take with them (for example, culturally appropriate clothing), inform their behaviour and begin to answer their questions about why the local people think and act as they do. Actions that meet baseline expectations for travelling sustainably include staying in locally owned and operated accommodation (homestays are a great options and good way to meet locals); eating local and in-season food; buying goods where the money will stay within the local economy; and choosing low-carbon transport options while in country (public transport versus private vehicles). Reflection sessions with the facilitator (an educationalist), as well as with other students, would be integrated throughout the programme and would open up space for values clarification and critical thinking.

Post-trip

Following the trip, students would be encouraged to continue to build bridges with the culture they had experienced and to apply what they had learned or experienced to their own lives back home. This may be result in getting involved in a community group, supporting positive initiatives already underway, and/or being more vocal and action-orientated over causes they believe are worth standing up for. In terms of environmental sustainability, it is hoped that students will be more aware of resource wastage and their carbon emissions and choose to act at home to reduce their environmental footprint.

Strengths and limitations of the study

As with any research project, this study had both strengths and limitations. The methods adopted – a qualitative focus group plus informal interviews – was deemed appropriate for the study. By following up the focus group with informal communication via email, a rich corpus of data was collected on the participants' views of education for

sustainable travel. Although not all the participants invited were able to attend, the focus group contained a wide range of experience, academic background and ages. The interview guide and methodology enabled the first author to include all participants by asking them questions, and to help them relax once the focus group commenced. One participant arrived late, meaning that they missed the introduction and were slower to become involved. However, they did end up contributing to the conversation. The first author was relatively inexperienced in terms of conducting research, and this was her first focus group. The second author, an experienced qualitative researcher, was involved throughout the data-collection and analysis process to provide support.

CONCLUSION

This study was undertaken to explore the sustainable teaching outputs from overseas travel programmes for youth. The conclusion reached from this investigation is that educating about sustainability can be applied to an existing travel programme, or as part of a new programme, but only where certain parameters are followed. The study findings and model provide a roadmap for educators wishing to adapt an existing programme so that it is relevant to sport teams, school groups and others travelling to undertake physical activity programmes overseas. It was found that although some effective sustainability initiatives were already in place, there is scope to develop these further to create long-lasting behavioural change. Two courses of action were identified: (i) develop a new travel programme to test these theories or (ii) adapt an existing one. The latter was chosen as a focus in this paper; recommendations include clearer pedagogical practice before and after an overseas travel experience; developing a sustainability purpose; and following the 'sustainable' and 'restorative' guidelines for travel in Figure 2. Education for sustainability is a well-defined concept with an established pedagogy, and is considered by many scholars and organisations as "the optimal way to tackle contemporary global environmental, social, and economic problems" (Boyle et al., 2015, p. 253). Our investigation found that education 'for' sustainability is one strategy for effective teaching 'about' sustainability, and supports the contention of Boyle et al. (2015) that education for sustainability is an effective educational philosophy in empowering behavioural change in students and allowing them to critically reflect on their own values.

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SMALL-SIDED GAMES: IS 6V6 A POSITIVE PROGRESSION FOR THE DEVELOPMENT OF JUNIOR NETBALL?

Kirsten Spencer and Sandra Wolf

INTRODUCTION

In New Zealand, netball is a sport that reigns supreme (Jackson & Andrews, 1999), and almost 50% of registered netball players in New Zealand are part of Junior Netball. The 2015 pilot for Years 5 & 6 is a small-sided modified game, with a philosophy aimed at maximising involvement, optimising player opportunity and advancing skills through the use of task constraints (Vilar et al., 2014). Small-sided games (SSG) imitate specific characteristics of full-sided games, while allowing development of social, physical, technical and tactical elements (Chow et al., 2006).

Coaches can maintain these elements by using task constraints based on the constraints-led approach to sport (Newell, 1986). These are more closely related to performance and are very significant for learning; they include the rules of the game, equipment used, pitch size, player numbers, task goals and instructions given to players (Glazier, 2010). These elements can channel player and team behaviour towards new levels of performance (Aguiar, Botelho, Lago, Maças & Sampaio, 2012; Vilar et al., 2014). Effective manipulation of such variables requires coaches to acquire a proficiency of experience and knowledge in various sports to allow learners to discover decision-making behaviours and functional coordination patterns (Dyson, Griffin & Hastie, 2004; Hill-Haas, Dawson, Impellizzeri & Coutts, 2011; Renshaw, Jia Yi, Davids & Hammond, 2010).

Reducing the number of players is a common strategy in invasion games, as they lessen the attentional demands on players (Rampinini et al., 2007) and increase technical actions (Capranica, Tessitore, Guidetti & Figura, 2001). However, reluctant adult supporters are sceptical, as they want to see their children play the 'adult version' as soon as possible. The importance of using SSG during youth has been highlighted by Fenoglio (2003) in a report on the use of 4 vs. 4 at the Manchester United Academy. Results showed that by playing 4 vs. 4 rather than 8 vs. 8, players made 135% more passes, scored 500% more goals and had 260% more attempts at goal (Fenoglio, 2003). The heightened frequency of these essential performance indicators in football allows players to further their opportunities to bed in basic skills and gain more tactical experience in situational contexts (Almeida, Ferreira & Volossovitch, 2013; Clemente, Couceiro, Martins & Mendes, 2012). To date, there has been no published research on SSG in netball. This study therefore provides a unique contribution to the training and preparation of young netball players.

In youth sport, environmental constraints include physical and social factors, which both have a great impact on young learners. Factors such as peer groups and social and cultural expectations are most relevant to young athletes, as motor learning is highly influenced by team-mates and coaches (Davids, 2010). SSG help players to learn new skills in manipulated environments, leading to the development of social interaction (Koekoek & Knoppers, 2015). Krustup, Dvorak, Junge & Bangsbo (2010) studied the psychological effects of football training in small groups of 10-20 participants who had limited skills and experience, and found that reduced numbers in training made the activity substantially more fun and rewarding (Parr & Oslin, 1998).

Fitness components such as strength, speed, flexibility and aerobic capacity have all been found to improve through SSG, as well as decision-making skills, thereby enhancing players' technical and tactical performance (Aguiar et al., 2012). The Team Performance Assessment Procedure (TPAP) (Grehaigue & Godbout, 1997) provides information

that quantifies offensive performance in selected invasion sports which reflect both technical and tactical characteristics of successful game play, making it a valid measurement of player performance. Köklü, Aşçı, Koçak, Alemdaroglu & Dündar (2011) have suggested that individual constraints need to be appreciated in order for modified aspects to have a positive effect on performance and allow for progression from SSG to the full-sided game (McCormick et al., 2012).

SSG are a viable example of how the constraints-led approach to acquisition of movement and decision-making skills enables coaches to heighten the capacity of players to perform in elaborate performance environments (Almeida et al., 2013; Davids, Araújo, Correia & Vilar, 2013). In netball, SSG allow the game to slow in pace and momentum in order to increase game appreciation and tactical awareness. Dyson et al. (2004) suggested that coaches should view SSG as developmental building blocks for progression to the advanced form of the game. The objective of the present study is to determine whether using modified games with young netballers improves player perception and performance, as well as cognitive, physical and social attributes, when compared to the traditional game.

METHODS

Participants

The 56 participants in the study were all in Years 5 & 6, and were drawn from the five constituent netball zones in New Zealand: Central, Northern, South, Mainland and Waikato. Each team consisted of six players, with rolling substitutes. Positions in the six-a-side game comprise two attackers, two links and two defenders. For the purposes of analysis, in this study 'C' was classified as a link player. The competency of participants varied significantly; some had been playing for two years at club level, while others were novices. Each participant (and parent) was informed of the study's purpose before filming and data collection commenced, and gave their consent to Netball New Zealand (NNZ). Inclusion criteria were that the participant was a playing member of their Years 5 & 6 team in the Netball NZ six-a-side competition.

Procedure

All matches were filmed during 2015 in a six-week segment. Each quarter lasted eight minutes, in which rotations of positions occurred. While the six-a-side game is played on a traditional court (30.5m x 15.25m), it uses different rules and equipment compared to the traditional game:

1. Centre pass goes to the non-scoring team
2. Time with ball increases from 3 seconds to 5 seconds
3. Link from each team stands on sideline of centre third during centre pass
4. Goal posts are lowered to 2.6m from 3.05m
5. Size 4 ball is used instead of size 5

A five-minute period was selected from each quarter (N=88) using Sportscode Elite analysis software (Sportscode Elite™, Hudl, USA), in order to be consistent with previous research. The data is presented as a complete total, by zone (N=5) and position (N=3).

The performance indicators measured were:

Fast

Passing (completed, intercepted, too high, too wide, to opposition, to nowhere)

Shooting (successful, unsuccessful)

Whistle blows (frequency)

Transition (uninterrupted passing of ball from end to end)

Focus

Engaged (player watching the players or ball)

Distracted (player watching crowd, sky – i.e., not the players or ball)

Change (TPAP)

Gaining possession (conquered and received ball)

Disposing of ball (offensive ball, lost ball, neutral ball, successful shot)

Motivation

Autonomy

Relatedness

Competence

Statistical Analyses

All data were reported as mean \pm standard deviations. Precision of estimation was indicated with a 95% confidence interval. The criteria for interpreting effect sizes were < 0.2 (small), < 0.6 (moderate) and > 1.2 (large) (Thalheimer & Cook, 2002). The frequency of whistle blows, passes completed and passes high/wide were measured, and the one-way between group analysis of variance (ANOVA) was used to determine significance. A Kruskal-Wallis test was used to determine if the frequency of transitions, passes intercepted, passes to nowhere, player engagement and distraction, as well as successful and unsuccessful shots, were significantly different. A t-test was performed on the basic motivational needs of all the players and the motivation among the zones to see if statistical differences occurred. Data was assessed for normality by inspecting the skewness, kurtosis and Shapiro-Wilk statistic. Statistical analyses were performed using the software package IBM SPSS Statistics (Version 22), and statistical significance was set at $p < 0.05$.

RESULTS

Table 1 shows the descriptive data for the key variables for themes, 'Fast' and 'Focus.' Cohen's practical effect size values for whistle blows, transitions and engagement suggest a high significance, whereas the effect size values for successful and unsuccessful shots suggest a moderate practical significance.

Variables	Mean ± S	P value	%95 CI	ES
Frequency of whistle blows	5.14 ± 2.97	0.341*	3.79 to 7.37	1.98 W & S
Frequency of full-court transitions	2.7 ± 1.61	0.053	1.81 to 4.19	1.23 S & N
Passes complete (zone)	14.6 ± 5.43	0.123*	13.13 to 16.94	0.65 C & W
Passes intercepted (zone)	3.05 ± 2.09	0.046*	2.12 to 4.39	1.06 W & S
Successful shots	0.93 ± 1.82	0.938	0.61 to 1.32	0.38 M & S
Unsuccessful shots	0.77 ± 1.42	0.697	0.5 to 1.03	0.36 M & W
Passes complete (position)	14.6 ± 5.43	0.001#	11.13 to 18.06	0.82 D & L
Passes intercepted (position)	3.05 ± 2.09	0.001#	1.03 to 5.08	0.78 A & L
Engaged (zone)	99.4 ± 55.4	0.02*	59.69 to 139.11	1.2 C & N
Distracted (zone)	8.35 ± 7.01	0.028*	5.73 to 11.08	1.01 W & N

Table 1. Mean ± S, P values, ES and precision of estimation with %95 CI for the frequency of whistle blows, full court transitions, passes complete and incomplete for zones and positions, successful and unsuccessful shots, plus engagement and distraction for zones. ES= effect size, CI= confidence intervals. *significant at $p < .05$; #significant at $p < .01$
Key: S= South, W= Waikato, C= Central, M= Mainland, N= North, D= Defence, A= Attack, L= Link

FAST

Spatial Distribution, Whistle Blows and Transitions

The visual representation of spatial distribution in Figure 1 suggests that players were maintaining an even distribution throughout the game, thus providing an environment for players to learn the skills relating to a balanced court. One-way ANOVA results revealed that the frequency of whistle blows was not statistically significant ($p = .102$), indicating that stoppage time was not influenced by zone.

A Kruskal-Wallis test indicated that there were no significant statistical differences between the zones for the number of transitions.

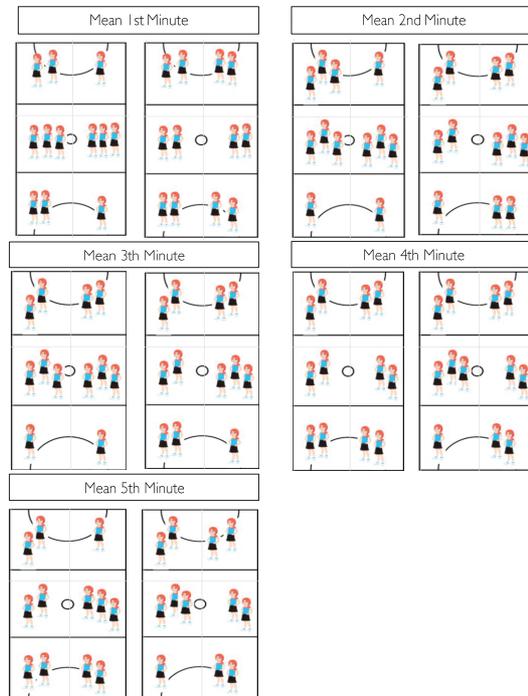


Figure 1. In order to understand the spatial distribution of the players in the 6v6 game, an average snapshot of player position was calculation every 30 seconds for a five-minute period

Passing and Shooting

Pass completions between positions were statistically significant ($F(2, 138) = 8.321, p = 0.001, \eta^2 = .101$), with link players having notably more completed passes. There were no significant differences in the number of completed passes between zones ($F(4, 132) = 1.848, p = 0.123, \eta^2 = .052$). Significant differences occurred in passes high/wide between zones ($F(4, 136) = 3.841, p = 0.005, \eta^2 = .101$). Intercepted passes between player positions were significantly different ($p = .001$); interceptions of link ($U = -34.128, z = 4.105, p = .001$) and defence ($U = -20.191, z = 2.429, p = .015$) passes were significantly higher than those of attack. Likewise, significant differences were found between the zones for passes intercepted ($p = 0.046$); Waikato had significantly fewer interceptions ($U = -42.229, z = -2.964, p = .003$) than South. Passes to nowhere showed significant differences ($p = 0.023$); North had significantly fewer passes to nowhere ($U = -23.641, z = 3.032, p = .002$) than South. No significant differences occurred between the zones for the frequency of successful ($p = 0.938$), and unsuccessful shots ($p = 0.697$).

Change

The Team Performance Assessment Procedure (TPAP) (Bouthier, Grehaigne & Godbout, 1999) utilised in Figure 2 suggests that there is more involvement from players when playing the 6v6 format, as opposed to the traditional game.

While variations were seen among zones when analysing performance score, efficiency and volume of play index, players from North scored highly on all categories of the index.

Focus

Player distraction (PD) exhibited significant differences between zones ($p= 0.02$); PD in Waikato was significantly greater ($U=21.409, z=2.998, p= .002$) than PD in the North.

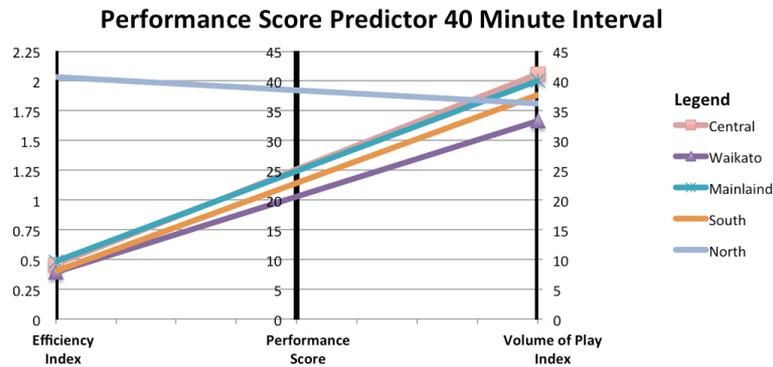


Figure 2. TPAP performance, efficiency and volume of play- average scores per player per 40 minutes of game play by zone (2015, 6v6)

Significant differences occurred for player engagement (PE) between zones ($p= 0.028$); PE in Central was significantly greater ($U=20.50, z=2.926, p= .003$) than PE in the North. Nonetheless, no significant positional differences for the frequency of engaged ($p= 0.365$) and distracted behaviour ($p= 0.431$) were apparent.

Motivation

A t-test was performed on the basic motivational needs of all players among zones; analysis shows that statistical differences occurred (Table 2).

Formats	Zones									
	North		Central		Mainland		Waikato		South	
	(N = 36)		(N = 86)		(N = 54)		(N = 27)		(N = 25)	
	M	SD	M	SD	M	SD	M	SD	M	SD
Competence (6v6)	36.81	3.58	33.56	5.51	29.77	7.40	31.19	4.57	34.96 [#]	3.65
Competence (7v7)	36.81	3.58	33.56	5.51	29.77	7.40	31.19	4.57	29.73 [#]	6.38
Autonomy (6v6)	36.17	6.36	32.21 [*]	5.45	31.28	7.26	34.37 [*]	5.65	34.08 [#]	3.46
Autonomy (7v7)	37.86	4.22	34.62 [*]	6.44	29.04	6.71	27.69 [*]	6.45	28.96 [#]	7.78
Relatedness (6v6)	49.81	4.26	48.61	6.94	41.22	9.78	44.01	7.72	47.92 [#]	4.79
Relatedness (7v7)	50.02	6.78	49.68	7.81	44.10	8.41	41.31	9.38	39.08 [#]	12.06

Table 2. Mean motivation scores, 6v6 zone and 7v7 zone. *significant at $p < .05$; #significant at $p < .01$

Results suggest that 6v6 players in the South are more likely to enjoy higher levels of intrinsic motivation. However, players in Central possess a greater level of autonomy in the traditional 7v7 format of the game, in contrast to the perspective of the players from the Waikato zone.

DISCUSSION

The aim of this study was to determine whether modified games give players greater individual time to perform varied tasks and opportunity to explore their skills. One question to be addressed is whether modified games are in effect simplified games, with long-term benefits for players.

The analysis shows that the six-a-side game is fast-paced, and allows for all positions to experience a high frequency of ball contacts compared to the traditional game. Prevalence of ball contacts is a dominant factor in player development (Piñar, Cárdenas, Alarcón, Escobar & Torre, 2009), due to its positive relationship with high levels of engagement, intrinsic motivation and enjoyment (Toh, Guelfi, Wong & Fournier; 2011). These findings are backed up

by the results of our study. Training with the 6v6 game allows a coach to incorporate a high frequency of turnover and ball contacts per player, while developing their tactical and technical movement patterns; in the traditional game, opportunities for 'end' players are reduced. The modified game is beneficial in providing occasions for adapting movement patterns to the varied and dynamic conditions of competition (Hodges, Edwards, Luttin & Bowcock, 2011).

In terms of focus, we found that players had greater periods of time when they were engaged and less time distracted compared to the traditional game. The greater length of engagement allows players to develop their decision-making and anticipatory skills, thus having a positive impact on their development. It's important that player attention be focused on both the ball and the movements of the opposition, which in turn will help players become more proficient at making decisions, able to predict outcomes, read the game and anticipate their opponents' intentions (Mann et al., 2007).

The analysis of the TPAP results suggests that players in SSG have more opportunities to practice passing, shooting and intercepting, resulting in a greater involvement in the game compared to the traditional format. The skills used in making appropriate decisions have been found to be an important step on the road to developing player excellence (Baker, Cote & Abernethy, 2003).

Based on the Basic Needs Satisfaction Questionnaire, we found that players in the South were more intrinsically motivated than other zones. This could be a result of the fact that players get more time on the ball, which allows them to bed in skills and develop further as netball players, consequently providing them with the motivation to succeed. These results are consistent with those of Flanagan and Merrick (2013), who suggested that improvement in technical and tactical skills as the result of increased motivation is one outcome of small-sided games.

This study has some limitations in relation to the ability of the players who participated. The players were of varying ability levels – some had been part of a team which trained and competed regularly, while others were novices to netball. As the rule of rotation was not upheld by all zones, players often played in their preferred positions and did not experience the variation which the six-a-side game offers.

Future research could consider the positive influence of 'upskilling coaches' as a way of reducing the variation found between zones. The differences found in passing, interception and efficiency levels may have been particularly noticeable in the 6v6 format due to the greater frequency of ball contact and transitions in SSG.

Practical recommendations for coaches include modifying the training environment (Davids, 2010), using an approach which emphasises the skills required for each position in the rotation. This non-linear approach will enable greater individual learning from a given performance, from the cognitive and affective perspectives.

CONCLUSION The results of this study support the view that, as a modified form of the game, six-a-side can provide a viable supplement to traditional netball. The modifications involved both simplify the game and also speed it up, creating pressures and decision-making demands which appear to be consistent with the game at the higher level, all in a motivational context. As a developmental game, six-a-side is not perfect; passing and engagement data suggests that it favours link players. Variations or rule changes need to address this bias. In general, this research emphasises the value of modifying games for the benefit of developing players. This approach is not exclusive to six-a-side, but rather a concept that merits greater emphasis in the development of coaches at all levels.

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Sandra Wolf completed a BSc (Hons) in sports psychology and coaching sciences at Bournemouth University. She worked as a research assistant in the SPRINZ Performance Analysis Research Group during her placement year at Bournemouth. Sandra was part of the AUT research team that worked with Netball New Zealand to redesign the NZ Junior Development Programme (ANZ futureFERNs) to provide an effective learning pathway into Ferns netball. Her responsibilities included disseminating information in several formats, including the Netball NZ website, and presentations to the coaching board of Netball NZ.

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Case Study

THE 2016 WAIMATE PROJECT: A REFLECTION ON COMMUNITY BASED LEARNING WITH UNDERGRADUATE MASSAGE STUDENTS

Jacky Keen

Background

The 2016 Waimate Project was born out of a philanthropic willingness to share life-long learning regarding massage and fitness expertise, and fostering collaborative community engagement. Waimate Harriers Toc H Club successful application to Waimate District Council Sports Grant for funds to provide room hire, resources and advertising launched the 2015 school holiday pilot workshop and set the community based learning project in motion. Residents Jacky Keen – a Remedial Massage therapist and Otago Polytechnic Massage Programme lecturer - teamed her skills with Geoff Lienert - a Masters' athlete and Waimate Civic Awardee (acknowledged in 2015 for his lifelong Harriers, Cycling and Athletics clubs volunteering mentoring and coaching).

The Waimate Project was underpinned by a case-based approach to learning, which engages students in discussion of specific scenarios that resemble or typically are real-world examples. This approach is learner-centred, typically with intense interaction between students and other participants (e.g. community, peers) as they build their knowledge and work together as a group to examine the case. Benefits of CBL include the development of intrinsic and extrinsic motivation; self-evaluation and critical reflection; use of scientific inquiry; integration of knowledge and practice, and the development of learning skills (Barrows & Tamblyn, 1980; Schmidt, 2000)

Workshop

The project team developed and ran a school holiday pilot workshop in 2015, targeting local senior school students and community members. The two-hour experiential workshop demonstrated the benefits of combining foundation skills massage and stretch.



Figure 1. Identified the target muscles. Photo credit: Jacky Keen

Before demonstrating, Jacky and Geoff identified the target muscle by drawing its location onto Geoff's thigh. The stretch technique, Facilitated Stretching, a step-by-step method accessible to everyone, can improve flexibility and reduce overuse injuries that result from muscle fatigue. Using the science behind PNF stretching, assessment of muscle function is made easy. (McAtee, Robert E. 2014)

On-going development for the 2016 Waimate Project was inspired by reflection on participant engagement and the positive feedback received:

'It was a really enjoyable, informative afternoon. Would be very interested in future workshops'

'It was good because I liked how we worked out the muscles and it could go on a bit longer to really get the gist of it.'

'Amazing, I learned a lot. It's going to be great to use the techniques in the future. Thanks heaps!'

'Really good I learnt a lot of new things about stretching my body and keeping fit.'

'Awesome!'

'It was a fantastic course, informative and useful. I will be putting it into practice before I do any sport. Thank you.'

'Self-Massage and Facilitated Stretch' module

Following the success of the workshop, the 20-hour 'Self Massage and Facilitated Stretch' module was developed, quality assured through Aoraki Polytechnic. Support from the 2016 Aoraki Foundation Endowment Fund (www.aorakifoundation.co.nz) enabled the delivery of two day Waimate-based workshops. Otago Polytechnic Undergraduate Massage students were recruited to host and participate as facilitators.

The project brought people together in a way that modelled the Mental Health Foundation's 'Five Ways to Wellbeing' framework, which is built on the following principals: *Give; Connect; Take notice; Keep Learning; and Be Active* (www.mentalhealth.org.nz).

The interaction with the community and positive feedback was highly validating and empowering for Massage students. As project Coordinator, it was empowering to see the reciprocity between campus and community. The undergraduate massage students shone in their roles, making new connections and reporting sense of belonging and a feeling of having made a genuine contribution to the community.

Moving forward

The success of these pilot projects, has led to further plans to increase student involvement in the future. One idea is to enable students to deliver short training modules in their own communities, such as the 'Self Massage and Facilitated Stretch' level 2 workshops. This would help students to continue to build emotional connections, and inspire others in their own communities.

The project coordinators - Jacky and Geoff - believe there are many new project-based rich learning experiences and insights to be created for students and from which case-based learning will inspire case reports, influence future case studies and research. This could include:

- Fostering health, fitness and companionship;
- Raising awareness of the benefits of massage and stretching; and
- Improving physical condition and renew a sense of well-being.

Otago Polytechnic Massage Programme students experienced case based massage learning at Waimate Therapeutic. Clients were most willing for students to observe their treatment sessions, for students to practice under supervision and to give rich and insightful feedback. One such elderly gent said, "I'm happy you can learn from what is happening for me." as he walked away from the trainee moving more freely, stronger, eased from pain, and much less anxious about losing his independence just yet.

On the back of the success of the 2016 Waimate Project, the project coordinators have secured a further pilot project within the community - entitled 'student self-managed project' - for second year undergraduate massage students' to deliver on-site chair massage for Dunedin MSD office staff. Student employment opportunity was created and on-going potential for future student work experience 'Case Reports' and 'Client Feedback Surveys'.

Jacky Keen is a lecturer in the Department of Physical Activity & Wellbeing at Otago Polytechnic. In 1990 and 1991, Child Cancer Foundation Scholarships helped Jacky to step aside from tertiary teaching at Auckland Technical Institute and retrain in counselling, shiatsu, aromatherapy, reflexology and massage. Jacky founded remedial massage therapy clinic Waimate Therapeutic. She specialises in resolving clients' chronic myofascial pain and dysfunction, bringing hands-on experience to her teaching. Jacky strives to broaden her student's critical thinking skills, in part through involvement in their own communities. In 2016, Jacky received the Otago Polytechnic Student Council Staff Awards' Excellent Support Award.

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COMPARISON OF BLOOD LIPIDS, BMI LEVELS AND HbA1c LEVELS AMONG VEGANS, OVO-LACTO VEGETARIANS AND OMNIVORES

Stephanie Bond, Pounamu Gardiner, Megan Gibbons, Richard Humphrey and Pete Eley

INTRODUCTION

Lifestyle diseases are becoming a growing epidemic within New Zealand. The average New Zealander has a cholesterol level of 5.7 mmol/L – significantly higher than the Heart Foundation's recommended levels of less than 4.0 mmol/L (The Heart Foundation NZ). Meanwhile, more than seven percent of New Zealanders have diabetes (Maori Diabetes NZ). This is consistent with global upward trends in the number of diabetes cases.

Both lifestyle diseases are firmly rooted to diet. Many foods consumed in New Zealand, such as fatty meats, full fat dairy products, biscuits, cakes, pastries and fried takeaways are high in saturated fats, which raise cholesterol levels (National Cholesterol Education Program NZ). This dietary pattern is one of the most important dietary risk factors for obesity and other lifestyle diseases (Lee & Krawinkel, 2009).

In this study, blood lipids, BMI and HbA1c were compared to determine which dietary category was most beneficial in preventing lifestyle diseases. Blood lipids are all the fatty substances in the blood including cholesterol and triglycerides (National Health Service Report UK). BMI is calculated by dividing weight in kilograms by the square of height in metres (kg/m^2), and provides a measure of weight adjusted for height (www.health.govt.nz). HbA1c measures average blood glucose over the previous four to six weeks (Diabetes NZ).

To offer clarification on the differences between the three dietary groups, adherence to a vegan diet excludes eggs, milk, meat, poultry, seafood and by-products of animal slaughter. An ovo-lacto vegetarian diet excludes meat, seafood and poultry, while omnivores consume both plant and animal products (Huang et al., 2014; Larsson & Johansson, 2002).

While the downsides of an omnivorous diet rich in saturated fat are well documented, so too are the factors in favour of a vegetarian diet, also known as ovo-lacto vegetarianism (Chaudhuri et al., 2013; Tonstad et al., 2009). However, evidence for the health benefits of a vegan diet in preventing lifestyle diseases is not as readily available.

As a result, a research gap exists in analysing the benefits of each diet and assessing whether one is more effective than another in achieving better health. Filling this gap is important, as it may help inform the public to make better decisions about the food they eat. The only relevant study conducted in Otago was published over 15 years ago (Harman & Parnell, 1999). The following section describes the nutritional status of vegetarians and vegans, before discussing the methods, results and analysis of the study.

Nutritional status of vegetarians and vegans

The Ministry of Health states that a vegetarian (including vegan) can get all their essential nutrients from food without eating animal products (www.health.govt.nz). Vegetarian diets are usually rich in carbohydrates, n-6 fatty acids, fibre, carotenoids, folic acid, vitamin C, vitamin E and magnesium, and relatively low in protein, saturated fat, long chain n-3 fatty acids, retinol, vitamin B12 and zinc. Vegans may have low intakes of vitamin B12 and calcium (Key, Appleby, & Rosell, 2006). Vegetarian diets are associated with health benefits because of their high fibre content and reduced saturated fat content. Vegan diets contain less saturated fat and cholesterol and are usually higher in iron and dietary fibre whilst containing fewer calories (Craig, 2009). A matched samples study which investigated the nutritional status of vegetarians and omnivores found that total energy intake was not significantly different between dietary categories. Vegetarians had lower sodium intake and higher calcium, zinc and iron intake compared with non-vegetarians (Deriemaeker et al., 2010). Individuals following plant-based diets typically consume fewer calories, less saturated fat and cholesterol and have lower BMIs than non-vegetarians. They also consume more fibre, potassium and vitamin (Trapp & Levin, 2012). Vegetarians usually consume more fruits and vegetables than omnivores while restricting animal products, providing a lower intake of saturated fatty acids and increased fibre compared to omnivores (Kim, Cho & Park, 2012).

Blood Lipids

Previous studies have shown that individuals consuming vegetarian or vegan diets have lower blood lipid levels, especially LDL and TG, compared with omnivores. When comparing TC, LDL, HDL and TG between vegetarians and omnivores, vegetarian diets were associated with lower levels (De Biase et al., 2007). A review of 27 randomised controlled and observational trials concluded that plant-based eating patterns including nuts, soy and/or soluble fibre can reduce LDL levels by 25-30%, an amount comparable to cholesterol-lowering drugs (Ferdowsian & Barnard, 2009). A 2012 study indicated that long-term vegetarians had significantly lower blood lipid levels than omnivores (Kim, Cho & Park, 2012). Low-fat, plant-based diets have shown effectiveness in reducing LDL levels and result in significant reductions in cardiovascular events and disease risk (Trapp & Levin, 2012). A study of lipid profiles of vegetarian and non-vegetarian women found increases in TC, TG, LDL and cholesterol/HDL ratio in women on the non-vegetarian diet (Chaudhuri et al., 2013). In contrast, a study comparing lipid profiles of female vegans, ovo-lacto vegetarians and omnivores showed that vegans had significantly lower HDL and higher TG, LDL and TC compared with omnivores (Huang et al., 2014). A hospital-based survey of healthy adults showed that vegetarians had lower TC and LDL levels than omnivores, demonstrating that the consumption of a vegan diet or ovo-lacto vegetarian diet lowers cardiovascular disease risk (Chen et al., 2007).

BMI

Studies of Western vegetarians have consistently reported that vegetarians have lower BMIs than comparable non-vegetarians, and that the proportion of vegetarians who are obese is correspondingly lower than that among non-vegetarians (Key, Appleby, & Rosell, 2006). In contrast, Lee et al. discovered that vegetarians had significantly higher body weight and BMI than omnivores; the median BMI of both vegetarians and omnivores fell into the normal range (22.6 vs 20.7 kg/m²). The prevalence of underweight (BMI < 18.5 kg/m²) cases in the omnivore group was higher than the vegetarian group, while the vegetarians showed tendencies of pre-obesity (25.0-29.9 kg/m²; Lee & Krawinkel, 2009). A 2009 study found that mean BMI was lowest in vegans (23.6 kg/m²), slightly higher in lacto-ovo vegetarians (25.7 kg/m²) and highest in non-vegetarians (28.8 kg/m²; Tonstad et al., 2009). The protective effects of vegetarian diets against being overweight may be due to avoidance of major food groups or displacement of calories toward more satiating food groups (Tonstad et al.). Kim et al. found that the median BMIs of vegetarians were lower than those of omnivores, and that body fat was significantly lower in vegetarians (21.6%) than in omnivores (25.4%;

Kim, Cho & Park, 2012). In observational studies, vegans and vegetarians are slimmer than non-vegetarians. When vegan and vegetarian diets are used in clinical trials, they produce significant weight loss. Notably, weight loss occurs in the absence of intentional calorie restriction even when exercise remains constant (Trapp & Levin, 2012). A large study cited by Kim et al. involving 38,000 participants showed that, in comparison to meat-eaters who consume a small amount of fibre, vegetarians (particularly vegans) have significantly lower BMIs (Kim, Cho & Park, 2012). Significant increases in BMI were also found in women consuming a non-vegetarian diet (Chaudhuri et al., 2013).

HbA1c

The World Health Organization projects that diabetes will be the seventh leading cause of death in 2030 (World Health Organization). In 2004, an estimated 3.4 million people died from consequences of high fasting blood sugar levels (WHO). A 2006 study that matched vegetarians and non-vegetarians found that non-vegetarians had higher insulin and glucose values (Valachovičová et al., 2005). Three biological factors may explain why a low-fat, plant-based diet can be effective for glycemic control: foods from plants contain less total and saturated fat, resulting in reduced caloric intake, weight loss and improved A1c levels (Barnard et al., 2006). Several observational studies have shown that the overall glycemic load and/or glycemic index of a diet is positively associated with the risk of type 2 diabetes (Waldmann, 2007). Tonstad et al. discovered that as consumption of animal products increased, so did the prevalence of diabetes, ranging from 2.9% in vegans to 7.6% among individuals with unlimited consumption of animal products (Tonstad et al., 2009). A plant-based diet can reduce the risk of developing type 2 diabetes and, for individuals who already have diabetes, a low-fat, plant-based approach has shown effectiveness for metabolic control (Trapp & Levin, 2012).

METHODS

Participants

The first 20 individuals who made contact in each dietary category, and who met the inclusion and exclusion criteria, were selected as participants.

Data Collection

Anthropometric measurements using segmental multi-frequency-bioelectrical impedance analysis (Tanita BC-418). Height was measured to the nearest 0.1 cm. BMI of the participants who had fasted overnight was calculated by the Tanita BC-418, which measures body composition using high-frequency current (50 kHz; www.tanita.com).

Blood sampling, lipid profile measurements and HbA1c measurements. Finger-prick blood samples were collected using a single-use, disposable blood lancet and results read by the Cobas b 101 instrument.

Data analysis

The Cobas b 101 instrument has specific measuring ranges for TC (1.28 – 12.95 mmol/L), TG (0.50 – 7.35 mmol/L) and HDL (0.38 – 2.60 mmol/L). LDL results are a calculated value which uses the Friedwald formula ($LDL = TC - HDL - TG/2.17$; Friedwald, Levy & Fredrickson, 1971). If a TC, TG or HDL result was out of the measuring range, 'Hi' or 'Lo' was displayed. To obtain a numerical figure, a number was entered just outside of the measuring range. Where a 'Lo' result was indicated for TG, a result of 0.49 was entered. Where a 'Hi' result was indicated for HDL, a result of 2.61 was entered. Where LDL could not be determined by the Cobas b 101 instrument, a result of 'N/A' was displayed and a numerical figure was obtained using the Friedwald formula.

A one-way between dietary groups multivariate analysis was performed to investigate dietary differences in TC and HbA1c. Two independent variables were used – TC and HbA1c. The independent variable was diet. This was broken down into vegan, ovo-lacto vegetarians and omnivores. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance–covariance matrices, and multicollinearity, with no serious violations observed.

RESULTS

Selected characteristics, mean BMI, TC and HbA1c of each dietary group is shown in Table 1. Sixty-one participants were tested. In the vegan dietary category, the mean age was 27.1 years with a ratio of 6:13 male to female, mean BMI = 24.20, mean TC = 4.22 and mean HbA1c = 31.84mmol. In the ovo-lacto vegetarian dietary category, mean age = 28.5 years with a ratio of 4:18 male to female, mean BMI = 22.55, mean TC = 4.50 and mean HbA1c = 32.45mmol. In the omnivorous dietary category, mean age = 25.8 with a ratio of 5:15 male to female, mean BMI = 25.11, mean TC = 4.52 and mean HbA1c = 33.30mmol.

Variable	Vegan n= 19	Ovo-Lacto Vegetarian n=22	Omnivore n= 20
Age Mean (s.d)	27.1	28.5	25.8
Male:Female	6:13	4:18	5:15
BMI Mean (s.d)	24.20	22.55	25.11
Total cholesterol Mean (s.d)	4.22	4.50	4.52
HbA1c Mean (s.d)	31.84	32.45	33.30

Table 1. Characteristics and BMI, total cholesterol and HbA1c by diet group

Physical Activity Category	Number
None	3
1-2 per week	5
2-4 per week	21
5-6 per week	17
7+ per week	15

Table 2. Physical activity frequency per week

Education level	Number
High School	18
Tertiary Certificate	5
Tertiary Diploma	6
Tertiary Bachelor's Degree	22
Tertiary Master's Degree	10

Table 3 Highest education level.

There was no statistical difference between vegans (n=19), ovo-lacto vegetarians (n=22) and omnivores (n=20) on the combined dependent variables, $F(4, 114) = 1.01, p = .405$; Wilks Lambda = .933; partial eta squared = .034. No differences reached statistical significance.

DISCUSSION

This study showed that a vegan, ovo-lacto vegetarian or omnivorous diet had no statistically significant effect on blood lipids, BMI or HbA1c levels. In this sample group of 61 participants, the mean age was 27.1 in the vegan dietary category, 28.5 in the ovo-lacto vegetarian group, and 25.8 in the omnivorous dietary category. This may be due to the age inclusion criteria of 18-45 and a sizeable proportion of the subjects being students (60.05%). The study was conducted in Dunedin, New Zealand – a university city that has a mean age of 35.0 years, lower than the national mean age of 35.9 (www.stats.govt.nz). A national survey of New Zealanders' health found that Dunedin residents consume the second-lowest amount of takeaways. Just 19% of Dunedinites ate fast food two or more times every week, compared to 34% of Aucklanders (www.southerncross.co.nz). Our study was similar, with only 18% of participants consuming takeaways one to two times per week or more. Further research which compares dietary categories across different regions of New Zealand is justified.

Our findings showed no significant difference in BMI between the dietary categories. This opposes a study which had a sample size of 1694 participants and where their mean BMI differed significantly between dietary groups; vegans had a lower mean BMI, with a much higher proportion of vegans having a BMI less than 20 (Bradbury et al., 2013). Other studies of Western vegetarians have reported that vegetarians have lower BMIs than comparable non-vegetarians (Key, Appleby, & Rosell, 2006; Tonstad et al., 2009). Trapp et al. (2012) and Chaudhuri et al. (2013) had similar findings, with vegans and vegetarians being slimmer than their meat-eating counterparts. However, a valid discussion point is that BMI is not a perfect measure of body composition (Bradbury et al.). Future studies comparing dietary categories should investigate more detailed body composition measures such as body fat percentage.

One limitation of our sample group could be due to participants being interested in their health and obtaining a free health screening. Our participants could reflect a sample of healthy, young individuals. As well as no statistically significant differences in BMI, there was no statistical difference in blood lipid levels between the dietary categories. The mean total cholesterol levels across all groups in our study (vegan = 4.22 mmol/L, ovo-lacto vegetarian = 4.50 mmol/L and omnivore = 4.52 mmol/L) were lower than the New Zealand average of 5.7 mmol/L (www.ncepnz.co.nz). A 1998 study compared vegetarians and omnivores and found that lipid levels for both dietary groups were

lower than what could be observed for the New Zealand population. No significant differences in blood lipids between the two dietary groups were found (Harman & Parnell, 1999). A cross-sectional study comparing blood lipids among vegans and vegetarians found that vegans had a significantly lower HDL level than omnivores; however, all other lipid levels were comparable to an omnivorous diet (Huang et al., 2014).

Our participants were very physically active; 34.42% exercised three to four times per week, 27.86% five to six times, and 24.59% exercised seven or more times per week. Only 4.91% of participants did not participate in any weekly exercise. South Islanders are much more likely to be physically active (73%) than the national average (54%; Ministry of Health NZ). Physically inactive people are more likely to develop heart disease and diabetes, for which blood lipids and HbA1c are precursors (Ministry of Health NZ). A 2012 study investigating the effects of exercise on blood lipids in persons with varying dietary patterns found that, independent of diet, exercise had a beneficial effect on blood lipids (Huffman et al., 2012).

Reports from cross-sectional studies provide compelling evidence for the positive influence of physical activity and exercise on blood lipids (Durstine et al., 2001). Blood lipid profiles of physically active groups reflect a reduced risk of cardiovascular disease when compared with their inactive counterparts (Durstine et al.). However, the same authors also suggest that those who are physically active exhibit lower levels of TC and LDL than those who are less active. Further research comparing active and inactive vegans, ovo-lacto vegetarians and omnivores, determining if both dietary group and physical activity contribute to a lower blood lipid profile, is warranted.

All participants had normal HbA1c levels. HbA1c measures the average blood glucose over the previous four to six weeks, with less than 53 mmol/L being very healthy (Diabetes New Zealand). Both aerobic and resistance exercise are associated with decreased risk of type 2 diabetes (Warburton, 2006). Each increase of 500 kcal (2100 kJ) in weekly energy expenditure is associated with a decreased incidence of type 2 diabetes of 6% (Helmrich et al., 1991). A high proportion of our sample was regularly physically active, which may have contributed to their healthy HbA1c levels.

Education level may have also influenced healthy blood lipids and HbA1c levels; 70.49% of participants held tertiary level qualifications, with 36% having bachelors degrees and 16% having masters. Individuals with higher education have reported less acute and chronic diseases such as heart disease, diabetes, raised cholesterol and strokes (Cutler & Lleras-Muney, 2006). The magnitude of the relationship between education and health is varied but large; completing an additional four years of education reduces the risk of heart disease by 2.16% and diabetes by 1.3% (Cutler & Lleras-Muney).

CONCLUSION

There were no findings of statistical significance when comparing blood lipids, BMI or HbA1c among vegans, ovo-lacto vegetarians and omnivores in this study. Our results suggested that following a vegan, ovo-lacto vegetarian or omnivorous diet had comparable benefits in preventing lifestyle diseases. Physical activity levels, age, education and region may have been confounding factors that influenced the results. Further research comparing physical activity, education and region among each dietary category is warranted.

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Peter Eley has spent the last 20 years blending his passion for the outdoors with a passion for education. During this time, he has carved out a niche for himself at Otago Polytechnic, where he has worked as a lecturer for the past 13 years. He continues to teach in the outdoors, but is also involved in student training and research supervision in the health and wellness area at the Polytechnic.

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WORKPLACE WELLNESS AT OTAGO POLYTECHNIC

Pete Eley, Simon Middlemas and Megan Gibbons

INTRODUCTION

Preventable health conditions such as heart disease, diabetes and cancer are the leading causes of death in NZ and are costly in terms of individual and societal health. If one's health and wellness are out of balance, health problems such as obesity, diabetes, cardiovascular disease, stroke, and cancer may become prevalent; there are also reduced levels of quality of life (van Oostrom, Smit, Wendel-Vos, Visser, Verschuren and Picaved, 2012). Cardiovascular disease is the leading cause of mortality in New Zealand. Mortality statistics show that 45% of female deaths and 43% of male deaths in 2008 were caused by CVD. The research shows that workplace wellness programmes can be beneficial to both employee and employers (Australasian College of Physicians (2013)). When comparing employees who are physically active with those who are non-active it was found those who engaged in physical activity had 20 days less sick leave (Proper et al., 2006). We also have a workforce that is ageing and becoming more diverse so we need to be ready to respond to their needs. These factors can impact on business through injury, illness and absenteeism that ultimately reduce productivity. People's work impacts on more than just their physical health as social, emotional and spiritual factors contribute to our overall health and wellbeing. With most employees spending a large proportion of their day at work, the workplace is an ideal setting to promote health and wellbeing, potentially contributing towards employee productivity, motivation and quality of life. Employers are starting to take an approach towards employee's health status and have introduced benefits and schemes that aim to improve physical activity and health.

Workplace wellness

Workplace health promotion is defined as any employer initiative directed at improving the health and well-being of workers and/or their dependents (Goetzel & Ozminkowski, 2008). Research found that the implementation of a workplace wellness programme could increase productivity, reduce absenteeism and stress (Ricci and Chee, 2005). Employee's health status improves which creates a positive environment resulting in a happier and more engaged workplace. Many hours of the day are spent in the workplace therefore it is a significant part of an individual's life. Statistics show that from March 2012 and June 2013 New Zealanders spent on average 52 hours a week at work (NZ Ministry of Health, 2013). This makes up just over 30% of an individual's week. A New Zealand report on 'Wellness in the Workplace' found that New Zealand lost around 6.1 million working days to absence in 2012 (Business NZ, 2013). Organisations who promote health and wellness may become increasingly competitive, by increasing productivity, lowering absence rates and increasing savings per employee (Wellness in the Workplace). With the high cost of sourcing external health and physical activity advice, employees are more likely to participate in a funded workplace wellness programme (Toker & Biron, 2012). Employees would also prefer to use time at work, rather than high valued personal time (Toker & Biron). Benefits of targeting the working population include; individuals are able to be targeted before disease develops, time and travel can be negated due to being onsite, there is already communication between employees and employers, the setting is non-evasive and can be manipulated to suit the employee's needs and provides opportunity for encouragement and support among peers

(Novak, Bullen, Howden-Chapman, & Thornley, 2007).

The Springin2it! Workplace Wellness Programme 2010-2015

Spring in2it! is a workplace wellness programme established by Otago Polytechnic in 2010. It is a 10-week, web-based scheme, which involves an event calendar for staff to participate in to improve physical activity and gain knowledge about nutrition and living a healthy lifestyle (Gibbons, Morland, Lubransky, 2013). Participants are health screened and completed a fitness test pre- and post-programme to see observe results and benefits. Springin2it! originally set up as part of a collaborative project between the Nursing and The Health and Safety Office at the Polytechnic, as a voluntary web-based wellness intervention with a focus on promoting nutrition and physical activity (Gibbons, 2011).

Specifically, Springin2it! aims to:

- (i) improve the cardiovascular risk profile of participants,
- (ii) contribute to the overall productivity of the organisations that participate, and
- (iii) create and support social sustainability, by creating a work environment that encourages staff to interact with colleagues and providing an opportunity for staff to improve their health status with the support of their workplace and workmates.

The major difference of Spring in2it! compared to other workplace interventions, is the combined focus on nutrition and physical activity. In addition, a number of health indicators - such as family history of health problems (diabetes, heart attacks) where they a smoker; their work lifestyle (active or sedentary) their diet – were collected allowing the researchers to gain an understanding of their health status and cardiovascular risk of this workplace population. Springin2it was group based and attendance throughout was not compulsory. Between 2013 and 2016 the program was led by students studying on the Bachelor of Applied Science (Health, Wellness and Physical Activity). Under supervision, the students run all aspects of the scheme, including recruitment of participant, data collection and screenings.

Participants

A total of 580 OP staff participated in Springin2it! in the first six years it was delivered ($m = 96.7$, range = 76-132). This equated to between 18% and 19% of the total staff employed at the company . Of these participants, two thirds were female employees ($m = 68.2$, range 62-73%) and one third were male ($m = 31.8$, range = 27-38%). More than half of the participants were aged between 34-54 ($m = 59\%$, range 26.4-32.6), followed by the 22-34 (22.2%) and 55-64 (17.2) age groups. Given the focus on a workplace context, there were few participants in the 18-21 (0.4%) and 65-74 age group (1.2%).

Year	Total	Female (n)	% Female	Male (n)	% Male	% total staff
2010	77	n/a	n/a	n/a	n/a	15%
2011	119	79	66%	40	34%	23%
2012	76	55	72%	21	28%	15%
2013	91	66	73%	25	27%	17%
2014	132	90	68%	42	32%	26%
2015	85	53	62%	32	38%	17%

Table 1. Demographic Information regarding Springin2it! Participants (2010-2015)

Health Screening

Participants were also asked to complete a health screening and assessment prior to starting. The assessment includes measures of body composition, blood pressure, blood lipids and glucose. Participants record on line their daily water intake, daily number of fruit and vegetable servings and daily minutes of exercise. The same assessment is completed at the end of the scheme. For the health screen, the following data was collected:

Body composition. Body composition was done using a Tanita BC-418 Segmental Body Composition Analyzer. This machine calculates regional body composition empowering healthcare professionals to better determine health risk associated with visceral and abdominal fat. Ordinary scales and/or calipers only provide weight or body fat%, but the BC-418 provides a complete print out of detailed body composition analysis- weight, body fat%, BMI, fat mass, fat free mass, and so much more- all without the traditional intrusive measurement methods.

Blood pressure. Blood pressure was taken using both manual and automatic machines, we used the Welch Allen SPOT VITAL SIGNS® DEVICE. Using an automated machine gave us more accuracy of data.

Blood lipids. Initially bloods were taken to Southern Community Labs for testing. To improve and costings, turnaround times we brought this in house. We now use a Roche Diagnostics Cobas b101, this machine lets us test for IVD test system offering HbA1c and a complete lipid profile (CHOL, HDL, LDL, TG, non-HDL, TC/HDL)

Blood Glucose. The Accu-Chek Performa blood glucose meter was used to measure blood glucose. We tested for high blood sugars to screen for the onset of diabetes. The test will not confirm the presence of diabetes but acts as an indicator; that may require the participant to be referred onto their GP.

	PrebldL DL	PostbldLD L	PrebldHD L	PostbldH DL	PrebldTo talChol	PostbldT otalChol	PrebldCh olHDL	PostbldC holHDL
Mean	2.65	1.18	1.42	0.67	4.86	2.26	3.28	1.46
N	580	580	577	579	579	580	580	580
Std. Dev.	1.58	1.56	0.67	0.87	1.85	2.74	1.65	1.92

Table 2. Body composition, blood pressure, blood lipids and glucose measures for Springin2it! participants 2010-2015

Weight. The total amount of weight lost for participants in the study period was 586.5 kg. It is known that excessive body fat increases the risk of contracting diabetes as well as increasing the risk of suffering a cardiac event.

Cholesterol. The total cholesterol for the staff was just under the recommended level of 5.2 at 4.8 (Metcalf, Scragg, Schaaf, Dyal, Black & Jackson, 2006). New Zealanders have some of the highest average cholesterol levels in the world and 17% of all deaths in New Zealand can be related to high cholesterol. It is estimated that 90% of adult New Zealanders would benefit from lowering their cholesterol levels.

DISCUSSION

While the screening results suggest that participation in Springin2it! was beneficial for the participants, the drop-off rate suggests that many participants didn't complete the programme. There were processes in place within the Springin2it! program to help the participants continue to engage. These included communication and information, recruitment and registration, testing and results, and regular support. Despite this, many of the staff did not return for a post-test, with almost half (44%) of the participants consistently failed to formally complete the programme. Reasons for failure to complete the programme were undetermined, but may have been due to factors such as motivation, lack of progress against personal goals and other commitments (e.g. work). Many of the participants were identified as within the 'healthy' range during pre-screening and may have felt that it was therefore unnecessary to return for post-study testing. Anecdotal evidence suggests that participants had limited engagement with the program may have not felt there would be a positive difference in their final results, and so were reluctant to re-test on the measures taken at the start of the programme. Lack of time was identified by numerous participants as a reason for not engaging in the follow-up screenings. Linnan, Weiner, Graham & Emmons (2007) found that managers believed that lack of time to participate (56%), lack of staff time (54%), production conflicts (41%), and cost (38%), were all barriers to implementing a workplace wellness (Linnan et al, 2007).

Springin2it was a web-based wellness scheme. Given difficulties of combining work and exercise, the internet has become increasingly popular means for communication within workplace wellness promotion. Employees who work off-site can also be involved. However, it could be argued that with a web-based approach the participant has to have a high internal motivation, since there is less contact with organisers during the scheme. Participants on web-based only wellness programmes have reported that they did miss the face-to-face interaction received during a non-web-based programme (Cook, Billings, Hersch, Back & Hendrickson, 2007). Regular meetings with a support person was found to help with motivation, and participants reported not wanting to let their support person down and feeling that they needed to stick to organised exercise times (Cook et al).

FINAL THOUGHTS

This suggests there is need for behaviour change from the management sector in order for this to spread within organisations. Workplace wellness programmes may have a better chance of being implemented with improvement outcomes if senior staff were keen to lead by example and promote health and wellness around their workplace (Linnan et al, 2007). During one year of Springin2it! there was a public commitment from the current senior leadership team to adopt healthy behaviours with the aim of losing weight collectively. While this was not a formal part of the Springin2it!, this idea was positively received by staff. Despite this, and other support mechanisms, the findings of this case study also question whether workplace programme is the most effective way to address workplace health and wellness. It could be argued that running a wellness programme within the traditional workplace 7-8-hour day may be unrealistic. One suggestion is the adoption of a 6-hour working day. The 6-hour day has been trialed in Sweden, in contexts such as car manufacturing, web design and surgery. The adoption of a 6-hour day has been associated with benefits such as increased productivity, reduced stress, and increased levels of physical activity (e.g. Heath, 2017).

Acknowledgements: The authors would like to acknowledge the work done by Lisa Barclay in the preparation of this article.

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VITAMIN D SUPPLEMENTATION IMPROVES MOOD OVER WINTER IN NEW ZEALAND OFFICE WORKERS

Stacy Poutasi, and Will Payne

INTRODUCTION

New Zealand's Ministry of Health (MOH) states that 5% of New Zealanders are vitamin D deficient and a further 27% fall below the recommended blood level of vitamin D. Vitamin D deficiency is associated with rickets in children and bone weakness in adults. Research has also linked vitamin D deficiency to a multitude of health and wellness issues such as mental health, cancer and cardiovascular disease (Murphy & Wagner, 2008). Research on maintaining adequate vitamin D levels has shown that it reduces the risk from diabetes mellitus, rheumatoid arthritis, multiple sclerosis and other autoimmune diseases (Murphy & Wagner, 2008). Symptoms of vitamin D deficiency include excessive sleep, daytime drowsiness, reduced concentration, carbohydrate craving, weight gain, increased appetite, reduced energy, aching bones, headaches, gastrointestinal issues and depression (Mercola, 2014).

Aspects of vitamin D deficiency can interrupt people achieving all the dimension of wellness; mood disorders, such as seasonal affective disorder (SAD), linked to vitamin D deficiency impact on emotional health. When SAD affects individuals, they may experience inappropriate feelings of worthlessness or guilt (Murphy & Wagner, 2008). Additionally, SAD affects interpersonal wellbeing, as individuals can lose their enjoyment of everyday activities (Murphy & Wagner, 2008; Fahey, Insel & Roth, 2009). The Mental Health Foundation New Zealand notes that people with SAD may withdraw from others. Interpersonal health includes maintaining relationships that are supportive and satisfying, along with participation within society and the community (Peters, 2014). Intellectual wellness is linked with challenging the mind and with learning. However, vitamin D deficiency and SAD may interrupt this process, as both have been related to memory loss and poor concentration (Murphy & Wagner, 2008; Statistics New Zealand, 2017).

Vitamin D is essentially a hormone, as it is synthesised on the skin through UVB rays. While vitamin D can be found minimally in food, the sun provides the predominate source (Murphy & Wagner, 2008). The MOH recommend that those living in the South Island of New Zealand consider taking vitamin D supplementation through the winter months of May to August, due to the region's high latitude. Southerners may not receive adequate UVB levels, which may lead to a vitamin D deficiency (NZ Ministry of Health, 2016; Johnston, McKenzie & Liley, 2017).

Vitamin D production via UVB rays is normally adequate in the skin to meet the needs of the body, particularly in tropical and subtropical areas. However, even in these climates people may suffer a deficiency if they spend most of their time indoors or are completely covered when outdoors. A deficiency can also occur in people who live in areas of heavy sky pollution or areas with insufficient UVB exposure in winter (Peters, 2014).

There are groups of individuals which are also more at risk of deficiency than others. Dark-skinned people are one such group, as the melanin in the skin absorbs the UV; therefore, it is recommended that time spent in the sun is 5-10 times longer than for those with lighter skin (Truswell & Mann, 2012). The aged are another group whose risk factor for deficiency is increased, as their skin lacks the capacity to synthesise vitamin D (Statistics New Zealand, 2017) due to a decrease in the starting material, 7-dehydrocholesterol. According to Truswell and Mann, those who are overweight or obese are also at risk, as the "excess adipose tissue sequesters vitamin D intake" (p. 249).

People who live in the South Island have a clear risk of becoming vitamin D deficient, particularly if individuals spend little time outdoors. This is due to the high latitude on which the South Island and, in particular, Invercargill, are positioned (Johnston, McKenzie & Liley, 2017). At high latitudes, UVB rays may not be as available for vitamin D production as is the case at mid- to low-range latitudes. Johnston et al. have shown that in Invercargill, the UV available for vitamin D production (UVvitD) is 0.02 ± 0.01 in winter, compared to Auckland's UVvitD, which is 0.08 ± 0.02 . A further comparison shows Brisbane's UVvitD as 0.25 ± 0.05 in winter (Johnston, McKenzie & Liley, 2017). Additional calculations carried out by Johnston et al. (2017) showed that people living in Invercargill have a shorter effective period than Auckland residents for vitamin D production. Furthermore, figures from Statistics NZ show that 49.3% of the Invercargill workforce potentially work indoors (Johnston, McKenzie & Liley).

There is a substantial link between vitamin D and wellness. This study is designed to test this finding further by investigating vitamin D supplementation during winter, and by measuring its effectiveness in the form of a wellness questionnaire.

The aim of this research is to examine the possibility that vitamin D supplementation may improve mood during wintertime in Southland, when UVB levels are low and a vitamin D deficiency may be present. Both an intervention group and a control group took part in the study. The investigation was undertaken by providing vitamin D supplementation to a randomised intervention group and measuring mood through mood surveys conducted at the beginning and conclusion of the supplementation period completed by both the control and intervention groups. A positive outcome would be demonstrated if the intervention group showed a marked improvement in their mood and wellness levels at the conclusion of the supplementation period.

METHODS

Participants

The participants recruited for the study were 20 Invercargill office workers (16 female, four male), aged between 28 and 65 years (average age 48 ± 11.44). Participants were provided with information on vitamin D and subsequently signed informed consent forms. Participants were required to be over 18 years of age, not currently taking vitamin D supplementation and not under medical care for a mood disorder.

Testing Procedure

In order to determine that vitamin D supplementation positively affects mood and wellness in winter, the participants ($n=20$) were randomised between an intervention group ($n=10$), which received vitamin D supplementation of 1000 IU for 30 days, and a control group ($n=10$), which did not receive the supplementation. The supplementation period was implemented in the month of August 2016.

A follow-up email was posted a week after, asking for confirmation of participation. Participants then completed two surveys (adapted from Lam, 1998 and RAND, 2017). The first contained six questions designed to ascertain the wellness and mood status of the participants over previous winters, as well as the participants' status before the intervention group undertook vitamin D supplementation. A second, two-question, survey was completed by all participants at the conclusion of the 30-day supplementation period to ascertain their current mood and wellness status. The results of these surveys were analysed to examine the effects of vitamin D supplementation on mood. The questionnaires were adapted to suit the requirements of this study.

Dietary Supplement

A local pharmacy provided the vitamin D supplements, along with capsule containers and labels that provided instructions. The supplementation protocol was 1000 IU of vitamin D3 (cholecalciferol 25mcg) per day in accordance with MOH guidelines, in addition to the labelled instructions on the Good Health Vitamin D supplements, for a period of 30 days (NZ Ministry of Health, 2016).

Statistical Analysis

A statistical analysis was carried out using Microsoft Excel to find mean, standard deviation and percentage figures in order to measure and compare the results from the two questionnaires. Results were deemed significant if $p \leq .05$. Utilising Microsoft Excel, an independent t-test (two-tailed) was used to determine differences within and between groups.

RESULTS

Descriptors and Characteristics of Participants

A summary of the participants' characteristics is shown in Table 1. A further summation of results from the questionnaire found that participants ($n=20$) felt that their mood was affected by the season, with 75% of participants agreeing with this. Summer was the season that participants ($n=20$) felt the best (85%); the remainder reported that no particular season made them feel better. Winter was the season in which participants ($n=20$) felt worst (80%), with the remainder divided between spring (5%) and no particular season (15%).

Demographic	Mean
Average age	48 years old (± 11.44)
Female participants	16
Male participants	4
Percentage of participants who work indoors	100%
Percentage of participants who spend leisure time indoors	63%
Hours spent outdoors	7.43 (± 6.32) hours per week
Leisure time spent being active	9.36 (± 9.28) hours per week
Does season affect mood?	Yes: 75% No: 25%
Season in which participants felt best	Summer: 63% Spring/Summer: 26% No change seasonally: 11%
Season in which participants felt worst	Winter: 84% Spring: 5% No change seasonally: 11%
Do you slip, slop, slap and wrap?	Yes: 53% Sometimes: 21% No: 26%

Table 1. Mean descriptive and characteristic data of participants ($n=20$)

Mood Rating

There was a significant difference between the intervention group and the control group for perceived improved mood over a 30-day period ($p < .05$). The intervention group results showed an 80% mood improvement over a 30-day period. The control group results showed a 20% mood improvement over a 30-day period (Figure 1).

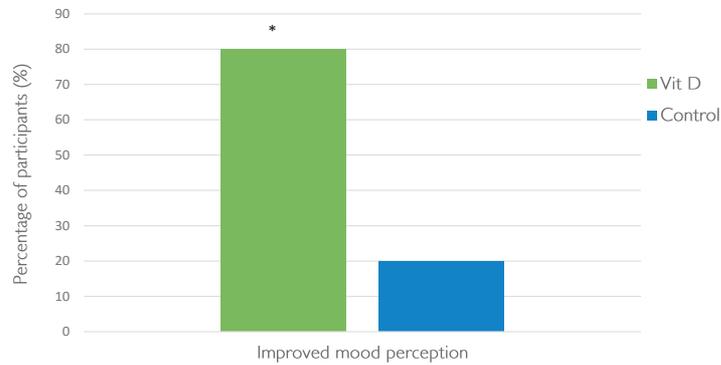


Figure 1. The percentage of participants showing a perceived improved mood for both intervention and control participants ($n=20$) over a 30-day period. *Significant difference between intervention and control group $p < .05$

Figure 2 shows that 30% of the intervention participants reported a "somewhat low" mood at the beginning of the study; however, at the conclusion of the supplementation period no participants (0%) reported a "somewhat low" mood. A "slightly low" mood was felt by 50% of the intervention participants at the beginning of the study, but by day 30 only 30% of intervention group participants reported a "slightly low" mood. Twenty percent of participants reported feeling no change in mood from usual on day one; this increased to 70% of participants experiencing no change in mood from usual at the conclusion of the supplementation period.

The control participants' results from day one to day 30 remained relatively unchanged. Figure 3 shows that 10% of participants perceived a "somewhat low" mood on day one, and this remained unchanged on day 30. A "slightly low" mood was experienced by 40% of participants on day one, reducing to 30% by day 30. Forty percent of participants perceived no change in their mood from usual on day one; this figure increased to 50% on day 30.

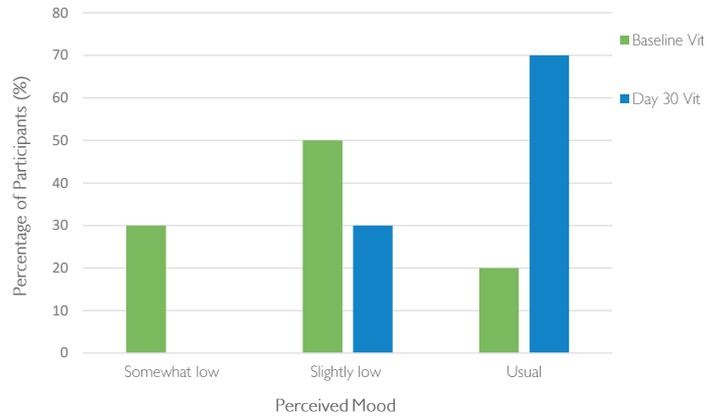


Figure 2. Percentage change of mood perception comparing pre-intervention and post-intervention for intervention participants (n=10)

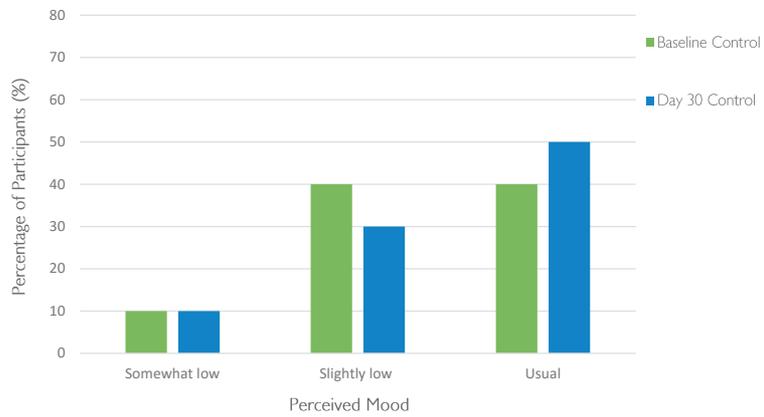


Figure 3. Percentage change of mood perception comparing pre-intervention and post-intervention for control participants (n=10)

	No change (%)	Slight-Marked change (%)
Sleep length	30	70
Social activity	30	70
Mood	25	75
Weight	25	75
Appetite	30	70
Energy levels	20	80

Table 2. Percentage degree of seasonal change for all participants (n=20)

The results also show that weight, sleep length, appetite, social activity and energy levels (Table 2) were all subject to seasonal change, with 70% or more of the participants (n=20) noticing a change in their behaviour.

Winter Mood Characteristics

When participants were asked to think back to previous winters, their (n=20) reports ranged from a 'slightly low' mood (50%) to a 'very low' mood (6%), with 22% noting no change in their mood over previous winters compared to normal. When considering the winter of 2016 (the study year), 45% of participants reported a 'slightly lower' mood than usual, 20% reported a 'somewhat lower' mood than usual, and 35% experienced no change in their mood from usual. A comparison of perceived mood over previous winters with the winter of 2016 (Figure 4) shows that participants' (n=20) mood improved in winter 2016; 22% reported a 'somewhat low' mood in previous winters, improving by 2% in 2016, while 22% experienced no change in mood in previous winters, improving by 13% in 2016.

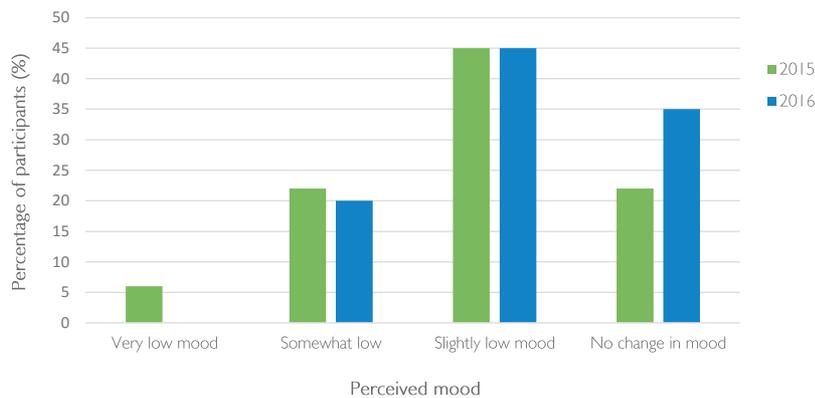


Figure 4. Winter mood characteristics, comparing the winter of 2015 against the winter of 2016 for all participants (n=20)

DISCUSSION

The results of our research indicate that mood is subject to seasonal change, and that vitamin D supplementation did improve mood for the intervention group over the supplementation period. The results show that vitamin D supplementation is effective in improving mood over winter; with 80% of the intervention group noting an improvement in perceived mood between day one and day 30 of vitamin D supplementation. These findings are consistent with those of Lansdowne and Provost (1998), who found that positive affect increased and negative affect decreased after five days of 800 IU per day of vitamin D supplementation; and with those of Berk et al. (2007) and Murphy and Wagner (2008), who also found that vitamin D supplementation improved mood scores. These results stand in contrast to those for the control group in our study, which showed only a slight increase in mood over the same period.

Most participants (75%) agreed that their mood is affected by the season. Lansdowne and Provost (1998) suggest that mood affected by the season exists on a continuum from no change in mood to a very low mood. With the exception of 20% of the intervention group, who experienced no change in their mood from season to season, the remaining 80% experienced an increase in mood after 30 days of vitamin D supplementation. By contrast, the control group remained relatively unchanged, with only 20% experiencing an increase in mood during the same period.

All the participants in our study worked indoors, which is a contributing factor to vitamin D deficiency according to the MOH (NZ Ministry of Health, 2016). Although the participants stated that they engaged in an average of 9.36 (± 9.28) hours of leisure activity per week, only 35% recorded that their leisure time was spent outdoors, with the average hours per week spent outside being 7.43 (± 6.32). The lack of time outdoors exposed to UVB light is a contributing factor to vitamin D deficiency. For Invercargill residents, it is recommended that to obtain sufficient vitamin D levels, three hours in the outdoors per day would be required during winter (Harding, 2010 & Page, 2017).

Globally, fear of skin damage or cancer has led to more individuals covering up in summer; with 52% of participants in this study doing this; a further 21% reported that they sometimes covered up in summer (Murphy & Wagner, 2008). This factor, combined with a relatively small amount of time spent outdoors, increases the risk factor for vitamin D deficiency. People who spend adequate time exposed to UVB light will maintain adequate stores of vitamin D – which may explain why some individuals experience nil change in their mood from season to season (Murphy & Wagner, 2008).

In our study, weight, sleep duration, appetite and energy levels were all subject to seasonal change, with 70% of participants noting a “slight” to “marked” change in their behaviour. A decrease in socialisation and a lack of energy was also experienced by 80% of participants. While these changes occur in normal populations during winter; they also match the symptoms of vitamin D deficiency (Lansdown & Provost, 1998).

Of special interest is the comparison we made between previous winters and the winter of 2016 (Figure 4). The results show that participants experienced a lower mood in previous winters than in the winter of 2016. A previous study carried out on SAD (Cabellero, 2009) reported that in addition to sunlight hours positively affecting mood, rainfall and low temperatures also negatively affect mood, especially rainfall. The National Institute of Water and Atmospheric Research (New Zealand) (NIWA, 2016) produced a climate report for August 2016, the month of the vitamin D supplementation period in our study. The report showed that while temperatures were below average (-1.2°C to -0.51°C), sunshine hours were above average across the country (110-125% of normal) and rainfall was well below average in the South Island (<50%), with January to August 2016 being the warmest recorded period over the seven-station temperature record. These weather results may have had an impact on the findings of our study, in that participants had not experienced the usual run of winter weather that may contribute to lower than usual mood levels.

The limitations of this study lie mainly with the small sample size; a larger sample size would provide a more accurate representation of the population. In addition, there may be compliance issues with taking the supplement for a period of 30 days, which will affect the accuracy of the results. Another limitation was that there were no double-blind trials, which would have strengthened the study.

While our research has shown that vitamin D supplementation can positively affect mood, in order to consolidate these findings, a double-blind protocol with a larger sample size and serum testing to compare vitamin D levels with the level of mood perceived is recommended.

CONCLUSION

The results showed a significant improvement in participants' mood after the 30-day vitamin D supplementation period. Our findings support the evidence of the literature that vitamin D deficiency can adversely affect wellness by lowering mood and energy levels, increasing appetite, causing a lack of sleep and increasing susceptibility to infection (Peters, 2014). As a result, it is imperative that vitamin D levels be maintained at recommended levels in order to reduce the negative risk to health and wellness.

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THE INTERSECTION OF MEDICAL TREATMENT AND MĀORI CULTURAL VALUES WITH SERIOUS HEAD-RELATED INJURIES

Gary Barclay, Richard Kerr-Bell and Simon Middlemas

PREFACE

This work is based on my (Gary Barclay) personal reflections regarding serious injury. The aim of this article is to stimulate discussion on the potential influence of cultural perspectives on the treatment of serious head-region injuries and the role of medical teams, including ambulance staff, nurses, occupational therapists, doctors and surgeons, in keeping patients culturally safe. A response is offered by Richard Kerr-Bell.

It goes dark

Saturday 18 May 2013: Local football field: *It's a drizzly, cold and cloudy Saturday. I've spent the morning transforming my daughter's old pink bike into my son's "new" blue bike, for his third birthday on Thursday. He's already able to ride without training wheels, so I'm really excited about the idea of going out for family bike rides. I've decided to play club football this season for the first time since 2006. ... Now that my children are a bit older (five and almost three), I thought it might be good for them to see "the old man" out running around on the field having a good time.*

It is midway through the second half in the game ... I'm breathing heavily, but feeling strong. I'm running towards the ball, which is a few metres away. I'm feeling quite happy and confident, as I know I can get to the ball. "It's mine!" I think to myself. As I'm approaching the ball, I hear heavy footsteps coming from behind me. I suspect that it's one of the opposing players who also wants the ball, but I'm in front of them. I know I will get there first. I start to turn my head slightly to the right to see if I can see what's happening behind me before I get to the ball. As I do so, I hear an effortful grunt and I'm hit, hard, somewhere on the side of my neck or head. Then I feel like I'm being forced to the ground somehow – maybe pulled back and thrown down, I'm not sure. It's rough. I feel like my head is flopping around, like I'm on a rollercoaster. I don't know which way is up. I see stars. It goes dark.

I wake up on the ground. I don't know if I'm in pain. I'm lying flat on my back. I feel tingling in my arms and legs. I've done first aid courses; I know instantly that this is a sign of spinal damage. I tell the people around me, "Don't move me!" I try to lift my head, but I can't even do that. ... I'm screwed, big time! I'm lying here thinking about a life of paralysis. I'll never be able to go for walks or bike rides with my family. My kids are going to miss out on me. I'm going to miss out on them. Images of my family riding their bikes next to our local stream come to mind, but where am I? I'm really scared ... I can't take this anymore, I just want to sleep (Barclay & Middlemas, in press).

Ambulance staff, with help from members of the public, put my neck in a very uncomfortable brace and placed me on a stretcher. I was then taken to the local hospital's emergency department and spent the next four days in hospital.

METHODOLOGICAL CONSIDERATIONS

Given the sensitive nature of this topic, an auto-ethnographic approach was utilised. Other investigators, for example, Clifton (2014), Dashper (2013), and Brown, Gilbourne and Claydon (2009), have also used an auto-ethnographic approach to examine personal trauma following sport-related injury. With these precedents in mind, a first-person approach is used throughout much of this text.

I undertook a critical reflection process in order to explore my experiences. Ellis and Bochner (2000) suggest that, to be an auto-ethnographer, you must be introspective about your feelings, observant about the world, self-questioning and vulnerable. It has been argued that there can be *no clear window into the inner life of an individual*, as any gaze is always filtered through the lenses of language, gender, social class, race and ethnicity (Denzin & Lincoln, 2011). Therefore, it is important to bear in mind that this research is filtered through my personal 'lenses,' which include those of husband, father, sport and exercise enthusiast, Pakeha, psychology lecturer and researcher (Barclay & Middlemas, in press).

Data collection for this project began with the generation of a dense description of the personal context of my injury and my experiences during rehabilitation. The second author (Dr Simon Middlemas) read my description and we discussed my early reflections. I revisited my notes to 'thicken' the description in parts of the narrative until 'saturation' was reached regarding my story. A series of collaborative research meetings were held between myself, Simon Middlemas and an experienced independent researcher in my academic department. These two, who acted as 'critical friends' (Smith & Sparkes, 2006), shared their own interpretations of the findings. Having lived this experience, I was best positioned to make final determinations about which themes, quotes and journal entries most accurately represented and supported my experience. Medical notes and family members were also utilised to help ensure historical accuracy (Barclay & Middlemas, in press). Co-writer Richard Kerr-Bell's knowledge includes tikanga (he is of Ngapuhi descent and has 24 years' experience in Otago working with Kai Tahu whanau) and sport experience as a coach and athlete for over 40 years.

LINKS TO PRACTICE

Saturday 18 May 2013: At the hospital: *A member of the medical team has just informed me that they are going to take my football jersey off. Instantly I think that this is not okay. "How are you going to do that?" I ask. They explain that they will take it off over my head, like you would normally take a top off. Instantly I think, "Fuck Off!" I'm still waiting to have scans and X-rays, for Christ sake! I have a neck injury, I had tingling in my limbs and they want to take my top off over my head! I'm thinking they could damage my spinal cord if they move my head. I'm not in serious pain at this moment, but I lie and tell them that I am. I tell her to just cut the jersey off because I hurt too much. They say that some people want to look after their jerseys. Given my situation, I think this sounds pretty bloody stupid. The staff member cuts the jersey off me and covers me with a robe, then goes away.*

A combination of X-rays and CAT scans identified that I had sustained a 'significant' fracture of the second cervical vertebra.

Saturday 18 May 2013: At the hospital: *I'm taken to a room in the orthopaedics ward. My wife stays with me. It's so boring just lying here – I can't move. I'm not allowed to move. I must not move. I have sandbags at either side of my head to prevent me from turning and I am in traction, with a large weight hanging off the back of my head – I'm not sure how it's attached. The doctors explain that I am going to have a halo brace attached to my head and assure me that when I have this, I will be able to get up and be somewhat physically active. ... It is getting late now, around 9pm on Saturday night. A friendly doctor comes to attach the halo to my head. I understand that I will need to have four screws inserted into my*

skull and that I'll need to wear it for 12 weeks. The doctor, with help from some nurses, has to shave a couple of areas behind each ear so that they can put the screws in for the halo.

My wife: "Gary tells me I should go home, but the nurse looks at me and says, 'It might be nice for you to stay.' Her eyes suggest that it's going to be a painful process for Gary and that he's going to need support."

My wife is holding my hand as the doctor gives me the first of four very painful anaesthetic injections in my head. Once the doctor is satisfied about their effectiveness, he begins to insert the screws into my head, two into my forehead and one to the rear of each ear. It feels really strange having something screwed into my head. I can feel every turn and I can hear and feel the crunch of my bone as the screws are gradually secured into my skull. There is a lot more pain with one of the screws. I tell the doctor. He applies more anaesthetic; we wait for it to be effective and then he tries again. Eventually, the halo and screws are all in place. Now I have to wait until Monday for attachment of a special vest.

Questions for practice

This article is based on my experience of traumatic injury. Although I identify as a New Zealand Pakeha, aspects of my experience could be relevant to people from other cultures. For instance, people from many cultures, including New Zealand Maori, are involved in contact sports, which have the potential for high-impact injuries similar to those I sustained. Further, my reflections on my experiences may be useful to medical teams; those suffering injuries; those with family, friends or team-mates who have been injured; as well as those working with injured people such as ambulance staff, nurses, occupational therapists, doctors and surgeons.

I acknowledge that my injury experiences and interpretations are unique to me – so, what is the journey like for others? I know little of cultures other than my own, but I do know that to some the head is tapu (in the case of New Zealand Maori), or of importance and deserving of respect. My experience brings to mind a number of questions which may deserve further attention from the medical community and others: How would people from such cultures cope physically, mentally, emotionally and spiritually with similar experiences? How would they cope with people physically handling their head and neck region in the immediate aftermath of a high spinal cord or head injury? How would they cope with having a halo brace screwed into their skull? What steps would or could medical teams take to ensure the cultural safety and security of a person having an experience similar to mine? Further, if a patient's cultural needs were not met during treatment, how might any 'wrongs' be made right?

The aim of this article is to stimulate discussion of the potential influence of cultural perspectives on the treatment of serious head-region injuries and the role of medical teams in keeping patients culturally safe. By reflecting on my experience and some of the questions posed above, we might be able to better appreciate and understand the needs of others.

A RESPONSE FROM RICHARD KERR-BELL

Ko Hunoke te maunga mai I tenei tut tapu ka titiro atu ki te moana o Hokianga, e rere ana, e rere ana ki te awa o Waiwhatawhata. Ka papatu tenei I te taha o toku marae o Aotea me the Whare Tupuna Te Kai Waha, he taonga mo te hapu o Ngati Wharara I te lwi o Ngapuhi. Ko Ngatokimatawhaorua te waka.

Gary has raised questions about appropriate, or tika, practice to support practitioners, patients and whanau who may seek guidance about treatment for head injury, given traditional and current beliefs about the head as tapu (Ihimaera, Long, Ramsden & Williams, 1993). I propose to share my understanding of such questions and where that knowledge has come from, as well as drawing on existing commentary to guide our responses to medical treatment

of the head, especially for those who believe that the head is tapu, sacred, or set aside for particular purposes (Mahoney, Scott, Sorrento, 2014).

There are inevitably many possible responses that reflect the confluence of traditions associated with whanau, hapu and iwi and contemporary thinking and treatment possibilities. Some responses involve direct and invasive actions, others require contact with hands or implements and are more surface-based treatments. According to Naida Glavish, who is the chief tikanga advisor to the Auckland District Health Board and has contributed significantly to best practice at the Southern DHB, all users of health services are to be treated with dignity and respect. In turn, users of health services are expected to behave respectfully. If these practices are honoured, the outcomes will be threefold: raised levels of awareness and confidence in the health workforce; a greater consideration of wider cultural needs and expectations; and improved access to, and effectiveness of, mainstream services for Maori.

Where the removal of body parts is required, practitioners should "Assist in properly removing, returning or disposing of body parts/tissues/substances in consultation with patients and/or their family and in accordance with Maori protocol." This process should be followed regardless of how minor the procedure (for example, removal of nail clippings, hair or blood) is perceived to be by staff. All discussions should be non-directive and follow an informed process (SDHB Tikaka Best Practice, 2005).

Many Maori rituals are underpinned or retained culturally through stories, legends, waiata, whakatauki and a variety of culturally expressed media. One example is the story of Rata. The abbreviated version presented below is adapted from the retelling of the legend by Wiremu Grace (2012):

In seeking a tree to build waka to help out his village, Rata found one and proceeded to chop it down. Returning the next day, he saw that the tree was right back in the place where he had found it, standing strong and tall and well-rooted into the ground. So once again, he took his toki (or axe) to it and returned again the next day, only to find it in the same healthy state in which he had first found it. Suspicious and confused, he hid in the bushes after his third attempt and discovered that the children of Tane were putting the tree back together piece by piece, shaving by shaving, branch by branch. He jumped out to challenge them. Angrily at first, they admonished him for not paying due respect to Tane, god of the forest, before taking the tree to repurpose it. Head bowed, Rata acknowledged his mistake, at the same time revealing that his motivation was to help his village. So, in the end, the children of Tane helped him create a magnificent waka.

The lesson of this story is that one must always acknowledge the whakapapa, mana and relationships in the environment, both natural and social.

To put things simply, I believe that today, with medical and technological innovations and applications so ubiquitous, one can still acknowledge the tapu of a place, thing, person – or head – and work with it or around it, showing an attitude of respect and protection, to use that term. Thus doctors, nurses, and other staff may act in accord with the permission given by the patient or their whanau, and through karakia or other cultural means provide a safe pathway.

When as often happens, the head, hair or part of the skull may require removal or modification, at the beginning or at some stage during the procedure, the karakia performed by the whanau, kaumatua or chaplain is able address the tapu of the head and its material, spiritual, and whakapapa significance to allow medical staff to perform their necessary actions with due attention to the patient's cultural needs.

The tapu status ascribed to the head in particular refers to the belief that it contains a person's whakapapa – and, by extension, their lineage, and the mana and matauranga or knowledge that forms a relationship to the people or atua where it originated. In addition, these persons, beings and elements remains real, living, and in present existence. I have acquired this knowledge through living for periods with my uncle in my rohe of Hokianga, and through working with kaumatua from a variety of iwi, mostly over the last 25 years, including Ngapuhi and Kai Tahu.

One of the challenges in any human interaction where values and principles differ – or at least use different terminology, language and interpretations – is to cross the cultural gap through the forming of a relationship, albeit a temporary one (chronologically, at least). Taking account of factors such as stress, tiredness, professional focus and time limitations, this relationship of respect can facilitate an element of trust that opens the ears and, more importantly, the hearts and minds, of those gathered to encourage them share the same goal, and to allow each to proceed and process those elements required to be professionally and culturally satisfied that the right path or tikanga has been addressed.

“Ki te oti te taha wairua, mama te taha kiko” (Ratana, 2000). When the spiritual aspects of life have been addressed, the material takes care of itself.

CONCLUSION

As a result of the diverse cultural belief matrix of patients and their families in New Zealand, the treatment of traumatic injuries requires sensitivity and awareness. Hospitals and care facilities with New Zealand-trained medical staff have significant resources available and easy access to information and training, thus enabling Māori cultural norms and traditions to be realised. This approach does require respect, listening and trust.

The attitudes of many health professionals in New Zealand to the diverse cultural practices of patients and their whanau has certainly come a long way from making front page news in the *Otago Daily Times* and in many places this awareness and openness has become the norm. We will do well to keep in mind the stories of Gary and of Rata, which remind us to tread carefully and respectfully when we walk in the world of others.

Gary Barclay is a senior lecturer in sport, exercise and health-related psychology at Otago Polytechnic's Institute of Sport and Adventure. He completed a Masters in sport psychology at the University of Otago in 2004 and has since completed graduate studies in psychology through Massey University. In addition to his teaching, Gary has consulted with a variety of individuals and groups in sport and performing arts contexts. He is now enjoying the opportunity to further his research interests in a number of areas including the influence of exercise on mental health and recovery from serious injury.

Richard Kerr-Bell (Ngapuhi, Ngati Kuri, Te Rarawa) works with the Otago Polytechnic's kaitohutohu team, overseeing Kai Tahu students with CapableNZ and Māori student support at Te Punaka Owheo. He has a background in counselling, teaching, theology and management. Richard also has a keen interest in sports coaching, writing and leadership issues. His community involvement includes leading roles in the Southern Maori Business Network, the Green Island Football Club and the Runanga o te Hahi Katorika ki Aotearoa. Richard has published three books: *Enjoy Your Life*, *A God of Love* and *From Rangi Point in Bare Feet*.

Simon Middlemas is a principal lecturer and research coordinator at the Otago Institute of Sport and Adventure at

Otago Polytechnic. He completed a PhD in sport psychology and performance analysis in 2014, focused on the use of video feedback in the psychological preparation of elite youth football players and coaches. For the past decade, Simon has worked as a sport psychology consultant within elite and development sport, for the English Institute of Sport (EIS) and as a private consultant, with clients such as GB Swimming, GB Volleyball/Beach Volleyball, England Netball, the British Equestrian Federation and the English Football Association. He completed a Graduate Diploma in Tertiary Education in 2015.

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THE SIGNIFICANCE OF BIRTH DATES OF NZ 'ALL BLACKS' – A COMPARISON OF THE PROFESSIONAL & AMATEUR ERAS.

Geoff Simons and Luke Adams

INTRODUCTION

Relative Age Effect (RAE) refers to the difference in age between children in the same age group (Musch & Grondin, 2001). For example, while a child born in December is 11 months younger than a child born in January of the same year, both children are grouped in the same age category. The potential consequences of relative age are labelled under the term 'relative age effect' (Musch & Grondin, 2001). RAE has both immediate and long-term consequences that effect participation and selection in youth sport. RAE is present in most (but not all) sports around the world and can result in significant cognitive development changes, with some students being up to one year older in the same 'year group.' It is argued that RAE is likely to increase both intrinsic (observed competence) and extrinsic (appreciation by teachers and parents) motivation to continue involvement in sport. Experience will differ, with one child born in January versus December, in terms of playing the sport longer. Players born early in the selection year are more likely to be identified by professional teams, as opposed to players born late in the selection year, who are more likely to drop out of the sport. Some talent IDs are too focussed on short-term success, rather than looking at the bigger picture for development of the athlete. Clear evidence of RAE was found in national youth selections for U15, 16, 17, 18, and UEFA U16 tournaments. RAE is prevalent due to a bias toward physical attributes, rather than technical skills or greater experience playing the sport (January versus December).

Physical maturity is not everything, particularly in gymnastics and aerobic sports (such as long-distance running). Football, which is predominantly skill-based, shows no significant differences in physical maturity, particularly dribbling and shooting/passing accuracy. Often coaches develop a short-term focus on winning, rather than the long-term development of an athlete. The Matthew Effect – the early advantage enjoyed by older children – holds that this initial advantage tends to beget further advantage (Rigney, 2010).

There are a number of different factors in place that lead to RAE and that have been identified in various studies. In Canadian ice hockey, the youngest age division is strictly non-competitive, reducing the effects of RAE due to coach selections based on physical maturity. While these two factors are important, it is most likely that parents are responsible for the genesis of RAEs – parents' interpretations of their children's size, strength, abilities and safety. If we can reduce or eliminate the Matthew Effect related to relative age, we may reduce future inequitable birthdate distributions, providing a more equitable sport environment. The Pygmalion Effect is the perception that the greater the expectation placed on an individual, the greater the results that individual will attain and vice-versa. (Rosenthal & Jacobson (1968). This phenomenon has been offered as one explanation why coaches' select players based on physical maturation relating to 'talent.'

In support of this theory, Rejeski, Darracott and Hutslar (1979) found that youth sport coaches offered high-expectancy athletes positive reinforcement, while offering low-expectancy athletes general instructions only. The Galatea Effect holds that once expectations are placed on an individual, that individual typically acts congruently with those expectations. Kierein and Gold (2000) explain the Galatea effect as a type of expectation effects, occurring not when the leader has expectations of subordinates, but when subordinates' raised expectations of themselves

are realized in their higher performance. This may explain the role of the athlete in enhancing the effects of RAE in sport. For instance, if a player is selected based on physical maturity, but believes they have been chosen on skill, they will have higher self-expectations and train harder and more frequently, thus becoming more skilled.

Rae literature in sport

Barnsley and Thompson (1985) explored this trend amongst 7313 Canadian hockey players in the 1983-84 season for the minor leagues. The authors argued that RAE gave a competitive advantage to older children. Grondin et al. (1984) found a highly skewed distribution in birthdates among competitive youth hockey leagues, and in the major professional hockey league (NHL) – those born in the first three months were overrepresented as a result of RAE. They asked whether these supposed physical and mental advantages enjoyed by the older children could lead to the development of personality traits in the younger children, such as enhanced work ethic and commitment, in order to reduce the gap with their peers. A study conducted by Rusell and Startup (1986) strongly supported their findings. It showed that younger children are more likely to drop out of voluntary sport participation, perhaps due to physical differences, as opposed to attendance at school, which is compulsory during these years.

In soccer, Verhulst (1992) found that significant RAEs were evident in first- and second-division pro football players in Belgium, the Netherlands and France. Dudink (1994) found the same phenomenon in England. Musch and Hay (1999) concluded that Australia, Brazil, Japan and Germany all demonstrated RAE in football. Daniel and Janssen (1987) found that RAE was not as prevalent in the NHL in the 1970s and 80s as it is today. Many other sports, such as baseball cricket and tennis, also show the effects of RAE. Other suggested explanations for variation in birth rates and professional sport include climatic, environmental, sociocultural and biological factors. Barnsley, Thompson and Legault (1992) found that this effect also occurred in three male FIFA (soccer) World Cups held in 1989 and 1990. This effect was stronger in the age-group leagues (under 17 and under 20) compared with the senior league. The same trend was found by Dudink among top-ranked tennis players in the Netherlands and among soccer players in that country and in the English leagues.

Competition is a major factor here: when competition is low, every player will belong to a team and compete, as there is space available. The larger the pool of players, the more likely RAE will come into play – as in ice hockey in Canada and soccer in England and Brazil. Physical development is the second most important factor, particularly in relation to the position played. RAE is not as prevalent in gymnastics, where physical development in terms of size is less important. Gender, earlier maturation of females versus males, and higher variance amongst males are all contributing factors, as is less competition, depending on the sport. In France, rugby union, handball and soccer are popular sports, leading to the hypothesis that they would incorporate a high RAE. Although RAE was not significant in these sports at the elite level, it could be argued that high-contact sports where physical attributes are important are more likely to show RAE. Also, profit maximisation leads to selection of players based on physical attributes, particularly at the youth level. The focus is on short-term success, prompted by the pressures of promotion and relegation and monetary incentives. Few studies have explored this phenomenon in professional rugby union.

The aim of this study was to explore the role played by RAE in the All Black rugby team in both the amateur (1884-1995) and professional (1996-2016) eras. Drawing on available data, the authors will offer a perspective on whether RAE effect was greater in the professional era than in the amateur era.

Case study: Professional vs. Amateur era All Blacks

A total of 1051 male athletes were included in this case study. The percentage of births each month (and quarter) were compared to the birth rates in New Zealand during the period 1980-1994 (These dates align well with

players entering the All Blacks during the professional era starting in 1996). We found that the actual birth rate per month during 1980-1994 differed slightly from the expected birth rate based on the number of days in a month.

We found that the amateur era and the professional era each showed the Relative Age Effect (RAE) as prominent. This was expected, given that many previous studies of high-performing athletes in other codes have also illustrated this – Barnsley on ice hockey, American football and baseball (North America); Dudink on tennis (Netherlands) and soccer (England); as well as Baker and Logan on ice hockey (North America).

Comparing the numbers of players born in each of the birth months for the amateur and professional eras, t-distribution results gave a significant difference between the two sets of data. The probability p-value is 0.000, meaning that the value of 61.583 could not have been achieved through random chance.

Table 1 and Figure 1 illustrate the expected birth rates based on actual rates in New Zealand during the period 1980-1994, compared to the percentage by month of birth dates for All Blacks over the two eras.

Month	Expected	1884-1995	1996-2016
Jan	0.085	0.101	0.117
Feb	0.077	0.09	0.092
Mar	0.085	0.085	0.121
Apr	0.082	0.087	0.102
May	0.085	0.08	0.058
Jun	0.082	0.073	0.063
Jul	0.085	0.081	0.087
Aug	0.085	0.081	0.068
Sep	0.082	0.08	0.063
Oct	0.085	0.087	0.068
Nov	0.082	0.079	0.078
Dec	0.085	0.075	0.083

Table 1. Percentage by month of All Black birth dates

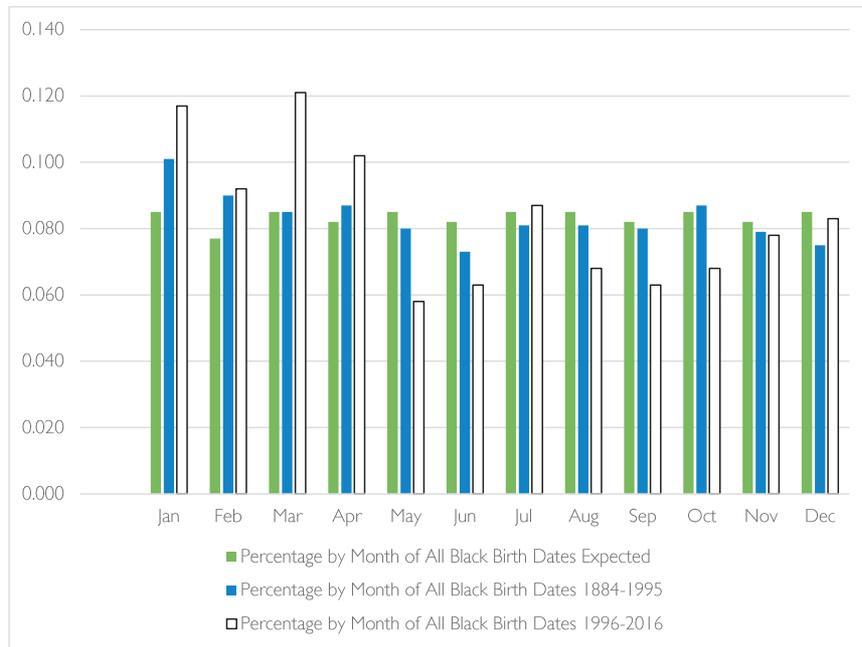


Figure 1. Percentage by month of All Black birth dates

The results show an increase in players born in each of the first four months of the year in the professional era compared to the amateur era. However, July, like February, also showed a small gain and, surprisingly, December was a popular month for player births.

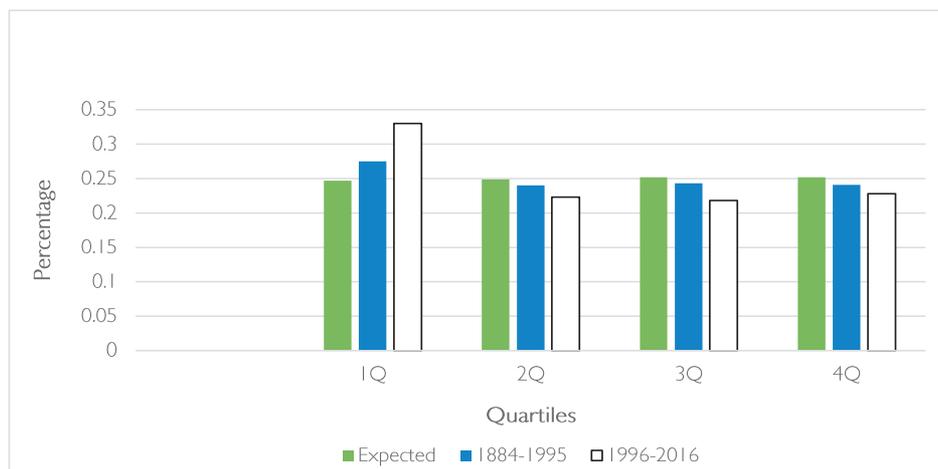


Figure 2. Percentage by Quartiles of All Black birth dates

Quartile	Expected	1884-1995	1884-2016
1Q	0.247	0.275	0.33
2Q	0.249	0.24	0.223
3Q	0.252	0.243	0.218
4Q	0.252	0.241	0.228

Table 2. Percentage of Quartiles of All Black birth dates

When divided into quartiles, the data clearly shows an increase in advantage for those players born in the first three months of the year who began playing in the professional era. This is illustrated in Table 2 and Figure 2.

It is widely believed that players who are older and more mature than their peers within an age-group level have a selection advantage. For example, an under 12-year-old born on 1 January has an 8% age advantage over a player born on 31 December, and an average advantage of 4% over others in their year group. The data suggests that in a sport like rugby union, where the size of a player is important, skilled players, especially if smaller, can be overlooked. It is worth noting that the All Blacks' most capped player, Richie McCaw, was born on 31 December. Once chosen for a representative team, older players get access to better coaching and knowledge, thus building more confidence. Their names are also better known by representative coaches, so that they are more likely to be chosen as a 'default' options for future teams.

FINAL THOUGHTS

Could RAE be a reason for players born in the later months of each year dropping out of their sport? In some sports with limited resources, both human and financial, an argument could be put forward that concentrating resources on fewer athletes could produce better results overall. However, the New Zealand Rugby Union is well resourced, and it would probably be of benefit if more players could have their standard raised across the game. Date of birth may not be the determining factor – the rate of development through significant developmental stages through early childhood may be more significant, and would relate directly to sociocultural and environmental factors. The larger the pool of players, the stronger the resulting RAE usually is, as reported by Grondin et al. (1984); this would apply to world football and rugby in New Zealand.

Physical development is crucial in rugby and other sports, is strongly correlated to chronological age and is position-specific – for example, a goalie in hockey might show a clear RAE due to having to carry heavy equipment. Gymnastics, where late maturation is preferred, is the opposite case, with RAE not evident among elite young British gymnasts.

More often it is the experience gained by older children in their sport that can exacerbate the effects of RAE – the more time invested in the sport, the more improvements are likely. This may lead to improved chances of selection for representative sides, leading to better coaching and higher levels of competition, specifically in terms of developing a foundational skillset at a younger age. Remedies for this situation would include classification according to biological age (height, weight, etc). Grondin et al. (1984) suggest a 15- or 21-month system designed to break through the yearly classifications. Baxter-Jones, Helms, Maffulli, Baines-Preece, & Preece (1995) found a difference in gender for RAE. They reported earlier maturation for females, and a high variable maturity status for boys. Awareness of RAE for coaches will be a crucial tool to help them understand and address this issue.

Another suggested solution to the RAE problem is rather than having age-group bands chosen on a full year cycle, alternative categories could be included. For example, representative teams could be chosen on an 18- or 30-month basis depending on the level under consideration and the resources an organisation has access to. A 15-month spread may be even better. An 18-month representative programme could be based on ages at the end of the year as follows: Under 12, Under 13.5, Under 15, Under 16.5, Under 18. The counter argument to this scheme is that selecting representative teams then becomes more difficult. However, in many current age-group representative teams, the best players are often playing for club or school teams in an older age group or are divided into weight categories.

Acknowledgements

The authors would like to thank Ron Palenski for confirming the birth dates of many All Blacks listed on the NZRU website as 1 January by default, and Associate Professor John Harraway of the University of Otago's Department of Mathematics and Statistics for his work on the statistical data.

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DEFINING ULTRA-ENDURANCE: A SURVEY OF ATHLETES AND COACHES TO ACHIEVE A CONSENSUS DEFINITION

Kate Spenceley, Richard Humphrey, and Candice Lingam-Willgoss

INTRODUCTION

The original starting point for this research was to investigate ultra-endurance sporting activities with a focus on the psychological, rather than physiological, preparation and fortitude of athletes. A literature review was undertaken in order to identify a working definition of ultra-endurance for the purpose of the planned psychological study. This initial literature review failed to retrieve a suitable definition. The definitions that were identified defined ultra-endurance in the light of what each specific race or discipline that was being studied. Thus the majority of the literature reviewed for the prospective research was consequently rejected, despite having considerable value and interest, as no all encompassing definition of ultra-endurance in terms of time, distance, specific physical training or race preparation could be found. In order to construct a comprehensive understanding of psychological ultra-endurance preparation and fortitude across a spectrum, a generalisable definition needs to be constructed.

The desire of athletes to test their abilities over long distances is a well-known phenomenon (Cejka et al, 2014; Hoffman, Ong & Wang, 2010). For a runner of average capability, the goal of a marathon is a sufficient challenge. For others, a marathon-length run is only the start of their odyssey. Ultra-endurance races can take place in hostile environments, which provide additional challenges to tax both the physiological and psychological capacities of the athletes who attempt them (da Fonesca-Engelhart et al, 2013; Hoffman et al, 2015; Park, 2005). As with any act that extends the human condition (i.e. the characteristics, key events, and situations which compose the essentials of human existence), there is curiosity regarding both how and why athletes seek to complete and compete in protracted races. Existing physiological research examines the preparation for and/or impact of these extreme events. However, the psychology of ultra-endurance is uniquely placed to study how a person endures these challenges, even when the body is failing.

To varying degrees each event creates its own definition: each physiological study does likewise. Indeed, some studies do not define the distance (Schuler, Wegner, & Knechtle, 2014), instead using other means to define their challenge. In addition, while science has considered the physiological preparation and subsequent impact on the body, there are few studies focus on the mental aptitude required to take an athlete over distance, terrain and hours or days of effort. Whatever specific physical preparation is required for the event, tempering mental capacity is an important element. However, the literature for a comprehensive view of psychological preparation for ultra-endurance was sparse. The existing literature variously describes ultra-endurance as runs longer than the standard marathon of 26.2 miles (Mueller, 2012; Krouse, Ransdell, Lucas & Pritchard, 2011); cycling over 100 miles (Linderman, Demchak, Dallas, & Buckworth, 2003), events of duration longer than 6 hours (Zaryski & Smith, 2005); multiple distance triathlon (Kenechlet, Schwanke, Kenecht & Kohler, 2008) and multiday races (Lahart et al., 2013). Some physiological studies do not define ultra-endurance except solely in terms of the specific event studied (Kenecht,

Enggist, & Jehle, 2005; Knechtle, Rust, Knechtle, Rosemann, & Lepers, 2012).

Due to the extremes that athletes take their bodies to, the field of ultra-endurance is apposite for physiological study. Within this field, scientists have the opportunity to research the human body when voluntarily extended beyond its physiological capacity for a relatively short, intense period. Cotter (2014) suggested that the ability of humans to control and regulate their living and working environments for comfort controlling stressors such as heat/cold, can restrict or prevent both physical and intellectual adaptation. Ultra-endurance athletes, by placing themselves freely in challenging situations, enabling physiologists to study human tolerance and accommodation to inhospitable/challenging settings. In physiological studies (Cotter & Tipton, 2014; Bescós, Rodríguez, Iglesias, Knechtle & Benítez, 2012; Geesmann, Mester, & Koehler, 2014) there has been some debate concerning continuous versus multistage races, specific to physical recovery. To date, limited literature has been located that views recovery from a specifically psychological perspective apart from a study following the replication of a long-distance walking event of 1000 miles in 1000 hours (Breslin, Murphy, Kremer, McClean & Davison, 2014). The study of this specific event found that the athlete was assessed to have a high degree of intrinsic motivation and mental toughness prior to the outset of the event. The athlete's fear of failure was a positive motivator for him completing the task.

When seeking to generate an understanding of ultra-endurance that was not limited to a specific sport or research study, the researchers needed to consider how to generate a suitable definition. The starting point for this was a study by Chidley, MacGregor, Martin, Arthur and Macdonald (2015) on downhill mountain biking. The authors of this study sought to discover which skills were most pertinent to downhill mountain biking. Other related disciplines such as cross-country mountain biking, motocross and off-road vehicle driving did not allow the authors to infer the necessary skills as "objective risk between the disciplines make inferences from these other sports difficult" (Chidley et al, p.183). To create a list of specific skills for downhill mountain biking, the authors consulted with an expert panel who generated a definition of the qualities required by downhill riders, and checked the validity of this definition by surveying competitive riders.

As a working definition of ultra-endurance, valid across disciplines, could not be located, a similar approach canvassing athletes' knowledge and opinion was utilised for this study. Athletes and coaches were invited to define and/or comment upon the existing definitions available within the literature. In addition, simple questions offered athletes the opportunity to expand on how they viewed ultra-endurance. The researchers were aware that while attempting to generate an overarching definition for all ultra disciplines was sought after in academic terms, there was a distinct possibility that no such definition could be obtained but that similarities between athletes or their preparation could be explored further:

METHODS

The methods adopted were broadly based upon the study of Chidley et al (2015). A survey was constructed for online distribution via Survey Monkey. Maori consultation was undertaken and ethics approval applied for and gained through Otago Polytechnic Ethics Committee. Participants were recruited, initially through personal contact and snowballing recruitment methods (i.e. initial participants forwarding to others they believed would have information to contribute). Professional coaches in the endurance field were also canvassed and invited to email the survey link through to their athletes. The coaches approached were known to the researchers as specialists in the endurance/ultra endurance coaching.

Given the relatively low numbers competing in this sport, the survey was aimed at attracting the maximum possible number of participants, with accessibility being an essential element in ensuring a high response rate. It is common for coaches to utilise online methods to communicate with and guide their athletes. Therefore, it was anticipated that the snowball method would bring in endurance athletes not only in the Pacifica region but worldwide. All respondents self-identified as endurance athletes. Initial response was slow so further requests were made via interest groups' Facebook pages. The initial page of the survey explained the purpose. Consent was obtained from participants by informing them that continuing with the survey inferred consent to participate and for the data they provided to be included. Participants demographics such as sex, age range and general geographical location were collected and all data collected was de-identified prior to analysis.

RESULTS

All participants chose to respond to this question and there was a near even split between the sexes; female 51.69%, male 48.31%. Details of age were collected since anecdotally endurance athletes occupy an older age group at an elite level than observed in other sporting endeavours. As can be seen below (see Figure 1), the highest grouping was in the age category 35-44 years (38.64% of respondents) and 45-54 years (29.55%).

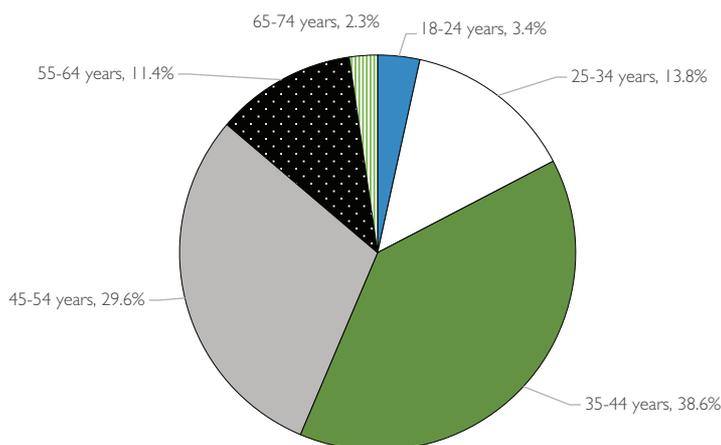


Figure 1. Age of respondents

While few conclusions could be drawn from this relatively small sample, in literature pertaining to ultra-endurance, where age was a component of data collected, most participants fall into the ≥ 39 years of age. The data collected in the present survey concurred with the findings in the literature considered.

Data were collected to ascertain the level of race knowledge/participation in respondents (see Figure 2). Frequency of race entry was not associated with expertise but it was anticipated that a greater depth of understanding would be acquired with experience.

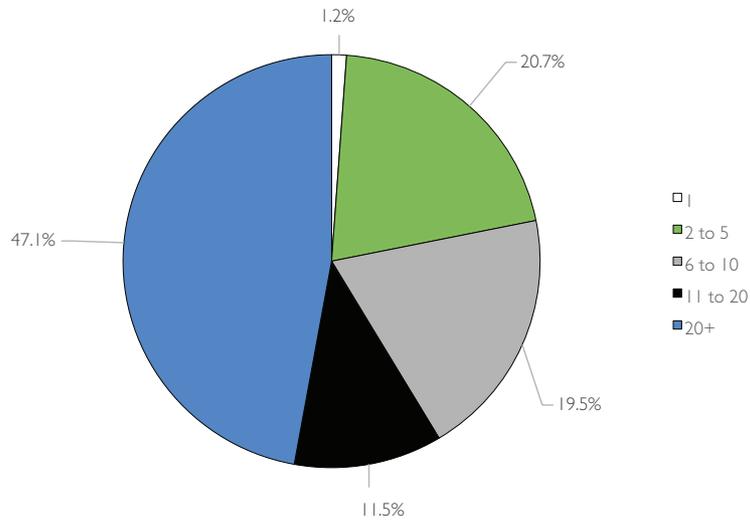


Figure 2. Number of races participated in

The population participating in ultra-endurance is relatively small (Doppelmayr & Molkenthin, 2004), although interest in long-distance events is increasing (Williams et al, 2011). When forming the question regarding ultra activities, the authors considered the most popular events covered in the existing literature (da Fonesca-Engelhart et al, 2013; Mueller, 2012; Krouse, Ransdell, Lucas & Pritchard, 2011; Zaryski & Smith, 2005). Ultra running is possibly the best known and most popular; although the most recognised in non-athletic circles could be professional multi-stage cycling events such as the Tour de France (Humphrey, personal communication, 2017). The researchers listed running; biking; mountain biking; multi-stage races (which could include a variety of disciplines such as mountain biking, running and kayaking); paddling; swimming and an open category to accommodate other long-distance/time efforts.

Literature retrieved for this study suggested the discipline respondents most frequently identified with (Figure 3) was runners (85.23%) followed by adventure racing (28.41%). Adventure races are multi-stage, continuous event comprising of two or more activities over several days, for example mountain biking, running and kayaking. For those who defined their events as 'other' the largest number indicated that they competed in long distance triathlon (Ironman). Debate exists, even in the Ironman community, over whether an iron length triathlon is ultra endurance or endurance due to the relatively short time elite athletes take on each discipline. This same paradox exists between the various adventure racing events available. Nevertheless, total time for accomplished athletes to complete a long-distance triathlon is typically eight plus hours, which falls into the definition of being over six hours (Zaryski & Smith, 2005). There was only one respondent who identified themselves as a solo off-shore single-handed sailing. Further efforts are required to ensure that responses are gathered from this community.

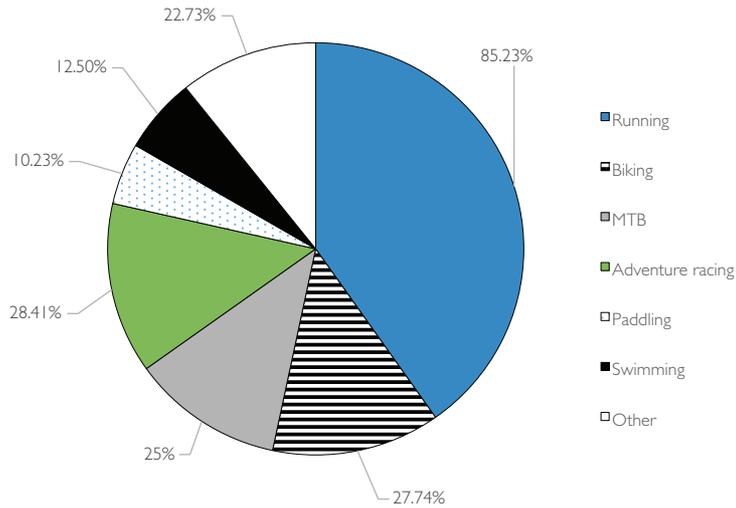


Figure 3. Ultra-endurance disciplines

Respondents identified the following as their definition(s) for ultra-endurance. Since the preponderance of ultra athletes identified as runner, the most commonly identified definition for ultra-endurance was 'run over marathon (42.2km) length (62.64%)'. Respondents also identified events longer than six hours (44.32%) or multi-day events (27.27%). The aim of this question was to elicit a collection of opinions for ultra and then encouraged the respondents to elaborate further in the subsequent question.

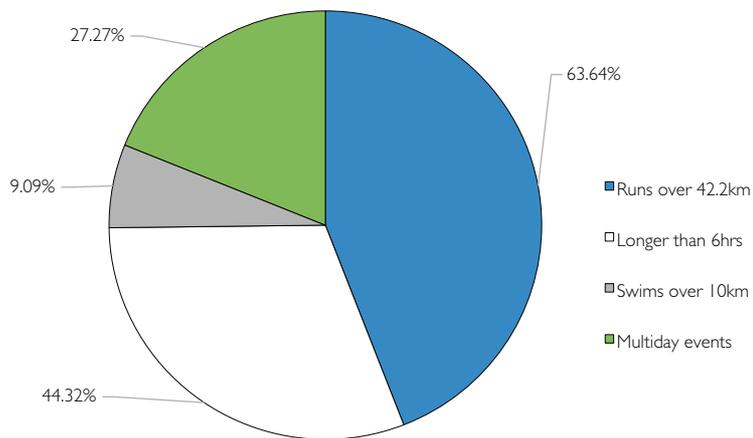


Figure 4. Ultra-endurance definitions

Respondents were invited to explore the provided definitions and elaborate with their own embellishments and comments. These were experienced athletes and coaches who had competed across a wide variety of events. The responses were categorised into five main themes: time; distance; perception of effort or challenge; training; suffering. Suffering was included as it represented a separate issue from being tested by the nature of the chosen event.

DISCUSSION

Time/distance was an anticipated theme from the participants' responses. Most of the runners concurred with a distance equal to or greater than marathon length, but with caveats. One athlete stated: "a 60km flattish course can be a lot easier than a hilly 45". Another added elevation gained during the event "a significant amount of ascent gain, for example more than 1000m of climb" and a further athlete that ultra "require(s) more than just the normal flat/road running". Some athletes added a specific distance such as over 50km or 80km for runners, over 160km for road cycling; over 10km for swimming. As most of the respondents were runners it was noticeable that distance figured prominently in their responses.

Comments regarding time featured consistently throughout the participants' responses. The definition offered to respondents was 'events over six hours'. For the majority of participants, a time of six hours did not qualify as an ultra-endurance event, with one respondent identifying 'anything over 8 hours'. A marathon swimmer participant, however, combined the time of the definition with the distance he would swim. For this respondent, an ultra-endurance swim would be ≥ 20 km. Further comments linked the grade of athlete to the length of time. A respondent stated: "for slower runners, a marathon could easily take 6+ hours, and represent an ultra-endurance race for them". This athlete compared the time taken by an elite athlete to do the Kepler Challenge, a 60km off-road race, at under 5 hours and his own time of 11 hours. This difference between professional and amateur athletes was echoed by another respondent who argued that the nonstop nature of Ironman events, although there are three events in the discipline, is ultra-endurance as "it is continuous over a minimum of 10 hours for most people".

A notable factor in participants' comments was that simple time/distance descriptions were not sufficient for the participating respondents. The time taken on the event and the distance covered were interlinked with other factors which contributed to the challenge of the event. Time and distance definitions were not adequate to encompass the effort made by the individual to complete the event undertaken. In addition, the respondents included all levels of athlete competing over extended distances and time, but specified that effort and challenge was a necessary factor in the definition.

One respondent stated: "Ultra-endurance is an event that extends the human condition" and it is arguable that this is possibly the most concise and accurate definition of the genre. As noted above, on time and distance, what one athlete found achievable might for another be well outside their capabilities. The same athlete noted "someone who has just learned to swim 200m without stopping would not think a 5km training session is 'normal' to them". Other athletes commented that ultra-endurance was "not something you can bluff your way through" or that ultra-endurance is "a mental challenge as much as the physical". It may be possible to surmise from these statements that there should be a significant amount of effort for the person involved in an ultra-endurance event but, as another stated, definitions are somewhat arbitrary as the concepts of effort and challenge are subjective. This notion of effort/challenge was reflected throughout many of the respondents' comments and is an area in ultra-endurance that requires further research.

Respondents stated: "ultra-endurance must include a high degree of commitment in training", and "something that requires a sustained period of training" and this corresponds with the concept that ultra-endurance is above and beyond the normal run of competition. A respondent stated that ultra-endurance "involves sleep deprivation, nutrition training, hard physical exertion, mental toughness, isolation" all of which require extensive preparation and training. Another athlete stated, "where your starting energy is fully depleted so you rely on fuelling to complete

the race” and further respondent specified “non-stop events, i.e. no allowance made for sleeping time”. It is not possible, according to the respondents, to “wing” it or “bluff your way through”. The event requires multiple forms of training, not simply in the discipline of the event but in nutrition replacement, stamina and ability to function on little sleep. There appears to be a background assumption that the participant must not only be trained but should be prepared to endure hardship to complete the event.

The theme of training was also associated with the notion of suffering or hardship in the respondents' comments. “Races where I have been on the brink or tears, or actually crying”, “a degree of mental and physical suffering is necessary...the sense of truly digging deep into oneself”, “an ultra is an event in which all competitors will endure some suffering in an effort to complete”. Although not specifically stated, these comments would appear to illustrate that ultra-endurance athletes embrace hardship and suffering as a positive rather than negative feature of their events. It is this aspect of ultra, this acceptance of hardship and the ability to “endure the daily rigours” of the event which requires greater exploration.

CONCLUSION

This survey was constructed to gather responses from the ultra-endurance community regarding a broad definition for ultra-endurance. The literature retrieved did not supply a definition that adequately encompassed the breadth of ultra-endurance endeavour.

Within the comments from the respondents the authors found that there was no conclusive agreement on time or distance but there was consensus that the events should be outside the standard athletic endeavour. In addition, respondents considered that what could be ultra for one athlete in terms of time and/or distance may not be for an athlete who was more experienced or able.

Respondents cited the necessity for an extensive preparation period for the event, and this preparation would include physical training in the sport, nutritional preparation and mental discipline. Further to the training required, the respondents evinced an expectation and acceptance of suffering, both mental and physical, in completing their chosen event. It is particularly this aspect of the survey that is apposite for further research.

The survey continues to be available for completion by athletes and the body of opinion and themes will gain greater depth. The researchers anticipate that even if an encompassing definition of ultra-endurance cannot be formed, exploration of the methods and preparation used by athletes to embrace the suffering they face could be the next phase of this research.

Kate Spenceley is a Registered Nurse and Midwife, with a BA(Hons) and an MPhil in midwifery. Seven years ago, an “activity epiphany” changed her from a “sedentary lecturer” in midwifery at Otago Polytechnic into an Ironman competitor; and led her to complete a Diploma in Personal Training at the Otago Institute of Sport and Adventure. Kate now seeks to introduce others to the joy of movement by working in the Green Prescription team at Sport Otago. Outside work, Kate’s main interests lie in ultra-endurance events, in particular long-distance self-supporting mountain bike rides called brevets. This explains her research interest in psychological preparation for ultra-endurance events.

Richard Humphrey began his academic career at the University of Southampton (UK), where he taught sport studies and sport management and development. Following some postgraduate study at the University of Bristol, he emigrated to New Zealand in 2013 and took up a lecturing position at the Institute of Sport and Adventure at Otago Polytechnic. Richard teaches and supervises undergraduate research in the fields of exercise, health and research methods. His research interests include the therapeutic use of exercise and substance misuse, particularly in the case of people with coexisting mental health issues.

Candice Lingam-Willgoss has a BSc in sport science and English from St Mary's University, London, and an MSc in Sport and Exercise Psychology from University College Chichester. For her PhD, she is investigating the transitional experiences of elite sportswomen. She is also a level 2 BTF triathlon coach, and has supported elite endurance athletes with their mental preparation for events. As a lecturer in sport and fitness at The Open University, she specialises in sport and exercise psychology, with research interests in exercise adherence, motherhood, career transitions in sport, and ultra-endurance performance. Candice's sporting interests include triathlon, swimming, running and waterskiing, and she has been a competitive ski racer.

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CONSIDERATION FOR RUGBY SEVENS-SPECIFIC TRAINING SCHEDULES

Matt Blair

INTRODUCTION

Rugby Sevens is a global sport, with increasing attention being paid to the physical loads endured by players during a Sevens tournament (Ross, Gill & Cronin, 2014). Sevens matches involve high-intensity intermittent exercise (HIIE) (Ross et al.), and the distinctive nature of this type of activity has been reported in a recent investigation into the metrics of World Series Sevens tournaments (Blair, Body & Croft, 2017). This study reported a variety of GPS metrics that clearly demonstrated how the levels of metabolic power – which represent the explosive elements of movement in a match, such as high-speed running and surges (sprints) – were much greater in Sevens than Fifteens. Consequently, Sevens tournaments involve significant physical work and a cumulative load over two to three days that is much more than that experienced in a weekly Fifteens match (Blair et al.). In preparing a Sevens player, coaches need to acknowledge this load difference. Interestingly, most Sevens coaches have extensive backgrounds in Fifteens, and therefore more experience with the weekly Fifteens match scenario.

Developing Sevens-specific training schedules for tournaments should combine both practical and theoretical considerations. Importantly, the schedule needs to consider the integration of key team departments using an interdisciplinary framework (Joyce & Lewindon, 2014). These departments comprise players and their support staff who include coaches, managers, sport science and sport medicine practitioners. During the creation and implementation of training schedules, there is often a wide variety of conflicts between these departments; to an extent, this is normal and part of the process of developing a schedule that is co-created and has 'team buy-in.'

Coaches at the 'coal face' often lead teams and have historically developed schedules through trial and error over a period of time. These methods have been passed on through generations of coaches, who continually adjust and implement them in accordance with what they find works best. While this practice-based evidence approach is critical to the advancement of training methods, it is only one part of the equation in terms of ongoing performance success. Modern sport science provides the evidence-based practice approach which underpins another vital part. Science can help explain the 'why?' (or 'why not?') behind the level of success achieved by the variety of training methods employed in high-performance sporting environments. For example, the way energy systems are engaged with a range of physical activity has contributed to programmes being designed to meet the actual demands of a particular sport (Deutsch, Kearney & Rehrer, 2007; Castagna, Abt & D'Ottavio, 2004), underpinning the training principle of specificity. Further, it has been established for some time that the benefits obtained from these programmes only occur when the conditioning stimulus overloads the actual demand that is required by the game (Dascombe, Reaburn, Arnold & Coutts, 2003; Weston, Helsen, MacMahon & Kirkendall, 2004). Herein lies the challenge with Sevens rugby; there is more than one game in a tournament.

Training schedule - External (GPS PMS) and internal load (RPE)

Multiple tournament matches are played over a one-to-three-day period, in contrast to rugby Fifteens, which follow a cycle of once-weekly games. Therefore, the overall external and internal physical load and specific metrics required by a Sevens tournament need to be considered together with technical training (style of play) to help optimise on-field performance outcomes. While annual periodised planning is beyond the scope of this report, an example target pre-season training week schedule for a professional Sevens team (see Table 1) suggests what a week's routines might look like when preparing for a three-day tournament. Pre-season is an opportune time to integrate styles of play, even if the period is short, and the conditioning coach needs to be closely coordinated with the coaching staff to ensure that technical sessions achieve conditioning goals (Joyce & Lewindon, 2014). Measures from a recent investigation of the metrics of World Series Sevens tournaments were used to illustrate how they can contribute to the design of Sevens-specific training schedules (Blair, Body & Croft, 2017). Importantly, these schedules need to consider measures from this type of investigation, such as RPE and the unique PMs of a Sevens match, as well as the cumulative load through the tournament, which is very different from weekly Fifteens matches

Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
am	Prehabilitation / Activation: Options include proprioception, balance, activation (e.g., hard foam roller on hip flexors and front shoulders) and other tissue-release techniques, dynamic flexibility, high-intensity running and strength–power patterns together with mental skills work (meditation, hypnotherapy, etc.) Reviews and checks between team departments: players and support staff – coaches, managers, sport science and sport medicine	Rest and relax	Rest and relax	Recovery: Light walk and/or pool session	Prehabilitation / Activation: Options include proprioception, balance, activation (e.g., hard foam roller on hip flexors and front shoulders) and other tissue-release techniques, dynamic flexibility, high-intensity running and strength–power patterns together with mental skills work (meditation, hypnotherapy, etc.)	Game simulation Focus: RPE 7+/10+, HIA Sp Distance (m) (450) with increased field size Recovery	Game simulation Focus: RPE 7+/10+, HIA Sp Distance (m) (450) with increased field size Recovery
pm	Gym-based power–strength, including ball skill work (hi intensity) Recovery	Field-based Sevens training, including repeated speed work with weighted and normal balls (mod-hi intensity) Recovery	Rest and relax	Rest and relax	Game simulation Focus: RPE 7+/10+, HIA Sp Distance (m) (450-500) and include 6-8 x surge (sprint) efforts up to 75m; standard field size Recovery	Game simulation Focus: RPE 7+/10+, HIA Sp Distance (m) (450-500) and combat activities; with reduced field size Recovery	Game simulation Focus: RPE 7+/10, HIA Sp Distance (m) (450-500) and combat activities; with reduced field size Recovery
eve	Rest and relax		Preparation: Mental skills work (meditation, hypnotherapy, etc.)	Preparation: Mental skills work (meditation, hypnotherapy, etc.)	Recovery: Massage and ROM work	Game simulation Focus: RPE 7+/10+, HIA Sp Distance (m) (450) and include contact; reduced field size Recovery	Game simulation Focus: RPE 7+/10+, HIA Sp Distance (m) (500+) and 10-12 x surge (sprint) efforts up to 60m; standard field size. Recovery

Table 1. Example target preseason training week schedule for a professional Sevens team.

Notes: Recovery options: active (e.g., 10 minute easy-moderate walking) vs. passive (e.g., nutrition, massage and mental skills)

Use of cross-training options (e.g., spin cycle and boxing) at the training ground for injured players and/or those who are not capable of pushing capacity to the target levels (individual monitoring required).

Key: HIA, high-intensity activity; W/kg, watts per kilogram

Essentially, the week is constructed to prepare for a three-day Sevens tournament. Friday, Saturday and Sunday are typical tournament days and, when three days are involved, the first day of match play is usually shorter than the others. While it is widely recognised that there is a need for player individualisation, the practical implications considered here relate to how both RPE and GPS PMs inform schedule development for the team. Individual targets based on needs analysis would also be set alongside the team targets. Importantly, the training sessions need to have players working consistently at RPE at and above 7/10+. However, to assess this rating correctly, players would need a trial period that allows them to become familiar with what it represents and why monitoring internal training load is important. High-speed running metres and surge (sprint) efforts are two essential high-speed metrics that could be used to monitor external loads of sessions and set targets (Blair, Body & Croft, 2017). High-speed running metres for each session within the week range from 450-500 and 500+, while surge (sprint) metres range from 50-70 x 6-12 efforts. Along with RPE, these PMs are at and above the respective match means of 344m and 39m (with 7.5 efforts) reported for World Series Sevens tournaments (Blair, Body & Croft, 2017). Importantly, players would on average cover more than 3000m high-speed running, which incurs an overload above the cumulative tournament total of 2063m presented in this study.

When these two metrics and RPE are monitored using analysis during and post-session, discussion of how to adjust physical parameters within and between sessions can occur. Focusing on these three variables does not mean that the others are neglected; rather, it simplifies the session monitoring and makes it coach-friendly. This ensures that players are working above the requirements of a Sevens match and doing this over a period of three days, simulating what is required in a three-day tournament. Other metrics, such as high-speed acceleration and deceleration, would also be monitored. This approach would allow levels of specificity and overload to be adjusted in accordance with previous screening and physical monitoring that provides the opportunity to set an appropriate training stimulus. For example, some professional Sevens teams might be completing a mean high-speed running distance of 500m during matches and up to 600m+ in some of their training sessions, whilst simultaneously achieving RPE session scores at and above 8/10+.

It is appreciated that there is variation between these types of plans and actual training sessions undertaken. Player illness and injury, team performance (optimal vs. sub-optimal) and resource availability mean that support staff need to be agile and continually adjust sessions according to requirements on any given day. However, simulating tournaments provides the opportunity for the team departments to practice for the real tournament, thus providing occasions to ensure 'team buy-in' with challenging events both on- and off-field. This practice should be very different to what Fifteens players and their support staff complete, as the cumulative physical metrics of a Sevens tournament exceed the weekly Fifteens match by a very large amount. Coaches working in Fifteens and Sevens rugby need to be mindful of this.

Further considerations

The example weekly schedule will prompt important questions that need to be addressed when these measures are developed and implemented. These might include:

- Should a tournament simulation (and varied formats) be completed prior to all tournaments?
- What type of load progression should be implemented over the months as the players improve their individual and collective Sevens-specific physical condition?
- How can physical conditioning session options such as strongman, combat, medium (Maximum aerobic speed – MAS) and short-interval (repeated speed), and speed (anaerobic power) training be incorporated not only into game simulation sessions, but also in regular conditioning sessions?

- Have players returning from injury demonstrated an ability to cope with a game simulation training session?
- Was the simulation period used effectively to try new training patterns, conditioning activities and mental skills training? If so, how can the efficiency of these new approaches be measured and therefore considered (or rejected) for integration into future sessions?
- What method can be used to measure and apply strength and conditioning scores such as monotony, strain and acute: chronic fatigue? These types of load measures are currently underpinning schedule development and monitoring in many HII E sports (Gabbett, 2016).
- What considerations are needed with Fifteens players used in a Sevens environment – for example, the impact this has on their physical capacity to train?

CONCLUSION

While GPS is a tool that provides objective metrics of the physical requirements of the Sevens game, the real benefits come from asking the type of questions listed above. GPS can highlight matters relating to the physical preparation of the athletes, but when these questions are considered and addressed by team departments, then positive contributions to schedule development – an ongoing, dynamic process – can occur.

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