SESNZ 2024 CONFERENCE
NOV 20–22, ŌTEPOTI DUNEDIN

CO-HOSTED WITH ISPAS

SE🌀NZ
SPORT & EXERCISE SCIENCE
— NEW ZEALAND —

ISPAS
INTERNATIONAL SOCIETY OF
PERFORMANCE ANALYSIS OF SPORT

The evolution of exercise science: bridging research and real-world impact
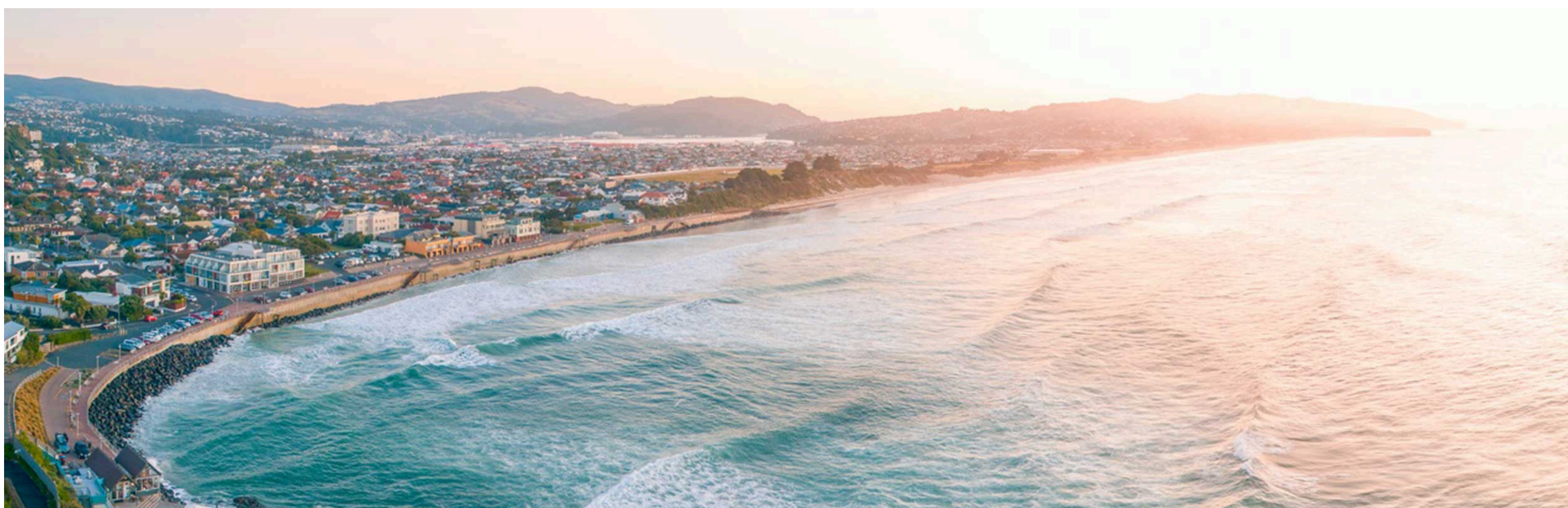
CONFERENCE HANDBOOK

SESNZ 2024 CONFERENCE
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The evolution of exercise science: bridging research and real-world impact

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📍 **University of Otago, Otago Polytechnic & Tūhura Otago Museum**

Ōtākou
Whakaihu Waka
UNIVERSITY OF OTAGO

OTAGO
POLYTECHNIC
Te Kura Matatini ki Otago

TŪHUra
Otago Museum

School of Physical Education Sport and Exercise Sciences: 55/47 Union Street West
Sargood Centre: 40 Logan Park Drive
Otago Museum: 419 Great King Street

Scan the QR code for a Google Maps list with all conference locations

SCAN ME

PROGRAMME AT A GLANCE:

Wed Nov 20th
- Pre-conference workshops 9am-3.00pm *(registration required)*
- Conference Opening 3.30pm
- Welcome Reception 6.00pm

Thurs Nov 21st
- Morning Activities 6:30-7:30am *(registration required)*
- Conference Program 9:00am-5:00pm
- Conference Dinner from 6:30pm *(registration required)*

Fri Nov 22nd
- Conference Program 8:30am-12.30pm
- Conference Closing 12.00pm

SPORT
NEW ZEALAND
GROUP

SPORT
NEW ZEALAND
IHI AOTEAROA

HIGH PERFORMANCE
SPORT NEW ZEALAND

Welcome from the SESNZ Chair

SESNZ
SPORT & EXERCISE SCIENCE
— NEW ZEALAND —

Kia ora koutou,

As Chair of SESNZ I would like to welcome you all to Dunedin Ōnepoti for our 2024 Annual Conference which we are delighted to be co-hosting with ISPAS – the International Society of Performance Analysis of Sport.

It is always a huge team effort to bring everything together for a Conference and we are very grateful and appreciative to everyone involved from the University of Otago and Otago Polytechnic for organising and hosting the event and associated activities, with special mention to Lara Vlietstra, Mat Blair and the local organising committee members, our hosts at Tūhura – Otago Museum, as well as our colleagues from ISPAS. I would also like to extend a heartfelt thank you to Vanessa, our National Manager, for all of the work that she undertakes behind the scenes to support the organisation, the Board and the members.

No conference is achievable without considerable financial assistance from our sponsors and I would like to extend our thanks to: **Vald; ASICS; Routledge; AI Medical International; Cosmed; Directed Electronics; PURE Sports Nutrition; HPSNZ and Sport NZ**. I urge all delegates to engage with our sponsors and where possible reciprocate their support of our organisation when your own institutions, organisations or research groups are considering which services or products to utilise in your practice. On a related note, I would like to specifically honour Ken Marment. Ken was a wonderfully warm individual who sadly passed away in June of this year. Ken was a staunch supporter of SESNZ and through his company (GBC BioMed) was ever present at our SESNZ annual conference. Ken will be sorely missed by SESNZ and by all those who had the pleasure of knowing him.

I would like to extend a warm welcome to our Invited Speakers for this year's conference: **Dr Steve Barrett; Dr Nathan Elsworthy; Dr Robbie Francis Watane; Dr Ihirangi Heke; Esme Soan and Associate Professor Brigit Mirfin-Veitch**. The expertise and experience of these academics and practitioners offers an exciting breadth and depth of knowledge that I'm sure will engage and inspire our delegates. I look forward to continuing my own journey of life-long learning.

Welcome from the SESNZ Chair

SE⊘NZ
SPORT & EXERCISE SCIENCE
— NEW ZEALAND —

Conferences are wonderful occasions not just for knowledge transfer but, often more importantly, for engagement and networking. We hope that you are able to make the most of the opportunities to catch up with colleagues and friends, as well as cultivate some new relationships that will further your research, your professional development and our profession. This year, 2024, has seen SESNZ continue to grow as an organisation, in regard to the continued success of the Journal, greater engagement with our student and early career members, new partnerships and enhanced stakeholder engagement. These developments are presented in more detail in the SESNZ Annual Report which members should have already received and which I will talk to at the AGM and I hope that you can join us to be part of the conversation.

I'd like to finish my welcome by challenging you to get the most that you can from this conference and from the organisation. If there are things that you want, and we currently do not offer then let us know. If you are interested in driving the organisation forward, then again we'd love to hear from you or welcome you onto the Board.

Ngā manaakitanga

Associate Professor Andy Foskett. *Chair, SESNZ*

Welcome from the Chair of ISPAS Oceania

The International Society of Performance Analysis of Sport (ISPAS) is a global organization dedicated to advancing the field of performance analysis in sports. Established to foster international collaboration, ISPAS provides a platform for professionals, researchers, and enthusiasts to exchange knowledge, discuss current research, and engage in joint projects aimed at enhancing sports performance through analytical methods.

In November 2024, ISPAS is honoured to co-host the Sport and Exercise Science New Zealand (SESNZ) Conference in Dunedin. This partnership underscores a shared commitment to integrating performance analysis into broader sports science disciplines, offering attendees a comprehensive program that includes keynote presentations, workshops, and networking opportunities.

ISPAS's involvement in the conference aims to highlight the critical role of performance analysis in modern sports. By leveraging data-driven insights, performance analysts contribute to optimizing athlete performance, refining coaching strategies, and advancing sports science research. The conference will feature sessions on the latest methodologies, technological advancements, and practical applications of performance analysis across various sports.

Attendees can anticipate engaging with leading experts and practitioners, gaining insights into cutting-edge research, and exploring innovative tools and techniques that are shaping the future of sports performance analysis. This collaboration between ISPAS and SESNZ promises to enrich the conference experience, fostering a deeper understanding of how performance analysis contributes to the evolving landscape of sport and exercise science.

Associate Professor Kirsten Spencer
Director of ISPAS and
Chair of ISPAS Oceania.

Welcome from the local organizing committee

As the Chair of the Organizing Committee for the 2024 Conference, it's my privilege to express my heartfelt gratitude to everyone who contributed to the success of this event. This year, the theme is: "The Evolution of Exercise Science: Bridging Research and Real-World Impact." Over the course of this conference, we hope you will explore ways to connect cutting-edge research with practical applications that transform lives, embodying the spirit of collaboration, innovation, and meaningful change.

A cornerstone of this year's event is our commitment to inclusion, diversity, and equity. The local organizing committee has strived to create a space where diverse perspectives are not only welcomed but celebrated—a space where everyone, regardless of background, can share, learn, and contribute to the ongoing evolution of our field. This effort is not just a reflection of our values but also a recognition that diversity strengthens the impact of our work.

I extend my deepest thanks to the local organizing committee for their dedication and creativity. Their thoughtful planning will make this conference a truly enriching experience for all. I would also like to thank our sponsors for their generous support. Your partnership has been essential in bringing this vision to life, enabling us to host a conference that reflects the highest standards of excellence and inclusivity. A special mention needs to go out to Vanessa, our national manager for all your help, and to Dr. Tina van Duijn, for leading the scientific committee. Lastly, to our speakers, volunteers, and every attendee — thank you for bringing your passion, insights, and energy to this event. You will be the heart of this conference, making it a vibrant platform for dialogue and progress.

I encourage us all to carry forward the connections, ideas, and values we've shared here. Together, we can continue to advance exercise science and ensure its benefits reach everyone.

Kā mihi nui,
Dr. Lara Vlietstra

Local Organizing Committee

Lara Vlietstra (chair), Matt Blair (co-chair), Vanessa Groome, Hayden Croft, Kirsten Spencer, Katherine Black, Neil Anderson, Maddie Connor, Jim Cotter, Kane Cocker, Stacey Pine, Nicole Spriggs & Codi Ramsey

Scientific Committee

Tina Van Duijn (chair), Lara Vlietstra, Kirsten Spencer, Katherine Black, Neil Anderson, Maddie Connor, Jim Cotter, Kane Cocker, Codi Ramsey, Chris Button, Eleanor Crabill & Brendon Roxburgh

MEET THE SPONSORS

Founded in 1980, with global headquarters in Rome (Italy), COSMED is a privately-owned company manufacturing Cardio Pulmonary, Metabolic and Body Composition assessment and diagnostic equipment.

COSMED's primary goal has always been to improve the quality of its products and services through innovation and superior customer service.

COSMED designed the first portable metabolic analyser (K4). This truly innovative device broke new grounds with metabolic measurement and rapidly became the best-selling oxygen measurement device in Education, Sports Science and Research. The 5th generation of wearable metabolic system K5 is considered the pinnacle in field metabolic testing.

The Quark line and the latest addition Q-NRG line are considered the Gold Standard for metabolic assessment in research, performance and clinical enviroments.

COSMED products are designed to meet the latest recommendations and guidelines from leading scientific organizations.

VALD offers a comprehensive musculoskeletal health technology platform for exercise professionals. Our solutions include sensor-based objective measurement systems for assessing strength, movement, asymmetry, balance and more, as well as digital health tools for educating patients, prescribing exercise and monitoring outcomes, and contextual, integrated normative data based on tens of millions of data points. The VALD product suite includes ForceDecks, NordBord, ForceFrame, SmartSpeed, DynaMo, HumanTrak, AirBands, MoveHealth and VALD Hub."

Playermaker

After kicking off in 2016, Playermaker has reshaped football innovation. Using Artificial Intelligence the brand can support elite players from early development, and provide personal, intuitive, meaningful insights to the best teams in the world.

Its advanced wearable solution, the Playermaker Connected Footwear Sensor, combines motion sensors and GPS technology to give athletes and teams real-time performance data. Headquartered in Israel with offices in the UK and US, Playermaker has seen impressive growth. It now serves over 150 elite and pro sports teams worldwide, including in leagues like the NFL and NBA. In global football it's the first footworn wearable to receive FIFA approval. The technology provides unparalleled, actionable insights for tens of thousands of players weekly. This data is accessed by some of the world's biggest teams, in a form that's never been so affordable. Players using it improve faster, take more ownership and enjoy playing more. Coaches can leverage precise data on speed, distance, acceleration and agility to accelerate player development. Playermaker is the smallest connected footwear solution and offers multi-sport compatibility. Strong market expansion is projected to continue, driven by popular adoption across sports and fitness industries. Playermaker is exclusively distributed by Directed Electronics in Australia and New Zealand..

The PURE Sports Nutrition brand was founded in 2012 by brother and sister duo Simon Kraak and Marewa Sutherland (BAppSc - University of Otago). Since inception PURE Sports Nutrition has remained committed to the core principles of science, quality, and practicality. Each product in the before, during and recovery ranges are formulated by the duo and undergo rigorous testing to ensure they deliver on performance as well as taste.

PURE
SPORTS NUTRITION

Today, PURE Sports Nutrition manufactures over 70 products in a custom built facility and is supported by a dedicated team of 25 people In Australia and New Zealand. We sponsor hundreds of events annually as well as support many developing and professional athletes to fuel clean performance.

After kicking off in 2016, Playermaker has reshaped football innovation. Its Artificial Intelligence supports elite players from early development, providing personal, intuitive, meaningful insights to the world's best teams. The Playermaker Connected Footwear Sensor combines motion sensors and GPS technology to give athletes and teams real-time performance data.

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At AIM our goal is to offer you the highest quality, latest technology and unique, proven solutions for research, sports science, rehabilitation and neuroscience. We partner with only the best manufacturers of instrumentation and devices worldwide.

Our team includes biomechanists and service engineers ready to assist you in the implementation and training of your devices. This translates into superior customer service and unparalleled local support in all the major cities throughout Australia and New Zealand. Our AIM is your success.

KEYNOTE SPEAKERS

Keynote 1: Dr. Ihirangi Heke

Title: Māori Health & Physical Activity

Bio: Ihi Heke is indigenous Māori and was raised in the mountain environments of New Zealand's South Island. During the past 40 years Dr Heke has variously guided mountain bikers, skiers and outrigger paddlers. Dr Heke also has post graduate degrees in Environmental Management, educational psychology and a PhD in indigenous population health. Dr Heke's most recent research focus has been utilising Systems Dynamics to help indigenous groups build health and wellness activities through traditional environmental knowledge. Dr Heke was also awarded a research grant by Johns Hopkins University (Baltimore) combining Systems Science and Maori Environmental Connections. Over the last several years Dr Heke has been consulting to Google X and recently developed a VR180 Māori environmental experience reel with a particular interest in high performance sport. More specifically his work has been looking at converting elite athletes into environmental champions by teaching them how to be environmentally centred rather than athlete centred in the ways that they train and evaluate elite performance. Key Research areas include:

- Ancestral Māori concepts of health obtained from the environment
- Production of Indigenous ESG (Environment, Social and Governance) AI powered plug ins.
- Environmental connections between climate change, well-being, indigenous ways of knowing and high performance sport.

Keynote 2: Dr. Steve Barrett

Title: Answering performance questions in an applied setting:
The role of academia to support practice

Bio: Steve is currently the Vice President of Sport Performance at Playermaker, alongside board roles with the UKSCA (United Kingdom of Strength and Conditioning Association), Hytro (BFR) and Sweatsearch (training app) ; previously, he has held positions across national football teams, premier league, championship and other roles within the sports tech industry. He completed both his Msc and PhD at the University of Hull, UK, looking at the utilisation of microtechnology for performance enhancement and injury risk reduction. His current research areas include performance/return to play monitoring in open and closed environments and the application of sub-maximal/ HIIT training methods across different sports, particularly around gait based metrics

Steve's Keynote title is "Answering performance questions in an applied setting: The role of academia to support practice"

Applied PhD, Masters, Honours students have been utilised by sport organisations to gain greater insights into specific areas of interest to the organisation. However, creating an environment to support both facets can be challenging across multi-disciplinary departments and in different sports to ensure the best outcomes for the club, the student and the university. The current key note explores working examples and challenges faced within the applications of these models.

KEYNOTE SPEAKERS

Keynote 3: Esme Soan
Title: 'Change the Face' of women's health

Bio: Esme has worked as an Accredited Exercise Physiologist with a Women's Health special interest for the past 10 years, and now both owns & works in her own clinic, Pear Exercise Physiology & Physio in Brisbane, Australia.

When she isn't working with patients, Esme is the Co-Director of The Women's Health Collective, where she promotes & teaches allied health education in all aspects of Women's Health. She is passionate about both learning more, & teaching more in Women's Health space, and feels we need to 'change the face' of women's health to reduce taboos & stigma, and welcome more younger practitioners into the field.

She is also the Exercise and Sports Science Australia (ESSA) Women's Health Media Expert. Through these roles Esme is actively involved in teaching and presenting across Australia with a range of institutions, and has taught in the women's health and exercise prescription space for ESSA, NSW Health, Sports Medicine Australia, and Australian Catholic University.

Keynote 4: Dr. Brigit Mirfin-Veitch & Dr. Robbie Francis Watene
Title: Exploring perspectives on sport and physical activity among people with disabilities (co-presentation)

Bio: Dr Brigit Mirfin-Veitch is the Director of the Donald Beasley Institute (DBI), and a Research Associate Professor with the Centre for Post Graduate Nursing Studies, University of Otago (Christchurch). Brigit is committed to initiating and achieving social change through evidence-based research. She has led or been involved in a wide range of disability rights-based projects in the area of health and well-being, access to justice, violence and abuse, parenting, and the progressive realisation of the United Nations Convention on the Rights of Persons with Disabilities, particularly Article 12 – Equal Recognition Before the Law – and Supported Decision Making. Brigit was centrally involved in the recent Royal Commission of Inquiry into Abuse in Care.

Bio: Dr Robbie Francis Watene is a disabled leader, scholar and advocate from South Auckland. With 35 years lived experience of disability, Robbie has worked in the disability sector for over 15 years as a support worker, humanitarian documentarian, social entrepreneur, researcher, consultant, and advisor. She has experience working with disabled people in France, Bangladesh, India, Mexico, Colombia and Ecuador, and has also spearheaded research on gender, war and disability rights. Robbie is Kairakahau Matua Whaikaha – Disabled Research Lead at the Donald Beasley Institute (DBI), where she oversees a team of disabled and disability researchers, as well as a range of human rights research projects.

KEYNOTE SPEAKERS

Keynote 5: Dr. Nathan Elsworthy
Title: Monitoring performance & wellbeing of team sport athletes and referees

Bio: Dr Nathan Elsworthy is a Senior Lecturer in Exercise and Sport Sciences at Central Queensland University (CQUniversity) since 2017, teaching in the Skill Acquisition and Motor Control units. Prior to this, he was a Lecturer at Victoria University. Nathan's research has encompassed the physical, physiological and decision-making demands of team sport officials, and he has completed projects in elite officiating groups, including World Rugby, Australian football league (AFL), Women's national basketball league (WNBL), National rugby league (NRL) and A-league soccer. Further to this, Nathan also has ongoing projects examining the fluctuations in neuromuscular status and well-being measures in National basketball players (via Cairns Taipans), and sub-elite NRL players, and well as international rugby union players (Tonga rugby).

Dinner Keynote: Dr. Jim Cotter & Lydia Bradey
Title: Stories of Everest

Bio: Jim Cotter has been training in Exercise and Environmental Physiology since the late 1980s, and sometimes training in Multisport and Adventure Racing over this same period. After 9 years in Australia he's back within the School of Physical Education, Sport and Exercise Sciences (Te Kura Para Whakawai), University of Otago (Ōtākou Whakaihu Waka). His main research interests are in the physiological and functional effects of stressors within both physical activity and the environment (esp. heat, dehydration, hypoxia, orthostatic), acutely and chronically.

Bio: Lydia grew up in New Zealand, and lives with her partner Dean Staples and her cat Koshka, by the side of Lake Hawea, near Wanaka, NZ. In 1988 Lydia became the first woman in the world to climb Mt Everest without supplementary oxygen. Lydia is the only New Zealander to have climbed Everest without oxygen, and has guided Everest five times, making six Everest ascents in total. Lydia has made over 35 expeditions to peaks over 6000m. In the 2020 New Years Honours (NZ) Lydia was awarded an Officer of the New Zealand Order of Merit (ONZM) for services to mountaineering. In 1987 Lydia became the first woman in the Southern Hemisphere to climb one of the world's fourteen 8000m peaks. On that ascent Lydia most probably became the first woman in the world to climb an "8000er" alpine-style, (with one push, bottom to summit, carrying everything) and without oxygen. In the early '80s (1981-82) Lydia spent nine months of her life in Yosemite Valley, Ca, USA, then the world Mecca for "Aid" rock-climbing. She climbed 10 "Big Walls" - cliffs taking up to 9 days to climb; and made 7 first female ascents. In 2017, Lydia was one of three Kiwis to make the first New Zealand ascent of the world's 7th highest mountain, Dhaulagiri, 8157m, Nepal, and in July 2019 became the first Kiwi woman to climb Broad Peak, 8047m, Pakistan. In the few years Lydia has twice guided Peak Lenin 7010m, Mt Kun 7077m Ladakh, ski-guided in South Georgia, ski toured in Kashmir, Georgia and Kyrgyzstan, led an expedition-trek in Bhutan, and guided two 6000m peaks in Nepal.

Playermaker 2.0

4 : 2
Playermaker FC — Opponent

87 min	CM	1	2
Duration	Position	Goals	Assists

Skills ⓘ — Details ›

69	76	70
Two-footed	Dribbling	First touch

88	80	Soon
Agility	Speed	Power

Highlights ⓘ

Work rate

PLAYER PLAYER PLAYER PLAYER PLAYER PLAYER PLAYER

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BALL TOUCHES
The total number of times your leg came in contact with the ball.

TOTAL DISTANCE
The total distance you covered during an activity.

ACCL/DECL
The total number of high-speed changes you made above 2 m/s2 for at least 0.5 second.

KICKING POWER
The maximum speed of your foot during the kick.

SPRINT DISTANCE
The total distance you covered above the speed threshold of 5.5 m/s for Pro Sprints or 4.2 m/s for Youth Sprints

INTENSE TURNS
Total number of times you changed running direction at least 30 degrees while running faster than 14/4kph.

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SESNZ
SPORT & EXERCISE SCIENCE
— NEW ZEALAND —

The evolution of exercise science: bridging research and real-world impact

THURSDAY 21ST MORNING ACTIVITIES
6:30 AM

WAKA AMA

Paddle on the Otago Habour and learn about the rich history of this area.

Meet: 35 Magnet Street, Central Dunedin

Maximum of 20 people.

Email mat.blair@op.ac.nz to register.

NATURE WALK

Led by Dr Ihirangi Heke. An opportunity to begin the day with a refreshing walk in nature.

Meet: Dunedin Botanic Garden Duck Feeding Area.

No registration required.

MORNING RUN

Enjoy the views of the Otago Harbour as we jog towards Port Chalmers and back.

Meet: Unipol Recreation Centre/Forsyth Barr carpark.

No registration required.

CACAO CEREMONY

An opportunity to try an anciet Peruvian ceremony that is designed to open-up your heart.

Meet: Sargood Centre (Logan Park).

Email mat.blair@op.ac.nz to register.

EARLY CAREER RESEARCHERS

Early Career

EC UPDATE

This year we held our first ever early career strategy day! Post graduate students from across the country came together to provide feedback and create a strategic plan for the future. Following this we have the EC sub-committee up and running, with the goal of having a student from every tertiary institute and practitions in each SESNZ disipline on the sub-comittee. If you're keen to get involved please don't hesistate to come chat to one of the EC sub-committee members (picture to the left) or email natmanager@sesnz.org.nz.

LETS TALK CONFERENCE

We are stoked to have lots of opportunities avaliable for our early career whanau at this years SESNZ Conference!

Make sure you head along to the early career networking event on Wednesday evening, 7pm at Ombrello's. This is an awesome opportunity to network with some like minded individuals before diving into the full day of the conference on Thursday! We also have a writing workshop designed for us on Wednesday 11am!

At this years conference we also say good bye to our Early Carrer Rep Nicole who has been in this role for the last three years. But we say a big hello to our new rep Maddie, who has lots of big plans moving forwards!

EARLY CAREER RESEARCHERS
CONFERENCE TIPS!

DEFINE YOUR GOALS

What do you want to achieve?
- Networking
- Skill leaning
- Exploring career opportunities

RESEARCH THE AGENDA

Identify key sessions, speakers and posters which are relevant to your goals and interests.

Remember to leave some room for spontaneity!

NETWORKING

Soak up all the networking opportunities we have on offer!
- Wednesday 6pm Opening ceremony
- Wednesday 7pm EC Networking
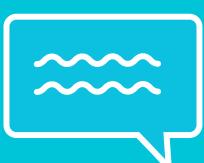- Thursday 6:30 Conference Dinner

ELEVATOR PITCH

Be ready to introduce yourself and your research.
Highlight your goals, interests and what you want to do moving forwards.

ENGAGE IN SESSIONS

Take notes and engage in sessions.

If you don't want to ask a question during the session, find the presenter afterwards and spark up a conversation.

ENJOY YOURSELF

Conferences can be some of the most memorable experiences in your research journey!

Don't forget to enjoy yourself and soak up all the knowledge and energy in the environment.

ACADEMIC WRITING WORKSHOP

This workshop will help strengthen and develop your skills for more persuasive and well-supported writing.

WEDNESDAY 20TH NOVEMBER 11AM - 1PM

This workshop is free and open to our early career and student members.

Location: Otago University, School of Physical Education, Sport and Exercise Sciences

SE🡒NZ
SPORT & EXERCISE SCIENCE
— NEW ZEALAND —

SESNZ Early Career *Social event*

WEDNESDAY 20TH

Ombrellos, 7pm

10 CLARENDON STREET, NORTH DUNEDIN

Look out for our EC reps Nicole and Maddie

Technology that helps
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VALD technology is made by clinicians providing objective measurement, efficient case management, generating data and actionable insights.

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VALD

Practitioner's Guide to Preseason

A comprehensive guide for planning, preparing and executing a successful, data-informed preseason with your team.

Guest Author
Jo Clubb
(Global Performance Insights)

VOLUME 1

VALD

Practitioner's Guide to Speed Testing

A comprehensive guide to understanding, assessing and improving the many dimensions of speed.

VOLUME 1

VALD

Practitioner's Guide to Isometrics

A comprehensive guide for practitioners implementing isometric testing and training into practice.

VOLUME

VALD

Practitioner's Guide to Force Plates

The definitive guide for practitioners implementing force plates into clinical practice.

VOLUME 1

VALD Health Industry **Webinars**

Interactive, educational presentations ranging from product tutorials to seminars from performance and health industry leaders.

Moving Beyong the ACL

Integrating objective strength and movement assessment into healthcare

Feature Presenter: **Dr Paul Read**

Researcher, Associate Professor S&C Coach Return to Play Consultant

Leveraging VALD Systems for ROI in Allied Health

Feature Presenter: **Mitch Vautin**

Founder/Clinical Exercise Physiologist, Exercise Healthcare Australia

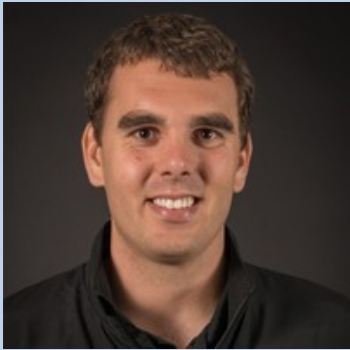# PROGRAMME

WEDNESDAY 20 NOVEMBER

The workshop by Dane Baker will take place at the Department of Human Nutrition
The workshop by Hoani Smith will take place at the Otago Polytechnic, Sargood Centre
All other workshops will take place at the School of Physical Education, Sport and Exercise Sciences

9.00AM

WORKSHOP	**WORKSHOP**	**WORKSHOP**
Flume (Cold Shock)	REDS	Motion Analysis
Prof. Jim Cotter	*Dane Baker*	*Dr. Neil Anderson*

11.00AM

WORKSHOP	**WORKSHOP**	**WORKSHOP**
Heat Chamber	Diastasis Recti Rehab	EMCR - Writing
Prof. Jim Cotter	*Esme Soan*	*Prof. Debra Waters*

1.00PM

WORKSHOP	**WORKSHOP**	**WORKSHOP**
Blood flow restriction training	Motivational Interviewing	Optimising sport science strategies
Hoani Smith	*Chris Higgs*	*Dr. Steve Barrett*

3.30PM

Opening ceremony
Location: Sargood Centre

4.00PM

Keynote #1
Speaker: Dr. Ihirangi Heke
Title: Māori Health & Physical Activity
Location: Sargood Centre

5.00PM

High Performance Sport New Zealand Panel
1. High Jump/Athletics: Detail on the gold medal winning campaign from a Coach PTA perspective – *Presented by James Sandilands (Coach/PTA/S&C)*
2. Sailing: Venue profiling and building effective tactical workbooks for sailors and coaches – *Presented by Alex Anastasiou (Sailing PTA)*
3. Canoe racing: How performance and technique analysis contributed to an accelerated learning environment within CRNZ's medal winning campaigns - *Presented by Paul McAlpine (HOD and CRNZ PTA)*
4. 15-minute panel discussion

   Location: Sargood Centre

6.00PM

Welcome Reception
Location: Sargood Centre

7.00PM

Early Career network function
Location: Ombrellos

THURSDAY 21 NOVEMBER - AM

6.30AM - 7.30AM	Physical activities, see advertisement

From 8.00AM
Registration desk opens
Location: Otago Museum, Hutton Theatre

9.00AM - 10.00AM
Keynote #2
Speaker: Steve Barrett
Title: Answering performance questions in an applied setting: The role of academia to support practice
Location: Otago Museum, Hutton Theatre

playermaker

10.00AM Morning tea

10.30AM - 12.00PM

🏠 *Hutton Theatre*

Ageing

Chair: David Gerrard

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1. Mike Annear
   Active ageing in an urban metropolis across the pandemic: problematic life stages and complex environments provide lessons for walkability.

2. Andrew Garrett
   Hot water immersion to protect older people from heat injury in the time of climate change.

3. Lara Vlietstra
   Physical function and the association with self-reported health-outcomes of retired older elite athletes.

4. Jennifer Gale
   Macronutrient intakes of retired elite New Zealand athletes over the age of 60 years.

5. Meredith Peddie
   24-hour movement patterns of retired elite New Zealand athletes: an observational study.

6. Tianci Li
   Characteristics and correlates of walking behaviour among ageing populations in Japanese age friendly cities.

🏠 *Barclay Theatre*

Strength, Conditioning & Biomechanics

Chair: Ryan Overmayer

----

1. Oliver Hanham
   "On track for jumping": in-the-field kinematic body position tracking over large distances during BMX jumping.

2. Andrew Kilding
   The effects of super shoes on running economy, gait and performance following cycling in triathletes.

3. Raul Martin Gomez
   Validation of step time and asymmetry detection algorithm in high-intensity running with Movesense IMU.

4. Moses Bygate-Smith
   Characteristics associated with countermovement jump performance in adult team-sport athletes: A systematic review.

5. Kyra Seiler
   Physiological comparison of eccentric versus concentric upper-body cycling at light to moderate intensity.

6. Brett Smith
   The relationship between horizontal scrum force and 1RM squat in professional rugby union players.

🏠 *Kākāpo Room*

Exercise Physiology

Chairs: Nicole Spriggs & Kane Cocker

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1. Jeffrey Rothschild
   A novel approach to measuring carbohydrate and energy expenditure during endurance exercise.

2. Chris Button
   Comparison of measurement methods to estimate body fat percentage.

3. Kane Cocker
   How the physiological cost of floating varies over time and by individual.

4. Nic Daniels
   Quantifying the physiological response to simulated motorsport driving in the heat.

5. Charles Simpson
   The effect of hypoxia (80% SpO2) on neuromuscular activity during repeated cycle sprints in young athletes.

6. Nicole Spriggs
   Incidence and magnitude of head acceleration events experienced by female adolescent rugby players across a season of rugby participation.

🏠 *Conservatory*

Performance Mindset Coaching

Chair: Kylie Wilson

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1. Panel Discussion (45 min.)
   Exploring the integration of mental skills and psychology into performance: perspectives of high performance coaches.

2. Jason McKenzie
   Referees are athletes too: An intentional approach integrating wellbeing and mental skills to create a performance edge.

3. Kylie Wilson
   Paris 2024 Olympics: Psychology and mental skills insights and recommendations.

4. David Galbraith
   The art of weaving mental skills and traditional performance coaching within high performance sport – where people and performance are seen as one in the same.

THURSDAY 21 NOVEMBER - PM

12.00PM
12.30PM

Poster Pulse: 2-Minute Spotlights
Location: Otago Museum, Hutton Theatre

12.30PM
1.30PM

Lunch
Sponsor exhibition & poster session

1.30PM
2.30PM

Keynote #3
Speaker: Esme Soan (AEP, ESSAM)
Title: 'Change the face' of women's health
Location: Otago Museum, Hutton Theatre

VALD PERFORMANCE

2.30PM
3.30PM

🏠 *Hutton Theatre*

Exercise and Women's Health

Chair: Katherine Black

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1. <u>Penelope Matkin-Hussey</u>
   Continuous glucose monitors - a novel tool in relative energy deficiency in sport (REDS).

2. <u>Marc Murray</u>
   Exercise tolerance and adaptation in untrained females: A 12-week training study.

3. <u>Brendon Timmins</u>
   Adapting to new challenges; preparing an amateur female Dragon Boat team.

4. <u>Michaela Rogan</u>
   FE-MALE Study: Female Exercisers – Menstrual (follicular And Luteal) Effects, a pilot study.

🏠 *Barclay Theatre*

Performance Analysis

Chair: Kirsten Spencer

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1. <u>Ieuan Leigh</u>
   A new measure of acceleration: GPS can accurately measure a 10m standing start.

2. <u>Mico Olivier</u>
   Applying performance analysis in elite women's water polo to understand the relationship between defensive formations and offensive outcomes.

3. <u>Alyssa-Joy Spence</u>
   Depth perception: Analysing the squat depth standard of the International Powerlifting Federation using motion capture.

4. <u>Brett Smith</u>
   Workload demands during ball-in-play periods: Comparison of locomotive and contact metrics in professional male versus female Rugby Union players.

🏠 *Kākāpo Room*

Teaching & Coaching

Chair: Chris Button

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1. <u>Hayden Croft</u>
   Applying an information framework for presenting coaches with large datasets.

2. <u>Anja Zoellner</u>
   Evaluating a framework for concussion management in New Zealand's secondary schools.

3. <u>Chris Button</u>
   Coming of age? Evaluating the acceptability of nonlinear pedagogy to PE teachers in Singapore.

4. <u>Rachel van Gorp</u>
   Empowering athletes: supporting educational achievement alongside athletic pursuits.

🏠 *Conservatory*

Performance Mindset Coaching

Chair: Kylie Wilson

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1. <u>Natalie Chapman</u>
   Back-to-back-to-back Gold: Tailoring mental skills and psychology support to meet personal and performance needs across multiple-Paralympic cycles.

2. <u>Kylie Wilson</u>
   The mahi between the magic: Mentally resetting between events at the Paris 2024 Olympic Games

3. <u>Panel Discussion (45 min.)</u>
   The evolution and revolution of mental skills and psychology in Aotearoa New Zealand.

3.30PM Afternoon tea

4.00PM
5.00PM

Keynote #4
Speakers: Dr. Brigit Mirfin-Veitch & Dr. Robbie Francis Watene
Title: Exploring perspectives on sport and physical activity among people with disabilities
Location: Otago Museum, Hutton Theatre

6.30PM

Conference dinner
Location: Sargood Centre

FRIDAY 22 NOVEMBER

8.30AM

<u>**Keynote #5**</u>
Speaker: Dr. Nathan Elsworthy
Title: Monitoring performance & wellbeing of team sport athletes and referees.
Location: Otago Museum, Hutton Theatre

9.30AM Morning tea & AGM

10.30AM – 12.00PM

🏠 *Hutton Theatre*

Exercise and Women's Health

Chair: Elaine Hargreaves

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1. Rebecca Julian
   Does aerobic fitness modulate the effects of dehydration in females?

2. Rebecca Attwell
   Hormonal fluctuations and sport performance: A Delphi study on menstrual cycle secondary impacts and monitoring in female athletes.

3. Violet Owans
   Menstrual tracking: Hormone profiling for athlete research.

4. Mary-Ann Moller
   Riding with flow: Menstrual health in World Cup and World Championship mountain bikers.

5. Monica Nelson
   The bleeding edge of women's performance enhancement? Examining sportswomen's interest in menstrual cycle-based training.

6. Val Burke
   Strength for skinny athletes – using strength training for bone health in an elite professional trail runner.

🏠 *Barclay Theatre*

PA & Health

Chair: Meredith Peddie & Jennifer Gale

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1. Nancy Rehrer
   Physical activity environment and wellbeing: Effects of nature.

2. Nick Parata
   Tama tu tama ora, tama noho tama mate - Play, Active Recreation and Sport (PARS) for rangatahi Māori mental wellbeing.

3. Samantha Heyward
   The effect of a single hot water immersion or high-intensity interval training exposure on 24-hour ambulatory blood pressure in adults with hypertension.

4. Codi Ramsey
   Exploring the impact of app-based instruction, group exercise class on the future role of group fitness instructors and personal trainers.

5. Siobhan Milner
   What is pain (and what can we do about it)?

6. Elahe Salehi
   Bidirectional associations between screen time and sleep and the influence of physical activity in pre-teens.

🏠 *Kākāpo Room*

Sport Sociology

Chair: Sally Shaw

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1. Lili Ovendale
   High performing athletes' experiences: Precarity, health and science-informed performance conundrums.

2. Shannon Booth
   Journey to the stage: An ethnographic exploration of the complex thoughts of a female bodybuilder.

3. Eleanor Crabill
   The hosting of the 2023 FIFA Women's World Cup in Aotearoa/New Zealand: Legacy, policies, and practice.

4. Timothy Dawbin
   The political economy of youth sports: Are young athletes a common pool resource?

🏠 *Conservatory*

Performance Analysis

Chair: Kirsten Spencer

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1. Kirsten Spencer
   Performance analysis insights into elite-level trampoline routine: Gender variation, routine movement patterns, construction strategies, and scoring components.

2. Martinique Sparkes
   Female field hockey match intensities: Comparing practice matches against male club-level players and international female teams versus international competition matches.

3. Hayden Croft
   Revisiting the development and application of virtual reality and first-person perspective video in team sports training: A netball case-study.

4. Peter Tu
   Advanced pressing and team performance in elite football.

12.00PM Closing & take away lunch

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ABSTRACTS
ORAL PRESENTATIONS

AGEING

Active ageing in an urban metropolis across the pandemic: problematic life stages and complex environments provide lessons for walkability

Dr Michael Annear, Lincoln University

Introduction: A five-year programme of epidemiological research was undertaken in the Greater Tokyo Metropolis from 2019-2023 to explore physical activity participation, health, and activity settings in super-aged neighbourhoods across the global COVID-19 pandemic.

Methods: A longitudinal and mixed-methods design was employed across three research phases. Online surveys were conducted before and during the COVID-19 pandemic with middle-aged and older Tokyo residents (N=2400), augmented with systematic walking audits of super-aged neighbourhoods (>25% of residents aged 65 years or older). Primary outcome measures included total weekly physical activity, walking, and sitting behaviour as determined by the International Physical Activity Questionnaire (IPAQ-SF-Japanese) and measures of general health. Walking audit data were gathered using the MAPS-mini audit tool, geographic information systems (GIS), and street photography to systematically chart walking journeys from older-adult housing to key activity destinations (i.e., parks, libraries, and health services).

Results: During the pandemic, >34% of middle-aged and older adults in Tokyo were inactive, walking declined significantly by 15 minutes per day, and sitting increased by over 60 minutes compared to pre-pandemic levels. Older adults (65+ years) were significantly more active and reported better health compared to those in middle age (45-64 years). Middle-aged women reported the lowest levels of activity and health, while older women reported the highest levels. Neighbourhood environments were a nexus for activity during the pandemic due to Japanese public health recommendations to remain near home. Among Tokyo's super-aged neighbourhoods, prevalent barriers to activity were identified, including poor access to parks and public transit, limited seating and shelter, inconsistent pedestrian infrastructure, narrow roadways, and few traffic calming measures. Signs of neighbourhood disorder were conspicuously absent suggesting that sociocultural influences may enhance walkability in the context of sparse infrastructure support.

Conclusions: Differential outcomes were identified among age and gender cohorts in Tokyo regarding physical activity and health across the pandemic with significantly worse impacts reported among middle-aged samples. Conditions in super-aged neighbourhoods appeared to exacerbate activity challenges during the pandemic, with myriad barriers observed. These results have implications for healthy transitions to later life and the design of post-pandemic environmental interventions in societies that are experiencing rapid demographic ageing.

Keywords: active ageing, IPAQ-SF, urban environment, walkability

Conflict of interest: The authors declare no relevant conflict of interest in relation to this work.

Hot water immersion to protect middle-age people from heat injury in the time of climate change

Cole, E. (1), Jackson, K. (1), Donnan, K.J. (1), Simpson, A.J. (1) & Garrett, A.T. (1,2)

1: School of Sport, Exercise and Rehabilitation, University of Hull, Hull, UK.
2: School of Health and Sport Science, Eastern Institute of Technology, Napier, New Zealand.

Introduction: Hot water immersion (HWI) may be an accessible method of heat exposure and adaptation with the general population. However, there is limited information on the technique used. Therefore, we compared the effectiveness of an 'Arms Out' method (reducing the submerged surface area), versus an "Arms In" submersion technique with middle-age, females and males.

Methods: A randomised, cross-over design used nine, healthy and trained adults (2 females; 7 males; aged 52±6 years). Completing a 6-min walk test to establish fitness levels, followed by two 45-min HWI trials ('Arms In' and 'Arms Out'), on separate days. A hot tub (40°C), located in an environmental chamber (21°C, 45% relative humidity) was used. The 'Arms In' condition required participants to be submerged up to the base of the neck, whereas 'Arms Out' was submerged up to the mid-sternum, with their arms exposed outside the hot tub. Physiological measurements included mean rectal, skin temperature and heartrate. Perceptual measures were thermal sensation, thermal comfort, affective valence and the 32-item Brunel Mood Scale. Each measurement was recorded at baseline and every 5-mins, except the Brunel Mood Scale which was taken at 15-min intervals.

Results: All participants completed both trials. The 'Arms In' immersion protocol induced a significant rise in heart rate from 15-mins (p=0.02) and rectal temperature from 35-mins (p=0.03), with all participants experiencing a ≥1°C increase by the end of the protocol. The 'Arms Out' demonstrated a rise in core temperature across the protocol. However, it was lower than 'Arms In'. Mean rectal temperature change from baseline to end-point for 'Arms In' was 1.64±0.55°C (p<0.01) vs 0.54±0.33°C (p=0.04) for 'Arms Out' respectively. Furthermore, participants reported significantly reduced comfort with 'Arms In' demonstrated by increased thermal discomfort scores from 5-mins (p<0.01), affective valence from 20-mins (p<0.02) and elevated tension on the Brunel Mood Scale (p<0.01).

Conclusion: These findings highlight the need to consider perceptual tolerance alongside thermal effectiveness of HWI protocols. This will enhance the development of practical heat acclimation methods for the general population that will both be utilised (i.e. tolerable) and induce adequate physiological thermal strain and adaptations.

Keywords: Hot-water, technique, thermal, protection, older, climate.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

AGEING

Physical function and the association with self-reported health-outcomes of retired older elite athletes

Lara Vlietstra (1), Clara Scoon (1), Jennifer T. Gale (2), David Gerrard (3), Meredith Peddie (2), Takiwai Russell-Camp (3), Debra L. Waters (3,4,5), Hamish Osborne (3), Eduardo Caldas Costa (6) & Xaviour J. Walker (3)

1: School of Physical Education, Sport and Exercise Sciences, University of Otago, Dunedin, New Zealand
2: Department of Human Nutrition, University of Otago, Dunedin, New Zealand
3: Department of Medicine, University of Otago, Dunedin, New Zealand
4: School of Physiotherapy, University of Otago, Dunedin, New Zealand
5: Department of Internal Medicine, Division of General Internal and Geriatric Medicine, University of New Mexico, USA
6: ExCE Research Group, Federal University of Rio Grande do Norte, Natal, Brazil

Introduction: Maintaining physical function is essential for continuing independence and a better quality of life in older people. It is hypothesized that due to the physiological advantages elite athletes might have, they do not experience the same level of functional decline that occurs with ageing. There is currently no literature available that has measured physical function and frailty in retired older elite athletes. The aim of this study is to describe the physical function of retired Olympic and Commonwealth Games athletes over the age of 60 years and investigate the association with self-reported health outcomes.

Methods: This cross-sectional descriptive study assessed retired elite New Zealand athletes over the age of 60 years who competed at Olympic or Commonwealth Games level. Physical assessments including grip strength, Short Physical Performance Battery (SPPB), Timed-Up and Go (TUG) and the two-minute step test (2MST) were conducted. Furthermore, validated questionnaires were used to measure health-related quality of life (HRQoL), frailty, fall risk and fear of falling. Spearman correlations were performed to describe the relationship between physical function and self-reported health-outcomes.

Results: The sample comprised 34 retired athletes with a mean age of 76 (SD 7.8) years. Retired elite athletes were found to be strong (mean grip strength 35.3 kg), agile with little risk of falling (mean TUG 7.4 sec), fit (mean 2MST 85 steps) and present no or little mobility limitations (mean SPPB 10 points). Furthermore, 79% of participants reported a good physical HRQoL, 92% reported a good mental HRQoL, 91% were not frail, 79% were not at risk of falling and 68% were not afraid of falling. Better performance in the SPPB, TUG and 2MST was moderately to strongly associated with better self-reported health-outcomes (rs ranging from -0.62 to 0.46, with p-values ranging from 0.02 to <0.01).

Conclusions: The findings from this study indicate that retired older elite athletes exhibit good physical function and self-reported health outcomes. Performance in elite sport may contribute to slower age-related decline and improved self-reported health outcomes. Future longitudinal research is needed to confirm these findings and investigate levels of physical activity throughout the lifespan that might contribute to the observed effects.

Keywords: physical function, physical activity, older adults

Conflict of Interest: The first author is co-chair of the organizing committee of the 2024 conference.

24-hour movement patterns of retired elite New Zealand athletes: an observational study

Jennifer T Gale (1), Lara Vlietstra (2), Clara Scoon (2), David Gerrard (3), Takiwai Russell-Camp (3), Debra L. Waters (2,4,5), Hamish Osborne (3), Xaviour J. Walker (3), Meredith C Peddie (1)

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2 School of Physical Education, Sport and Exercises Sciences, University of Otago
3 Department of Medicine, University of Otago
4 School of Physiotherapy, University of Otago, Dunedin, New Zealand
5 Department of Internal Medicine, Division of General Internal and Geriatric Medicine, University of New Mexico, USA

Introduction: Increasing age is associated with reduced physical activity and greater time spent sedentary. Indeed, national self-reported data indicates that less than half of older adults are engaging in sufficient physical activity and almost one third do not get enough sleep. However, participation in competitive sport in early adulthood can promote physical activity in older age and international evidence indicates that former elite athletes live longer than their inactive peers. To provide insight into the movement patterns of older adults who have performed at an elite level, this study aimed to describe the 24-hour movement patterns of retired elite New Zealand athletes.

Methods: A total of 28 adults over 60 years of age (mean 74±7 years) who had represented New Zealand at an Olympic or Commonwealth Games, provided data for this cross-sectional study. Participants completed a data collection visit in their homes. At the end of this visit participants were fitted with two accelerometers which they wore continuously for 7-days: an ActiGraph GT3X+ on the wrist and an activPAL on the thigh. Participants recorded attempted sleep times and when the devices were removed in a diary provided. Time spent sedentary, sleeping and engaged in physical activity was determined from accelerometer data using the Neil-Sztramko validated cut-points and algorithms for wrist worn accelerometry.

Results: Participants spent an average of 7 hours 8 minutes (SD 58 minutes) asleep per night; 43% of participants were short sleepers (<7 hours/night) and 18% were long sleepers (>8 hours/night). Participants spent an average of 3 hours 20 minutes (SD 40 minutes) engaged in light- and 2 hours 22 minutes (SD 1 hour 1 minutes) engaged in moderate-to-vigorous physical activity, per day. On average participants spent 46%, or 10 hours 46 minutes (SD 1 hour 27 minutes) of their day sedentary.

Conclusions: This group of former NZ athletes engaged in a large amount of physical activity which is in excess of the New Zealand Ministry of Health physical activity guidelines for extra health benefits. A marked number of participants were identified as having insufficient sleep and may benefit from an intervention to improve overall sleep duration.

Keywords: physical activity; older adults; athlete; accelerometry; observational

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Macronutrient intakes of retired elite New Zealand athletes over the age of 60 years

Meredith Peddie (1), Jennifer T. Gale (1), Millie Harland (1), Sophie Grenfell (1), Xaviour J. Walker (2), David Gerrard (2), Takiwai Russell-Camp (2), Debra L. Waters (2,3,4) & Lara Vlietstra (5)

1: Department of Human Nutrition, University of Otago, Dunedin, New Zealand
2: Department of Medicine, University of Otago, Dunedin, New Zealand
3: School of Physiotherapy, University of Otago, Dunedin, New Zealand
4: Department of Internal Medicine, Division of General Internal and Geriatric Medicine, University of New Mexico, USA
5: School of Physical Education, Sport and Exercise Sciences, University of Otago, Dunedin, New Zealand

Introduction: Masters' athletes tend to consume more energy, mostly in the form of carbohydrate, when compared to representative population samples of the same age. However, little is known about the diets of retired elite New Zealand athletes as they get older. This study aimed to describe the macronutrient intakes of retired New Zealand Olympic and Commonwealth Games athletes over the age of 60 years and make comparisons with National Nutrition Survey data, and acceptable macronutrient distribution ranges (AMDRs).

Methods: Thirty-three individuals (mean age 76±8 years, n=27 male) who represented New Zealand at an Olympic or Commonwealth Games provided data for this analysis. Dietary intake was assessed using three 24-h diet recalls. The first recall was conducted face to face in the participant's home and the second and third were completed over a voice or video call on non-consecutive days following this. All recalls were performed using a multiple-pass technique and entered into FoodWorks dietary analysis software (Version 9, Xyris Software Ltd., Brisbane, Australia). Mean intakes across the three recalls were used to represent the intake of each individual.

Results: The mean energy intakes of the retired elite athletes (males 9498.6±2624.7 kj, females 7404.3±700.8 kj) was 23 and 19% higher than intakes reported for men and women over the age of 71 y in the 2008/09 New Zealand Adult Nutrition Survey. As a percentage of total energy however, the retired elite athletes were consuming more fat and less carbohydrate than the population representative sample. Additionally, 58% of retired elite athletes had fat intakes above, and 67% had carbohydrate intake below the AMDRs.

Conclusions: Given that the AMDRs are set to allow for an adequate intake of nutrients while maximizing general health outcomes, this group of retired elite athletes may benefit from a nutrition intervention to improve the overall quality, and health providing effects of their diet.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Characteristics and correlates of walking behaviour among ageing populations in Japanese Age Friendly Cities

Li T. (1), Sugimoto D. (1,2), Annear M. (3)

1: Waseda University, Tokyo, Japan,
2: The Micheli Center for Sports Injury Prevention, Massachusetts, USA,
3: Lincoln University, Canterbury, New Zealand

Introduction: Japan is a super-aged society with 58% of the population aged over 45 and 30% exceeding 65 years. Studying the determinants of health-related quality of life in urban areas is crucial to informing interventions to promote healthy ageing. Walking is the most common physical activity among middle-aged and older adults and is associated with reduced risks of cardiovascular disease, stroke, type 2 diabetes, and dementia. There is a gap in understanding how environmental factors may be related to walking in Japanese cities. The purpose of this study was to characterise walking behaviour and explore potential associations between environment and walking among middle-aged and older adults in three World Health Organization (WHO) Age-Friendly Cities (AFCs) in Japan.

Method: The study was cross-sectional and comparative with online survey data collected during October 2023 using the International Physical Activity Questionnaire-short-form (IPAQ-SF-J) and the WHO Quality of Life Survey (WHOQOL-Bref). Quota samples of 175 middle-aged and older adults were obtained in three Japanese AFCs (Akita, Fujisawa, and Takarazuka; N = 525). The main outcome variable was daily walking minutes. Independent variables included items from all four domains of the WHO-Bref (physical, psychological, social, and environmental) and selected demographic information (e.g., age, sex, car ownership). Multiple linear regression (MLR) was used to explore associations between daily walking and independent variables.

Results: Mean age of respondents was 67.8 years (range: 45-88 years) with equal representation from female and male respondents. Mean walking time was 61.8 minutes per day. The MLR model was statistically significant (p=0.005, adjusted r^2=0.025) and the environmental domain (standardized β coefficient=0.76, p=0.007, partial correction r=0.118) and age (standardized β coefficient=-0.124, p=0.013, partial correlation r=-0.108) were independently associated with daily walking minutes across three AFCs.

Conclusion: The study suggests that age and environmental factors may influence walking behaviours. Walking in Japanese AFCs is potentially affected by younger age and environmental conditions, including living conditions, health services, and transportation, although the association is relatively weak. More work is needed to determine specific environmental and socio-demographic pathways for walking and to explore if environmental conditions for walking could be enhanced to support health-related quality of life.

Keywords: Health-Related Quality of Life, Walking, Environment, Active Ageing

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Strength, Conditioning & Biomechanics

"On track for jumping": in-the-field kinematic body position tracking over large distances during BMX jumping.

Oliver T. Hanham (1), Michael I.C. Kingsley (1), Angus J.C. McMorland (1)

1: Department of Exercise Sciences, University of Auckland

Introduction: Bicycle Motocross (BMX) athletes spend more time jumping, manualing, and pumping than pedalling; however, the start, which is pedalled, is the most studied element of the sport. Challenges for using motion analysis to study BMX jumping include the requirement for large recording volumes, high speeds, and specialized tracks which cannot be recreated in a lab environment. The aim of this study was to develop a field-based method of motion capture for application during BMX jumping.

Method: A markerless method was developed to capture 3-D position data for three bike landmarks and 16 of the rider's joints. Six GoPro Hero cameras were arranged to provide a 360° view of BMX jumping on an outdoor track (capture area: 20 m x 20 m). Using DeepLabCut with stereophotogrammetry software (Anipose), we calibrated and amalgamated 2-D landmark and joint positions from 6 camera views to develop a model for 3-D reconstruction of positional data..

Results: After trialling a range of camera configurations and calibration strategies, we found that the optimum experimental set up used three cameras arranged on each side of the capture volume, camera horizontal display resolution of 4K, and a large A0 calibration checkerboard. We tracked the centre of the front and rear wheels, and the front of the bike frame, and calculated the apparent lengths of the bike frame (935mm) and fork (380mm) using these markers. Using this approach DeepLabCut reported 2D tracking error of 3.33 pixels averaged across all markers, while Anipose reported a calibration error of 0.44 pixels, resulting in a 3D tracking error of 26 mm and 11 mm for the frame length and fork length respectively.

Conclusion: Combining DeepLabCut and Anipose it is possible to determine 3-D joint positional data during BMX jumping across over 10 meters of movement. Furthermore, the ability to use low-cost cameras with readily available software to provide markerless motion analysis across a large capture volume might enable new biomechanical insight for sporting activities that are difficult to measure using current techniques.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

The effects of super shoes on running economy, gait and performance following cycling in triathletes

Andrew E. Kilding (1,2), Samuel Keats (1,2), Fangcheng Zhu (1,2) and Kelly R. Sheerin (1,2)

1: Sports Performance Research Institute New Zealand (SPRINZ),
2: School of Sport and Recreation, Auckland University of Technology, Auckland, New Zealand

Introduction: The development of advanced footwear technology, commonly referred to as "super shoes" (SS), has significantly influenced performance in track and road running. However, the impact of SS in other sports where running plays a central role remains understudied, particularly in contexts where other preceding activities may interfere with normal running gait and physiology, such as triathlon. This study aimed to determine whether SS improve running economy (RE), gait characteristics, and running performance following a simulated bike-to-run transition in triathletes.

Methods: An acute randomised balanced crossover trial was conducted during which eight male triathletes visited the laboratory on three occasions. Visit one involved a maximal incremental cycling assessment and protocol familiarisation. Visits two and three consisted of a simulated bike-run protocol involving assessments of RE and gait measures (cadence, ground contact time [GCT] and flight time [FT]) before and after a 120-min bout of cycling, followed by a 10km treadmill time-trial (TT). All running components involved wearing either SS (Asics Metaspeed Sky) or control shoes (CS) (Asics Evoride 3).

Results: There was no shoe*time interaction for RE but main effects for shoe indicated improved RE ($p=0.03$, $\eta p2=0.55$) and lower GCT ($p<0.001$, $\eta p2 = 0.81$) in SS compared to CS. There was a main effect of time, indicating a higher cadence ($p=0.01$, $\eta p2 =0.63$) and reduced FT ($p<0.01$, $\eta p2 =0.68$) during running after cycling. Time-trial performance was significantly faster in SS compared to CS ($p=0.02$, effect size: 1.04). During the TT, there was no shoe*distance interaction for any gait measure ($p>0.05$), but the main effects for shoe highlighted a shorter GCT ($p<0.001$, $\eta p2 = 0.81$) and a longer FT ($p<=0.03$, $\eta p2 = 0.50$) during SS than CS.

Conclusions: Based on the observed changes in TT performance and RE, our data suggest that wearing SS is an advantageous strategy for triathletes to use in a fatigued state.

Keywords: Endurance, footwear, triathlon, technology, efficiency

Conflict of Interest: The authors have no financial or other competing interests with this research. The shoes were supplied free of cost by Brittain Wynyard & Co NZ (Asics distributor). They had no input into the design of the research or otherwise. No other financial support was in place.

Strength, Conditioning & Biomechanics

Validation of step time and asymmetry detection algorithm in high-intensity running with Movesense IMU

Raul Martin Gomez, Haye Kamstra, Enzo Allevard, Lucas Pollet-Villard, Jim Cotter, Peter Lamb

School of Physical Education, Sport and Exercise Sciences / Te Kura Para-Whakawai, Division of Sciences/ Te Rohe a Ahikaroa, University of Otago/ Ōtākou Whaikaihu Waka

Introduction: The wider research aims are to develop a novel approach to assessing human performance using Movesense wearable devices, with applications from performance analysis to injury monitoring. Movesense sensors are open-source, low-cost, and programmable, with Bluetooth capability. The focus of this study was to assess the validity and reliability of Movesense Inertial Measurement Units (IMU) for measuring step time and its left-right asymmetry. Data were collected using IMUs with custom firmware, recording app and analysis algorithms. The results were compared with those from a standard force plate system and a leading commercial device.

Methods: Fourteen participants (7 female; age: 22 ± 3 years; mass: 70.6 ± 8.7 kg) provided informed consent and performed a running protocol consisting of 6 min at 8 km/h before stepwise increments of 1 km/h every 2 min until exhaustion. Chest-mounted IMUs sampled at 208 Hz, alongside force plate data at 1000 Hz and Garmin HRM chest metrics, such as cadence. 33,477 steps were analysed across 103 speed-participant combinations. The algorithm calculated step time by analysing the vertical acceleration in both time and frequency domains, and angular velocity to identify left and right foot strikes.

Results: The step time calculations resulted in a mean difference of 0.0 ± 6.0 ms (r = 0.97) across all 33,477 steps, and 0.0 ± 0.0 ms (r = 1.00) for the means of the 103 speed-participant sets. The algorithm correctly identified 100% of left and right foot strikes, and revealed a step imbalance mean diff (SD) of 0.11 (± 0.14) and a correlation coefficient of r = 0.92 for the 103 speed participants subsets. In comparison, the commercial device (Garmin) does not provide step-by-step step time or asymmetry data; however, Garmin-derived step time means across the same speed-participant sets showed a mean difference of -0.6 ± 0.4 ms (r = 1.00).

Conclusions: The agreement is excellent between the Movesense IMU's and our novel algorithm and the criterion force plate system for both step times and foot strike identification and left-right asymmetry. Garmin also exhibited a high capacity for detecting mean values. Movesense's step-by-step capability suggests it will perform better for outdoor running on variable terrain, offering a low-cost alternative. Movesense IMUs can be effectively used in the field to accurately track running related metrics.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Characteristics associated with countermovement jump performance in adult team-sport athletes: A systematic review

Moses Bygate-Smith

Introduction: The objective of this systematic review was to identify the relationship between physical characteristics and countermovement jumping (CMJ) performance. Jumping is a crucial skill across many sports and the CMJ is also commonly utilised for training, assessing and monitoring lower-body power. Therefore, understanding the physiological underpinnings of the CMJ is crucial for sports performance.

Methods: A systematic literature was conducted according to the PRISMA statement. Included studies were peer-reviewed articles that involved healthy human adult team-sport athletes, and focused on the relationship between physical characteristics and CMJ performance.

Results: Physical characteristics were reported in four of 21 studies, with 13 statistically significant correlations including height, weight, girths, muscle-to-bone ratio, and muscle cross-sectional area (effect sizes: moderate to very large). Strength and power characteristics were reported in six of 21 studies, with 25/50 significant correlations including knee-joint isokinetic outputs, back squat, squat jump, and deadlift (effects sizes: moderate to extremely large). Change of direction and speed characteristics were reported in seven out of 21 studies, with 13/46 correlations being significant. Effect sizes ranged between moderate and very large and included sprint tests, change of direction tests, running velocity, and change of direction deficit. Global CMJ characteristics were reported in seven out of 21 studies, with 24/37 correlations being significant. Effect sizes ranged between small and extremely large and included impulse, force, rate of force development, power, and force-time profile characteristics. Joint-related CMJ characteristics were reported in four of 21 studies, with 20/49 correlations being statistically significant. Effect sizes ranged between small and very large and included work, net moments, and range of motion.

Conclusions: A wide range of physical characteristics appear to have significant relationships with CMJ performance. However, morphological characteristics, hip and ankle-joint isokinetic outputs, and braking-phase variables appear to be underreported. The large heterogeneity in effect sizes for braking-phase variables may suggest individual differences in movement strategies being used.

Keywords: Characteristics; performance; CMJ, vertical jump; physical

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Physiological comparison of eccentric versus concentric upper-body cycling at light to moderate intensity

Kyra Seiler

Introduction: Eccentric training increases strength at a lower metabolic, ventilatory and hemodynamic cost when compared to concentric exercise. Eccentric exercise has been effectively used as an adaptive stressor to enhance lower body muscle function in a wide range of populations, from frail and debilitated individuals to highly trained athletes. An exercise modality that could a possible alternative to traditional resistance training to increase strength and improve quality of life in the older adults is eccentric cycling (ECCcyc). The present study aims were to 1) compare HR responses to ECCcyc and concentric cycling (CONcyc) in adults over 60, 2) investigate differences in power output in ECCcyc at different intensities, and 3) assess feasibility and acceptability of eccentric cycling.

Methods: After a single familiarisation session, 15 adults (average age 63.7 ± 2.8 years) underwent experimental protocols on a custom-made eccentric/concentric upper-body cycle ergometer. The testing involved a 2-min warm-up at RPE3 and ~60 rpm, followed by three 2-min cycling bouts at RPE-matched loads (3RPE, 5RPE, 7RPE) with 2-min rest between intervals. The RPE scale was from 0 to 10. After the testing, participants were asked to complete a feasibility questionnaire.

Results: The ECCcyc protocol demonstrated increasing power outputs with each rising rate of perceived exertion (RPE), marked by values at RPE 3 (61.4 ± 19.7 W), RPE 5 (79.8 ± 27.0 W), and RPE 7 (100.8 ± 39.4 W). Significant differences in power output existed between all RPE levels (RPE 3 vs. RPE 5, RPE 5 vs. RPE 7, and RPE 3 vs. RPE 7, with $p<0.05$). The significant differences in power outputs across different levels of perceived exertion (RPE) indicate that participants can engage in progressively more intense exercise using both the ECCcyc and CONcyc protocols.

In the conventional cycling protocol, heart rates were consistently higher than in ECCcyc across RPE levels. Notably, at RPE 7, the HR was significantly higher in CONcyc (141.1 ± 18.2 bpm) than ECCcyc (132.5 ± 19.2 bpm, $p<0.0005$), while RPE 3 and RPE 5 showed minimal difference between the protocols. For ECCcyc, HR differences were significant across all RPE levels. For CONcyc, HR increased with RPE but with a smaller change between RPE 3 and RPE 5 and a much larger change between RPE 5 and RPE 7.The consistently higher heart rates recorded during the CONcyc protocol, especially at RPE 7, demonstrate that conventional cycling elicits a more intense cardiovascular response compared to eccentric cycling. This insight is crucial for tailoring exercise prescriptions for individuals based on their fitness levels and cardiovascular health, particularly in populations where heart rate responses may need careful management. Participants rated their experience with the pedal machine positively, indicating ease of use, comfort, and willingness to use it again. Most found it feasible as an alternative exercise, especially in poor weather, with minimal joint or back pain reported. The positive feedback regarding the pedal machine's usability and the low reports of discomfort suggest a favourable reception among participants, as user willingness to engage with the equipment is essential for sustained exercise participation.

Conclusion: The study highlights the lower cardiovascular demand of ECCcyc at similar perceived exertion levels, making it suitable for adults requiring a gentler cardiovascular load. Significant differences in power output across RPE levels (3, 5, and 7) confirm ECCcyc's ability to accommodate varied intensities, supporting its use for progressive strength and endurance training. Positive participant feedback on ease of use, comfort, and willingness to adopt ECCcyc underscores its feasibility and acceptance, suggesting potential for integration into community, clinical, and home-based exercise programs.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

The relationship between horizontal scrum force and 1RM squat in professional rugby union players

Conway Bradey and Tiaki Brett Smith

Introduction: Horizontal force development plays a large role in rugby union, but gym-based resistance exercises such as the barbell back squat, a vertical force production exercise, is a commonly used key performance indicator of lower body strength for scrummaging. This project employed an instrumented scrumtruk to measure the isometric horizontal scrum specific force compared to the maximal squat.

Methods: Data was collected for one repetition maximum barbell back squat (1RM) and peak (PeakST) and 10-second average (10sAvgST) isometric force on a scrumtruk for 15 professional rugby union forwards across four data collection points throughout a super rugby season. These four points were baseline (start of the pre-season), late pre-season, early in-season and late in-season, with each period separated by approximately six weeks. The analysis involved correlations for the forwards as a whole and the different subgroups of tight forwards, front row, props, and representative props. Standardised differences in 1RM, and PeakST, and 10sAvgST force for these groups across the key data collection points of the season were also determined.

Results: Correlations between 1RM and PeakST force (0.133, small), 1RM and 10sST (0.097, small), PeakST and 10sAvgST force (0.926, strong) were found for all forwards across the season. Better correlations for 1RM were detected with props and representative props. Small and very large magnitude increases were observed during pre-season for 1 RM squat and PeakST and 10sAvgST respectively, followed by significant decreases from pre-season to in-season for all variables. Small increases were shown from early to late in-season. Overall, 1RM decreased, while PeakST and 10sAvgST force showed large and moderate increases from baseline to late in-season.

Conclusion: Surprisingly despite the promotion of heavy squatting for scrummaging there was only a small relationship between 1RM squat and both PeakST and 10sAvgST in professional rugby players across a competitive season. Rugby conditioners should consider including various specific horizontal isometric training options alongside the squat to facilitate optimal scrummaging force development.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Exercise Physiology

A novel approach to measuring carbohydrate and energy expenditure during endurance exercise

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Introduction: Sports nutrition guidelines recommend carbohydrate intake be individualized to the athlete and modulated according to changes in training load. However, assessment of carbohydrate requirements is limited by current methodologies. Indirect calorimetry is invalid during high-intensity exercise, while muscle glycogen measurement via biopsy is invasive and does not provide information on whole-body carbohydrate use. Another approach is to calculate the contribution of the three energy systems (aerobic, anaerobic alactic, and anaerobic lactic) based on measurements of oxygen uptake, the fast component of excess post-exercise oxygen uptake, and net changes in blood lactate concentration. This method estimates of energy produced by each system but does not consider the substrate used for energy production or differences in efficiency with each substrate. We introduce a novel approach that combines traditional gas exchange measurements with energy system contributions to estimate total carbohydrate and energy expenditure across varying exercise intensities. We then quantify the relationships between carbohydrate and energy expenditure and commonly used training load (TL) metrics during cycling sessions of different durations and intensities.

Methods: Fifteen cyclists (5 females; $\dot{V}O_2$max: 52 ± 7 mL·kg^{-1}·min^{-1}) performed a graded exercise test and four training sessions: (1) 90 minutes at 90% power at the first ventilatory threshold (VT1), (2) 30 minutes at 90% VT1, (3) 15 minutes at 90% VT1 followed by two sets of 5×3-minute intervals with 2-minute recovery, and (4) 15 minutes at 90% VT1 followed by two sets of 10×30-second intervals with 30-second recovery. Six TL metrics were utilized: two heart rate-based, three power-based, and one perceived exertion-based. Carbohydrate and energy expenditures were calculated separately for aerobic (via gas exchange) and anaerobic (using net lactate accumulation and O_2 equivalents) systems and then summed. Repeated-measures correlations assessed the relationships between TL metrics and expenditure measures.

Results: Very-large to near-perfect correlations ($r = 0.76-0.96$) were evident between all TL metrics and both carbohydrate and energy expenditure.

Conclusions: Our novel method for estimating carbohydrate and energy expenditure is feasible and correlates strongly with standard non-invasive TL measures during cycling. This approach may enhance individualized nutrition strategies by providing accurate assessments of carbohydrate needs across different training sessions.

Comparison of measurement methods to estimate body fat percentage

Chris Button, Kane Cocker, Robert Rein & Kim Meredith-Jones

Introduction: The traditional approach to hydrostatic weighing involves the fully submerged participant bending at the waist from a seated position whilst performing a maximum voluntary expiration. However, this technique can be challenging particularly for inexperienced participants. We contrasted two underwater weighing positions (seated vs. supine) alongside two other common measurement methods to estimate total body fat percentage.

Methods: 187 New Zealand adults (age = 18-65 years; 99 female, 88 male) volunteered to participate in a cross-sectional, observation design. Three repeated measures of underwater weight were first obtained whilst participants were lying (supine position) on a steel frame in a swimming flume, followed by 3 further measures whilst they sat on a plastic seat in a 3m deep tank (seated position). Underwater weight was recorded with uniaxial load cells to within 0.01kg. Estimates of body fat were also obtained from bioelectrical impedance analysis (BIA) and from dual-energy x-ray absorptiometry (DXA). Descriptive statistics, Wilcoxon paired sample t-tests and inter-trial reliability analysis were conducted in Jamovi (v.2.3.28).

Results: In contrast to DXA, body fat was estimated well by the Supine method (within 0.3%) however it was underestimated by the Seated method and by BIA (p's < .001) (Table 1). The intertrial variability was similar between underwater weighing methods, but slightly lower in the supine position (CV=3.62%, ICC=0.998) compared to seated (CV=4.43%, ICC=0.996).

Conclusions: Hydrostatic weighing to estimate total body fat percentage is more accurate when conducted with participants in a supine, lying position (compared to gold standard) versus when seated. A take home message is that bioelectrical impedance analysis machines which are increasingly common in gyms and clinics are prone to error and should not be relied upon as a diagnostic tool.

Table 1: Comparison of Body Fat Percentage with different measurement methods.
Note: Siri calculations were applied for both hydrostatic weighing methods.

Method	% Body Fat	SEM	95%CI
Seated	25.0 ± 9.07	0.66	23.7 - 26.3
Supine	26.1 ± 9.22	0.67	24.8 - 27.4
BIA	21.5 ± 8.98	0.66	20.2 - 22.8
DXA	26.4 ± 8.51	0.62	25.1 - 27.6

How the physiological cost of floating varies over time and by individual

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Introduction: 'Float to Live' is becoming more prevalent in drowning prevention advice issued to the public by lifesaving organisations. However, the physiological cost of floating might differ substantially between individuals, due to differences in anthropometry and other factors. We aimed to investigate how the physiological cost of floating varies over time and by individual.

Methods: Adults of varying floating ability, experience and body composition (n = 187, Age: 36.9 ± 13.7 y; Sex: M=88, F=99; Height = 1.73 ± 0.10 m; Mass = 75.7 ± 15.2 kg; body fat percentage 26.4 ± 8.5%) floated for 3 min in a non-saline flume. Body composition was assessed by dual x-ray absorptiometry (DXA). Oxygen consumption was analysed in 30 s epochs across the 3-min float, ignoring the first 30 s.

Results: Preliminary analysis has shown on average that floating required a mean oxygen consumption of 11.1 ± 4.5 mL/min/kg (~2.5 times higher than rest) but was highly variable between individuals, ranging from 2.2 - 36.2 mL/min/kg. Additional analyses investigating the role of anthropometry will be presented at conference.

Conclusions: Floating is a crucial survival skill. However, the physiological cost of floating is highly variable between individuals. Further analytical approaches are currently being developed to model the role of body composition on the cost of floating.

Quantifying the physiological response to simulated motorsport driving in the heat

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Introduction: Motorsport drivers are exposed to a range of stressors, including heat stress. Sources of heat include that generated by the driver, the car, and the external environment when competing in high ambient temperatures. Sweating is the most effective way for humans to regulate body temperature; however, the protective clothing worn by drivers renders sweating ineffective, instead resulting in fluid loss for minimal cooling effect. The rate of core temperature increase and fluid loss can vary among individuals within the same environment. The aim of this study was to characterise the heat strain during simulated racing in hot environments.

Method: In this descriptive study 32 elite academy male drivers (19 ± 3 y, 73 ± 11 kg) completed an incremental exercise test to exhaustion to determine VO2max (52 ± 7 mL/min/kg). Two days later they completed a ~ 50-min simulated race session consisting of three consecutive 15-min races with a 3-min break between each, in an environmental chamber (42°C, 50% RH), whilst wearing their full race suits. The simulators featured force feedback steering, hydraulic brakes, and a motion platform.

Results: Core temperature increased by 1.1 ± 0.4°C (t(31) = 13.9, p < 0.001) across the session, reaching 38.5 ± 0.4°C. The increase in core temperature (Race1 = 0.1 ± 0.1°C, Race2 = 0.3 ± 0.2°C, Race3 = 0.4 ± 0.1°C) differed across the three races (F(2, 93) = 23.14, p < 0.001). Drivers lost 0.9 ± 0.3 L of fluid. The maximal heart rate recorded during the session was 154 ± 15 bpm or 77 ± 7% HRmax.

Conclusion: Simulated racing in a hot environment evoked substantive thermoregulatory and cardiovascular strain. However, even in these physically-demanding simulators, the stress and thermal and cardiovascular strain are likely less pronounced than in a true race setting because of the additional g-forces, increased muscular work, pollutants, sympathetic activation, and race's duration. Future research should explore the relationship between driver characteristics and physiological responses, to identify drivers at greater risk of developing hyperthermia or hypohydration, allowing for the implementation of appropriate countermeasures. Furthermore, the impact of this strain on their driving performance should be evaluated.

The effect of hypoxia (10% FiO2) on neuromuscular activity during repeated cycle-sprints in young athletes

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Introduction: A decrease in oxygen concentration produced by hypoxia training in exercising muscles, or metabolic stress, is proposed to stimulate various physiological processes associated with muscle hypertrophy. One possible mechanism, is an increase in motor unit recruitment (volume). Another is a change in the muscle fibre type recruitment ratio, away from type-1 motor units (oxidative) contribution to force production toward type-2 motor units (glycolytic) to complete an exercise task. However there is conflicting evidence regarding whether such training produces similar hypertrophic and or strength/force production increases as traditional resistance training, but with lower injury risk. Aim: This study investigated neuromuscular recruitment patterns using electromyography (EMG), of the vastus lateralis (VL) during rest and after fatiguing exercise during either continuous normoxia or hypoxia (Fraction inspired oxygen = 10% - hypoxicator, GO2Altitude).

Methods: The effects on VL muscle strength (leg extensions) in a cross-over study were examined in eighteen athletes (13 males, 5 females) before and after completing 10 x of 6-second cycle-sprints. At 2 timepoints post-exercise, immediately after, and again 5 minutes later; EMG, heart rate variability, maximal voluntary contraction (MVC), near-infrared-spectroscopy, peak power output and arterial oxygen saturation were compared to 2 pre-exercise sets ("Baseline" and "Pre").

Results: Final post-exercise MVC was significantly lower (7.5%) than baseline across time but not by condition. Comparative frequency analysis of the percentage change from pre to post-exercise in EMG area, at low 1-29 Hz (type-1 fibre activity) and high 75-100 Hz (type-2 fibre activity), revealed a significant reduction in type-1 fibre area/activity relative to type-2, by between 20-30% during hypoxia with a 10% difference in type-1 fibre activity between conditions. Significantly higher non-linear analysed sympathetic nervous system (SNS) tone "Immediate" post-exercise occurred in hypoxia, with positive correlations between SNS index at low (1-29 Hz) and high band (75-100 Hz) EMG areas ($R^2 = 0.47$, $P < 0.002$ and R^2 0.56, $P < 0.0003$).

Conclusion: Exercise in hypoxia appeared to cause a temporary increase in central command mediated SNS tone and greater recruitment of type-2 muscle fibers with an accompanying reduction in type-1. Acute hypoxia training may benefit type-2, fast twitch muscle fiber conditioning.

Keywords: Hypoxia, repeated cycle-sprints, SNS, EMG.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Incidence and magnitude of head acceleration events experienced by female adolescent rugby players across a season of rugby participation

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Introduction: Rugby union is a popular fast paced collision, which exposes players to repeated head acceleration events (HAE). Despite the popularity of the game there is growing concern for rugby union player safety and ongoing medical problems following a concussion or long-term participation in the game. Research on females and adolescent rugby players is sparse, yet they are a growing cohort wanting to play the game. This study aimed to address the gap in the literature regarding HAE exposure in adolescent female rugby players, which will contribute to age and sex specific mitigation strategies for player welfare in rugby union.

Methods: Forty-two (age 14.6 ± 1.3) female rugby players wore an instrumented mouthguard (HIT IQ Nexus) for all games and contact trainings during the 2022 and 2023 rugby seasons. All HAE above 8 g were recorded by the instrumented mouthguard. All sessions were recorded by video to verify all mouthguard detected HAE. In total 1979 rugby player hours were recorded across the two seasons (1283 player-hours of training, 696 player-hours of matches).

Results: We found 3433 video-verified HAEs. Over half of these events (n=2039) were from direct contact to the head and 644 indirect impacts not associated with head contact. Average (± SD) HAE incidence per game was 3.9 ± 2.6 and per training was 0.3 ± 0.2. Average HAE incidence was significantly higher in games (p <0.01, d = 1.2) compared to trainings. Peak Rotational Acceleration was significantly higher (p <0.01, d = 0.10) in games (1735 ± 1549 rads/s2) compared to trainings (1586 ± 1284 rads/s2). However Peak Linear Acceleration was not significantly different (p = 0.15, d = 0.06) between games (19 ± 14 g) and trainings (18 ± 12 g).

Conclusions: Adolescent female rugby players are subject to moderately less HAE incidence compared to male counterparts, with HAE occurring predominantly in games. Monitoring HAE magnitude and incidence is important for rugby safety and understanding the effect of concussive and non-concussive HAE in rugby union, both acutely and over the longer term.

Keywords: biomechanics, head acceleration, subconcussion, concussion, kinematics

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Performance Mindset Coaching

Panel Discussion exploring the Integration of Mental Skills and Psychology into Performance: Perspectives of High Performance Coaches

Purpose: The purpose of this project was to explore high performance coach perspectives regarding how they integrate mental skills and psychology into their performance environments. The discussion will tap into the coaches philosophies, approaches and experiences working with mental skills and psychology providers.

Project: A Performance Mindset Coach will facilitate a panel discussion with two high performance coaches to better understand the enablers and barriers of integrating mental skills and psychology into their programs, teams and campaigns. Jon Andrews (Cycling NZ Women's Elite Sprint Coach) and Jamie Joseph (Highlanders Super Rugby Head Coach) will share their insights and experiences and provide recommendations to coaches and practitioners to optimise integration and impact on performance.

Conclusions: The panel discussion aims to provide both coaches and mental skills and psychology providers an insight into optimising integration and improve performance impact.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Referees are athletes too: An intentional approach integrating wellbeing and mental skills to create a performance edge

Jason McKenzie (NZAC registered counselor and Mindset Performance Coach, currently working with NZ Rugby professional referees)
James Doleman (one of the four current professional referees in NZ. He has been a professional referee since 2020 and made his international debut refereeing Australia v France in 2021)

Purpose: The purpose of this seminar is to provide an inside view of James's journey from trained teacher to NPC referee, Super rugby, then International rugby, as a full-time professional and the role of Mental skills throughout this time.

Project: Practitioner and athlete retrospectively reviewed the last four years of their work together, alongside the full-time referee group, and changing the culture to focus on the person and their well-being. We will also explore Jame's individual growth this year using the mental skill pillars of growth mindset, process focus and enjoyment to prepare him to be to perform at his best when it matters most.

Conclusions: The insights shared offer examples of how a collaborative team approach, the right skill set and competency in the psychology and mental skills space, can help to drive the development of the person and the athlete (referees are athletes too!)

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Paris 2024 Olympics: Psychology and Mental Skills Insights and Recommendations

Kylie Wilson

Purpose: The purpose of this project was to capture support provision data from providers contracted by the New Zealand Olympic Committee to deliver psychology, mental skills and wellbeing/transition services before and during the Paris 2024 Olympic Games. To the authors knowledge, data of this nature has not been formally captured by the NZOC at any previous Olympic or Commonwealth Games.

Project: Three practitioners worked with an Athlete Management System expert to refine a data capture dashboard to utilise at the Paris Olympics. At the games, information was entered by the practitioners after every consultation with an athlete, coach or support staff team member. Post-games, the AMS expert generated a report that outlined levels of engagement, settings in which support was provided, timing of the support (pre-, in- or post-competition), focus of support (e.g., performance, wellbeing) and the most prominent perpetuating-protective factors. The practitioners then reviewed the report to formulate insights and recommendations.

Conclusions: The insights and recommendations have practice implications for the provision of psychology/mental skills provision throughout the 2028 Los Angeles Olympic cycle and during pinnacle events.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

The art of weaving mental skills and traditional performance coaching within high performance sport – where people and performance are seen as one in the same

David Galbraith, NZ registered clinical psychologist, currently working within High Performance Sport NZ
Jon Andrews, current head Coach to the Cycling NZ High Performance Sprint Team

"The magic lies in between the notes"
'Sting'

This workshop with Jon Andrews, Head Coach to the NZ Cycling High Performance Sprint Program and David Galbraith, High Performance Sport NZ Mental Skills Coach in this same program will provide an inside view of how Jon and David worked seamlessly together to ensure athletes had advanced mental skills competency to support both wellbeing and performance in the Paris 2024 Olympic Games. The workshop will provide examples of the frameworks used to support the athletes to build the mental competence to do this; and specific reflections on the structure and process used to assist them to get to the games ready to perform their best.

Continuous glucose monitors - A novel tool in Relative Energy Deficiency in Sport (REDS)

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Introduction: Relative Energy Deficiency in Sport (REDs) is a multi-factorial clinical condition associated with profound adverse long-term health and performance consequences. Detection of REDs is largely via the retrospective identification of the long-term health manifestations of problematic low energy availability, which can often delay diagnosis and treatment. Therefore, a process of providing rapid feedback on an individual's energy availability status is required to enable the support team to detect, monitor and treat REDs. This cross-sectional intervention study investigated the effectiveness of Continuous Glucose Monitors (CGMs) to identify and manage inappropriate energy or carbohydrate (CHO) intake in those with clinically diagnosed REDs, and healthy controls.

Methods: Females (n=11, 28.5 + 6.9 years) with a prior diagnosis of REDs by an experienced medical specialist, and healthy matched controls (n=11, 30.4 + 7.5 years) participated in a seven-day trial whereby they wore a CGM and recorded their exercise data each day. Participants also recorded their dietary intake for four days of the trial. REDs were interviewed following the trial to gain an understanding of their experience of wearing a CGM. The parameters of glycaemic variability including mean amplitude of glycaemic excursion, percentage time spent within range, mean and standard deviation (SD) of interstitial glucose readings were calculated for the two groups. Descriptive data (means and SD) on glucose, exercise energy expenditure, and energy and macronutrient intake for both groups were calculated.

Results: Interim analysis show no significant differences in glucose regulation between the REDs and the control group across the nychthemeron. Neither group met the recommended CHO intake for training days (REDs, 3.7 g.kg.d-1 + 1.0; control, 3.7 g.kg.d-1 + 0.7). Protein intake, as a percentage of total energy intake, was significantly higher in the REDs participants than the control (23.7% + 5.8 versus 17.0% + 3.6, p=0.02). Initial analysis of the interview data from the REDs participants indicates CGMs may have a role to play in nutritional behaviour change, specifically around exercise.

Conclusion: CGMs do not appear to be a diagnostic tool for REDs, but may help education and behaviour change for nutrition around exercise.

Keywords: Relative energy deficiency in sport; low energy availability; continuous glucose monitors; female athlete health.

Exercise tolerance and adaptation in untrained females: a 12-week training study

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Introduction: Physical activity guidelines were developed largely based on male data. The aims of the current study were to investigate adaptations to training in accordance with physical activity guidelines, in females, and assess the effects of post-exercise protein supplementation.

Methods: Untrained females (n=27, 33.6±9.2 y, 69.5±13 kg, BMI 25.4±3.8 kg/m2, VO2peak 27.3±3.7 mL/kg·min) were randomly assigned to either high protein (HP, 24 g) or low protein (LP, 4 g) post-training supplementation. Participants completed 12 weeks of progressive concurrent training (upper-body resistance training 2 x/wk and HIIT cycling 3 x/wk). Body composition (DXA), 3RM exercises (chest press, row, shoulder press), VO2peak and 3-day dietary records were taken every 4 weeks, with DXA scans at week 0 and 12. Subjective measures and HRrest, were recorded daily in a symptom-tracking app (Wild AIR). Mixed-effect models were used to analyse data, with ordinal linear regression used to analyse subjective measures.

Results: Participants completed 89.7±6.6% and 84.8±11.3% of prescribed resistance and aerobic sessions, respectively. There were no differences in energy and macronutrient intake, however, when accounting for bodyweight, participants in the HP group had greater relative protein consumption (1.2±0.4, 1.5±0.3 g/kg/24h, p=0.011). Increases in VO2peak0-12 (17.3±13.3%) and all 3RM exercises (CP; 49±16%, Row; 43±15%, SP; 58±25%), were significant (p<0.001), although no group differences were seen. HRrest decreased (Δ0-12 -3 ± 6 bpm, p< 0.001), with no group difference. Subjective energy levels increased to a greater extent in participants in HP (p=0.006). Mood, sleep quality and duration remained unchanged over time with no group difference. Lean mass increased (Δ0-12 0.7±1.2 kg, p=0.008), although no changes in fat mass (Δ0-12 -0.5±1.6 kg) or body mass (Δ0-12 0.2±1.8 kg) were observed, with no group differences.

Conclusion: Untrained females tolerate and adapt to loads based on physical activity guidelines. Protein supplementation (24g) after exercise, in untrained females, did not significantly improve adaptive responses, compared to an equicaloric, low-protein (4g) supplement. This may be due to a lower total dietary protein intake than ideal for females unaccustomed to training.

Autoethnography or preparing an amateur female team to prepare for Dragon Boat World Club Championship

Brendon Timmins

Introduction: The researcher as a former professional sportsman, strength and conditioning coach and sports academic, came to Waka Ama in 2020 and became deeply involved in the local club as its club president, competitor and coach. In April 2024 the researcher was approached by an amateur female Dragon Boat team who had qualified for the World Club 2024 Championship in September at Ravenna, Italy. The researcher was tasked with overseeing a twenty-week window of off water physical conditioning for the 12 female paddlers (24 to 57 yrs). Having worked predominantly with professional rugby, this was a journey of self-discovery for me as practitioner and researcher.

Method: This autoethnographic study explores the researcher's experiences and observations in preparing this group of amateur athletes for the competition. The questions to be explored were: 1) how I adapted from a professional to amateur environment, from working with young professional males to a group of amateur women of varying ages, 2) how conditioning could be fitted around the life and stage of life pressures of amateur women, 3) how we could link our process and practices to Te Ao Māori, and 4) how I, as a practitioner, adapted to a very different practice environment.

Results: Key to this journey was sharing the complete twenty-week plan at the initial hui. This provided the chance for the athletes to question and map their commitment for the training window. Every session began with Whakawhanaukataka and connection with each athlete to know their space coming into that session. The experiences and reflections within this opportunity provided me with an understanding that the "doing to" as per previous roles meant this relationship would not have survived and this was more about "doing alongside".

Conclusion: Looking back at how I coached professional male rugby players in my 30s to how I interacted with this team of amateur females in my 50s, I changed my processes and delivery. I became more empathetic and made more effort to understand the person. The shift both in the athletes and myself would suggest this was a positive outcome and something to develop further.

FE-MALE Study: Female Exercisers – Menstrual (follicular And Luteal) Effects, A Pilot Study

Michaela Rogan

Introduction: Previous research suggests that energy intake may be greater in the luteal phase compared with the follicular phase of the menstrual cycle, while macronutrient intake patterns are less clear. However, high-quality evidence is lacking due to poor adherence to best-practice menstrual cycle research guidelines. Furthermore, existing research is mostly in sedentary populations. This pilot study aimed to investigate: 1) variability of energy availability, energy intake, and macronutrient intake across the menstrual cycle in female exercisers; 2) post-exercise phase-related dietary intake; and 3) retention rates to aid future research.

Methods: Six regularly menstruating female exercisers (>2.5hrs·week-1) completed three-day diet and training records in the early-follicular (days 2-4 of the cycle) and mid-luteal phases (7-9 days after a positive urinary ovulation test) over two cycles. In each phase, body composition was measured via bioelectrical impedance analysis and participants completed a fasted 60-minute cycling test, followed by an ad-libitum meal.

Results: Mean energy availability was slightly greater in the mid-luteal phase (35.7 ± 7.1 kcal·kgFFM-1·day1) compared with the early-follicular phase (32.6 ± 11.5 kcal·kgFFM-1·day1). Daily macronutrient intakes were similar between phases but many participants failed to meet carbohydrate and protein guidelines in either phase. Post-exercise energy and macronutrient intakes were similar between phases, but fat increased from the early-follicular phase (20.7 ± 12.0 g) to the mid-luteal phase (25.5 ± 12.5 g). While 26 females expressed interest in the study, of those who were eligible after screening, 43.8% (n=7) were excluded due to menstrual irregularities.

Conclusions: Future observational and interventional research investigating energy availability in females may need to consider menstrual cycle effects, beyond exclusively conducting research in the follicular phase. While macronutrient intakes don't appear to differ by cycle phase, this study was limited by its sample size. Ideally, larger studies in more diverse populations that adhere to best-practice menstrual cycle research guidelines are required. However, with the high rate of menstrual irregularities in exercising females, without greater collaboration between research centres and increased funding for female-specific research, the feasibility of this seems challenging.

Conflict of Interest: The authors declare no relevant conflicts of interest in relation to this work.

A new measure of acceleration: GPS can accurately measure a 10 m standing start

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Introduction: In this study, we developed a novel method for measuring standing 10-metre sprint times (S10M) from GPS and extracting the fastest attempts. Existing measurement methods present numerous logistical challenges, such as setting up additional equipment. The purposes of this study were to overcome these challenges by a) creating an algorithm for extracting the fastest S10M from GPS and b) validating the method.
Methods: Five GPS units were attached to a wheeled trolley system, pulling the units from stationary over a 10-m distance with varying acceleration. VALD Smart speed timing lights (1000Hz), STATSports GPS (10 Hz) and two GoPro Hero 4 cameras (100 fps) were used. Two hundred forty trials were performed. The time taken to travel 10 m was determined by the timing gates, visually from camera frames and GPS using a MATLAB script. Timing gates are considered the criterion measurement method, with the camera being the gold standard. The analysis included percentage differences between methods and Bland Altman plots.
Results: The average time for speed lights was 1.89 s, which is close to rugby union players' capabilities. The resulting 10-m times from GPS were slower than the speed lights (4.2 ± 2.7%) and cameras (3.4 ± 3.4%). The intraclass correlation coefficient (ICC) was 0.994 with a Bland Altman bias of 0.08 s and 0.06 s between speed lights and the camera, respectively. After adjusting the GPS based on the bias of raw GPS and speed lights data, the correlation was r = 0.98 between the adjusted GPS and speed lights 10-m times.
Conclusion: Using GPS to measure S10M offers advantages to coaches, athletes, physical conditioners, medics and scientists alike. GPS-derived sprint times provide an accurate way to understand players' weekly acceleration ability, eliminating the logistical challenge of setting up external aids such as speed lights and opening up the possibility of objectively measuring a programme's effectiveness and its impact on a player's S10M. Additionally, there is the possibility of injury prevention and management with consistent tracking of this metric.

Conflict of Interest: The authors declare no relevant conflict of interest concerning this work.

Understanding the relationship between defensive formations and offensive outcomes in elite women's water polo

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Introduction: Improved game dynamics create more spectator engagement [1], however, success probabilities in water polo are favoured by defensive efficiency [2]. The relationship between defensive formations and offensive outcomes in elite women's water polo is yet to be investigated. Therefore, the aim of this study was to examine the offensive outcomes that resulted from different defensive formations in elite women's water polo.
Methods: Fourteen women's water polo matches, involving USA, Hungary, Netherlands, Italy, Spain, Australia, Greece and Canada, from the 2022 19th FINA Water Polo World Championships were analysed. Defensive formations were notated, including Press, Zone, Zone-Press and Press into Zone defence. A binomial regression assessed the relationship between offensive outcomes (e.g., Goal, Steal, Exclusion) and predictor variables (such as defensive formation, defensive team, offensive team and location of last ball possession).
Results: The likelihood of a steal occurring was significantly lower further away from goal. A steal was 74.5% less likely during offensive possessions by Netherlands (ranked #3) compared to Australia (ranked #6) (p = 0.047). For every additional second of possession duration, from the onset of even play situations, the likelihood of exclusions decreased by 11.5%. Exclusions in front of goal were significantly more likely closer to goal [p = 0.004]. Australian defence was 20.5% less likely to incur an exclusion compared to Greece (ranked #7) (p = 0.004). Offensively, the likelihood of Australia obtaining exclusions were 32% less likely compared to Hungary (ranked #2) (p = 0.048). Press defence resulted in a 66% reduction in scoring a goal compared to Zone defence (p = 0.052), though not statistically significant. Defensive formation significantly improved model performance (p < 0.001).
Conclusion: Defensively, ball possession within closer proximity to the goal significantly increases the likelihood of a steal and exclusion. Each defensive formation directly impacts the likelihood of offensive outcomes. Consequently, the playing style of each country becomes evident given the synergistic link between the individual and collective strengths and weaknesses of each team, coaching philosophy and opposition [3-5]. Future research should investigate variables relating to the type of shot, the amount of pressure on shots, and individual expertise within each defensive formation.

Conflict of Interest: The authors declare no relevant conflicts of interest in relation to this work.

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Depth perception: Analysing the squat depth standard of the International Powerlifting Federation using motion capture

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Introduction: To successfully complete a squat the international powerlifting federation (IPF) rules state "the lifter must bend the knees and lower the body until the top surface of the legs at the hip joint is lower than the top of the knees." This "depth" is judged by three referees, and in some cases, a jury who can use video replay to guide decisions. For accuracy, referees and jury would ideally view lifts from perpendicular to the thigh; however, the need for safety spotters makes this infeasible. The purpose of this research is to determine the agreement between 2D video (from the typical viewpoint of referees) and 3D motion capture assessments of squat depth.

Methods: Seventeen participants performed three squat repetitions. Retroreflective markers were placed at the hip crease and just proximal to the patella per IPF technical rules, following consultation with IPF referees. 2D video analysis and 3D motion capture were used to assess the relative position of markers to determine if "depth" was achieved. Video cameras were set at angles consistent with referee placement. To account for inter-dependencies of the data (i.e., multiple repetitions per participant), bootstrap resampling approaches were used to estimate Cohen's kappa (κ) with the median values and 95% confidence intervals reported. The level of agreement was interpreted as follows: none (0-0.20), minimal (0.21-0.39), weak (0.40-0.59), moderate (0.60-0.79), strong (0.80-0.90), and almost perfect (0.90).

Results: Due to marker obstruction in 2D, depth could not be assessed for 49 observations. Therefore, the final analysis included 49 observations from 34 unique squat repetitions across 13 participants. Bootstrap analysis revealed a median Cohen's κ of 0.27 (95% CI: 0.19, 0.37), suggesting none-to-minimal agreement between assessment methods. The overall accuracy (percent agreement) was 57.1%.

Conclusions: Caution should be exercised judging squat depth with 2D video analysis, particularly from positions not perpendicular to the thigh. The view of a referee may contribute to a lack of accurate depth judgement in the squat task. Subsequent research will quantify the observed differences and investigate possible predictors.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Workload demands during ball-in-play periods: Comparison of locomotive and contact metrics in professional male versus female Rugby Union Players

Chantal MacDonald & Tiaki Brett Smith

Purpose: Rugby Union is a high collision-based sport demanding the best physical, technical, tactical and decision-making capabilities of players to influence success on the field. Various factors affect the ability for females and males to perform and meet the demands of match-play. This project employed an innovative design that examined and compared contact and locomotion metrics between female and male professional rugby union players during match play.

Methods: Data was collected from 60 professional male and female rugby players, from one male and one female professional National Provincial Rugby teams. All participants wore GPS units (Apex Pro Pod, STATSport, Newry, NIR). Each match was filmed and coded using Sportscode video analysis software package (Sportscode 12.4.3, Sportstec, Australia), where contact and GPS metrics were identified throughout the match. GPS and Sportscode data were combined in a bespoke software package. Difference were determined using Welch's t-test with the level of significance set at P<0.5 and the magnitude of the differences was calculated using Cohen's d (Hopkins, 2009, 2017). Tests for equality of variances, normality and the examination of outliers was conducted in IBM SPSS Statistics (Version 27).

Results: Males locomotive metrics (GPS) and impacts (accelerometer) were typically significantly greater than females showing large to moderate magnitude differences. On the other hand, contacts were often significantly higher for females with small to large magnitude differences.

Conclusion: The differences between males and females were likely a combination of genetic differences, differences in how the respective games were played, and the males in this study typically had greater full-time professional training support and resources. Due to these differences, altering female threshold standards for specific intensive locomotion metrics to suit the physical capabilities of females, may give more of an accurate representation of game demands. On the other hand, providing greater resources to female rugby union players for similar periods of time to the males may reduce the differences observed in this study.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Applying an information framework for presenting coaches with large datasets

Croft, H., Spencer, K., & Bowden, M.

Introduction: There is a growing body of literature rationalising and describing the opportunities and risks associated with big data in sport (Vermeulen & Yadavalli, 2018; Passfield & Hopker, 2017). There are more data producing technologies in existence than any other time in history, with claims of 20.8 to 50 billion connected devices existing world-wide in 2020 (Aeris, 2021). Frameworks are important for guiding practitioners in many areas of sport science and coaching. The 'coaching process' and 'systems design' approach are examples of frameworks that can be used for coaches and performance analysts. A framework does not exist for performance analysts developing 'large' or 'big data' tools which assist coaches decision making.

Methods: This research implements a framework (Croft et. al., 2021) specifically designed for this problem and demonstrates a tool for netball coaches and sport science staff to navigate datasets in an ecologically valid way. The tool incorporated findings from previous research (Figure 1) and utilised PowerBITM to present information about team and player performance. The tool was evaluated by six coaching and sport science staff participants. A survey gathered feedback, and a net promoter score was then calculated.

Results: Overall, the survey results, and net-promoters score of 100, provided evidence that good ecological validity (M=9.3, SD=0.82) was achieved with this tool. "Ability to have this data on hand, clear easy presentation using averages and having historical data supports the athlete's awareness of performance and the coach's capacity to make robust decisions and be supported with accurate feedback (Coach 2)."
In contrast, the 'movement' category within the tool was rated lowest which indicates better information needs to be included.

Conclusion: Frameworks are an effective method for guiding the development of data presenting tools, however the impact of artificial intelligence (AI) technologies, like ChatGPTTM, should also be considered and evaluated within these frameworks, in future research.

Keywords: Big-data, coaching, frameworks, netball, artificial-intelligence, sport.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Figure 1.
A complete framework for the development of tools to navigate large datasets.
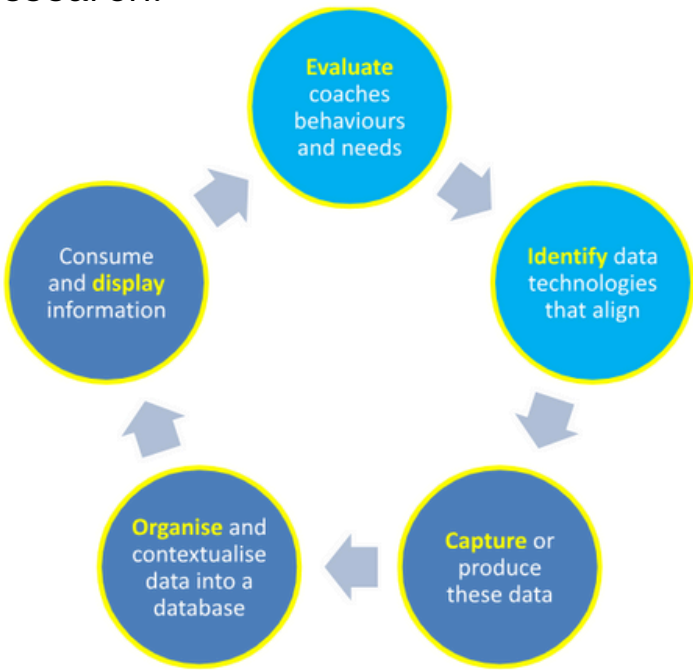
Evaluating a framework for concussion management in New Zealand's Secondary Schools

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Introduction: Concussions in youth add additional challenges to those experienced by adults, as the adolescent brain is still developing alongside the body undergoing hormonal changes. Early intervention is critical for recovery, but support in schools for students with concussion is lacking. We co-designed a framework to provide support for adolescents with concussion in their return to learn and sport, the FRAmework for maNaging Concussions in NZ secondary Schools (FRANCS) and implemented it as a pilot in 12 NZ schools. This study draws upon the experiences and perceptions of key stakeholders involved in the implementation of FRANCS.

Method: This study adopted a pragmatic, qualitative descriptive approach. Following implementation semi-structured interviews and focus groups were conducted to gain feedback from schools, parents and students on the proposed framework. A total of 24 interviews (participants age = 50.1±10.5 years, 18 female) were carried out across 2022 (n=11) and 2023 (n=13). Framework analysis was used to analyse participant responses.

Results: Key themes identified were: flexibility of implementation; seeing value/owning it; and paying lip service. These themes fed into contextual elements of the process, external confounders of the process and the overall student outcome of feeling supported or not. Schools that implemented the framework successfully were those schools that embraced the flexibility of FRANCS and saw the value in it. These schools were able to overcome barriers to implementation and this resulted in students and their parents feeling supported. Schools that struggled to implement the framework found the framework and its flexibility to be a burden. These schools were overcome by perceived barriers (staffing, communication gaps and technology), and ultimately paid 'lip service' to the process by not utilising the framework to its full potential leaving students feeling unsupported.

Conclusions: Flexibility can act as barrier or facilitator, and we need to look at strategies to support schools in owning it to minimise barriers.

Coming of age? Evaluating the acceptability of Nonlinear Pedagogy to PE teachers in Singapore

Chris Button, John Komar, Lee Shu Shing, Benjamin Tan Su-Jim, Irfan Bin Ismail, Ludovic Seifert, Jonathan Ng, Loh Huai Kai, Chow Jia-Yi

Purpose: Motor learning is punctuated by nonlinear characteristics such as sudden changes in capability and individual differences in learning rates. Nonlinear Pedagogy (NLP) provides a set of design principles teachers can use to deliver learner-centred physical education (PE) lessons with a focus on exploratory learning. As NLP approaches its 18th anniversary since conception (Chow et al., 2007) it is timely to consider how/whether it is understood and used by teachers. The aims were to: i) determine what PE teachers know about NLP (study 1) and ii) examine the effectiveness of an intervention programme (professional development) for in-service teachers to enact NLP (study 2).
Project: 200 PE teachers from Singapore were surveyed about their knowledge and application of NLP. The teachers were knowledgeable about the valuable role of exploration for the learning process. They knew about constraints manipulation and how to use it, but they were less confident at how to infuse practice variability. Importantly, a key strength of NLP according to the teachers was that it helped to develop learner motivation and enjoyment. In brief, PE teachers perceived themselves to understand NLP but were less familiar with how to teach using NLP.
We then invited 37 Physical Education (PE) teachers to complete a 4-week professional development intervention to enhance their knowledge and application of NLP. A survey and interviews revealed there was a change in teachers' knowledge and enactment of NLP. Interestingly, a video tool that coded teaching behaviours also confirmed that NLP design principles were applied more frequently following the intervention. However, some participants voiced lingering concerns about the need to teach children 'correct movement forms'. Also some said NLP was more "chaotic" (than other teaching approaches), and potentially more demanding in terms of both time and resources.
Conclusions: Acceptance of NLP (i.e., awareness, understanding and use) is growing amongst PE teachers in Singapore, although there are still some lingering concerns to be addressed. Professional development training can allow in-service teachers to upskill and include NLP in their daily practice.

Keywords: Attitudes, Behaviours, Knowledge, Learning, Professional Development

References:
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"Empowering athletes: Supporting educational achievement alongside athletic pursuits"

Rachel van Gorp

Introduction: Athletes often face educational challenges as they balance their sports careers with academic goals. For many, these challenges stem from inadequate secondary education, disengagement from traditional learning environments, or a strong focus on sport over study. Additionally, some athletes may experience further difficulties related to attention, reading, or processing, such as those associated with ADHD or dyslexia. This research explores the wide-ranging learning challenges athletes encounter and emphasises the need for collective support from sporting bodies, educational institutions, and the coaching team. By recognising these challenges and providing tailored assistance, we can help athletes succeed in their sports and academic journeys. This approach fosters personal growth and prepares them for life beyond their athletic careers. Educational accomplishment for athletes can be transformative, contributing to a well-rounded identity and opening doors for future opportunities.
Methods: A mixed-methods survey was conducted by Gualter, van Gorp and Ker (2024), gathering both quantitative and qualitative data from 119 athletes – 78 of whom provided in-depth responses. Learners were enrolled in either Capable NZ's flexible Independent Learning Pathway (ILP) or a programme through the Sports Institute, which enabled a comprehensive examination of athletes' learning challenges.
Results: The study revealed that 35% of respondents experienced significant challenges balancing academic and sporting commitments. Athletes aged 25-44 demonstrated the highest awareness of neurodivergent needs. Key findings identified time management difficulties (72%), focus challenges (68%), and memory retention issues (56%) as primary academic barriers. Both neurodivergent and non-neurodivergent athletes reported experiencing stigma around seeking additional support, especially in areas of reading and writing, and learning styles, though younger athletes showed greater openness to utilising support services.
Conclusions: The findings highlight the need for comprehensive support systems that address both neurodivergent and general learning challenges in athlete education. Personalised learning approaches, including assistive technologies and flexible study options, proved effective in supporting academic achievement. This research contributes to understanding how educational institutions better support athletes' diverse learning needs can while maintaining their sporting commitments.

Keywords: athlete education, neurodiversity, learning support, sports education, academic achievement, mixed methods

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Performance Mindset Coaching

Back-to-back-to-back Gold: Tailoring mental skills and psychology support to meet personal and performance needs across multiple-Paralympic cycles.

Abstract submitted by Natalie Chapman Performance Coach currently working within High Performance Sport NZ
Anna Grimaldi is the second author of the abstract and is a 3-time Paralympic Gold Medallist competing in T47 Long Jump, 100m and 200m

Purpose: The purpose of this seminar is to provide insights into how mental skills and psychology support was tailored throughout multiple Paralympic campaigns to meet the personal and performance needs of 3 X Gold medallist Anna Grimaldi.
Project: Practitioner and athlete retrospectively reviewed the delivery of mental skills and psychology support implemented over the last 3 Paralympic campaigns (Rio 2016, Tokyo 2020/1 and Paris 2024) to identify the key interventions that met personal and performance needs which helped enable the athlete to perform their best at multiple pinnacle events.
Conclusions: The insights shared offer examples of how a collaborative team approach, utilising the right person with the right skill set and competency in the psychology and mental skills space, can help to drive personal development and performance at pinnacle events.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

The Mahi between the Magic: Mentally resetting between events at the Paris 2024 Olympic Games

Kylie Wilson

Purpose: The purpose of this project was to explore the approaches and strategies employed to mentally reset between events at a pinnacle event.
Project: One individual and one team athlete who competed at the Paris 2024 Olympics will share their reflections on how they navigated the period between key events during the games. The performance mindset coach who supported both of these athletes throughout the Paris Olympic cycle will build upon their reflections, sharing insights into the strategies they employed, how they were introduced and developed and the theoretical underpinnings of the approached employed.
Conclusions: The insights provided will assist those working with athletes and teams to build their understanding and strategies to support effective mental resets.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Panel Discussion: The evolution and revolution of mental skills and psychology in Aotearoa New Zealand

Purpose: This panel discussion aims to explore the evolution of mental skills and psychology delivery across high performance sport settings in N Z. The panellists will be challenged to address current and future challenges for the domain and how these might be navigated to optimise both performance and wellbeing impact.
Project: The panel will include Professor Ken Hodge (Mental Skill Coach), David Galbraith (Clinical Psychologist) and Dr Rod Corban (Psychologist) who have collectively been involved in delivering to high performance sport for 80+ years. The panellists will describe the early stages of the profession, key system shifts that impacted the domain and the influence of these shifts on themselves, their roles and the sport environments in which they work. Panellists will also explore current system challenges and predicted future challenges and shifts.
Conclusions: The panel discussion aims to provide insights, perspectives and predictions for providers and sports to deepen their understanding of delivering mental skills and psychology in uniquely Aotearoa New Zealand contexts.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Does aerobic fitness modulate the effects of dehydration in females?

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Introduction: Dehydration has been repeatedly shown to impair endurance performance in laboratory-controlled environments. Fit people dehydrate more than unfit people do during endurance exercise. However, few studies have addressed whether fitness modulates the effects of dehydration, and no such data exist for females. Therefore, we examined the interactive effect of aerobic fitness and hydration status on physiological responses and endurance work capacity in females in a hot environment.

Methods: Twelve eumenorrheic females of wide-ranging fitness (VO2max: M= 42, 29-55 mL/kg/min) performed two 90-min trials in a randomised order during the mid-luteal menstrual cycle phase (i.e., days 19-25) with heart rate clamped at 130 bpm. Dehydration was prevented in one trial (EUH) and imposed in the other (except 20 mL every 20 min) (DEH). Trials were undertaken in a hot environment (40°C and 38% relative humidity) and comprised three 30-min repeats of 12-min walking/jogging, 12-min cycling, and 5-min rest.

Results: At clamped and matched physiological strain (130 bpm), each 1 mL/kg/min greater aerobic power permitted 0.05 W/kg additional average relative work rate regardless of hydration condition (EUH 95%CI: 0.03, 0.07 W/kg; DEH 95%CI: 0.02, 0.07 W/kg) and 0.05% more dehydration in DEH (95%CI 0.02, 0.07) (M=1.5, 1.0-2.9%). Despite fitter females dehydrating to a greater extent (by a factor of ~1.9), they did not show a commensurately larger dehydration induced reduction in relative work rate (95%CI -4.4, 8.2 %/h) or rise in core (95%CI -0.2, 0.03 °C/h) or skin temperature (95%CI -0.2, 1.3 °C/h).

Conclusions: Aerobic fitness had a far greater influence than dehydration on endurance work capacity and thermal drift when exercising at a regulated heart rate (130 bpm) in a hot environment. Therefore, restricting fluid intake during exercise regulated at a given physiological strain in 90-min of severe heat stress results in minimal ii dehydration in unfit females, but moreso in fit females, yet the functional effects of dehydration are minimal in fit females.

Hormonal fluctuations and sport performance: A Delphi study on menstrual cycle monitoring and secondary impacts in female athletes

Rebecca Attwell, Nick Draper, Jackie Cowan, & Hannah Wyatt

Introduction: Menstrual cycle literacy among (and for) female athletes is rapidly developing with new scientific insights offering greater knowledge of the physiological impacts of female sex hormones. Investigations into the key hormones that make up the menstrual cycle have shown evidence of secondary impacts on multiple body systems outside of reproduction (Julian & Sargent, 2020; Steiner et al., 2003). Some claim that performance and training adaptations can be enhanced by modifying, training, recovery and/or nutrition based on menstrual cycle phase (Julian & Sargent, 2020). However, the results are often trivial and inconsistent due to the variability that exists between and within women. While existing methodologies are well designed for exploring impacts at a population level, the variability in the menstrual cycle makes it less meaningful to be making conclusions or recommendations for female athletes in this way. The first aim of this study was to develop an expert consensus on which body systems could be impacted by female sex hormones in different female athletes. The second aim of this study was to find a consensus on the key hormonal profiles, terminology and red flags of a robust menstrual cycle. This is important as a robust menstrual cycle is a vital sign of health (Vigil et al., 2017) and therefore could be used as a tool for athletes who menstruate to monitor their own health status through different life events, stressors and training blocks (De Souza et al., 2010). This consensus will be useful for any stakeholder including but not limited to athletes, parents, coaches, managers, physiotherapists, or other health experts.

Method: To explore this topic, a 3-round, classic Delphi process is currently underway with an expert panel of 22 individuals from around the world. Experts were nominated through a snowball sampling process and all have a background, experience and/or an advanced degree (e.g., PhD) in sports science, sports medicine, or similar field with a focus on female athletes and/or the menstrual cycle. All experts initially took part in video interviews responding to open-ended questions, and the qualitative results were analysed using NVIVO. The following two rounds will require experts to respond to an online survey consisting of statements developed from round one. Experts will rank statements on a Likert scale and provide qualitative justification if warranted.

Results: So far there is a strong consensus that a large number of body systems are regulated by and could therefore be impacted by the menstrual cycle. Including the reproductive, skeletal, cardiovascular, muscular, nervous (brain, central & periphery), endocrine, immune and digestive systems. Experts all agree that women's menstrual cycles are highly individualistic, with significant variation both between and within individuals. The degree and detail needed for monitoring menstrual cycles varies and is dependent on the individual, the goal/intention, and the time/resources available.

Conclusions: Overall, monitoring and understanding the menstrual cycle can lead to more effective, and individualised management of a female athlete's health and performance. Including increased self-awareness, body literacy, empowerment and optimisation.

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Menstrual tracking: Hormone profiling for athlete research

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Introduction: Methods of tracking and confirming athletes' menstrual status and phase in research vary greatly and are often poorly applied in past and current research. Nonhormonal tracking makes comparisons between cycles and between individuals very challenging and often leads to poor quality conclusions. The aim of this project is to establish a method of profiling Progesterone, Estradiol, Cortisol, and Testosterone. Enabling confident menstrual phase confirmation for analysis. Saliva is a preferred sample type for longitudinal hormone profiling. Due to its ease of collection and simple storage and processing requirements. However, quantification of salivary hormones can be challenging due to their low concentrations. ELISA kits are commonly used to quantify salivary hormones for research. As they are simple to run and easy to procure as needed. Unfortunately, it is also well known that ELISA methods don't have high fidelity in their quantification accuracy. Mass Spectrometry is known to have much higher accuracy, particularly in samples with low concentrations like saliva. Additionally, MS allows for flexible batch sizes and the ability to quantify multiple hormones in the same run.
Method: Using Mass Spectrometry, we are developing a method of quantifying hormones from saliva samples. This method will then be validated and compared to commonly used ELISA kits.
Conclusion: Once finalised the method can be used by New Zealand researchers to perform reliable and robust studies on the menstrual cycle's relationship with athlete readiness, performance, and training.

Keywords: Menstrual cycle, methodology

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Riding with Flow: Menstrual Health in World Cup and World Championship Mountain Bikers

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Introduction: Menstrual health is an indicator of overall health and is an important aspect of female athlete physiology. Menstrual disturbances can have long term health consequences and are most likely related to high training volumes, disordered eating, and low energy availability. While menstrual health has been studied in some sports, it has been neglected in mountain biking. The aim of this research was to report the menstrual health status of female World Cup and World Championship Mountain bikers, in cross country and downhill disciplines, with a specific focus on 1) the prevalence of menstrual disturbances; 2) hormonal contraceptive use; and 3) menstrual cycle symptomology and period characteristics.
Methods: An online survey was made available for female cross country and downhill mountain bikers competing in the 2021 season of the UCI Mountain Bike World Cup Series, World Championships and Tokyo Olympics. There were a total of 76 valid survey responses.
Results: Riders were 85.5% (n = 65) cross-country riders and 14.5% downhill riders (n = 11). The prevalence of menstrual disturbances was 58% (n = 44), with 34% of riders reporting amenorrhea (n = 26) and 47% oligomenorrhea (n = 36). There were no significant age or discipline differences in menstrual disturbances. Twenty-five percent of riders (n = 19) were current hormonal contraceptive users. About a third of riders (29%, n = 22) experienced heavy menstrual bleeding. Fifteen percent of riders (n = 11) had been diagnosed with eating disorders, 58% (n = 44) engaged in disordered eating practices and 9% (n = 7) had been diagnosed with Relative Energy Deficiency in Sport (RED-S).
Conclusions: Over half of all riders in this study had experienced menstrual disturbances. Negative menstrual cycle symptoms were experienced by most. There were no significant differences in menstrual health when comparing cross-country and downhill riders. Eating disorders and associated behaviours were relatively high in mountain bikers and in the higher level riders this was only seen in cross-country riders.

Keywords: female athlete, menstruation, menstrual cycle, mountain biking, hormonal contraceptive, menstrual disturbances

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

The Bleeding Edge of Women's Performance Enhancement? Examining sportswomen's interest in menstrual cycle-based training

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Introduction: Evolving and at times inaccurate information about training methods that vary with the menstrual cycle (MC)—i.e., cycle-synced training (CST) and phase-based training (PBT)—proliferate inside and outside of academic spaces. Yet it is unclear what elements of this information women athletes are engaging with. This project examines the sources and contents of information about MC-based training strategies encountered by competitive women Olympic Weightlifters and their interest in and trust of this information.

Methods: This project was conducted at two Olympic Weightlifting gyms in the same city in Aotearoa NZ. It engages two qualitative methods: 1) in-depth interviews with seven competitive women athletes; 2) one focus group at each gym, attended by a total of 15 women athletes. Focus groups provided a broad understanding of athletes' perceptions of MC-based training strategies, and interviews examined athletes' sources of information about the MC and its impact on performance.

Results: Athletes encountered information about MC-based training from three main sources: 1) teammates; 2) coaches; and 3) social media (fitness influencers, science communicators, academics). Recounted information focused on three ideas: 1) the MC affects every athlete differently; 2) 'one-size-fits-all' PBT perspectives are not trustworthy or functional in competitive sport; and 3) the MC is primarily characterized by 'bad' phases for strength. Athletes expressed both an interest in and distrust of MC-based training, citing a lack of access to sport-specific information and a dislike of prescriptive PBT approaches from online sources. Most information encountered in the gym and on social media highlighted the negative impact of the MC on athletic performance and recommended decreased effort in training, which athletes found unhelpful.

Conclusions: As research on MC-based training strategies develops, there is a need to frame messaging around the variability of athletes' experiences of the MC and athletes' interest in findings that emphasize 'positive' phases of the MC for sport-specific performance.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

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Strength for skinny athletes –using strength training for bone health in an elite professional trail runner

Val Burke, Exercise Physiologist

Purpose: The purpose of this project was to help an elite runner use strength training to improve performance and prevent the multiple stress fractures that had plagued her career. Prior to mid-2017 this runner suffered 6 stress fractures (metatarsal, Rt & Lt femoral neck, sacral, tibia and fibula). Prior to mid-2017 she had RED-S and amenorrhea, and did no strength training alongside her running. From late-2017 – 2024 this athlete has had no stress reactions or fractures, no injuries and multiple podiums at World Champs. This case supports the current research supporting the decrease in run injuries associated with the potential adaptation of bone and soft tissue that is due to strength and jump training.

Project Description: Development & Implementation: The strength, mobility & jumps were periodised around the home & away run season. The following strength phases were also phased throughout the training weeks. General Prep Phase 4 – 8 weeks (10-12 RM strength; post-season rehab; unilateral, core & glut focus; jumps for calf/tendon stiffness). Specific Preparation Phase 12 – 16 weeks (6 – 8 RM; Run & Bone Density-specific exercises; higher intensity jumps and landings); In-Season Phase 8 – 12 weeks (6 RM; lower number and volume of exercises leaving priority for running). Key Strength Exercises: Trap Bar Squats; Leg Press; RDL; Split Squats; Calf Raises. She strength trained 2- 3x/week.

Evaluation: Up to our intervention in 2017 this runner had suffered multiple serious stress fractures. Between 2017 and 2024 this athlete has had no stress reactions, no stress fractures, no injuries and multiple podiums in World Champ Races. Dexa Scans from 2005 – 2021 show the following: 2005: L1-L4 0.90 gm/cm2; Z-Score -2.8. Comments: "Bone density significantly reduced compared to other 16 year olds. Influenced by puberty. Skeletal age 13 yrs using the retarded maturation charts". 2017: L1-4 0.976 gm/cm2; Z score -1.4. Total hip 0.940 gm/cm2; Z-Score -0.3. Comments: "Well within normal range at hips; lower ½ or normal at spine; up 8% in 12 years keeping with peak bone mass. Normal bone mass for age". 2021: L1-4 1.043 g/cm2; Z-Score -1.2; Femoral neck 0 .960 g/cm2; Z score -0.04. We have her peak 6 RM data from key exercises to demonstrate her load.

Dissemination: I hope to present at the 2024 SESNZ conference. I will send the abstract to physiotherapists, strength and endurance coaches, and distribute via social media. I'd love to present it to Athletics and Triathlon New Zealand.

Conclusions: This case has demonstrated that the application of strength and jump training can be effective in preventing stress reactions, stress fractures and soft tissue injuries in an elite trail runner. Poor bone health has multifactorial causes, and strength and jump training can be used as one of the methods of reversing it in runners.

Conflict of Interest: This athlete is my client, and these conclusions are open to bias.

Physical activity environment and wellbeing: Effects of nature

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Introduction: Being in, or even just looking at, nature is associated with enhanced Hauora, physical and psychological wellbeing, as well as positive behavioural and cognitive outcomes. Similarly living in or near green spaces is associated with greater longevity, which is likely in part due to increased physical activity (PA). PA is without question a key driver of reduced risk of non-communicable diseases and a healthy, long life. The aim of the present study was to explore effects of the exercise environment on wellbeing with a focus on nature and nature affinity.

Methods: An online survey was used incorporating the Nature Relatedness Scale (NR-6), EQ-5D health questionnaire, WHO-5 wellbeing questionnaire, International Physical Activity Questionnaire - Short Form (IPAQ-SF), with additional questions on PA (bouts > 20 min) in various environments and other personal factors. Statistical analyses were conducted using linear regression and non-parametric tests in R.

Results: Survey was accessed by 221 individuals, with 179 included in analyses. Exclusion was primarily due to incomplete surveys (<80%), missing necessary content (e.g. measures of wellbeing), or not living in New Zealand. Over 50% of respondents had high PA levels (IPAQ-SF). Mean activity level was 4547 ± 4981 MET-min/week. Most (96%) did PA with others, and 45% with animals, >1x/week. PA was associated with physical wellbeing ($p=0.04$, corr=0.30 (medium effect size)) and psychological wellbeing ($p< 0.001$, corr=0.34 (medium effect size)). 83% of respondents exercised indoors, 72% in outdoors built and 66% in nature >1x/week. PA in nature was correlated with wellbeing, with each additional bout of PA in nature associated with an increase in EQ-5D score of 1.74, and 232 in WHO-5, ($p=0.020$, corr =0.22; $p=0.001$, corr=0.25) with small-medium effect sizes. Nature relatedness was associated with wellbeing (EQ-5D, $p=0.028$, corr=0.18; WHO-5, $p=0.001$, corr= 0.22) with small-medium effect sizes. Physical activity outdoors in a built environment was not correlated with psychological ($p=0.4$) nor physical wellbeing ($p=0.10$). Physical activity indoors was positively correlated with psychological wellbeing ($p=0.03$, corr=0.18 (small-medium effect size)), but not physical wellbeing ($p=0.19$).

Conclusions: The exercise environment has the potential to impact perceived physical and psychological wellbeing, as does affinity with nature. Physical activity in nature appears to be more beneficial than in other environments.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Tama tu tama ora, tama noho tama mate - Play, Active Recreation and Sport (PARS) for rangatahi Māori mental wellbeing

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Introduction: Rangatahi Māori (Māori youth) experience greater mental health disparities compared to non-Māori (YouthLine, 2022). There is a growing body of scholarship suggesting that regular physical activity and participation in sports can have significant benefits, including for positive mental health outcomes. However, research that focuses specifically on how PARS benefits rangatahi Māori mental wellbeing is needed. Evidence suggests that cultural identity and connection to ancestral landscapes and language positively influence wellbeing, particularly mental wellbeing. Thus, there is a compelling need to investigate the potential of PARS engagement as a holistic and culturally relevant intervention for flourishing mental wellbeing in rangatahi Māori.

Methods: This study employed a mixed-methods approach, integrating qualitative and quantitative survey data, as well as a systematic review of literature. Twenty-seven (M = 15, F = 11, NB = 1) participants were recruited for the anonymous online survey. A systematic review was also conducted using the Ngā Poutama Whetū framework (Hapeta, et al., 2019). This project adopted a Te Ao Māori (Māori worldview) perspective, including using the Te Whetū Rehua (Sport NZ, 2012) framework to inform our data analysis.

Results: The systematic literature review across fourteen articles identified three key themes: (1) Importance of applying Indigenous Knowledge; (2) Cultural identity - Uncovering 'the space between'; (3) and barriers and challenges rangatahi Māori continue to face. The survey data revealed that participants responses support the idea that PARS could be an effective tool for flourishing mental wellbeing in rangatahi Māori. Additionally, a lack of Te Ao Māori representation in PARS programmes is emphasized through participants survey responses.

Conclusions: These findings provide evidence that PARS can be strongly connected to mental wellbeing and may provide an effective pathway for flourishing mental wellbeing in rangatahi Māori. The findings also highlight the lack of Te Ao Māori in PARS programmes and spaces around Aotearoa. Thus, mātauranga Māori (Māori knowledge) should be incorporated throughout PARS spaces. This benefits rangatahi and Māori communities but may also be relevant for other ethnic minorities throughout Aotearoa.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

The effect of a single hot water immersion or High-Intensity Interval Training Exposure on 24-hour Ambulatory Blood Pressure in Adults with Hypertension

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Introduction: Hypertension affects over 30% of adults in Aotearoa, increasing the risk of brain, heart, and kidney diseases. High-intensity interval training (HIIT) is a well-researched stimulus for improving cardiovascular health, including lowering blood pressure (BP) in people with hypertension. Heat therapy (e.g., spa, sauna and onsen) has been used for centuries as a healing practice. Previous research has shown that heat therapy improves cardiovascular health and may lower resting blood pressure in people with hypertension. Furthermore, the magnitude of acute response to a single session is associated with the magnitude of adaptive response to repeated exposures. However, no study has examined the BP response using ambulatory monitoring, the gold standard for BP measurement. Therefore, this ongoing study aims to explore the 24-h BP response following a single hot-water immersion (HWI) or high- intensity interval training (HIIT) exposure. It was hypothesised that HWI and HIIT would each reduce 24-h ambulatory blood pressure, compared to baseline.

Methods: Ten participants with hypertension (taking at least one anti-hypertensive medication) were randomly assigned to perform a single exposure of HWI (n=5; 20-min immersion in 40°C water) or HIIT (n=5; 6 x 60-s intervals at 85% of heart rate reserve, with 90-s recovery). Participants underwent baseline 24-h ambulatory BP monitoring prior to randomisation and repeated this immediately after exposure.

Results: For HWI, mean 24-h systolic BP was 3 mm Hg lower (95%CI: 7, 0; P=0.02) and diastolic pressure was 3 mm Hg lower (95%CI: 4, 1; P=0.02) than baseline. For HIIT, systolic BP was not reliably affected (95%CI: 7, -9; P=0.359) and diastolic BP was 3 mm Hg higher (95%CI: 6, 1; P=0.012).

Conclusion: Preliminary findings indicate that one session of HWI meaningfully reduced systolic and diastolic BP in individuals with hypertension, and may therefore be a suitable adjunct therapy for BP management. Further analysis will include investigation of the duration of this acute response and its association with adaptive reductions in people with hypertension.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Exploring the impact of app-based instruction, group exercise class on the future role of group fitness instructors and personal trainers

Codi A. Ramsey, Adain Summerfield

Introduction: This study aims to provide insight into how group fitness instructors and personal trainers can integrate AI and app-based exercise programmes into exercise instruction. As AI is becoming increasingly more efficient and personalised, the role of group fitness instructors and personal trainers is inevitably set to change. This impacts how we teach and certify fitness professionals. Information from end-users can provide valuable insights into the behaviours and acceptance of AI programmes that run in-place of or alongside traditional fitness programmes.

Methods: This ongoing study uses a survey to gather data on the impacts of an app-based (DownDog) group exercise class (yoga) on the participants expectations, motivation, and commitment. Follow-up interviews gather data on the participants perceived benefits/harms of the class.

Results: Preliminary results and findings suggest that app-based instruction meets or exceeds expectations in regard to the design and app-functionality – which creates motivation and commitment to continue the exercise programme. Participants indicated that the AI-generated programmes provide sufficient prompts and feedback for executing movements. Perceived benefits are related to themes around lack of judgement from instructors, consistent and flexible class schedules, and the ability to complete additional classes at home. Perceived negative attributes of AI-based exercise courses consist of themes associated to lack of modifications or correction when needed, lower social interactions, decreased motivation due to a lack of accountability.

Conclusion: This project may have implications for how group fitness instructors and personal trainers can work alongside AI and exercise-based apps to continue delivering exercise instruction in a fast-paced and changing industry.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

What is pain (and what can we do about it)?

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Purpose: Pain is an unavoidable and often necessary part of the human experience. The International Association for the Study of Pain defines it as "an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage." Because pain involves both sensory and emotional dimensions, each individual—whether athlete or patient—experiences it uniquely. In recent decades, pain science has advanced significantly, with an emphasis on practitioner and patient education. However, outdated beliefs about pain and its management persist. Persistent pain affects roughly 30% of the population and can lead to avoidance of physical activity, one of the most effective interventions for improving overall health and well-being. Understanding pain and how to manage it is essential for practitioners aiming to improve physical activity adherence in the presence of (persistent) pain.

Project: This presentation will provide an evidence-based introduction to the complexity of pain. Drawing from her unique experience working with both patients facing chronic disease and terminal illness, as well as elite athletes with persistent pain, Siobhan Milner will discuss the current scientific understanding of pain. Topics will include pain's underlying mechanisms, the disconnect between pain and tissue damage, and evidence-based, practice-informed strategies for managing persistent pain. Practical examples from clinical and athletic settings will illustrate how pain can be managed in real-world contexts.

Conclusions: Understanding pain is crucial for guiding athletes and active individuals through both acute and persistent pain. Pain is complex and multifaceted, requiring empathy and personalized strategies that consider the various factors influencing an individual's pain experience. By integrating an understanding of pain with practical, individualized approaches, practitioners can help individuals overcome barriers to movement and enhance overall well-being.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Bidirectional associations between screen time and sleep and the influence of physical activity in pre-teens

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4: *Child Health Research Centre, Faculty of Medicine, The University of Queensland, Brisbane, Queensland, Australia*

Introduction: Excessive screen time and poor sleep duration have significant implications for children's health and well-being. Understanding the dynamic relationship between screen time and sleep duration, as well as the impact of physical activity in this relationship, is essential for promoting healthy behaviours. The aims of this study were to: 1) investigate the bidirectional association between screen time and sleep duration in children, and 2) examine the role of physical activity in this association.

Methods: Time-use diaries (TUDs) from waves 3 (age 5), 6 (age 10), and 7 (age 12) of the Longitudinal Study of Australian Children (LSAC), comprising 2,064 children (47% girls), were used to record the duration (in minutes) of screen time, sleep, and physical activity. Cross-lagged panel modelling was conducted to test bidirectional associations between screen time and sleep duration. Furthermore, lagged mediation models were used to examine the indirect effects of physical activity.

Results: Descriptive results indicated that boys' screen time in minutes was higher than girls' across wave 3 (boys = 117, girls = 104), wave 6 (boys = 199, girls = 147), and wave 7 (boys = 214, girls = 165). The cross-lagged results revealed a bidirectional association between screen time and sleep duration across ages 10 to 12. An increase of 60 minutes (1 hour) in screen time at age 10 decreased sleep duration at age 12 by approximately 2.07 minutes on average (β = -0.063 [95%CI, -0. 107 to -0.019]), and an increase of 10 minutes in sleep duration at age 10 decreased screen time at age 12 by approximately 1 minute on average (β = -0.042 [95%CI, -0. 083 to -0.001]). Higher levels of physical activity at age 12 reduced the association between screen time at age 10 and sleep at age 12 (β = 0.004 [95% CI, -0.000 to 0.008], P = 0.038). No significant associations were found between the ages of 5 and 10.

Conclusions: Our findings show that greater amounts of screen time can have very small long-term effects on sleep (and vice versa) between the ages of 10 and 12, but physical activity might be a protective factor. This underscores the importance of promoting healthy screen time habits in pre-teens. Interventions aimed at increasing physical activity levels may help mitigate the negative effects of excessive screen time on sleep duration, but further work is needed in this area.

Keywords: Screen time; Sleep; Physical activity; Bidirectional; Longitudinal

Conflict of Interest: This athlete is my client, and these conclusions are open to bias.

High performing athletes' experiences: precarity, health and science-informed performance conundrums

Lili Ovendale, Mark Falcous, Sebastian Potgieter

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Introduction: High profile publicity on the numerous challenges faced by athletes in elite sports environments has characterised recent years. Little research, however, has explored the lives of athletes within elite sport and high-performance systems despite this. This exploratory project analysed athletes' lived experiences of high-performance sport cultures. We focused specifically on how encounters with sports science and sport scientists inform their sporting experiences.

Methods: Data collection involved 9 semi-structured interviews with elite, New Zealand representative athletes from a range of 7 sports including team and individual. Participants were questioned about topics such as the relationship between health and performance, body cultures, the use of technology, and sport science support. A critical sociological approach emphasizing a qualitative approach to lived experiences was used.

Results: Results highlighted first, the broad diversity of athletes' experiences. Second, themes emerged around their experiences in relation to precarity, access to support, and managing challenges such as injury. It also showed access to technology and sports science support to aid performance, depending on an athlete's sport and level. It was evident that sophisticated involvement from sport science technology and individuals was only accessible to top athletes in top sports. Athletes considered the role of sports science as complex, labelling it as both necessary for and distracting from performance, dependent on the nature of use. Another consistent theme was that athletes experienced the prioritisation of performance over health as well as difficulty in voicing their opinions within current systems.

Conclusions: Athletes' experience were found to be varied and complex in relation to support, funding and sports science engagement. Further research is required, especially that which focuses specifically on the needs of athletes in relation to sports science support, to provide future direction for its' use throughout high performance sport in New Zealand.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Journey to the stage: An ethnographic exploration of the complex thoughts of a female bodybuilder

Shanon Booth

Introduction: The physical challenges and adaptations a female bodybuilder experiences during the process of training, dieting and then competing are well documented in exercise-based research. However, there is significantly less research that examines what goes on in the mind of a bodybuilder throughout this process. The primary purpose of this research is to explore the question "what does a female athlete experience, both mentally and emotionally, when preparing and competing in a women's competitive bodybuilding competition?' This research is innovative because it explores this topic directly from the athlete's own perspective.

Methods: This research offers an autoethnographic account of my return to the sport of bodybuilding after a seven-year break. It follows my journey to the stage, competing at both regional, national and international levels. I have utilised both written reflections and verbal recordings to document the mental and emotional challenges and successes I have encountered, reflecting on my experiences, conversations, and feelings throughout the training, competition prep, and post-competition phases. Recurring themes have then been identified through thematic analysis.

Results: The current research is still in progress, as I have only just returned to New Zealand after attending the ICN World Natural Games. However, preliminary emerging themes include the complexity of multiple and conflicting subjectivities and personal values, the impact of social media, feelings around body image and bodily judgement, the impact of dieting on my relationship with food, self sabotage and imposter syndrome, pressures to conform and perform, and the impact on social wellbeing and family life.

Conclusions: As my research is in the preliminary stages, I aim to use this presentation opportunity to share what I have done to date, and to gather colleague/stake holder feedback for where this research could progress from here.

I hope that by sharing my experiences, I can contribute to the growing body of research on women in sport and create something that serves as a resource for both future female bodybuilding athletes, as well as their coaches who support these athletes, to help navigate their journey to the stage.

Keywords: Bodybuilding, autoethnography, qualitative research, body image, female athlete, women's sports.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

The Hosting of the 2023 FIFA Women's World Cup in Aotearoa/New Zealand: Legacy, Policies, and Practice

Eleanor Crabill

Introduction: The purpose of this research is to investigate the legacy and impacts of the 2023 FIFA Women's World Cup (FWWC) concerning women's football development in Aotearoa New Zealand (NZ). Notably, FIFA and New Zealand Football (NZF) emphasised its host-nation legacy from the onset, claiming the FWWC will supercharge women's football in Aotearoa NZ post-event. I will address the following research questions: In what ways has hosting the 2023 FWWC, as a women's sporting mega event (SME), advanced and impacted women's football development through legacy initiatives in Aotearoa NZ? What evidence supports the tangible effects of legacy post-2023 FWWC? Have conflicts, contradictions, and/or unintended consequences emerged within the development of the 2023 FWWC legacy in Aotearoa NZ?. Previous research has investigated SME legacy, however, there is limited research on women's SME legacies, specifically looking at women's sport development. This research offers insights into the intersectionality of gender, sport, and development while raising critical questions regarding the legacy and impacts of the 2023 FWWC.

Methods: I conducted a qualitative analysis of official FIFA, Oceania Football Confederation, New Zealand government, Sport New Zealand, and NZF documents related to the 2023 FWWC. I reviewed and manually coded 18 documents in NVivo to identify key themes related to legacy objectives and projected outcomes of the 2023 FWWC.

Results: Initial findings show three main themes emerging from the documents: Equality; growth/development; and opportunity. 13 documents discussed equality, with the topic being referenced a total of 85 times. The growth/development of women's football was discussed in 16 documents, with the topic being referenced 99 times. 14 documents discussed opportunity building for women footballers, with the topic being referenced 85 times.

Conclusion: The document analysis reveals critical focus areas where positive change is anticipated resulting from hosting the 2023 FWWC. Each of the three identified themes includes a discussion of both specific and broad objectives intended to be realised in the years after the event concludes. This analysis further elucidates how SMEs can be strategically employed to enhance sports development within the host nation, thereby highlighting an alternative pathway towards sports policy development.

Conflict of Interest: There are no conflicts of interest.

The political economy of youth sports: Are young athletes a common pool resource?

Timothy Dawbin

Introduction: This study examines whether youth athletes can be conceptualised as a Common Pool Resource (CPR) analogous to fisheries, forests, and volunteers. It applies a foundational political economy perspective (CPR theory) to the novel context of youth sports. The research investigates whether youth athletes meet CPR criteria and explores implications for their management within sports systems. Insights from other CPR settings (particularly addressing sustainable management) could be valuable to address comparable issues in the youth sport sector.

Methods: This exploratory conceptual research uses the case of New Zealand youth sport to apply the CPR perspective to youth athletes. Employing a qualitative abductive approach, we summarise and integrate knowledge from goods economics, CPR theory, and sport sector studies, focusing on the structure and delivery of New Zealand sport. Alongside academic scholarship, we draw from sport organisations and media sources providing additional contextualisation. Thus, we compare youth athletes against the CPR criteria.

Results: Youth athletes exhibit key CPR characteristics: they provide value/ utility to stakeholders, are non-excludable (resource use cannot be restricted), subtractable (resource use limits availability to others), and are subject to 'appropriation'. Despite caveats (e.g., the role of individual agency), this perspective reveals significant challenges in managing youth athletes, including resultant collective action dilemmas (CADs) and potential tragedies of the commons.

Conclusions: This study synthesises insights to explore the political economy of youth athlete management. The CPR perspective elucidates the risks associated with youth sport, including overuse and other issues arising from CADs facing stakeholders. CPR literature draws attention to a potential 'tragedy of the commons' occurring in the absence of specific governance structures. One benefit of applying the CPR perspective to this novel setting is the ability to draw insights from comparable CPR settings. We suggest that Ostrom's design principles, which advocate for decentralised, bottom-up governance, could mitigate such risks. Notwithstanding these contributions, we identify differences between the youth sport context and other CPR settings. Therefore, future research should investigate how stakeholders respond to the CADs they face and the impact of Ostrom's principles on youth sports system sustainability.

Keywords: Common pool resources, political economy, youth sport, sport delivery

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

Performance Analysis insights into elite-level trampoline routine

Kristen Spencer

Introduction: Elite trampoline athletes perform explosive jumps during competition. Their final score is a combination of objective (Time of Flight[Tof], Degree of Difficulty [DD], Horizontal Displacement) and subjective (Execution) components. The overarching aim of this study was to gain insight into trampoline routine movement patterns, routine construction, finalists vs podium finishers, trends in competition, and relationships between the scoring components used by the judges and then implement this in the recent Paris Olympics.

Methods: HPSNZ in collaboration with CUB Digital created a tagging application for Gymnastics Trampoline using Python and utilising their open-source libraries to build out the graphical user interface (GUI). 60 Elite athletes competing at World, European and Olympic games participated. Analysis focussed on contact with and leaving the trampoline, twists, and rotations comparing routine construction, finalists vs podium finishers, trends in competition, gender variation and relationships between scoring components.

Initially, jump difficulty was set as the dependent variable, while jump numbers (1-10) were considered as the fixed effect. Subsequently, additional fixed effects were introduced, including gender (Male, Female), round (qualifying, semi-finals, and finals), competition (European championships, Olympic games, World championships), podium (yes, no), and world championship year (2017, 2018, 2019, 2021, 2022). Another linear mixed model was used later in the analysis to determine if twists and rotations could predict rank in competition.

Results: Males expressed a higher range of DD scores than females with a 95%CI ($p < .001$). Males expressed a higher range of ToF scores than females with 95% CI ($p < .001$). DD for podium vs non-podium finishers: There was a difference of 0.051 between Podium and Non-Podium male athletes ($p = .003$, 95%CI). In females there was a difference of 0.018 between Podium and Non-Podium athletes ($p = .015$, 95% CI). ToF for podium vs non-podium finishers: There was a difference of 0.025 between Podium and Non-Podium ToF male athletes ($p < .001$, 95%CI). There was a difference of 0.018 between Podium and Non-Podium femle athletes ($p = .015$, 95%CI.

Conclusion: This study provided valuable recommendations for athletes and coaches to optimize routine design strategies, considering gender-specific differences and scoring components (ToF & DD). Routine structures had challenging movements at the beginning and end. Podium athletes had higher jump and more rotations, emphasizing ToF importance. Non-podium athletes used fewer rotations but more twists during specific phases of their routines.

Female field hockey match intensities: comparing practice matches against male club-level players and international female teams versus international competition matches

Sparks, M. (1,2,3)

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Introduction: The growing competitive demands in female field hockey have prompted a closer examination of training tactics to enhance performance. Financial constraints for international tournament preparations have led to practice matches against male club-level teams as a potential solution for simulating official match intensity. As tournaments approach, practice matches against international female teams are also planned. However, it remains unclear whether these practice matches generate similar match intensities to official international competitions matches. The aim is to compare the match intensities of practice matches against varying levels of opposition with those of international matches.

Methods: Match activity profiles of 21 international female hockey players (n=211) were recorded using GPS units during seven official international test matches (n=105), three practice matches against international female teams (n=44), and four practice matches against male club-level teams (n=62). Relative distance covered (m/min), relative player load (PL/min), and intensities (moderate: 2.3–4.4 m/s, high: 4.5–5.5 m/s, very high: >5.6 m/s) were compared across matches, positions, and quarters.

Results: Players covered significantly (p<0.05) less relative distance during international test matches (107.8 m/min) compared to practice matches against international female (118.6 m/min) and club male opposition (117.4 m/min). There was also significantly (p<0.05) less distance covered in the MI zone during international test matches (44.9%) compared to club level men's matches (45.7%). However, during international test matches players covered significantly (p<0.05) more distance in the VHI zone (2.3%) compared to practice matches against international female opponents (1.6%).

Discussion: Match intensities differ significantly between international test matches and practice matches, regardless of the opposition, however there are no significant differences in intensity when comparing international female practice matches to club-level male practice matches. To conclude, training against club level male opposition will elicit similar intensities than training against other international female teams without additional financial liability.

Conflict of interest: The author declares no relevant conflict of interest in relation to this work.

Performance Analysis

Revisiting the development and application of virtual reality and first-person perspective video in team sports training: A netball case-study

Hayden Croft

Purpose: First person, augmented or video learning modes, can assist players in team sports learn not only tactics or strategies, but also review and better understand the skill sets required to perform at an elite level. It may also reduce monotony for players learning complex strategies and skillsets.

Project or policy description:

Development: When this author last published on virtual reality (VR) (Croft and Chong 2009; Croft et., al. 2011) and first-person perspective video augmented decision making in sport (Croft, et., al. 2013; Croft and Ribeiro. 2013), more than 10 years ago, when technologies where expensive and not practical. With the introduction of VR headset technologies, like Meta Quest 3TM, and 360-degree cameras, like GoPro MaxTM and Insta360TM, the use of virtual training should be revisited in sport.

Implementation: Footage was captured using a GoPro Max camera positioned on a netball court post, slightly above the players heads and secured to the post padding. The device captured netball practice as players moved around the court. This footage was captured at various frame rates, and resolutions to ensure optimal visual quality was achieved. The video was then edited into playlists of different phases of game play, e.g. centre pass attack, and loaded onto a Meta Quest 3TM headset.

Evaluation: Players and coaches gave feedback on the perspective and content of the videos, as well as their impressions of ecological validity. Feedback was received and acted upon around the use of head-mounted video capture, achieved with an "off-the-shelf" GoProTM product.

Dissemination: The revised footage was made available to players in the team room with playlists available to select. Coaches viewed a screencast, in real-time (figure 1), of the players interactions with the video and answered questions about the strategy shown in the footage.

Conclusions: VR, first person perspective video, is a powerful tool for player learning. For players to remain engaged in using this type of learning modality, it must maintain high game authenticity and be perceived as of high value to the players. This means that understanding the application of this technology into a team training environment is crucial.

Conflict of Interest: No financial or commercial conflicts of interest are acknowledged in this presentation. A professional relationship exists between the players and coach and author of this presentation and is acknowledged. Consent was given for the use of the image in figure 1.

Figure 1. Coach and player utilising virtual reality headset with training 360 video footage.

Advanced pressing and team performance in elite football

Peter Tu

Introduction: This study aimed to investigate the relationship between advanced pressing metrics and team performance across the top five European football leagues. The research sought to determine how advanced pressing intensity and individual defensive metrics correlate with offensive and defensive outcomes, and whether these metrics could predict team rankings. The study also examined league-specific differences, contributing new insights into tactical trends in football.

Methods: A quantitative approach was used, analyzing data from 98 teams across the Premier League, La Liga, Serie A, Bundesliga, and Ligue 1 during the 2022-23 and 2023-24 seasons. Metrics such as possessions won in the attacking third (Att 3rd), Passes per Defensive Action (PPDA), and tackling successful rate (TackleWon) were examined. Regression models, including both multiple linear regression and ordinal logistic regression, were used to assess the predictive capacity of these variables on team rankings and performance indicators such as expected goals per game (xG_Per) and expected goals against per game (xGA_Per).

Results: The analysis revealed that Att 3rd and PPDA were significantly correlated with improved offensive and defensive metrics, contributing to higher team rankings. These models were particularly predictive in La Liga, where pressing intensity aligned with the prevailing tactical approach. TackleWon, though relevant, had a weaker association with overall team success. The ordinal regression models were significant in predicting neighboring rank transitions, particularly in La Liga.

Conclusions: Advanced pressing metrics, particularly Att 3rd and PPDA, are valuable predictors of team success across the top five European leagues. These findings suggest that teams utilizing high-intensity pressing strategies can expect improved performance outcomes. The study advances the understanding of pressing efficacy and provides actionable insights for coaches and analysts seeking to optimize tactical performance.

Conflict of interest: The author declares no relevant conflict of interest in relation to this work.

ABSTRACTS
POSTER PRESENTATIONS

Poster Presentations

The Garage Gym: a neighbourhood fitness and wellbeing initiative

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Introduction: The Garage Gym (GG) was established in an Anderson's Bay, Dunedin, neighbourhood in April 2022. A 20-minute stretch, strengthen and balance class commences at 9am on Saturdays, followed by coffee. WhatsApp announces dates and 13 have attended. Our aims were to determine why people come; how do they perceive fitness, general health, and social benefits? Has it encouraged exercise

Methods: A survey was prepared, with most responses involving Likert scales (%). Otago Polytechnic Māori consultation was undertaken, and ethical approval granted.

Results: All 13 responded (100%). Eight were aged over 65 years and 10 had attended GG since inception. Six reported health issues and 2 were hospitalized in the past 2 years. Some 77% said it got them up and ready to do things, and for 81% the time was satisfactory. The venue was convenient (99%) and the leader non-threatening (98%). It assisted strength (90%), flexibility (96%) and balance (88%). Attendees felt good afterwards (98%), and no fees or contracts was appreciated (92%). Attending resulted in no increase in walking or attending another gym, and there was no increase in swimming, yoga and Pilates. However, 62% reported exercising more and 74% did GG exercises at home. Meeting up and staying in touch were important (both 100%). Some 92% had made new friends, and only 46% mainly went for coffee. A mean of $76 was outlaid for clothing and equipment, but 6 spent nothing. Ten responded to a question about improving GG. Three suggested that it could be improved, but all considered it valuable. In 2024 the maximum attending was 11 (mean 6 per session). Spin-off activities included cricket, a street party and an organized walk.

Conclusion: GG resulted in an increase in both exercise and social interaction.

Conflict of Interest: The authors declare no relevant conflicts of interest.

Altered light exposure during basic training in military barracks on subsequent sleep, wellbeing and performance of new recruits: a placebo-controlled study

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Introduction: The manipulation of light-exposure in the evening has been shown to improve sleep, and may be beneficial in the military setting where sleep is reported as being problematic. This study investigated the efficacy of reduced temperature-light and luminous-flux in living quarters on sleep, performance and wellbeing of military-trainees.

Methods: 64 officer-trainees (52 male/12 female, mean ± SD age: 25 ± 5 years), wore wrist-actigraphy devices for 6-weeks during initial military training to assess sleep. Participants were randomly allocated to either: low-temperature light (LOW, n=19), standard-temperature lighting + placebo 'sleep-enhancing device' (PLA, n=17) or standard-temperature lighting (CON n=28) in barracks, where they resided. Trainees were tested using a 2.4 km run and measures of upper-body muscular-endurance pre and post a 6-week training course and completed weekly subjective wellbeing questionnaires.

Results: Run time improved by 91 s pre to post training in LOW, which was significantly greater than PLA (35 s) and CON (68 s), respectively ($p < 0.05$). Similarly, curl-up improvement favoured LOW (Δ14 reps), compared to PLA and CON (Δ6 and Δ8 reps, respectively, $p < 0.05$). Repeated measures MANOVA revealed a significant Group x Time interaction for time in bed, total sleep time, soreness, fatigue and mood ($p < 0.05$), with significant and small to large effect sizes in favour of LOW for total sleep time and mood compared to both PLA and CON. Small to large effects were also seen in favour of PLA for soreness and fatigue compared to LOW and CON.

Discussion: The current study showed that altering the light-exposure in military barracks in the evening, may lead to improvements in sleep, mood and aspects of physical performance over a duration of 6-weeks in military recruits.

Practical application: Altering lighting conditions over a 6-week military training period significantly improved physical performance, sleep and mood.

Conflict of Interest: The authors declare no relevant conflicts of interest.

Association of leisure-time physical activity with fall-related outcomes in community-dwelling Brazilian older adults

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Introduction: Falls are the major cause of mortality in older adults. To understand patterns of falls outcomes, associated behaviours and evaluating the need for preventive interventions is crucial to health care planning. Physical activity is a protective factor for falls and the aim of this research was to analyse the association between fear of falling and history of falls with leisure-time physical activity in community-dwelling Brazilian older adults.

Methods: Secondary data analysis of the follow-up data from of Study of Cardiovascular, Cognitive, and Exercise Study in Elderly (CORE). Data were collected between 2022-2024 (n=202). Volunteers were 60-80 years and lived in Natal/Brazil. They completed assessments of sociodemographic variables, activity (moderate to vigorous physical activity MVPA > 150min/week; questionnaire) fear of falling (Short Falls Efficacy Scale-International, FES-I; minimum 7 (no concern about falling) to maximum 28 (severe concern about falling)), and history of falls over the past 12 months (yes/no).

Results: Mean age was 69.9±4.91 years, with the majority being women (73.3%). Over fifty percent (50.8%) of the participants were classified as physically inactive, without differences for sex (p=0.35), age (p=0.07), skin colour (p=0.24), or years in the study (p=0.81). Marital status was associated with MVPA, with single participants being reporting less activity than married participants (p=0.04). Fifty percent of the sample reported no fear of falling, 30.3% reported sporadic fear, and 19.7% recurrent fear of falling. 26.1% felt on the past 12 months Women presented a higher concern of falling (p<0.001) and history (p=0.01) of falls compared to men. No significant differences in fall risk (p=0.08) or history of falls (p=0.39) were found between active and inactive older adults.

Conclusions: Our findings indicate that leisure-time physical activity was not associated with high concern of falling and history of falls in community-dwelling Brazilian older adults. We emphasize that the data were self-reported considering the last 12 months, and there may be an underestimation of the history of falls.

Conflict of Interest: The authors declare no relevant conflicts of interest.

The effects of diet and exercise on type II diabetes and mental health: An autoethnographic study

Richard A. Humphrey

Introduction: In Aotearoa New Zealand, a troubling trend has emerged with the simultaneous increase in Type II diabetes and depression. These two conditions, while seemingly distinct, frequently coincide, magnifying the challenges faced by individuals and their health providers. As the prevalence of each condition continues to rise, understanding their interrelated nature is vital for effective public health interventions. Studies have shown that there is a bidirectional relationship between the two conditions, each exacerbating the other's symptoms and complications. Those individuals with diabetes are more prone to depression due to the stress of managing a chronic illness, concerns about complications, and the impact on lifestyle.

Method: This research was an autoethnographic case study exploring the effects of diet and exercise on type II diabetes and depression monitoring a variety of health markers (including HbA1c, blood lipids, blood pressure, body composition and medication). At the start of the research the lead researcher was on medication for type II diabetes and had received treatment in the previous six months for depression. Of principle interest to the research team was whether or not diet and exercise could reduce, or completely eliminate, the symptoms for these conditions and thereby negate the need for medication. Personal reflections were collated using Microsoft Word. The researcher undertook to make entries at least weekly and notes were made more frequently if experiences or noteworthy incidents occurred.

Results: Are ongoing as the study has another six months to run. The participant has experienced significant weight loss (>15Kgs), improvements in HbA1c scores (66 – 35mmol/mol) and reduction in their prescribed medications. While the physiological benefits were documented, the anticipated psychological benefits were not as anticipated.

Discussion: The diet and exercise regime delivered weight loss, reduction in % body fat and improved fitness scores. However, the psychological benefits that were anticipated were not achieved. The pressures of work, personal life and especially lack of sleep all combined to adversely impact the participants mental health. The future progress of the study will involve further adaptations to the diet (still maintaining a CHO intake less than 50g/day), including the addition of antidepressant specific foods.

Conflict of Interest: The authors declare no relevant conflicts of interest.

Collisions in junior rugby: Incidence, magnitude and the potential of headgear to reduce impact accelerations

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Introduction: The safety and neurological health of rugby union athletes receiving concussive and sub-concussive impacts during the sport remains a public health concern. Rugby has been found to be the contact sport with the highest concussion incidence and a predictor of severe injury relative to other sports. While there has been growing rugby collision research, there is still relatively little research measuring head impact forces and investigating their influence on cognition and brain structure and function with junior rugby players. Additionally, more research is required that examines novel headgear models' ability to attenuate impact forces. This study aimed to measure the incidence and magnitude of head acceleration events (HAEs) and estimate headgear's potential to reduce peak linear (PLA, g) and peak rotational (PRA, rads/s2) accelerations from collisions in Year 8 players.

Methods: Nineteen Year 8 male rugby players aged 12-13 years wore instrumented mouthguards during all games and contact trainings. The collisions were video verified and coded according to relevant rugby and biomechanical descriptors.

Results: 958 verified HAEs were recorded during the season. Of these, 85.2% involved direct head contact and 14.8% involved indirect contact elsewhere on the body. Backs experienced fewer HAEs than forwards. Incidence range per player was 7 to 246 HAEs across the season, with an average of 50.4. Average PLA was 17.54 g at trainings and 21.73 g at games. Average PRA was 1732.53 rads/s2 at training and 2247.83 rads/s2 at games. Backs experienced significantly higher PLA (p=.014, Cohen's d=.168) and PRA (p=.004, Cohen's d=.198) than forwards. PRA and PLA in HAEs were lower when wearing headgear with PRA being significantly lower (p=<.001, Cohen's d=.287). Well-anticipated impacts resulted in lower PLA and PRA than both poorly (PLA p=.009, Cohen's d=.151; PRA p=.052) and non-anticipated (PLA p=.033, Cohen's d=.295; PRA p=.021, Cohen's d=.304) impacts.

Conclusions: After the first season of data collection, we can report preliminary results. Headgear shows promise in this age-group in significantly reducing rotational acceleration to the head during rugby collisions and potential in reducing linear acceleration.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.

The effects of an in-season 6 week plyometric training programme on senior high school youth female netball players.

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Introduction: In Aotearoa New Zealand, a troubling trend has emerged with the simultaneous increase in Type II diabetes and depression. These two conditions, while seemingly distinct, frequently coincide, magnifying the challenges faced by individuals and their health providers. As the prevalence of each condition continues to rise, understanding their interrelated nature is vital for effective public health interventions. Studies have shown that there is a bidirectional relationship between the two conditions, each exacerbating the other's symptoms and complications. Those individuals with diabetes are more prone to depression due to the stress of managing a chronic illness, concerns about complications, and the impact on lifestyle.

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Discussion: The diet and exercise regime delivered weight loss, reduction in % body fat and improved fitness scores. However, the psychological benefits that were anticipated were not achieved. The pressures of work, personal life and especially lack of sleep all combined to adversely impact the participants mental health. The future progress of the study will involve further adaptations to the diet (still maintaining a CHO intake less than 50g/day), including the addition of antidepressant specific foods.

Keywords: Youth, Female, Netball, Plyometric Training, Speed

Conflict of Interest: The authors declare no relevant conflicts of interest.

Poster Presentations

The importance of cardiopulmonary exercise testing for accurate individualized aerobic exercise prescription in women living with metastatic breast cancer.

Stacey Reading

Introduction: Many women living with metastatic breast cancer (MBC) remain healthy enough to seek out and participate in exercise but published evidence suggests they are unable to meet current guidelines for all cancer patients that includes 150 or 75 minutes of moderate or vigorous aerobic exercise each week. One explanation could be overestimation of the exercise prescription relative to actual cardiopulmonary burden in MBC patients. This study compares measured cardiopulmonary responses during moderate to vigorous intensity aerobic exercise between women living with and without MBC to identify if common estimation methods used in exercise prescription design remain useful for this patient population.

Methods: Thirty-seven women (52±10yrs) completed a cardiopulmonary exercise test (CPX) on a cycle ergometer. Expired air was collected and analysed via metabolic cart and HR recorded by 12-lead ECG. Historical CPX test records (n=37) were used to construct a representative data set for healthy untrained women (54±8yrs). CPX tests were analysed to identify the oxygen consumption (VO2) and heart (HR) rates at peak exercise and the first (VT1) and second (VT2) ventilatory thresholds.

Results: VO2 at peak, VT1, and VT2, were significantly lower in MBC vs. healthy women (1.5±0.3, 0.8±0.2 and 1.3±0.3 L·min-1 vs. 2.0±0.4, 1.0±0.2 and 1.7±0.3 L·min-1). Interestingly, VT1 and VT2 occurred at the same percentages of the measured VO2 peak, VO2 reserve, HR peak and HR reserve in both groups. When peak HR was estimated (HR=208-(0.7x age)), the measured HR at VT1 and VT2 represented a significantly lower percentage of the HR peak (-10%) and HR reserve (-20%). A similar outcome occurred when VO2peak was estimated. This was not observed for the healthy group.

Conclusions: Measured data collected via CPX should be used to accurately align aerobic exercise prescription advice with the actual cardiopulmonary burden during exercise for women living with MBC. Use of traditional methods to estimate peak VO2 and HR significantly underestimate the true physiological exercise intensity when expressed as a percentage of the peak or reserve HR or VO2 in women living with MBC.

Conflict of Interest: The author has conflict of interests in relation to this work.

Predicting health-related quality of life in persons with risk for developing non-communicable diseases in a rural setting: B-Healthy Study

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Introduction: South African rural settings show a high prevalence of non-communicable disease (NCD) risk factors influencing health-related quality of life (HRQoL). Information regarding the predictors of HRQoL in rural populations with at least one risk factor for NCD is scarce, especially objectively measured NCD, functional performance and physical activity data.

Methods: This cross-sectional study aimed to determine predictions for HRQoL in persons from a rural setting in South Africa. The study included 128 participants (35-80 years), with at least one NCD risk factor. Short-form-8 (SF-8) questionnaire was used to determine HRQoL. Risk factors for NCDs (blood pressure, cholesterol, glucose, physical activity and body composition) and functional performance (hand grip strength, balance, sit-to-stand, timed up-and-go test) were measured objectively. Predictors of each domain of HRQoL were determined by multiple linear regression analysis.

Results: Participants' mean age was 52.84 ± 11.31 years. The results indicated that sit-to-stand was related to physical function (β = 0.206, p = 0.025) and high-density lipoprotein cholesterol (HDL-C) to physical role (β = 0.176, p = 0.054). General health and waist-to-hip ratio (WHR) were related (β = 0.253 p = 0.005). Vitality and sit-to-stand were related (β = 0.085 p = 0.011). Emotional role and moderate to vigorous physical activity (β = -4.94, p = <0.001). Mental health and systolic blood pressure (SBP) (β = 0.247' p = 0.011), triglycerides (β = -0.192 p = 0.051) and sit-to-stand (β = 0.179 p = 0.051).

Conclusion: The study indicates that sit-to-stand, physical activity, triglyceride, WHR, SBP, and HDL-C are significant predictors of HRQoL among persons with at least one risk factor for NCDs in a rural setting. Not only do the risk but also individuals' functional abilities predict self-reported HRQoL in the presence of NCD risk factors. The findings highlight the importance of tailored interventions for participants in a rural setting to improve HRQoL. HRQoL is multidimensional and affected by several physical and mental components.

Conflict of Interest: Authors declare no relevant conflict of interest concerning this work.

Keywords: Non-communicable disease, Health-related Quality of life, rural, functional performance

Thirst is stimulated effectively during heat exposure in women, regardless of fitness.

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Introduction: Dehydration is commonly identified as a key risk factor for heat illness during heat stress. Thirst plays a primary role in constraining dehydration. Dehydration during physical exertion is faster in people of higher fitness because of greater heat production but they are also less sensitive to effects of dehydration, at least in males. The aim of this study was to investigate thirst during high ambient heat stress and physical activity, in females, across a range of fitness at matched cardiovascular strain, with dehydration either imposed or prevented. A secondary aim was to investigate whether people drink to a plan rather than ad libitum during heat stress.

Methods: Twelve healthy, female volunteers (age: 19-36 y) of widely varying fitness ($\dot{V}O2max$ 29-55 mL/kg/min) completed two 90-min trials in a hot environment (40 °C, 38% relative humidity) under two experimental conditions (EUH: fluid intake to replace nude body mass loss; DEH: 20 mL water every 20 min). Each trial included three 30-min repeated blocks of 12 min on a treadmill and 12 min on a cycle ergometer at 130 bpm followed by 5 min rest. Thirst was measured using a 9-points categorical scale. Information about habitual drinking behaviour was obtained via questionnaire.

Results: In DEH, all participants rated thirst as at least "thirsty" at the end of the trial, with median body mass loss of 1.4%, (range 1.0% to 2.9%). Two participants also rated thirst strongly during EUH. Eleven of the twelve participants self-reported "thirst" as the most important factor (e.g., relative to having a hydration plan) for fluid consumption while performing physical activity outdoors in hot environments.

Conclusions: Thirst among healthy adult females of wide-ranging fitness is sensitive to changes of hydration status while performing low to moderate-intensity physical activity in the heat, i.e., dehydration did not develop insidiously. Accordingly - and we believe appropriately - participants of widely varying fitness also reportedly use this rather than a drinking plan to hydrate during physical activity in hot environments.

Conflict of Interest: The authors declare no relevant conflict of interest in relation to this work.