

Rugby Codes Research Group

e-Magazine

Issue 11 (Sept) 2023

Hume, P.A., Uthoff, A., King, D. Editors.

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RCRG website:

<https://sprinz.aut.ac.nz/areas-of-expertise/interdisciplinary-research/rugby-codes>



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E-MAGAZINE EDITORS WELCOME



Welcome to issue 11 Rugby Codes Research Group (RCRG) e-Magazine.

We welcome our new RCRG members and hope you will reach out to collaborate and share information. The RCRG is an international network of members from who focus their research on performance improvement and injury reduction in the “Rugby” codes (Union, League) which has been expanded to other like sports codes (American Football, Australian Football, Football-soccer, Futsal, Touch). The RCRG members enable international collaboration to improve health for rugby codes players, support staff and families. As an aim for the RCRG e-Magazine is to communicate advances in evidence-based knowledge and its practical application to the wider support network of rugby codes, please do contribute.

RCRG e-Magazine contributions can be sent to: Patria.Hume@aut.ac.nz or aaron.uthoff@aut.ac.nz

For more information including membership forms, see <https://sprinz.aut.ac.nz/areas-of-expertise/rugby-codes>

RUGBY WORLD CUP 2023

From John Nauright profjohnnauright@gmail.com The Rugby World Cup Conference was held 27-28 September 2023 at LOU Rugby Club and hosted by Gui Bodet, Olivier Nier and the team at the University of Lyon. There was a feature session on the 150th anniversary of rugby union. There were World Cup matches at the Olympique Lyonnais Stadium during that week.

RECRUITMENT OF PARTICIPANTS FOR PROJECTS



**GLOBAL RUGBY HEALTH
RESEARCH GROUP**

The Global Rugby Health Research Group focuses on sport originated brain injury (see [Traumatic Brain Injury Network](#) for details), and musculoskeletal injury – led by Professor Patria Hume, Dr Doug King, and Dr Karen Hind.

Currently recruiting study participants

- Female specific brain health research - We are developing a protocol to help study brain injured females. If you have a regular natural menstrual cycle, and would like to take part in the study that will measure hormone profiles and symptoms across the menstrual cycle.

[Download recruitment information](#) [PDF, 112.1 KB]

If you have any projects you would like promoted, or need help with recruitment of participants for internationally relevant projects, then please let us know. We provide links to project sites, and information packages for projects.

THE SCIENCE OF CONCUSSION SEMINAR OCT 12TH

Hosted by



**The Neurological
Foundation**

The event will be live streamed for those who are unable to join in person. Here's the link if you want to join or circulate to anyone else who might be interested.

<https://events.humanitix.com/the-science-of-concussion-with-dr-josh-mcgeown-and-dr-helen-murray>



[The Science of Concussion | Humanitix](#)

The Science of Concussion, Hosted at AMRF lecture theatre, Grafton, Auckland 1023, New Zealand, Thu 12th Oct 2023, 6:00 pm - 7:30 pm NZDT. Tickets are free. Only on Humanitix events.humanitix.com

Join Distinguished Professor Sir Richard Faull as he introduces special speakers Dr Josh McGeown and Dr Helen Murray. These amazing researchers are passionate about both sport and neuroscience. Join them as they discuss their fascinating research into head injury in contact sport, its consequences and ways to help prevent it.

Dr Joshua McGeown and Dr Helen Murray will be presenting for the Neurological Foundation on October 12th.

Dr Josh McGeown is a postdoctoral research fellow at Mātai Medical Research Institute, supported by a Neurological Foundation First Fellowship. His work focusses on understanding the consequences of mild traumatic brain injury (mTBI) and identifying targets for better prevention, assessment, and rehabilitation. He has a diverse skillset, spanning from clinical experience to advanced statistical analysis, including machine learning.



Mātai

Te Mata Mātai Hura
Mātai Medical Research Institute
TAIRĀWHITI GISBORNE | NEW ZEALAND

Dr Helen Murray is a senior research fellow at the Centre for Brain Research, University of Auckland. Beyond her scientific pursuits, Helen has represented New Zealand in ice hockey, having captained the Ice Fernz from 2016 to 2020. Her research delves into the intricate relationship between repetitive head injuries and dementia, a topic intimately tied to her background as an athlete with extensive expertise in human neuropathology research.

KEEPING TBIN MEMBERS UP TO DATE WITH ISSUES, ARTICLES AND MEDIA

Dr Doug King appeared on the NZ Sunday TV programme to talk about Tere Livingstone TBI playing rugby league.

🔄 Doug King BN PhD3 CNS(Emerg) reposted

Sunday @SundayTVNZ · Sep 20

When Tere Livingstone suffered a traumatic brain injury playing the game he loved, he shouldn't have been on the field. This week - @taniapage asks: who's really looking out for the players? And we reveal Tere's remarkable legacy. Sunday, 7.30PM on TVNZ1 and TVNZ+



0:03 / 0:15



Doug King BN PhD3 CNS(Emerg)
@dougleague

Interested in rugby league injuries and head impacts and concussion. Independent researcher, Lead CNS (Emergency). #SportsNurse

Doug provides tweets that are heightened on our RCRG website, so that we can keep up to date with issues, research articles and keep up with the debates of the day.

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Tweets from @dougleague Follow on Twitter

🔄 Doug King BN PhD3 CNS(Emerg) reposted

Progressive Rugby @ProgressiveRug · Aug 30

"I think this World Cup is the end of rugby as we know it. I think the current form of rugby union as it is played will change straight after."

Quite a statement from Prof Willie Stewart, a neuropathologist & former brain health adviser to World Rugby.



NEW MEMBER'S PROFILES

Professor Gareth Jones BSc(Hons), MSc.Econ, PhD

Research specialisation: Epidemiology; musculoskeletal health, pain, axial spondyloarthritis, psoriatic arthritis.

Experience: Non-clinical epidemiologist with 25 years working in the epidemiology of musculoskeletal pain, arthritis, and musculoskeletal health. Also, ~20 years experience teaching epidemiological and statistical methods. Gained PhD in Epidemiology at University of Manchester, UK. Currently Professor in Epidemiology and deputy head of Epidemiology Group at the University of Aberdeen, UK.

Research overview: Research interests centre on the aetiology, outcome, and management of arthritis and other musculoskeletal conditions, with a major focus on musculoskeletal pain, fibromyalgia, axial spondyloarthritis and psoriatic arthritis. Have previously studied effects of trauma on musculoskeletal health, principally factors associated with road traffic accidents on whiplash associated disorder and chronic widespread pain. Also, interested in the role of musculoskeletal health and its impact on the occupational environment.

Postgraduate supervision: Have supervised 14 PhD students, 10 to completion, all bar one in the field of musculoskeletal health.

Research publications: Have published >130 peer reviewed publications, and four book chapters. Example publications:

- Ørnbjerg et al. One-third of European axial spondyloarthritis patients reach pain "remission" with routine care TNF-inhibitor treatment. *Journal of Rheumatology*; 2023; 50: 1009-19.
- Walker-Bone et al. Advice to remain active with arm pain reduces disability. *Occupational Medicine*; 73: 268-74.
- Macfarlane et al. The risk of inflammatory bowel disease in patients with axial spondyloarthritis treated with biologic agents: BSRBR-AS and meta-analysis. *Journal of Rheumatology*; 2023; 50(2): 175-84.
- Ørnbjerg et al. Predictors of ASDAS-CRP inactive disease in axial spondyloarthritis during treatment with TNF-inhibitors: data from the EuroSpA Collaboration. *Seminars in Arthritis and Rheumatism* 2022; 56: 152081.
- Neilson et al. Generating EQ-5D-5L health utility scores from BASDAI and BASFI: a mapping study in patients with axial spondyloarthritis using longitudinal UK registry data. *The European Journal of Health Economics* 2022; 23: 1357-69.
- Christiansen et al. European bio-naïve spondyloarthritis patients initiating TNF inhibitor: time trends in baseline characteristics, treatment retention and response. *Rheumatology* 2022; 61(9): 3799-807.
- Tucker et al. Executive summary: The 2022 British Society for Rheumatology guideline for the treatment of psoriatic arthritis with biologic and targeted synthetic DMARDs. *Rheumatology* 2022; 61(9): 3514-20.
- Morton et al. Driving difficulties in patients with axial spondyloarthritis: results from the Scotland Registry for Ankylosing Spondylitis. *Arthritis Care and Research*; 2022; 74 (9): 1541-9.
- Morton et al. Enabling work participation for people with musculoskeletal conditions: lessons from work changes imposed by COVID-19: a mixed-method study. *BMJ Open* 2022; 12(4): e057919.
- Biallas et al. The role of metrology in axSpA: does it provide unique information in assessing patients and predicting outcome? Results from the BSRBR-AS registry. *Arthritis Care & Research* 2022; 74(4): 665-74.



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Dr Daniel Glassbrook PhD



Research specialisation: Sports biomechanics; sports science.

Experience: Daniel has five years of university teaching experience across four universities and ten units, and in in three countries. During this time, he has developed and implemented blended learning course content for biomechanics, coaching, and strength and conditioning. Daniel received his PhD in 2021 from Macquarie University, Australia, and during his PhD was industry-based within a national rugby league team. In his time at the club, he acted as the sport scientist for the first-grade team and applied wearable technology in a high-performance environment. Prior to completing his PhD, Daniel completed a Master of Sport and Exercise and Bachelor of Sport and Recreation (Coaching and Exercise Science) at the Auckland University of Technology, New Zealand. Daniel is also a fellow of the Durham University Wolfson Research Institute for Health and Wellbeing; and an experienced strength and conditioning coach. Daniel is accredited as a Professional Level 2 Coach by the Australian Strength and Conditioning Association, and as a Sport Scientist (Level 1) and Exercise Scientist (Level 1) by Exercise and Sport Science Australia.

Research overview: Daniel's PhD research focused on the use of wearable technology such as global positioning systems and inertial measurement units to quantify and understand the running demands of professional rugby league match-play, the mechanics of lower limb function, and injury risk in professional athletes. In his current position of postdoctoral research associate at Durham University, Daniel's research focus is sports related concussion, and he is leading two projects: 1) establishing resting and post-sport neurocognitive performance in athletes at risk of concussion, and 2) an acceptability and tolerability trial of a new, natural supplement for brain health.

Postgraduate supervision: None currently.

Research publications: 8 publications in journals, and 10 conference paper/abstract proceedings. Example publications:

Glassbrook, D. J., Fuller, J. T., Alderson, J. A., & Doyle, T. L. A. (Under Review). Changes in acceleration load as measured by inertial measurement units manifest in the upper body after an extended running task. *Journal of Sport Sciences*.

Glassbrook, D. J., Fuller, J. T., Wade, J. A., & Doyle, T. L. A. (2022). Not all physical performance tests are related to early season match running performance in professional rugby league. *Journal of Strength and Conditioning Research*. (In Press). doi: 10.1519/JSC.0000000000003775

Glassbrook, D. J., Fuller, J. T., Alderson, J. A., & Doyle, T. L. A. (2020). Measurement of lower-limb asymmetry in professional rugby league: A technical note describing the use of inertial measurement units. *PeerJ*, 8:e9366.

Glassbrook, D. J., Doyle, T. L. A., Alderson, J. A., & Fuller, J. T. (2019). The demands of professional rugby league match-play: A meta-analysis. *Sports Medicine - Open*, 5(1), 24.

Glassbrook, D. J., Fuller, J. T., Alderson, J. A., & Doyle, T. L. A. (2019). Foot accelerations are larger than tibia accelerations during sprinting when measured with inertial measurement units. *Journal of Sports Sciences*, 38(3), 248-255.

Wills, J. A., Saxby, D. J., **Glassbrook**, D. J., & Doyle, T. L. (2019). Load-carriage conditioning elicits task-specific physical and psychophysical improvements in males. *The Journal of Strength & Conditioning Research*, 33(9), 2338-2343.

Glassbrook, D. J., Helms, E. R., Brown, S. R., & Storey, A. G. (2017). A review of the biomechanical differences between the high-bar and low-bar back-squat. *The Journal of Strength & Conditioning Research*, 31(9), 2618-2634.

Glassbrook, D. J., Brown, S. R., Helms, E. R., Duncan, J. S., & Storey, A. G. (2017). The high-bar and low-bar back-squats: A biomechanical analysis. *The Journal of Strength & Conditioning Research*, 33(1), S1-S18.



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Natalie Hardaker BSc (Hons), PhD candidate AUT SPRINZ

ACC Injury Prevention Partner – Sport and Traumatic Brain Injury

Research specialisation: Sex differences; Concussion; Injury prevention.

Thesis title: The impact of the female sex hormones on concussion.

Supervisors: Professor Patria Hume (AUT), Dr Stacy Sims (Uni, of Waikato), Dr Doug King (University of Auckland), Professor James Selfe (Manchester Metropolitan University).



Experience: Nat has over 20 years of mixed clinical and research experience in sports injury prevention and rehabilitation and has conducted research projects in the areas of patellofemoral pain, cryotherapy and thermoregulation. Nat leads the SportSmart injury prevention programme for ACC and works with the Sports Collaboration Group (cross code group to address injury issues and management in sport) to drive implementation. Nat is actively involved in the developing and implementing the updated ACC National Guideline for Concussion in Sport.

Research overview: Nat has an interest in adolescent and female athletes and is increasingly driven to understand the impact of puberty and the female physiology on overall health outcomes. Currently studying for her PhD investigating the influence of the sex hormones on concussion recovery and symptomology in female athletes.

Research publications: 30 peer reviewed publications and conference contributions including;

King D, Hume P, Hind K, Clark T, **Hardaker N**, The incidence, cost and burden of concussion in women's rugby league and rugby union: A systematic review and pooled analysis. *Sports Medicine* (2022).

Lancaster, C., Reid, DR, Theadom, AT., **Hardaker, NJ.**, Fulcher, MF., "Knowledge and Management of Sport-related Concussion in Primary Care in New Zealand" *New Zealand Medical Journal* (2022) 135 (1548) 20-30.

Theadom, A., Reid, D., **Hardaker, N.**, Lough, J., Hume, PA, Concussion knowledge, attitudes and behaviour in equestrian athletes. *J Sci Med Sport* (2020) **23**(11): 1055-1061, <https://doi.org/10.1016/j.jsams.2020.05.008>.

O'Reilly, M., S. Mahon, D. Reid, P. A. Hume, **N. Hardaker**, A. Theadom (2020). "Knowledge, attitudes and behaviour towards concussion in adult cyclists." *Brain Injury* 34(9): 1175-1182.

Hume PA, **Hardaker N.**, et al. Sport Concussion in New Zealand: ACC National Guidelines. In: Corporation AC, editor. First ed. Wellington: Accident Compensation Corporation; 2015. p. 18. (updated 2017).

Theadom A, Starkey N, Dowell T, Hume P, ... **Hardaker N**, Te Ao B, Sports Related Brain Injury in the General population; an epidemiological study. *Journal of Science and Medicine in Sport* (2014) 17(6).

Selfe J, Sutton C, **Hardaker N** et al. (2010) Cold Females a Distinct Group of Patellofemoral Pain Syndrome Patients? *Journal of Orthopaedic and Sports Physical Therapy* 40 (3) A42.

Hardaker N, Selfe J, Richards J, Sullivan I, Moss A, Jarvis S. (2007) The relationship between skin surface temperature measured via non-contact thermal imaging and intra-muscular temperature of the rectus femoris muscle. *Thermology International*, 17 (1) 45-50.

Hardaker N, Hume P, Sims, S, Selfe, J, Sex Differences for Injury Risk in Sport. Sports Performance and Prevention Conference, Auckland, New Zealand February 2020.

Hardaker N, Hume P, Quinn D, Fulcher M, Kara S. The role of physiotherapists in the *diagnosis* & management of Sports Related Concussion. Sports Medicine NZ National conference, Auckland, New Zealand November 2019.

Hardaker N, McGeown, J et al. Sex; A key Predictor for complicated symptom Resolution in Sport Originated? The Female Athlete Health Conference, Boston. June 2019; poster presentation.

Hardaker N, Hume P, Sims S, Sex Differences in Sports Related Concussion. 3rd Female Athlete Health Symposium: Youth in the Spotlight. Auckland, New Zealand April 2019.



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Dr Marelise Badenhorst PhD, MSc Physiotherapy

Research specialisation: Sports injury prevention and management; athlete welfare, qualitative research, concussion.

Experience: I graduated with a physiotherapy degree from Stellenbosch University (Cape Town) in 2005 and worked as a sports physiotherapist for 11 years. During this time, I completed a MSc in physiotherapy, and lectured part-time at Stellenbosch University. I switched to full-time academia in 2016 and completed a joint PhD through the University of Cape Town and Vrije University Amsterdam (VU), as part of the National Research Foundation/VU Desmond Tutu Doctoral scholarship. My PhD research investigated the incidence, immediate management, and long-term consequences of rugby-related spinal cord injuries in South African rugby union players. I completed a two-year postdoctoral fellowship in the Institute of Sport and Exercise Medicine (Stellenbosch University), before becoming a SPRINZ research associate and independent research contractor in 2020. I serve as an Associate editor with BMJ Open Sport and Exercise Medicine.



Research overview: Since 2020, I have been working with on research related to New Zealand Rugby's concussion management pathway (CMP). As one part of the CMP's evaluation, my focus has been on the analysis and publication of qualitative data, collected over multiple years since the inception of the pathway in 2018. The data explores various stakeholders within the community rugby system's experiences of the CMP, and perceptions around concussion overall, with the ultimate aim of improving the delivery and uptake of the CMP.

Postgraduate supervision: I am currently supervising a PhD student from Edith Cowan University (Spinal cord injury in Australian rugby union players).

Research publications: <https://orcid.org/0000-0001-8443-9173>

Salmon, D. M., **Badenhorst, M.**, Walters, S., Clacy, A., et al. (2023). Concussion education for New Zealand high school rugby players: A mixed method analysis of the impact on concussion knowledge, attitudes, and reporting behaviours. *International Journal of Sports Science and Coaching*, Epub ahead of print.

<https://doi.org/10.1177/17479541231156159>

Salmon, D. M., **Badenhorst, M.**, Sole, G., Sullivan, S. J., et al. (2023). The balancing act—Physiotherapists' experiences of managing rugby-related concussion in the community. *Physiotherapy Theory and Practice*, 616–621. doi: 10.1080/09593985.2023.2170195

Fortington, L. V., **Badenhorst, M.**, Bolling, C., Derman, W., et al. (2023). Are we levelling the playing field? A qualitative case study of the awareness, uptake and relevance of the IOC consensus statements in two countries. *British Journal of Sports Medicine*, 0, bjsports-2022-105984. <https://doi.org/10.1136/bjsports-2022-105984>

Salmon, D. M., **Badenhorst, M.**, Falvey, É., Kerr, Z. Y., et al. (2022). Time to expand the circle of care—General practitioners' experiences of managing concussion in the community. *Journal of Sports Sciences*, 40(19), 2102–2117. doi: 10.1080/02640414.2022.2130586.

Derman, W., **Badenhorst, M.**, Blauwet, C., Emery, C. A. et al (2021). Para sport translation of the IOC consensus on recording and reporting of data for injury and illness in sport. *British Journal of Sports Medicine*, 55(19), 1068–1076. <https://doi.org/10.1136/bjsports-2020-103464>

Badenhorst, M., Verhagen, E., Lambert, M., van Mechelen, W., & Brown, J. (2021). Accessing healthcare as a person with a rugby-related spinal cord injury in South Africa: The injured player's perspective. *Physiotherapy Theory and Practice*. <https://doi.org/10.1080/09593985.2021.1872753>



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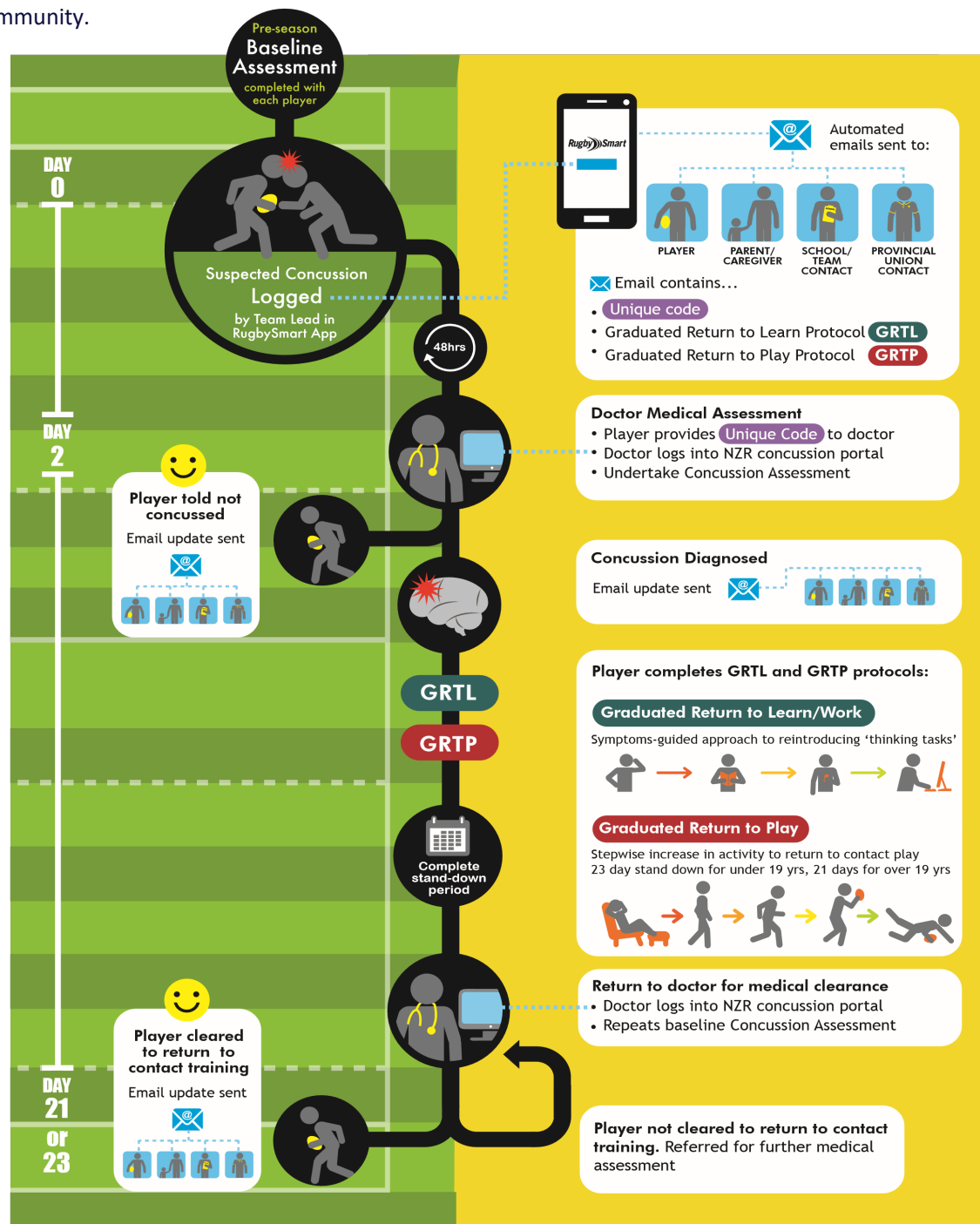
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PROJECT UPDATES

From Danielle Salmon <Danielle.Salmon@worldrugby.org>

New Zealand Rugby's Community Concussion Management Pathway (a Recap)

World Rugby developed guidelines for pitch-side care and concussion management as one of its initiatives to improve player welfare for the elite game. At the community level World Rugby endorse the recognise and remove approach where players are encouraged to seek medical care and follow the recommended return to play guidelines. However, the translation of the guidelines in a community setting remains a challenge. In addition there is also a need to consider cultural and contextual factors. In response, New Zealand Rugby (NZR) developed a community concussion management pathway (CMP) to support concussion recognition, removal from play, diagnosis, and safe return to play for rugby. To create the CMP we collaborated with provincial unions, players, coaches, physiotherapists, doctors, clubs, and schools to develop a user-centred pathway. Overall, the development of the CMP is underpinned by a systems thinking perspective. From this perspective, injuries and their management are influenced by the decisions and actions of various people across multiple levels of a sport system, and the wider community.



Salmon, D., Romanchuk, J., Murphy, I., Sullivan, J., Walters, S., Whatman, C., Clacy, A., Keung, S., & Van Der Vis, K. (2020). Infographic. New Zealand Rugby's concussion management pathway. *British Journal of Sports Medicine*, 54(5), 298–299.

<https://doi.org/10.1136/bjsports-2019-100950>

How does the CMP work?

With the aid of technology, the CMP seeks to close the information gap between the diagnosis of suspected concussions and return-to-play. As a first step, player baseline testing conducted prior to the season is the first phase of the CMP. If a suspected concussion occurs during training or a game, the team lead /manager, coach or physiotherapist logs the incident on the CMP phone application (App). Thereafter, the player, their parents/caregivers, coaches, school/club, and provincial union receive email notifications from the App. These notifications include a unique identifier code that allows a general practitioner (GP) to view the player's baseline concussion score via a secure web-based concussion portal. Additionally, the webpage offers clearing and diagnosis guidelines. Email notifications are issued to pertinent parties upon diagnosis. After that, the player must adhere to the gradual return-to-play and learn guidelines. Following the end of the stand-down period, the player returns to the GP to get medical clearance to resume contact training, and notices of clearance are sent to the appropriate parties via email.

Where are we now with the CMP?

The CMP was first implemented in the 2018 rugby season and has since undergone multiple adaptations based on evidence and feedback from the rugby community, clubs and schools, provincial unions and health care professionals. The number of teams involved increased from 27 in 2018 to 130 in 2022. Additionally, there has been a significant improvement in concussion reporting, with an increase from 19% of rugby related concussions reported through the Blue Card system in 2017 to 98% (n=251) of suspected concussions reported through the CMP from the 137 teams that participated in 2022. There has been an increase in the proportion of players seeking medical diagnosis from 50% to 87%. Of those that returned to play, there has also been an increase in the number of players obtaining medical clearance from 66% to 86% and adhering to stand-down periods from 43% to 85%.

Some key findings within the project:

- Roles and Responsibilities:

The manner in which concussions will realistically be managed in a real-world sporting context, and by whom, needs to be clearly defined and accepted by the various stakeholder groups involved. We have developed a 'framework of responsibilities' that may act as a starting point for discussion within different, community rugby settings, on how these responsibilities translate to their own context and how these responsibilities can be assigned amongst available stakeholders.
- Concussion Baseline testing:

High baseline symptom severity scores is a unique phenomenon identified in community rugby players and should be highlighted to primary care doctors to assist in clinical interpretation of the New Zealand Rugby Concussion Assessment (NZRCA). Although many logistical barriers exist, the value of baseline testing may extend beyond concussion assessment and management, by adding value to community concussion education and player safety. Findings within the project also demonstrated that the majority of logged concussions had valid baselines, which points to the importance of starting the process 'correctly' and potentially signifies baseline testing as a pre-cursor to overall CMP compliance. Completing a preseason baseline test was also associated with better compliance to obtaining a medical clearance and completing the appropriate standdown following a concussion in our current study.
- CMP Barriers and Facilitators:

Having a team physiotherapist and completing a pre-season baseline test were associated with improved compliance to the CMP. Conflicting priorities of other stakeholders influences physiotherapists' ability to optimally manage players with concussions. However, the structure provided by the CMP gave physiotherapists "authority" to manage concussions following the recommended guidelines. Our findings have highlighted the importance of making greater strides towards expanding the role of other healthcare providers, such as physiotherapists, to reduce the burden on GPs, while also delivering a more holistic experience to improve clinical outcomes. Interviews conducted with players highlighted the importance of having a defined management pathway to support players' recovery. However, it also reiterated the need to address the negative aspects of rugby's culture, such as non-disclosure. Additionally, during the season the majority of concussions were not seen/witnessed by anyone, thus the onus remains on players to report the presence of symptoms. However, the decision-making process for players to disclose these symptoms is hampered by socio- cultural issues engrained in rugby.

Overall, as part of the qualitative inquiry, we identified belief in the value of pathway, and the perception that nothing should be placed above player welfare, as the most important facilitator to implementation across all components of the pathway.

One of the challenges identified in the CMP data was the lack of support students received when returning to school and learning after sustaining a concussion. This led to a separate multi-phase project, focusing on the collaborative creation of a framework for the implementation of concussion guidelines in secondary schools to support the return to learn process. This project is being led by Professor Gisela Sole from the University of Otago in collaboration with AUT and NZR. To date this study has implemented the framework in 12 schools, and we continue to evaluate the implementation process and student outcomes. In addition, we sought the perspectives of relevant healthcare professional bodies, national sports organisations, and education stakeholders in different geographic areas, on the value of the framework for their organisation or professional sector, recommendations to improve the framework, and for preparation for potential wider-scale implementation. <https://www.otago.ac.nz/physio/research/sports-concussion-and-injury-prevention/framework-for-managing-concussions-in-new-zealand-secondary-schools-francs>.

At a time when concussion is a major concern receiving significant attention, rugby union as a sport has been under the spotlight and pressure to better manage and care for players. Much of the attention relating to concussions has been focused on the elite game; however, the CMP has broadened the scope to safeguard players at the community level, with a particular focus on our younger players who are the future of the sport. Overall, the research conducted has allowed us to keep refining and improving the CMP, by giving voice to players, parents, coaches, provincial union representatives, school contacts and medical professionals; by tracking players through the CMP; and by investigating the assessment tools used in diagnosis of concussion. As discussed, this has led to a project that focuses on the return to learn journey for all secondary school students, regardless of concussion aetiology. The findings and insight gained from this CMP project may also be expanded to other sports and to support the management of concussions in general in the primary care setting.

Recent publications

- Salmon, D., Chua, J., Brown, J., Clacy, A., Kerr, ZY., Walters., S, Keung, S., Sullivan, SJ., Register-Mihalik, J., Whatman, C., Sole, G., Badenhorst, M., (2023) **The Quest for Clarity – Investigating Concussion-related Responsibilities across the New Zealand Rugby Community System**. British Medical Journal Open Sport and Exercise Medicine. Accepted for publication 25 September 2023
- Salmon, D. M., Badenhorst, M., Walters, S., Clacy, A., Chua, J., Register-Mihalik, J., Romanchuk, J., Kerr, Z. Y., Keung, S., Sullivan, S. J., & Whatman, C. (2023). **Concussion education for New Zealand high school rugby players: A mixed method analysis of the impact on concussion knowledge, attitudes, and reporting behaviours**. International Journal of Sports Science and Coaching. Epub ahead of print. <https://doi.org/10.1177/17479541231156159>
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TRAUMATIC BRAIN INJURY NETWORK (TBIN) UPDATE

Editors' note: Given the RCRG interest in sports-related concussions, Professor Alice Theadom has kindly provided an update on the traumatic brain injury work of TBIN.



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Tweets from @atheadom

Follow



Alice Thead... @athead... · Aug 29

New article out - showing persistent symptoms still exist for many 10 years after #TBI #concussion. Follow the link authors.elsevier.com/sd/article/S00...



For further information see [TBI Network - TBI Network - AUT](#)

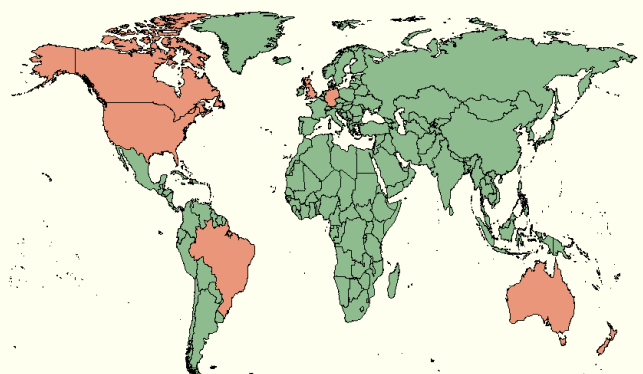
The TBI Network has five active research programmes:

- Recognition, Recovery and Rehabilitation
- Neurophysiological markers and data analytics
- Neurocognitive assessment and intervention
- Sensory sensitivities
- Sports-related Brain Injury

The screenshot shows the website's navigation menu: About us, Our research, Our expertise, Support and resources. The main heading reads "Improving recovery for people experiencing traumatic brain injuries". Below this, a paragraph states: "Nearly 1/3 of people have experienced at least one traumatic brain injury by age 25. Almost half go on to experience long-term problems. The TBI Network aims to support better health and wellbeing for people with traumatic brain injuries by uniting people, services and research to discover how to optimise recovery." The page features three images: a glowing brain, a woman and a man in a meeting, and a group of people in a discussion.

The international network membership has 415 members from countries including the US, Canada, UK, Africa, Australia and Europe. Members are involved in the largest global TBI funded programmes including TRACK-TBI led by the US and the ACRM TBI working group led by Canada, CENTER-TBI led by Europe and TBI VISION in Australia.

TBI Network - Global Perspective



The Traumatic Brain Injury Network (TBIN) was established in 2019 to revolutionise how we prevent, identify and treat traumatic brain injuries, with the aim to work towards better health and wellbeing for people affected by TBI.

Before the TBI Network was established, researchers were working in isolation, evidence was not meeting stakeholder need and there were difficulties in integrating evidence into practice. TBIN provides a central hub to facilitate researchers to work in partnership with stakeholders and the community to address the research questions that matter. The global TBIN membership consists of clinicians, international academics and members of the public who have an interest in guiding the direction of the work that we do, support us to implement our findings, and ensure we meet the needs of the communities we seek to serve. We currently have 27 international academics, 76 NZ academics, 168 clinicians and 144 public members of TBIN.

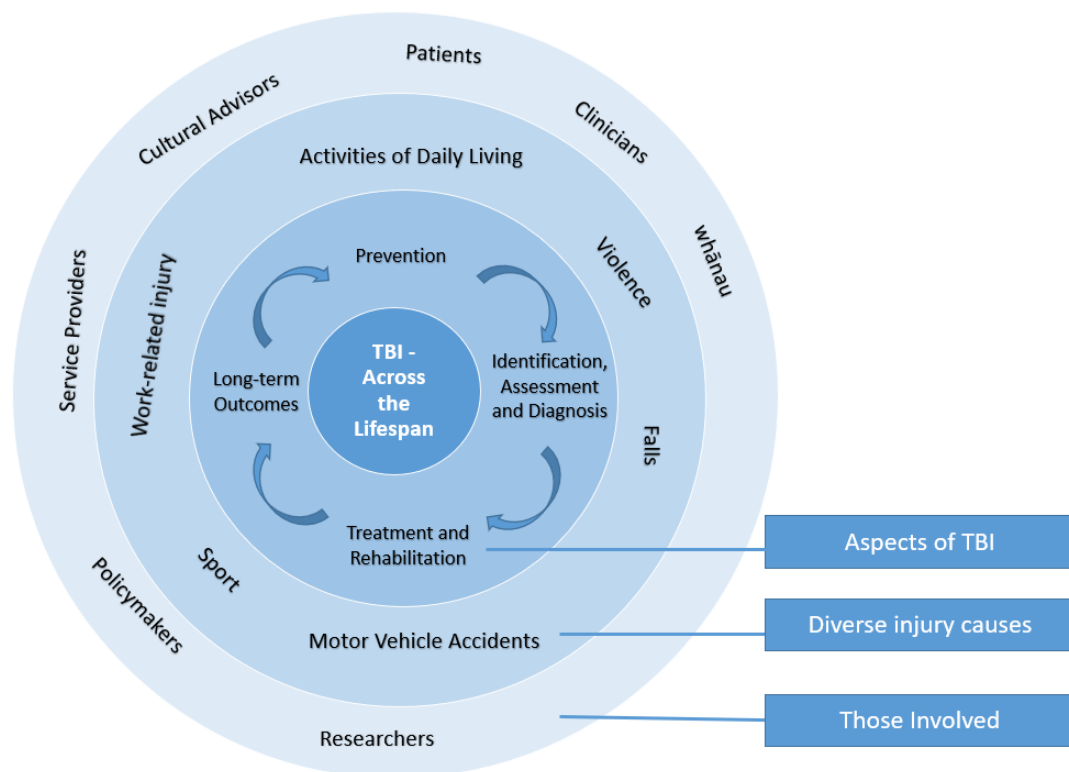
TBIN provides information to the wider network on work that is underway, facilitates connections between researchers across the globe and provides input into global TBI related issues e.g., the Concussion in Sport Group Consensus Meeting.

Goals of TBIN

- Identify gaps in international knowledge
- Prioritise research 'that matters' to patients, their whānau and services
- Connect those affected, researchers, clinicians, service providers and policymakers
- Upskill members to increase effective collaborative working
- Encourage new researchers and grow capacity in the field
- Stimulate new ideas and new ways of 'doing'
- Establish collaborative projects to test new innovations and provide evidence of what works to support consistent, high quality health care across NZ
- Facilitate translation of research findings into everyday life to make a difference to those affected by brain injury

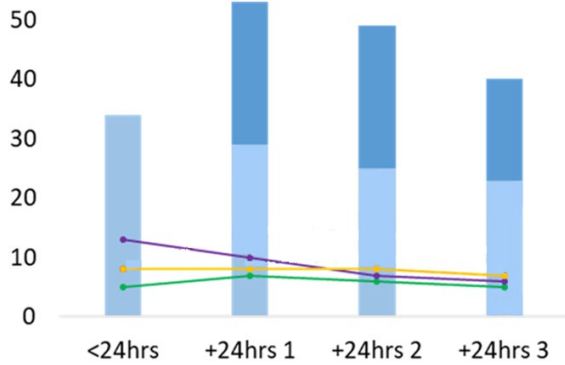
Comprehensive coverage of the field of TBI

The work of TBIN extends across TBI injuries sustained through sport, falls, assaults, being hit by or hitting the head against objects and via vehicle accidents. Work focuses on injuries within the general population and vulnerable groups including victims of domestic violence, prison populations and sports athletes.

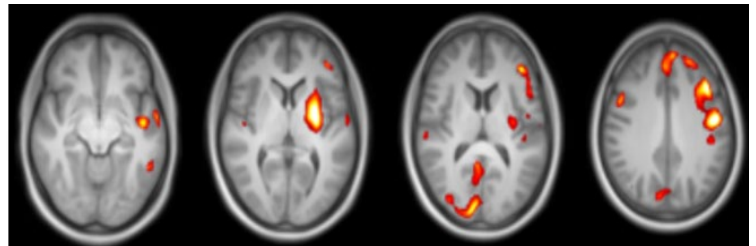


Key TBIN project areas

Recognition and assessment



Neuroimaging



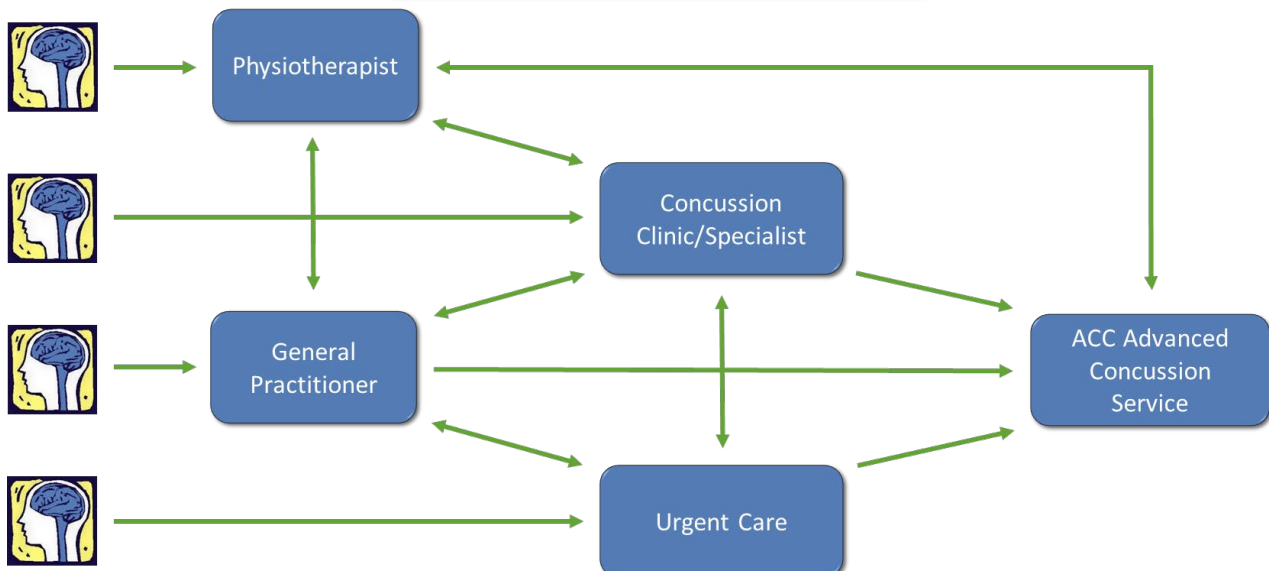
Innovative treatments



Exploring recovery



Patient pathways of care



Examples of TBIN research projects in 2023

- Piloting implementation of the Brain Injury Screening Tool in primary care. In collaboration with ACC, Hutt Valley DHB, Capital and Coast DHB, Counties Manukau DHB, Axis Sports Med, Wellington Sports Med, Freemans Bay Medical Centre, Active+, Cereus Health, Serco ABI Rehabilitation.
- Acceptance and Commitment Therapy for TBI (ACTION TBI), Funded by HRC, In collaboration with Massey University, University of Otago, University of Auckland, University of Waikato and Proactive4Health.
- Use of imaging to predict outcome following concussion. Funded by HRC, In collaboration with the Matai Research Institute and NZ Rugby.
- Experience of TBI in the context of domestic violence. In collaboration with Universite de Clermont Auvergne (France), University of Granada (Spain) and Harvard Medical School (US)
- Impact of mild TBI 10 years on (BIONIC-10). Funded by HRC, In collaboration with Auckland University, University of Waikato, Victoria University of Wellington.
- Role of physiotherapy in the management of concussion. In collaboration with ACC and Wellington Sports Medicine Clinic.
- Impact of early TBI on later life cognition. Funded by the Royal Society Te Apārangi. In collaboration with the University of Otago, University of Auckland, Duke University USA.
- Impact of mild TBI on income, employment and criminal activity. Funded by The Royal Society Te Apārangi, In collaboration with the Integrated Data Infrastructure, NZ Work Research Institute
- Longer term impacts of return to play decisions after concussion. In collaboration with Durham University, UK, and NZ Rugby.
- Integration and Implementation of the Brain Injury Screening Tool within Christchurch Emergency Department. Funded by ACC, in collaboration with Health New Zealand, Christchurch Hospital, Otago University and ACC.

Examples of TBIN collaborative research publications

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TBIN recent media publicity

TBIN work has received newspaper, radio and television and social media attention:

- [NZ Rugby gets first results in study that could link rugby to increased brain disease, deaths over decades](#) (Article quoting Patria Hume, stuff.co.nz, 18 September 2022)
- ['Rugby's bubbling beer conundrum'](#) (Article quoting Patria Hume, Dylan Cleaver / The Bounce, 28 January 2022)
- ['Rugby: Retired rugby players twice as likely to be involved in hazardous levels of drinking, study finds'](#) (Article quoting Patria Hume, Newshub, 28 January 2022)
- [Experts say the 'invisible disability' of brain injuries is a 'silent epidemic'](#) (Article quoting Alice Theadom, NZ Herald, 27 October 2022)
- [PhD Candidate's Renata Bastos Gottgroy and Anja Zoellner featured on TVNZ Breakfast](#) discussing Renata's concussion research and Anja's concussion journey (TVNZ Breakfast, 17 October 2022)
- [Huge concern as research shows quarter of concussion patients waiting months for treatment](#) (Article featuring Renata Bastos Gottgroy, Newshub, 17 October 2022)
- [People with concussions wait 60 days on average for help, says brain expert](#) (Article quoting Alice Theadom, Stuff , 13 May 2022)
- ['We could have been killed': Moment car smashes through school doors into family caught on camera](#) (Article quoting Alice Theadom, Stuff, 12 May 2022)
- ['Domestic violence survivors 'left hanging' without support for brain injuries'](#) (Article quoting Magdalena Durrant, Stuff, 12 March 2022)
- ['The CTE sports wall of denial is crumbling'](#) (Article mentioning Patria Hume, Dylan Cleaver / The Bounce , 4 March 2022)
- [Life-changing brain injuries in domestic violence survivors going unrecognised](#) (Article quoting Alice Theadom, Stuff, 8 January 2022)

TBIN AUT academics



Alice Theadom Patria Hume Mangor Pedersen Susan Mahon Nusrat Shaikh



Daniel Shepherd Jason Chua Richard Siegert Sharon Olsen Clair O'Donovan

TBIN AUT students



Renata Gottgroy Louise Patterson Sam Guy Mayan Bedgood Lara Wilson Magdalena Durrant



Colin Hancock Charlotte Bray Christi Essex Natalie Hardaker Geet Vashista Mahdi Zangi

TBIN AUT research assistants/officers



Amabelle Voice-Powell Suzy Hodgson Joanna Macfarlane Tessa Chaffey

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Current active TBIN AUT-collaborations



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