

About Us

Brain Research New Zealand - Rangahau Roro Aotearoa (BRNZ) is a national Centre of Research Excellence (CoRE) undertaking ground-breaking research on the ageing brain and ageing-related neurological conditions. We bring together New Zealand's best neuroscientists and clinicians, and work in partnership with Māori and community organisations to combat neurological disorders such as stroke, Parkinson's and Alzheimer's diseases. Our ultimate aim is to improve brain health for all New Zealanders in the years to come.

"He aha te mea nui o te ao

What is the most important thing in the world?

He tāngata, he tāngata, he tāngata.

It is the people, it is the people, it is the people."



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OUR GOALS FOR NEW ZEALAND

Lifelong brain health for all New Zealanders.

Better health outcomes, improved quality of life and positive ageing for older persons and their families, including reduced physical, emotional, social and financial costs of ageing-related neurological disorders, through public dissemination of the latest research and the creation of partnerships with patients, families, community organisations and NGOs across New Zealand.

A Centre of Neuroscience Research Excellence that is nationally and internationally recognised and sought after for its expertise and innovation in the study of the ageing brain.

Improved strategies for prevention, early detection and slowing of progression of ageing-related neurological disorders, through identification of early biomarkers and an improved understanding of the mechanisms of ageing-related neurological disorders.

Our vision:

Our mission:

To unlock the secrets of the ageing brain and develop new therapies and better clinical and community care to enhance life-long brain health for all New Zealanders.

Our goals:

Improved clinical practice by translating scientific knowledge into treatments, strategies and care pathways aimed at delaying or moderating ageing-related neurological disorders.



Increased scientific, clinical, translational and leadership capability that will improve research output, patient outcomes, productivity and health industry research capacity.



Improved Māori health and wellbeing during ageing by working with Māori communities to understand their needs and value and build equal relationships, incorporating Mātauranga into innovative research and clinical methods, and by supporting Māori to determine their own pathways to brain health through training of Māori neuroscientists and clinicians.





As for everyone else in New Zealand and indeed world-wide, the last 18 months have been quite the rollercoaster ride. 2020 began with high ambitions of building even further on our outstanding national research efforts, the national Dementia Prevention Research Clinics, the training of our rising stars, and the engagement with Māori and many community partners.

AFTER starting 2020 with a bang with another amazing workshop for early career researchers, BRNZ joined the country in a nation-wide lockdown as the Covid-19 pandemic took hold. Fortunately, we live in a country where science advice is taken seriously, and New Zealand was able to return to near normal through to June 2021, the end of this reporting period.

Despite the relatively short lockdown, there have been significant flow-on effects for teams and many of our graduate students, as stress levels remained high and resources became scarcer. Accordingly, we went to great lengths to extend contracts and provide additional funding as required to give maximal opportunity for projects and degrees to be completed. We have been most impressed with the resilience of our researchers and staff. Thus, our cutting edge work on the mechanisms, biomarkers and treatments for a wide range of ageing-related neurological disorders continued to make major advances, as outlined in this report.

We were also pleased to fund a number of projects in response to the pandemic, ranging from its effects on people living with neurological disorders and the NGOs that support them, to blood biomarkers of "long" COVID, which bears significant similarity to chronic fatigue syndrome. The world is in for a long haul with respect to this pandemic, and our researchers will continue to play major roles in the world-wide response.

With the six and a half years of BRNZ drawing to a close, we reflect with pride the winding-road journey that the CoRE has travelled as a research/community whānau since 2015. On the way, we achieved all our targeted milestones in developing a national neuroscience network engaged with community and delivering hope for all those affected by ageing-related neurological disorders. We thank our Governance, Māori Advisory and International

Science Advisory Boards for their steadfast support, all our researchers, clinicians, trainees, students and community partners for their wonderfully innovative and collaborative work, and our superb administrative team for being the glue holding the CoRE together. It has been a true honour for us as Co-Directors to have been a part of this mahi. The legacy of BRNZ will continue to shine brightly in the years to come, we are sure.

Nāku te rourou nāu te rourou ka ora ai te iwi

With your basket and my basket the people will live

long

Professor Peter Thorne (University of Auckland) Co-Director Brain Research New Zealand-Rangahau Roro Aotearoa

WCAbraham

Professor Cliff Abraham (University of Otago) Co-Director Brain Research New Zealand-Rangahau Roro Aotearoa

BOARD CHAIR REPORT

A lifetime of public service helps to set the standard for research in Aotearoa



Sir Don McKinnon has been with Brain Research New Zealand since its inception, helping to grow a simple idea into a national Centre of Research Excellence. But now, after 6 years, he has retired as chairman, saying that "renewal is an essential component of success and longevity for any organisation."

A politician for most of his professional life, Sir Don admits that he was surprised by Sir Richard Faull asking him to chair the ambitious collaboration between leading neuroscientists, clinicians and community organisations from across New Zealand, who were aiming to find ways to combat or treat disorders of the ageing brain. "I was on a Rutherford Foundation panel with Richard Faull, and he approached me with this idea. Initially I was sure he'd chosen the wrong guy, but once we were all sitting down together it made a lot more sense as to where I would fit in."

As both a former Deputy Prime Minister of New Zealand and a former Secretary General of the Commonwealth, Sir Don's political antenna was crucial in establishing and growing BRNZ. "Scientists and academics have incredibly deep knowledge in their areas, and it was my job to bring a breadth of knowledge that would help us mesh all their disciplines together."

In the 1980s, Sir Don was National's health spokesman, which is when he first became concerned with the stresses that an ageing population puts on public health systems. "Healthcare costs are uneven throughout a person's life, and they increase sharply after the age of 65. By more successfully addressing the issues of ageing such as dementia, we could reduce the overall cost of health care as well as improving the quality of life for so many." Sir Don wanted BRNZ to fund work that would, if possible, create noticeable changes in people's lives now, as well as keeping an eye on the prize of eventual therapies and treatments. "It's never been enough to sell people the hope of a future cure; it is critical to also provide information that could change the way they age, and improve their quality of life. And as our funding comes from the taxpayer, we need to demonstrate that we can provide value for that money."

Sir Don says he took the perspective of advocating for the community, and ensuring that the bigger picture of brain health in New Zealand remained tightly focused on people. Each time he considered funding applications, from PhD scholarships to large-scale research projects, Sir Don says he always wanted to keep the community at the heart of discussions. This remains a key part of BRNZ's vision, and it has set a new standard for research organisations in Aotearoa.

Alongside Sir Richard Faull, Sir Don has ensured that Maori were part of the conversation from the beginning. "It was very intentional. I'd had an eye on Ngāti Hine, and their health trust, for years, and their success made it clear that we needed people involved who understood these communities deeply, and who could guide us in the right direction." To him, the successes of BRNZ, including the Dementia Prevention Research Clinics, are a testament to that community focus. "We tapped into something there - the clinics are funded in part by philanthropy, which I feel really shows how strongly people feel about addressing these issues."

Work that has been behind the scenes for so many years is now making its way into those communities and improving people's lives. "As a youngster I didn't really think about what my life would be like after 60. But now we know that the choices you make in your youth can have a big impact on the kind of life you lead after 60, and that's been an important message to get out there."

At the end of his time as Chairman, Sir Don, now 82 and still busy, says it is fulfilling to see big projects bearing fruit, whether it's the clinics or the long-term research projects. "This has been truly satisfying work with some amazing people devoted to some of the toughest challenges facing people in terms of their health. There are knock on effects for them, their families, our communities, and our country. I am glad fresh eyes and fresh ideas will take over to add to what we have achieved."

2020-2021 AT A GLANCE

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OUR PEOPLE RESEARCH HIGHLIGHTS 4 universities, 72 Principal and Associate 3 Investigators peer-reviewed journal articles patent Postdoctoral fellows in external research funding identify as Māori International collaborating **Collaborations with** institutions 19 national partners

DEMENTIA PREVENTION RESEARCH CLINICS



3 Dementia Prevention Research Clinics, 5 DHBs



2

research projects





sent to Sweden for SIMOA analysis

MĀORI SUCCESS COMMUNITY ENGAGEMENT



members have completed

Takarangi training courses

_

Māori specific

research

projects

-`**!**-

Māori summer

scholarships awarded



schools have registered for the **Being Brainy** Programme



BRNZ researchers appeared in the media on average almost 6 times a week

in philanthropic funding raised to support our research





TRAINING AND EDUCATION

CoRE training and Early Career Researcher (ECR) activity

One of the pillars on which we formed BRNZ was the desire to provide a world class training ground in Aotearoa New Zealand for neuroscientists and clinicians specialising in brain research. Our aim was to extend opportunities available to new researchers and enhance their experience and capabilities. All signs point to us having achieved remarkable success in this effort.

WE held two outstanding workshops during 2020-21. In February 2020, over 50 ECRs came together at the University of Otago for two days packed with exciting talks, discussions, and interactive sessions. Professor Glenda Halliday from the University of Sydney kicked off the event as a keynote speaker and shared her research on human neurodegenerative diseases. Professor James Maclaurin (Otago) talked about Artificial Intelligence, discussing what AI can teach us about thought and thinking, and Dr Nick Cutfield, Director of the Dunedin BRNZ Dementia Prevention Research Clinic, gave us insights into Parkinson's disease in a clinical setting. He also invited a patient with Parkinson's disease to share the realities of living with PD. Professor Stephen Robertson (Otago) gave useful advice for growing science in the New Zealand research environment, and Laurie Winkless, an accomplished science writer, followed with practical tips for communicating science. In a very interactive workshop session, the ECRs were taken through real scenarios, and discussed ethics and making big decisions in health and science. Dr Makarena Dudley (Auckland) presented her Mate Wareware App for dementia awareness, an app for dementia awareness and prevention that she has been developing in a collaboration with AUT and MedTech. In a session on "Using the F-word in science", BRNZ Co-Director Professor Cliff Abraham delved into some failures of his career and discussed how to deal with failure with a BRNZ panel. In the end, Cliff emphasised that "Failure is an outcome, not a personal characteristic."

The 2021 workshop was also a two-day event held in Dunedin. Sixty ECRs from our four sites descended upon the University of Otago's Psychology Department, and spirits, as always, were high (especially after a session of laughter yoga, which took a little getting into by some). Delegates were challenged by Otago's Dr Anna Latu to think about how their work impacts on tangata whenua and the underpinning of Te Tiriti o Waitangi; likewise, Professor Ekant Veer (Canterbury) emphasised the importance of thinking differently about the impact of their work and about looking after their own wellness. Returning to more conventional science-based material, they were informed about translating their science discoveries by Professor Paul Glue (Otago) and gene/disease



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Training workshops

associations by Professor Justin O'Sullivan (Auckland). We were very privileged to have a talk by the visiting Professor Graham Collingridge from Toronto, one of the true international gurus of synaptic plasticity. On the more social side, we enjoyed a scrumptious meal at Tītī on the first evening, followed by a compulsory session of karaoke for a (very!) seasoned few, and an educational trip to the Orokonui Ecosanctuary to observe New Zealand's beautiful bird life in a predator free zone. All in all, another highly successful workshop!

In sum, our workshops have been highly valued by ECRs, as they have fostered productive relationships between ECRs across institutions, engendering a noticeable shift in culture towards inherent collegiality through improved understanding and knowledge sharing across institutions and career levels.



Training opportunities for our early career researchers

ALL our ECRs, including Masters and PhD students, recent graduates, postdoctoral fellows and early faculty scientists and clinicians, had available to them enhanced training opportunities within BRNZ over the six years of the CoRE. They were exposed to an environment of multidisciplinarity, giving them opportunities to develop the skills and networks they need to compete on the international stage. Instead of the conventional single-investigator research projects, all of our projects are collaborative, involving investigators across our partner universities, offering different skill sets and experiences to impart. The exposure to multidisciplinary research from an early stage gave students direct access to a greater breadth of expertise that will propel them into successful careers in healthcare, industry, and academia. To facilitate opportunities to acquire research skills and knowledge internationally, we invested in a Young Ambassadors scheme, designed to support the travel of our young neuroscientists to attend international conferences and training workshops, and to visit laboratories around the world.

Unfortunately, the COVID-19 pandemic restricted international travel in 2020-21 and so we had to promote other opportunities for researchers to link and present their research. BRNZ thus provided funding for virtual conference attendance, and also established a monthly webinar series "BRNZ 20-20 for 2020" which was organised and run by the ECRs. They hosted a series of webinars on a variety of topics, followed by a discussion session. Topics included the impact of the isolation on older people during the COVID-19 pandemic, specific areas of brain research, women in science leadership, and the Dementia Prevention Research Clinics. These were very well attended and received, and also showed the potential opportunities that existed for virtual conferencing in a COVID-altered world.

Throughout the period of the funding, BRNZ provided opportunities for our ECRs to undertake advanced training in specialist research skills by hosting international skill-based workshops in New Zealand. Although put on hold during the pandemic, as an example, we had earlier sponsored a highly successful three-day workshop, where 12 ECRs learnt from a team from UCLA how to manufacture a "mini-scope" at the fraction of the retail cost, to allow them to visualise the activity of large ensembles of neurons deep within the brain.

In addition to developing their usual academic and research skills, we wanted our ECRs to broaden their interest and knowledge of commercialisation in science, with the aim

of generating a clearer line of sight from basic science discoveries to future economic and broad health impacts. Our speaking programme often involved speakers who have successfully taken a science discovery to commercial market to share their experiences and knowledge.

We also recognised the importance of improving the skills and opportunities for our ECRs to communicate their science and research to community groups. Our ECRs were encouraged to discuss their work with interested community groups, through panel discussions, presentations, and outreach opportunities (Brain Day, Brain Bee, Brain Awareness Week, Being Brainy programme, Café Scientifique) and through building relationships with Māori and Pacific people with invitations to marae and Pacific community centres. In 2021 a wānanga held by BRNZ at the CoRE's partner school Te Kura Kaupapa Māori o Hoani Waititi Marae provided opportunities for ECRs to engage with rangatahi and exchange ideas around brain research and mental health.

The CoRE has been able to offer fellowships for postdoctoral fellows, PhD students, and summer research students to train under BRNZ investigators. We have enjoyed a successful track record of student support and completion. By 2020, BRNZ had directly funded 15 Māori Summer Scholarships, 2 Masters students, 25 PhD students (including 3 Māori) and 9 postdoctoral fellows (including 1 Māori), as well as 28 clinicians (i.e. psychologists, physiotherapists, medical student PhDs), two of whom are Māori. In 2020 we offered targeted summer studentships for Pacific students. During our time as a CoRE, 352 students have been involved in BRNZ's research programme across our four partner universities.

Closing remarks

The BRNZ CoRE has been supremely successful in fostering the development of multidisciplinary skillsets and collegial relationships amongst our ECRs and enhanced their training and leadership opportunities. There is no doubt that beyond the CoRE we need to capitalise on this in order to ensure the continued development of our innovative workforce that is needed for the future benefit for all New Zealanders, a progressively increasing proportion of whom are at risk of developing a brain disorder in their later years.

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Support was crucial on the path to becoming a lecturer

At the start of 2020, Dr Reece Roberts accepted a much sought-after lecturing position at the University of Auckland's School of Psychology; the same institution he first entered as an undergrad and never left. This, he acknowledges, is a fairly unusual situation in academia, where stints spent in different parts of the world are seen as the norm. "I always wanted to stay in New Zealand after my PhD, or at least to try and stay," says Reece. "More than anything, I just feel incredibly lucky that I've managed to do that." But there's much more than luck to Reece's story.

IN his Honours year, Reece studied under Emeritus Professor Mike Corballis, where his work focused on visual cognition. He went on to undertake a PhD in the same lab. Reece says that at that stage, he'd have described himself as: "A good old fashioned cognitive psychologist. So all of my experiments were behavioural experiments." Because his PhD was unfunded, Reece supported himself via a series of part-time jobs; working at a library, tutoring undergrads, anything that could keep the lights on while he plugged away at his thesis. Then, Professor Donna Rose Addis offered him a position as a research assistant in her neuroimaging lab. "Back then, I was kind of sceptical of neuroimaging in many ways... or at least I had a pretty cartoonish view of what imaging would be able to tell us", he says. "But I figured it'd allow me to quit my library job and do something more related to research." Reece was also aware that the skills he'd learn in that lab could stand him in good stead. "If I wanted to stay in academia, it would pay to have some expertise in something as important as neuroimaging." What he didn't expect was how much he'd enjoy the work. Reece took to the project quickly, and was drawn to the complex, technical nature of the data analysis. "So I ended up with these two parallel streams of work, which honestly was difficult, especially at that stage of my PhD. This new work was intellectually engaging and exciting in comparison."

After submitting his PhD, Reece joined Donna Rose's lab fulltime. She became an important mentor for him as the years went on, guiding him through the parts of research they don't teach you in classes: planning and applying for grants, supervising students, and the day-to-day running of a big grant project. "Donna and I wrote a Marsden grant together, with me as the named postdoc," he says. "And it was successful. That was amazing." During that time, Reece was interested in creative cognition. "We were looking at the relationship between future imagination, creativity and the blood-oxygen-level-dependent (BOLD) variability of the fMRI signal." A University of Auckland faculty fellowship followed, and that's where Reece first started working with BRNZ. "We were looking at a data set from an ageing population, and BRNZ funded some of the data collection." That opened the door to other opportunities too. In 2018, Reece was awarded a fellowship from BRNZ, where his focus was on the valuable neuroimaging data from the network of Dementia Prevention Research Clinics. "The idea was to take all this data and try to develop classification systems; to look for differences in the brains of people with mild cognitive impairment," he says. The ultimate aim is to be able to use a brain scan to determine if a patient is likely to recover, to stabilise, or to continue to progress toward dementia. "That data pipeline is set up now, and the full database will be up and running soon," Reece says. "So, even though my fellowship is over, I'm still involved, and the systems we have will keep going for the life of the clinics."

For Reece, the role of BRNZ in his career development has been as much about networking as funding. "It's really helped me get a sense of the NZ neuroscience landscape, and really made it feel like its own community," Reece says, "there is something about this organisation that just makes it feel like we're all pulling in the same direction; we're all working toward something together as a group instead of as a bunch of individual labs around the country." It wasn't just the senior researchers getting the support either; BRNZ's commitment to their early career researchers stuck out in Reece's mind. "The extent to which they would invest time and money in PhD students, Master students and postdocs was something that just doesn't happen very often" he says, "and I'll always be really appreciative for that."

Reece admits that since accepting his lecturer position, things have been more challenging than he expected, not least because of the ongoing difficulties of COVID-19. "It's been a slow process, but we're getting up and running," he says, "I'm starting a whole new phase of research now, investigating event segmentation, which is essentially how the brain cuts continuous experience up into manageable chunks." With such a tremendous journey already, it's clear that Reece will continue to make strides for neuroscience in Aotearoa.





Up and coming talent at a glance

Malvindar Singh-Bains

Dr Malvindar Singh-Bains is the Leo Nilon Huntington's Disease Research Fellow based at the Centre for Brain Research, University of Auckland. Malvindar is currently working to unravel the role of disease-causing proteins in Huntington's disease, by studying human brain tissue samples donated to the Neurological Foundation Human Brain Bank. Throughout the duration of BRNZ, Malvindar has helped establish a method to profile new drug targets in human brain tissue for the treatment of neurological disorders, using tissue microarray technology and automated analysis. This work has been published in the prestigious scientific journal Nature Protocols. Malvindar says that BRNZ has enabled her to connect and collaborate with researchers across New Zealand through her role in the Early Career Advisory Group for BRNZ. She also engages with Māori through the Takarangi framework workshops and has established strong connections with rangatahi at Hoani Waititi Marae. In the future, Malvindar's goal is to lead her own laboratory focused on finding better therapeutic options for patients with Huntington's Disease.

Kyla-Louise Horne

Dr Kyla-Louise Horne researches cognitive and neuropsychiatric issues in Parkinson's disease. During her research career, she received a BRNZ Postdoctoral Fellowship, conference travel funding, and attended every BRNZ Early Career Researcher Workshop. These opportunities have broadened her knowledge, increased her research skills, and helped her develop many relationships with like-minded researchers. In 2017, Kyla-Louise attended the International Movement Disorders Congress in Vancouver – a trip that was made possible by conference travel funding provided by BRNZ. While there she met Professor Simon Lewis and developed an international collaboration between the New Zealand Brain Research Institute (NZBRI) and the University of Sydney. This collaboration examines whether hallucinations in Parkinson's disease could be an early clinical biomarker of increased dementia risk. Currently, Kyla-Louise is developing the Parkinson's hallucinations research program with her colleagues at the NZBRI. This will characterise hallucinations, their impact on quality of life and examine the underlying neural mechanisms causing them.





Ann George

As a novice researcher, I joined the reputable National Institute for Stroke and Applied Neurosciences (NISAN) institute at AUT with a desire to meaningfully contribute to preventative efforts for stroke. The inspiration for my PhD took seed while working on a pilot study where I discovered that despite stroke risk awareness, participants chose not to modify lifestyle risk factors. BRNZ brought my research dream to fruition by awarding me a highly prestigious PhD scholarship. In doing so, I was able to not only meet, but exceed the objectives of my research. Furthermore, the Early Career Researcher (ECR) workshops provided opportunities for collaboration with other academics and honed my skills in becoming a successful researcher. I was also able to showcase my work internationally with the assistance of BRNZ's ECR travel stipend. With BRNZ's support, after having successfully completed my PhD, today I am a well-rounded, competent academic and at the forefront of several exciting projects at NISAN.

I am devising a clinical tool to objectively evaluate the cognitive workload of a rehabilitation task. It has been shown that patients undergoing rehabilitation benefit from an optimal amount of cognitive workload – not too much and not too little. My approach aims to assess how changes in brain signals can be used to measure cognitive workload during rehabilitation. This will help guide clinicians to prescribe the appropriate worklo level to maximise recovery for people with brain injury. I was fortunate to be part of a diverse research team at the Health & Rehabilitation Research Institute at AUT, led by Professor Denise Taylor. When I started my PhD, I had difficulty adapting to my role as an engineer conducting health research. This is where BRNZ stepped in – by attending BRNZ Early Career Research workshops and symposia, this helped me to understand the important intersection between the basic science, engineering, and clinical aspects of research. The diversity of researchers I met at these events inspired me and made me realise that I am a "Neuroscientist" as well as an "Engineer".

Margaret Ryan

BRNZ has been an important support to both my research and my professional development as an independent research scientist. My research focuses on the early molecular changes underpinning development of pre-clinical Alzheimer's disease. Through funding from BRNZ, I have identified alterations in small blood-borne markers, known as microRNA, in a unique cohort of 'pre-clinical' Australian participants. These are people who, though considered cognitively normal, have high brain amyloid-beta levels which significantly increases their risk of developing Alzheimer's disease. Closer to home, I am examining blood microRNA levels from the Dementia Prevention Research Clinic (DPRC) cohort. This longitudinal study follows individuals with mild cognitive impairment, some of whom have since progressed to Alzheimer's disease. The combined data from these studies will contribute to the effort to develop a much-needed diagnostic marker of pre-clinical and early Alzheimer's disease.

As study coordinator at the Dunedin DPRC, I've seen the impact of memory loss on individuals and their whanau. Cultural competency courses and several marae visits organised by BRNZ have increased my understanding of Māori perspectives in my research. I've also had opportunities to serve on committees, and attend and organise BRNZ research conferences. Together, these experiences have greatly expanded my network, and importantly, helped me to develop my knowledge of te ao Māori (the Māori world view), grow new research collaborations, and make lasting friendships





Owen Jones

It is hard to overstate how much BRNZ has done for New Zealand's emerging crop of neuroscientists. I was one of many to receive a Fellowship from them, which enabled me to establish an independent research stream and provided a platform for three subsequent grants (with a fourth application underway). Through BRNZ, I was also able to organise an early career workshop that allowed researchers from UCLA to travel here, and provide training on building miniaturised microscopes ("miniscopes") for imaging brain cell activity in freely behaving animals. Thus, BRNZ played a pivotal role in bringing cutting edge, yet affordable, technology to our early career neuroscientists. This technology is now used in projects at the Universities of Otago and Auckland. Aside from financial support, BRNZ invested in its emerging researchers by asking many (myself included) to join its Theme Leadership groups and experience the research world beyond the lab. Furthermore, BRNZ hosted several early career conferences where training and guidance could be offered to the Principal Investigators of tomorrow - without exaggeration, these actions by BRNZ have laid the foundations of people's careers.



RESEARCH EXCELLENCE



For its 6.5 years, BRNZ's central mission has always been to undertake the highest quality research to understand and promote brain health during ageing. Our efforts have covered both biomedical and clinical research, using modern, innovative approaches and state-of-the-art methodologies. It has also developed in a way that embraces kaupapa Māori methodologies for Māori-focused research. Below we summarise some of the outstanding work that has been undertaken in recent times.

Preventing, detecting and treating neurological disease

Translation of optimised brain injury rehabilitation programmes for clinical use

Many BRNZ researchers are actively investigating the best ways of promoting motor recovery from stroke with the aim of enhancing clinical neurorehabilitation. For example, Professors Cathy Stinear and Winston Byblow have been developing prediction tools for determining person-specific capacity for stroke recovery (published in Stroke), while also identifying, in conjuction with Professor Alan Barber, inhibitory networks in the brain that may be impeding stroke recovery and thus need to be targeted during therapy (Clinical Neurophysiology; J Neurophysiology). They also published a prominent review of stroke therapy trials, and the challenges they face but also the advances that have been made (Lancet Neurology). Professor Denise Taylor and colleagues have been leading the way as well in developing and optimising novel non-invasive brain stimulation techniques for aiding stroke rehabilitation therapy (Brain Sciences: Frontiers Human Neuroscience), Importantly, Professor Nicola Kayes has emphasised that cultures of care that recognise a patient's new reality are central to enhancing person-centred practice and enabling capacity for improvement (Disability and Rehabilitation).

Development and testing of large animal models of neurodegenerative diseases

New Zealand researchers have been making exciting and pioneering advances in the development of sheep models of neurological disease. Professors Richard Faull, Russell Snell and colleagues have a long-standing study of sheep expressing a Huntington's disease gene. They have released a detailed "multi-omics" database of information derived from brain, blood and other tissues from these animals that is available to international investigators for hypothesis generation and comparative studies of samples from patients and other model systems to expand our understanding of the pathogenesis of Huntington's disease (J Huntington's Disease). An example of such work is their recent comparison of epigenetic differences between patients and the sheep model, versus rodent models (Nature Communications; Neurobiology of Disease), where the mouse model differed markedly from the other samples. Similar work is in progress for the sheep model of Alzheimer's disease, while Professor John Reynolds and Associate Professors Louise Parr-Brownlie and Stephanie Hughes have been developing a sheep model of Parkinson's disease for the testing of novel therapies to rescue motor function.

Treatments for ageing and disease-related dysfunction in sensory function

Loss of hearing and associated tinnitus is one of the most common sequelae of ageing, and is a significant risk factor for cognitive decline. Although hearing aids and cochlear implants are front-line treatment options for hearing loss, tinnitus can remain a major issue for many people. A wide range of novel, non-invasive brain magnetic and electrical stimulation techniques are being developed by Professor Dirk de Ridder and colleagues for tinnitus (Expert Review Medical Devices; Brain Imaging and Behavior). Similarly, chronic pain is being targeted with some success by this group (Neuromodulation; NeuroRegulation), with addiction being another disorder of interest using such technologies (Neurotherapeutics). Associate Professor Grant Searchfield's group has been very active as well in testing new ways of improving the lives of tinnitus patients, including multisensory perception training (International J Neuroscience), a novel recategorisation sound therapy technique (Brain Sciences), MDMA drug treatment (International J Neuroscience) and individualised counselling (International J Audiology). A new drug treatment for noise-induced hearing loss in rodent models developed by Associate Professor Srjdan Vlajkovic and Professor Peter Thorne has shown promising success as well (International Journal of Molecular Sciences).

Predictive benefit of neurological disease biomarkers

Early biomarker-based detection of ageing-related neurological disease is a critical component of the global approach to addressing the disease burden. This means that current and new treatments can be delivered earlier in the disease time-course, a time when they are likely to be more effective, and when clinical trials can be optimised to focus on those people at risk for disease. Accordingly, it is exciting to report that a provisional patent has been gained by Associate Professor Joanna Williams and colleagues for a plasma biomarker panel that identifies patients with earlystage Alzheimer's disease (Alzheimer's & Dementia: Diagnosis, Assessment and Disease Monitoring). Associate Professor Jian Guan and colleagues Professors Tim Anderson and John Dalrymple-Alford have shown that ageing-related changes in a different plasma biomarker correlates with cognitive decline in Parkinson's disease (Alzheimer's & Dementia). In related work on normal ageing, Professor Richie Poulton and colleagues have revealed a blood biomarker indicator of the pace of biological aging (eLife), and this was used along with other sensory and cognitive indicators to show that the history of psychiatric disturbance is associated with a faster pace of ageing (JAMA).

Snapshots of leading BRNZ researchers

John Reynolds

Professor John Reynolds enjoys building bridges. He started his working life in medical electronics, before completing medical training and transitioning to a career in neuroscience. Now, his focus is on taking discoveries from his lab and transitioning them into diagnostic methods and treatments for brain disorders. In particular, he's interested in providing new avenues for treating Parkinson's disease and stroke; two conditions he routinely observed in clinical practice. "What frustrated me is that doctors simply lacked the tools in the toolbox to help people living with these debilitating conditions," he says.

Through BRNZ he has received funding to collaborate with scientists and clinicians throughout Aotearoa to apply the tools developed in his lab. At Otago, he's working on novel viral labelling techniques with Associate Professor Stephanie Hughes. These techniques can identify circuits in sheep that make the chemical dopamine; circuits known to malfunction in Parkinson's disease. John and Associate Professor Yiwen Zheng have been using stimulation of dopamine circuits to reduce the sensation of tinnitus, and this grew to a successful project grant from the Health Research Council. In Christchurch, he has worked with Professor Tim Anderson to test a novel computer tool that has the potential to aid early diagnosis of Parkinson's disease. Currently, he is working with Professor Denise Taylor at AUT to evaluate a novel stimulation method to help people with stroke improve their hand and arm function. All of these projects have leveraged basic science observations from his lab; building bridges from labs, to experiments, to clinics, and eventually to patients.

Meanwhile, John has been helping others with their own building projects; connecting BRNZ's Early Career Researchers across the country. "This is perhaps the most satisfying part of my role," John says. It has also proven hugely impactful for those on the receiving end, with numerous Early Career Researchers describing the support and time given to them by BRNZ - and John in particular – as

beyond anything they'd received elsewhere.

Louise Parr-Brownlie

Associate Professor Louise Parr-Brownlie (Ngāti Maniapoto me Te Arawa) is an internationally renowned expert in Parkinson's disease. In recent years, her work has become more translational, focusing on potential interventions to ease the symptoms of the disease. In 2016, alongside Associate Professor Stephanie Hughes, Louise launched Mārama, a BRNZ funded platform based at Otago that provides resources and training for optogenetics research. Optogenetics uses a hollowed-out virus to implant light-reactive proteins into specific cells, enabling researchers

to activate those cells with light.

A densely packed brain, however, doesn't leave much room for light to penetrate. "To have a reliable signal in the brain, you need to be working with longer wavelengths," which is exactly what Louise and her team have been working on, "We've been testing out an opsin that responds to orange light instead of blue light."

Louise has also been working with bioengineers from the University of Auckland to develop and test a long-term lightemitting brain implant, which is now available commercially by a Dunedin-based biomedical company ADInstruments. The implant is designed for use in animal models of Parkinson's disease, and gave Louise and her team the ability to see how chronic light stimulation could impact better control of symptoms. While optogenetics is still a young and developing discipline, the combination of improved light-emitting implants and light-responsive proteins has made the goal of future optogenetics treatments more realistic.

Alongside Dr Hinemoa Elder (Ngāti Kuri, Te Aupouri, Te Rarawa and Ngāpuhi), Dr Justine Camp (Kāi Tahu, Kāti Mamoe, Waitaha), and Mariana Te Pou (Ngāi Tūhoe, Ngātiwai, Whakatōhea, and Tainui), Louise has also been investigating Māori community perspectives of neurosurgical interventions, like her optogenetic work. The outcomes have deeply impacted her research, and have made her think about its future implications. "I think the work being done around the world on brain stimulation is worthwhile and important, but it can also be a real source of medical inequity," she says. "We know that Māori are unlikely to go for these kinds of treatments for a range of cultural reasons. On top of that, the eligibility criteria are really strict, so only around 10 people are getting these surgeries each year in Aotearoa." Developing more accessible, more equitable, interventions for those living with Parkinson's disease will be a high priority for Louise in the coming years.

Denise Taylor

Staying upright on two feet is an inherently unstable activity, and as we age - or if we suffer from a variety of neurological or musculoskeletal conditions - our balance tends to deteriorate. Professor Denise Taylor and her team at AUT's Health and Rehabilitation Research Institute are working to understand how the different senses are involved in maintaining balance. With that increased understanding, they are developing innovative rehabilitation interventions to improve balance.

Balance is complex and important for many daily activities. We need balance to walk, to stand, and to run. Denise calls it the SuperFunction as it underpins almost all our daily activities. Balance involves sensing where we are in space using our eyes, our ears and the feeling of our feet on the ground. There is growing evidence showing that the inner ear, or vestibular system, is linked to our ability to navigate and find our way around our environments, as well as being important for balance.

Researchers from the University of Otago, the University of Auckland and AUT recently joined forces to investigate this connection. Funded by BRNZ, the study asked whether a very small electrical stimulation to the inner ear combined with a balance rehabilitation programme could help improve the balance and navigation abilities of people with mild cognitive impairment. Promising results from the BRNZ study led to the team receiving subsequent funding from the Health Research Council of New Zealand. In this project, they will investigate the use of the intervention in older adults who have an increased risk of falling.





Grant Searchfield

For Associate Professor Grant Searchfield, effective treatments for tinnitus have to go further than the ear; they must address the ways we engage with sound. In his research and clinical work, he takes a multidisciplinary approach, combining relaxation techniques, therapy, and the use of 'masking sounds' as a form of short-term relief from the dreaded high-pitched ringing that accompanies the condition. Grant has always wanted to make such treatments accessible to all. So, in 2017, he and his team created Tinnitus Tunes, an online platform that provides information, brain training exercises, and masking sounds to participants, over the course of a 12-week treatment program. This gave Grant a way to reach people around the world who were living with tinnitus, and provide them with the same programme they offer at the University of Auckland Hearing and Tinnitus Clinic.

His new project provides a similar service; counselling, sound therapy, and perceptual training through in-app gameplay. The intention is to create a service that is always on hand when people need it, and what better way to do this than by linking in with the smartphone already in your pocket? Grant says the app will continue to develop, and in future will use artificial intelligence to fine-tune therapies so that the time spent on the app is as effective as possible. "Translational research is central to impacting people's lives," Grant says, "it demonstrates that there is a real usefulness to research, that there is a pathway for that work to be translated into real tangible outcomes for people."

Along the road to developing these 'real-world' applications, Grant says he's found the BRNZ community incredibly important. "Often you'd find people who had specialties and skills that you'd never have learned about if you hadn't met them in person," Grant says. "Having on-going opportunities to meet other researchers has been crucial. You really can't overstate the importance of useful and friendly critique."



Nicola Kayes

People and whānau experiencing neurological injury or illness live with ongoing social and emotional impacts which are not well addressed by existing services. In fact, psychosocial wellbeing is cited as one of the biggest unmet needs by people living with long-term neurological impairment. This lack of attention to psychosocial wellbeing hinders the development of psychological resources necessary for living well with neurological impairment. Professor Nicola Kayes' research focuses on how we can optimise what happens at the point of care and beyond to address this.

BRNZ has supported a diversity of projects to advance this work. This has included co-designing a website for people experiencing changes to their memory and thinking (www.greymatters.co.nz) so they can share their tips, tricks, and experiences with their peers; unpacking under what conditions psychosocial resources are developed and maintained for people experiencing neurological injury or illness; and mapping the impact of COVID-19 on people and whānau living with age-related neurological impairment. My favourite project, however, has been working with Māori colleagues and whānau experiencing neurological injury or illness to explore what matters most to them in their health interactions. In this work, we found a sense of *wairua* (spirit) and *hononga* (connection) are fundamental for meaningful interactions for Māori accessing health services, and that hononga is enabled and enhanced through whakapapa (genealogy), whanaungatanga (relationships), tikanga (Māori cultural practices), and in an environment which invites whānau to engage as Māori. This work will soon be published in a special issue of *Brain Impairment* devoted to humanising connections in neurorehabilitation.

Of course, BRNZ has been so much more to me than the projects they support. It has been an absolute privilege to get to know people from all corners of the brain research landscape – from benchside to community. The future is full of possibility when we bring that intersection of knowledge together!



Emma Scotter

For the past seven years, Dr Emma Scotter has run the MND Research Hub, a lab that coordinates Motor Neuron Disease (MND) research at the University of Auckland. In that time, Emma's lab has grown from a team of one to a team of ten, and The Hub has grown to connect researchers across Aotearoa. "The Hub was modelled on the success of the Dementia Prevention Research Clinics," Emma says, "and we had strong support from BRNZ leadership in setting it up." The Hub coordinates a wide variety of research projects including cell culture and brain tissue studies to understand disease mechanisms, as well as skin cell banking and genetic screening to ensure New Zealanders with Motor Neuron Disease are 'clinical trial ready'.

The foundational studies carried out by Emma's team characterised the genetics and protein clumping signatures of Motor Neuron Disease in brains donated to the Neurological Foundation Human Brain Bank, and established the rate of Motor Neuron Disease across New Zealand for the first time. They have contributed to studies that characterised a rare genetic form of Motor Neuron Disease, demonstrated that changes to motor neurons in the spinal cords of those with the disease occur in a different location than previously expected, and have established an ongoing nationwide Motor Neuron Disease genetics study with more than 130 individuals.

This expansive coordination and research effort has been possible due to funding from the Aotearoa Foundation, Royal Society Te Apārangi (Rutherford Discovery and FastStart grants), and philanthropic support from Amelia Pais-Rodriguez and Marcus Gerbich, the Coker Family, Emirates Team NZ, the Freemasons Foundation of NZ, MND NZ, and PaR nz Golfing.

Improving clinical practice

Studies involving the Dementia Prevention Research Clinics

THE Dementia Prevention Research Clinics (DPRCs), which have been developed at three sites across the country, have been providing a unique resource for the study of the biomarkers and factors that predict the progression from early memory difficulties to Alzheimer's disease in order to inform further clinical practice and advice. As the participant numbers have grown to permit adequately sized studies, BRNZ researchers have been actively investigating predictive biomarkers, with one particular focus being the identification of novel blood biomarkers such as microRNA (Associate Professor Joanna Williams), cyclic Glycine-Proline (Associate Professor Jian Guan), and other small blood-borne molecules (Dr Erin Cawston). Complementary to these blood-based studies, other researchers are

generating leading edge measures of brain changes through novel analyses of MRI data (Dr Reece Roberts; Dr Catherine Morgan). In related research on a different aging cohort provided by the Dunedin Multidisciplinary Health and Development Study, Dr Tracy Melzer's research in collaboration with Professor Richie Poulton has revealed correlations between both childhood self-control and adult cardiovascular fitness as predictors of the pace of ageing in mid-life (Frontiers in Aging Neuroscience; Aging; Proceedings of the National Academy of Science, USA; NeuroImage). In the future, we hope the two cohorts to become more and more collaborative as the Dunedin cohort moves into their 50's.

Therapeutic interventions in the community

PROVIDING practical support by way of identifying and trialling therapeutic interventions for people in the community has been a key, long-standing objective of BRNZ.

Associate Professor Liana Machado has shown that physical activity in old age is associated with cognitive ability (Aging, Neuropsychology, and Cognition). In addition, Professor Ngaire Kerse, Dr Gary Cheung and Professor Denise Taylor have completed a feasibility test of combining cognitive stimulation therapy with exercise as a falls prevention strategy. While the combination was shown to be possible, modifications to the procedures were needed for good compliance by the participants (Pilot and Feasibility Studies). This important research is ongoing. Similar research into combining physical exercise and cognitive training is being undertaken by Professor John Dalrymple-Alford and Professor Leigh Hale in Parkinson's disease patients. Interesting research also by Professor Kerse has shown that home gardens can be not only therapeutic and protective of health and wellbeing, they are also enabling places for the expression and performance of agency in advanced age. Thus home gardening has practical implications for supporting wellbeing amongst those in advanced age (Social Science and Medicine). Of particular note, Dr Makarena Dudley has launched a free mate wareware (dementia) mobile app in order to increase awareness amongst Māori of what mate wareware is and Māori understanding of it,

the types and causes of it, how to look after whanau who are affected by it and how to identify if someone might be suffering from it (see article on Dr Dudley in the Empowering Māori section).

Rehabilitation after stroke is an ongoing challenge for clinicians, and Professor Nicola Kayes' research has emphasised the importance of person-centred care in neurorehabilitation (Disability and Rehabilitation) as a way of improving outcomes. Her group has completed a promising feasibility trial of their Living Well Toolkit package given to clinicians to provide to their patients (BMC Health Services Research). This concept has been supported by a study by Professor Leigh Hale on understanding the experiences of stroke survivors in reintegrating into the community (Disability and Rehabilitation). Associate Professor Rita Krishnamurthi and Professor Valery Feigin have developed and distributed a free mobile Stroke Riskometer app for helping individuals assess their risk of stroke over the next 5-10 years, as described in a previous annual report. This app is now in use across the globe, and provides a rich set of data for these researchers. More recently they have used a telephone survey to assess the awareness of stroke and revealed a need for a culturally tailored public communication to improve knowledge of stroke risk and to recognise stroke and appropriate actions (J Stroke and Cerebrovascular Diseases).

Work with GPs and primary healthcare providers to improve awareness, diagnosis and treatment of dementia and/or stroke.

BRNZ researchers have been very active in their engagement Older People's Health for use with screening for dementia with clinicians and healthcare providers to contribute their in Māori. Regarding stroke, Professor Feigin, Professor Barber and Associate Professor Krishnamurthi have met expertise to knowledge-based clinical practice. Professor Kerse spoke at the General Practitioner Continuing Medical with or presented to hundreds of GPs to discuss advances Education conference online in August 2020 about dementia in stroke care and management, based in part on recent clinical identification and management, and to the March clinical research (Stroke; MIR Research Protocols; Clinical 2020 Goodfellow symposium on dementia diagnosis and Neurophysiology; Lancet; Anaesthesia; Internal Medicine J). management. She also presented at the Alzheimer's NZ Professor Kayes spoke at a nursing symposium on how to webinar series on the topic of practical issues that arise for embed person-centred care into practice, and at Habit older people living with dementia. Dr Phil Wood routinely Rehabilitation in-service training on "The why, what and how of goal planning in rehabilitation". BRNZ researchers also works with national and Northern regional groups to improve served on the Rehabilitation Working Group for the National the models of care and support for those with cognitive Stroke Network to develop and share guidelines to improve impairment and their whānau. Dr Dudley's validated mate wareware diagnostic tool has been targeted by DHBs' the quality of stroke rehabilitation nationally.

Work with government to improve policy around dementia and stroke prevention and management

ANOTHER important means of making an impact for New Zealand is through advising government agencies on policy regarding ageing-related neurological disorders. In one example, BRNZ made a submission to the governmentsponsored "Dementia Spotlight: A Compilation of Initiatives to Address Dementia in the Asia-Pacific Region". Professor Kerse, as president of the New Zealand Gerontology Association, met with the minister for Seniors, Dr Ayesha Verrall, on two occasions to discuss the roll-out of the Dementia Action plan. Dr Sarah Cullum served as a member of the working party to develop the Alzheimers New Zealand National Dementia Mate Wareware Action Plan which was subsequently presented to the Ministry of Health and will be the cornerstone of new policy around dementia. Dr Cullum was also Lead Investigator together with Dr Dudley for a BRNZ team on a successful bid to update the Alzheimers NZ Dementia Economic Impact Report, previously produced by Deloitte in 2008, 2012 and 2016. This new report was launched in September 2021 and provides estimates to the NZ government, public sector and other policy-makers on

the economic cost of dementia from a societal perspective that includes health care, social care and informal care provided by families. The latter is of particular importance for Māori, Pacific and Asian communities who choose not to use long-term aged residential services for their family member with dementia, and therefore bear the economic cost of providing care at home. Dr Wood meets regularly to advise the Minister and Associate Minister of Health on dementia health needs and opportunities provided by research. Dr Dudley is part of a working group to develop the Mate Wareware Action Plan to be integrated into the Dementia Action Plan for re-submission to the Associate Minister of Health in September 2021. She was also contracted to provide a report that included cultural considerations for the Chief Ombudsman's OPCAT aged care inspection criteria. Professor Feigin and Assoc Professor Krishnamurthi have met with relevant Ministry of Health representatives regarding their Auckland Regional Community Stroke Study (ARCOS) research programme and its potential impact on policy.

A decade of dedication pays off for Alzheimer's biomarker research

TEN years ago, Associate Professor Joanna Williams, Diane Guévremont, and their colleagues set out to identify a biomarker for Alzheimer's disease, but until recently, the details of the research had to stay under wraps. "We had to be so careful not to talk about the specifics of what we were looking at. It was always 'microRNA A' and 'microRNA B', because we knew we'd need to patent it in order to get it where it needed to be in the end; in the clinic."

The hope was to eventually use this biomarker as a tool for widespread clinical screening of Alzheimer's disease. "There's a period of about 15 to 20 years before the disease really starts to be noticeable," Joanna says, "so if you're thinking about trying to improve the lives of people with Alzheimer's in their 60s and 70s, you really need to be able to identify them in their 40s."

Current tests for Alzheimer's disease are highly specialised, costly, and invasive: lumbar punctures, PET scans, and cognitive functioning tests. Joanna and her team wanted a simple blood test that could be processed in any medical laboratory. "We were quite naive when we started this," Joanna says, "we thought we'd just look at some microRNA and find one that went up as the disease progressed." It turned out to not be so simple. They started with over 700 microRNA contenders and, over time, narrowed the focus down. "We wanted microRNA that were present in all of our subjects, not just 10% or 80%," Joanna says, "and they had to be in high enough concentrations that they wouldn't just disappear in the processing for whatever reason." That narrowed down the options to around 180 microRNA, and from there it was all about looking at the concentrations in different groups.

Joanna's project pre-dates BRNZ but has had the support of the CoRE since its formation: directly via funding and indirectly by helping to facilitate those crucial relationships between scientists, clinicians, community groups, and patients. In order to continue refining the biomarker, Joanna and her team needed a large number of samples from

people across the spectrum of disease progression: from people without symptoms who would eventually develop the disease; those living with mild cognitive impairment, a memory condition that can develop into dementia; and from people who were living with the daily hardships of Alzheimer's disease. "Having that human element really kept us grounded in the end goal," she says. "We had our work to do, but we were also seeing the other side of the equation; the real daily experiences of these people and their families." For Joanna and her team, this was a huge motivating factor, and it drove the decision to patent the technology rather than immediately publishing it in the scientific literature. "We need to work with a pharmaceutical company in order to go through the next stages, and if we'd published it ahead of time it would have been out there, sure, but it wouldn't make it into clinics; it wouldn't do what we set out to do."

Over the past decade, Joanna and her team have narrowed those 180 possible microRNA down to just three sets, and found that the changes in the levels of those microRNA across the disease progression reveal a consistent biomarker. "We submitted the patent application last year, at the same time we submitted our paper for publication," and while they've been working through the reviews of their paper, the patent application was accepted. "I'm endlessly telling people the numbers of the microRNA now, and they're boring names, one of them is miR-122-5p," she says, "they don't really mean anything to anyone else but being able to say it is just relieving."

All the hard work and secrets have paid off. This biomarker could be used as a broad diagnostic tool to identify people who should go on to further testing; it's not a silver bullet, but it gives clinicians precious time. "It would also give us a chance to intervene with lifestyle therapy and follow the patient's response to it," Joanna says, "and hopefully in the future, intervene with drug therapy."

Untangling the mysteries of Parkinson's and dementia

PROFESSOR Tim Anderson has set his sights on a big challenge. He wants to identify specific biomarkers – clinical or laboratory indicators that can trace the development of dementia in those with Parkinson's disease. "We know that a proportion of Parkinson's patients will develop dementia at some time during the course of their condition. But what we can't do with any certainty is predict when it will happen or which individuals will be affected," he says.

As a neurologist at the University of Otago, Christchurch and Clinical Director of the New Zealand Brain Research Institute, Tim has been studying movement disorders in the lab and in the clinic for decades. What ultimately motivates him is improving the quality of life of his patients. "The fact is that we don't yet have effective therapies for dementia. But if we can predict who is likely to experience cognitive decline, then when we do get treatments we can be highly targeted, and hopefully help prevent patients from sliding any further in their cognition."

Globally, Tim says, predictions for the development of dementia in Parkinson's disease are fairly bleak, "some studies suggest that 80% or 90% of people with Parkinson's will get it." But that is not reflected in Tim's own longitudinal study, carried out with a New Zealand cohort of 350 patients. "From our results at the clinic here in Christchurch, we can say that about 50% of Parkinson's patients will eventually get dementia."

This ground-breaking study, which initially concentrated on finding biomarkers through brain imaging, has expanded to include other clinical indicators. Patients have annual or biannual appointments at the clinic, undertaking blood tests, scans, motor tests, and neuropsychological assessments over the course of many hours. From this, Tim and his colleagues have identified two major determinants for whether or not someone with Parkinson's will go on to develop dementia. "The first is age. The older you are when you get Parkinson's, the sooner you're likely to develop dementia. The second most powerful predictor is existing cognitive impairment. My colleague Dr Kyla Horne found that about half of Parkinson's patients with mild cognitive impairment will go on to get dementia within the next four years."

One of the major challenges they face is that, in terms of biomarkers, the form of dementia that develops in people with Parkinson's disease is rather different from that which characterises Alzheimer's disease. Our brain is full of proteins. The accumulation of two – amyloid and tau – is considered a signature of the development and progression of Alzheimer's. A third, alphasynuclein, has been identified as the protein that goes awry in Parkinson's. "Misfolding of the protein deep in the brain is what causes the disease's characteristic motor problems," says Tim. In what would become the largest ever study of amyloid in Parkinson's disease, Tim and his team determined that alpha-synuclein accumulation is likely to be the main contributor to the development of cognitive impairment and dementia. "Once we take account of age, amyloid build-up doesn't seem to be correlated with cognitive impairment in people with Parkinson's. Alpha-synuclein is causing most of the cognition problems. That was an important finding."

One of Tim's collaborators on that study was Professor Jian Wang, a neurologist from Fudan University. The pair met in 2017, when Tim visited Shanghai as part of a BRNZ delegation supported by the New Zealand-China Research Collaboration Centre. They've continued working together ever since, publishing several papers together. "Jian and I have similar research interests and priorities," says Tim. "There was quite a natural synergy there from the start." A new area in which they're beginning to collaborate is the use of artificial intelligence in motion tracking. "There are various movements in patients that we look at to make the diagnosis of Parkinson's, and to track its progression over time," he says. "But it can be a fairly crude, subjective measurement, and makes an early diagnosis difficult." The goal is to develop software that can analyse videos of patients and track their movements digitally. "We could then use that information to make very sensitive calculations of their movement difficulties. It would help with diagnosis, and also possibly with remote monitoring of people's conditions."

Earlier this year, the team suffered a setback. Their partner – a Chinese technology company – withdrew from the research project unexpectedly. But Tim pivoted quickly. "We're going to develop the software here in New Zealand. We've been given some funding by MBIE, and have an excellent medical student who will be transferring over to a PhD to work on it. Professor Wang has access to a huge patient cohort, so we'll certainly be collaborating with him to test and refine the software."







DEMENTIA PREVENTION RESEARCH CLINICS

Transforming the landscape of dementia research

The Dementia Prevention Research Clinics (DPRCs) are a cornerstone of BRNZ's work. They are home to a ground-breaking longitudinal research study that aims to identify biomarkers of the development and progression of memory problems and dementia in communities across Aotearoa New Zealand. The three DPRCs in Auckland, Christchurch and Dunedin are run by a multidisciplinary team of 40 clinicians, nurses, medical specialists, researchers, technicians and students. Overseeing it all is Associate Professor Lynette Tippett, a clinical psychologist and neuropsychologist at the University of Auckland. "The clinics are rather all-encompassing for me personally," says Lynette. "But it's an absolute dream and privilege to be involved in something like this. It's a wonderful mixture of really working with people in the community, while also collecting incredibly rich, multidisciplinary data in an area of great importance for Aotearoa."

THE participants enrolled in the longitudinal study fit into one of three groups - healthy older adults, those with mild cognitive impairment, and a small number of people at the earliest stage of Alzheimer's disease. "Our main group of interest is really those with mild cognitive impairment," explains Lynette. "We know at a population level that they are the people at highest risk of developing dementia, but we're still quite poor at predicting which specific individuals will progress to that point." This is something that the DPRCs hope to address through their research.

Each time a participant attends a clinic, they undergo a series of detailed assessments and tests, which Lynette describes as "...a huge process. It happens over several days, and it includes clinical and medical assessment, taking blood samples, undergoing MRI brain imaging and amyloid PET scans, neuropsychological assessments, and lifestyle questions." The information gathered is enormously rich. One of the key parts of this, as Lynette explains, has resulted from the work of BRNZ Tissue Bank Research Fellow, Dr Erin Cawston. "DPRC blood samples are preprocessed into 13 different fractionations of the blood, and then stored in approximately 96 cryotubes. That's per participant, per visit. So, currently we have more than 52,000 available specimens. Erin has managed all of that process and has developed an incredible specimen tracking system."

From all of these data, Lynette and her colleagues are trying to identify a biomarker signature; a set of biological (and possibly, non-biological) factors that could quantify a



AROVE

Associate Professor Lynette Tippett, clinical neuropsychologist at the University of Auckland, and Director of the national network of Dementia Prevention Research Clinics.

"I think that one way our study differs from many international studies is that our focus, first and foremost, is on the people who are taking part. It's about those members of the community, rather than research careers. The team on the ground are wonderful and supportive, and the national effort has produced 'a nationwide whānau', absolutely committed to our participants."

person's dementia risk. New Zealand's ethnic diversity makes research in this area potentially unique, says Lynette. "We have an incredible opportunity to investigate whether there are multiple biomarker signatures that differ by ethnicity or cultural practices. So engaging Māori, Pacific and Asian participants is a top priority for us." Longer-term, the goal is to use that information to target therapies and treatment to those who could benefit most from them.

The idea of setting up the DPRCs was planted during a conversation between Lynette and Sir Richard Faull en route to Dunedin, in the inauspicious surroundings of Auckland Airport. "This was before the CoRE existed," says Lynette. "The BRNZ proposal was still in its early stages of development." But even then, the team had their sights set on establishing a national network of research clinics. She continues, "Richard managed to secure some philanthropic funding which helped us to start out small, and develop some of the protocols that the future clinics would need." Laying the groundwork early gave them a head-start; it meant that soon after BRNZ came into being, the first of the clinics could begin recruiting their cohort. The Auckland clinic launched on 8th April 2016, and the work hasn't stopped since.

There are currently around 275 participants in the national study, with more being recruited all the time. And while each of the three clinics have their own unique group of participants, the data can be combined and shared with researchers across the country. Lynette admits that making this possible has been a huge undertaking, "The richness

and quality of this data is astonishing, really, and it is enabling studies that are unique to New Zealand. With over 1,000 variables, even developing the database so that it can facilitate use of these data and ensure that it can be continuously added to in the future has been a massive task". There are 22 research projects currently underway that involve either DPRC data, or the participants themselves – on everything from wellbeing in MCI, through to pilot intervention studies. One study that Lynette is particularly excited about is being led by Dr Erin Cawston, who along with her international collaborators, is using the latest technology to quantify key proteins in blood - amyloid and tau – over time.

But, there's much more to the clinics than the science they enable. "I think that one way our study differs from many international studies is that our focus, first and foremost, is on the people who are taking part. It's about those members of the community, rather than research careers. The team on the ground are wonderful and supportive, and the national effort has produced 'a nationwide whanau', absolutely committed to our participants." This sentiment was echoed by clinic manager Jane Govender, who joined the DPRC four years ago because she wanted to contribute to New Zealand's dementia research landscape. Described by Lynette as "the glue in the Auckland clinic", Jane is central to its day-today operation. "I wear a number of hats in my role," Jane says. "But as a research nurse, advocating for participants is especially important. To be able to walk beside them on their journey is really humbling."

For Lynette, the next stage of the clinics' development, which will again rely on philanthropic funding and success in grant applications, will be characterised by further developing relationships with partners in the community. "To date, we have strived to provide an interaction with participants that is informed by mātauranga Māori, and have had the invaluable support of Dr Waiora Port in the clinic, but still have had only modest success with recruitment of Māori. Following the advice of BRNZ Māori Strategy Leader Dr Hinemoa Elder, it's clear that in order to engage more Māori, we need to take the DPRCs to Māori communities, with Māori staff who will help make the process comfortable for participants. So that is my number one priority. Dr Makarena Dudley and I are, in particular, working on ways we could develop a Māori DPRC in partnership with the community, and I am keen to incorporate her MANA diagnostic tool into our practise."

In addition, Lynette explains, she not only wants to understand the impact of dementia in Māori populations, but also to identify protective factors – which may be cultural practices. "The LiLACS NZ study showed that in people of advanced age [over 80], there's no greater incidence of dementia in Māori, despite that group having many negative risk factors usually associated with dementia. That to me just shouts that there are protective factors within their culture that are mitigating some of the risk factors. There's an important story that needs to be understood and told."

FACING PAGE:

Top: Auckland Dementia Prevention Research Clinic team Centre: Christchurch Dementia Prevention Research Clinic team Bottom: Dunedin Dementia Prevention Research Clinic team

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On the hunt for an Alzheimer's biomarker

Dr Erin Cawston has been part of the BRNZ **Dementia Prevention Research Clinic** (DPRC) team since 2015 and is the **DPRC Tissue Bank Research Fellow** and Co-Director. Erin has been responsible for establishing blood collection protocols, training, and ensuring that samples are processed to the highest standards across all three of the DPRC sites. Her key area of research is the identification of blood biomarkers to aid in the diagnosis and progression of Alzheimer's disease.

Erin has also developed new research initiatives and projects for biomarker studies using blood samples collected from DPRC participants. Following a visit to Professor Henrik Zetterberg's world leading laboratory in Sweden, Erin established an ongoing collaboration with him. It has seen blood samples from 617 DPRC participant visits sent to Sweden to be analysed using ultrasensitive Single Molecule Array (Simoa) technology. Professor Zetterberg is a world-leader in using Simoa to identify promising neurodegenerative blood markers, such as lowly-expressed proteins like amyloid, tau and neurofilament light. Erin hopes that these analyses will help to determine the level of amyloid build-up in participants' brains. If they have this information, it may allow the team to classify and predict changes that occur in very early Alzheimer's disease in a non-invasive way.

Erin is also in the process of establishing the first ever Simoa technology capability here in New Zealand. This was made possible by a Lottery Health Research grant, with additional support from the University of Auckland School of Medical Sciences and the Centre for Brain Research.



She says, "When I started with the DPRCs in 2015, the ultimate goal of Alzheimer's disease fluid biomarker research was to identify biomarker(s) in blood that could indicate the very early stages of the AD disease pathway. Since then, technology has advanced, and ultra-sensitive methods such as Simoa have enabled new opportunities. Candidate blood biomarkers such as phosphorylated-tau species are in particular showing great promise."

Erin continues, "I have been privileged to be involved with BRNZ through my work with the Dementia Prevention Research Clinics. The leadership and whānau there have been extremely supportive, and allowed me to grow as an independent researcher."



Remembering Sir Eion Edgar

Our dear friend, benefactor and inspiring supporter of BRNZ and the Dementia Prevention Research Clinics, passed away on 14 June 2021. Sir Eion was chairman of investment company Forsyth Barr, a former chancellor of the University of Otago, a director of the Reserve Bank of New Zealand, chairman of the New Zealand Stock Exchange, and president of the New Zealand Olympic Committee. In 2009, Sir Eion was made a Knight Companion of the New Zealand Order of Merit, for services to education, business, and sport.

At BRNZ, we remember Sir Eion as a leader in philanthropy in New Zealand. He was particularly notable for bringing his positivity and optimism in a way that brought many others along with him. No problem was too big for him to tackle. Above all else, he was a man of integrity, compassion, mana and commitment to do the right thing for the people of Aotearoa New Zealand.

Sir Eion was a determined warrior for advancing brain research for the future benefit of all New Zealanders. In 2015, he embraced with enthusiasm and passion the Brain Research New Zealand vision to establish a national network of Dementia Prevention Research Clinics in Auckland, Christchurch and Dunedin with the ambitious dream to develop new treatments for dementia and Alzheimer's disease to give hope to the ageing population.

He was the mover and shaker behind the establishment of the New Zealand Dementia Prevention Trust with the prime aim to raise \$10M to provide long-term support of the dementia clinics. As the founder and chair of the Trust, he led by example through the gifting of \$1M in 2015 from the Eion and Jan Edgar Charitable Trust. Sir Eion leaves a huge legacy to this fight against dementia, through the dementia clinic research that continues to be supported by his Trust.

The BRNZ whānau will be forever grateful to Sir Eion and his family for their enduring support and faith in the research to find solutions to dementia and other neurological conditions.



EMPOWERING MÃORI

Te Kura Kaupapa Māori o Hoani Waititi Marae

Partnering with Māori in a meaningful way is vital for ensuring that our research is culturally responsive and results in improved health and wellbeing for Māori. To help guide us, we have developed strong partnerships with two Māori communities: Te Kura Kaupapa Māori o Hoani Waititi Marae in Tāmaki Makaurau (Auckland) and Puketeraki Marae in Ōtepoti (Dunedin).

LOOKING back, on 11 October 2016, we visited te Kura Kaupapa Māori o Hoani Waititi Marae for the very first time. Dr Hinemoa Elder, Māori Strategy Leader at BRNZ, had identified the school as a partner for our research centre based on the community's dedication to learning and commitment to Māori advancement and wellbeing. Since then, we have visited the school for annual wananga and have discussed many complex topics ranging from stress and anxiety, to dementia and caregiving, to animal research. Our Māori partners have shared their ideas, voiced their opinions, and asked challenging questions about the work we do. We have seen our researchers and clinicians grow more confident participating in powhiri, reciting their pēpeha and learning more about tikanga Māori. They also had the opportunity to explore the unique perspectives of the tauira and kaiako (students and teachers) around many important topics to do with the brain and brain health, and learn how it might apply to their own work.

In 2020 and 2021, we held two further wānanga at the kura and we were able to strengthen our partnership beyond these meetings. On International Day of Women in Science, we invited a group of young female students from Hoani Waititi to the University of Auckland. They visited our neuroscience labs, met some of our early career researchers, explored the range of opportunities available in (neuro)science, and got a first taste of university life.

We also worked together on a video ad, which Māori TV created for the occasion of BRNZ's sponsorship of the Health and Science Award of

THIS PAGE: BRNZ researchers visit te Kura Kaupapa Māori o Hoani Waititi Marae. Māori TV's annual Ngā Whetū o Matariki Awards. The video showcases the relationship of BRNZ and te Kura Kaupapa Māori o Hoani Waititi Marae and the kaupapa we've been working on together over the past six years. The rangatahi talked about the impact that this partnership has had on them and where they think their future might lead them. Listening to their kōrero is incredibly inspiring, and we cannot wait to see how they will continue to grow and make a big difference to their community one day. We are immensely proud to have had the privilege to be part of it.





Mate Wareware: Dementia from a Māori perspective

Dr Makarena Dudley (Te Rarawa, Te Aupōuri, Ngāti Kahu) is a clinical neuropsychologist and Senior Lecturer at the University of Auckland. For more than 20 years, Makarena has worked with a wide range of communities, but since 2015, she has focused on Māori living with mate wareware (dementia).

MAKARENA says spending time with kaumātua was a personal highlight of a major research study she recently led. "It was such a rich experience. To be able to be amongst our elderly people, talking to them, listening to them, learning from them, was an honour for me. It was incredibly emotional at times, too." The goal of this study, funded by the Health Research Council, was to understand dementia from a Māori perspective. Makarena and her team interviewed 223 kaumātua from across Aotearoa, and published their findings in the New Zealand Medical Journal. It also led to the development of a Māori term for dementia: mate wareware, with mate referring to being ill, unwell or diseased, and wareware, which means forget or forgotten.

"One of the really interesting threads we uncovered was around the perception of mate wareware among these kaumātua," says Makarena. "The condition wasn't necessarily seen from a deficit perspective. It was more tolerated and managed within the whanau (family), without all the stigma that's often attached to dementia." Other messages emerged, loud and clear from the study, including a desire for accessible advice and resources on brain health, "It was a plea that resonated right throughout all the hui we did," she says. That motivated Makarena to develop an app and website, with the support of BRNZ and the MedTech CoRE. "The feedback on the app has been hugely positive so far. I've been overwhelmed with emails from people who've used it," she says. "We have lots of ideas and plans on how to improve it further, and are talking with a Māori NGO who wants to support that next stage."

Though itself a huge undertaking, the mate wareware app is only one aspect of Makarena's research. For the past few years, her major piece of work has been the development of a diagnostic tool called MANA, or Māori Assessment of Neuropsychological Abilities. "It's unlike anything we've ever seen in Aotearoa New Zealand, and we're really, really proud of it," she says. "All throughout my career I've used tools that were developed overseas



One part of MANA is already in use, as Makarena explains, "Quite a few clinicians have come to me and asked to use the wairua component as a standalone assessment. This component reflects something that we heard again and again from the kaumātua when we toured the country. For kaumātua, wairua underpins everything about their journey. So to have that as part of the conversation with their GP is fantastic."

On average, Māori are diagnosed with mate wareware 8.5 years younger than Pākehā, but the actual prevalence of mate wareware in Aotearoa New Zealand is unknown, says Makarena. "No such study has been conducted. But this is information we really need to know in order to inform and prepare government and dementia services for what I see as a rising demand for health services for the elderly. It's certainly a priority for us, and I'm optimistic that we'll be able to undertake such a study in the near future."

In the longer-term, Makarena's hope is that Māori can access the help and support they need within their communities, "Something we're trying to do better is improving literacy around brain health. I'd love to see more researchers make closer contact with those communities most impacted," she says. "Professors Richard Faull and Ngaire Kerse and I recently did a workshop in Kaitaia. The people were so excited and grateful that we took the time to go to their little town. But that's exactly where we should be going – to the people".



Guiding the way: The long journey toward equity in brain health

Since the earliest days of BRNZ, we have been committed to embedding kaupapa and mātauranga Māori within all aspects of our research and community outreach. We've been fortunate to be guided in that journey by remarkable kaumātua, including the Co-Chairs of our Māori Advisory Board – the Venerable Lloyd Nau Popata (Ngāti Kahu) and Dr Waiora Port (Te Aupouri, Te Rarawa).

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LLOYD'S introduction to BRNZ came through his friend and colleague, Te Kaanga Skipper. "Kaanga had been involved with the University of Auckland for some time," he says. "After one of the Māori advisors – kaumātua Eru Thompson – passed away, she asked if I'd come along to a BRNZ conference. She was very persuasive, and in the end, I enjoyed meeting everyone." By day, Lloyd is an Anglican priest who manages the pastorate at the Church of the Holy Sepulchre in Grafton. While accustomed to working with people from a wide range of backgrounds, he admits that it took him a while to adjust to life on the Advisory Board. "It probably took me 12 months to get used to it. Don't get me wrong, everyone there was very supportive and positive and were determined to get things done. It just felt like a different world. But once I began to understand how the research helped people, and got to know the people driving it, I started to feel more comfortable." He particularly acknowledges Sir Don McKinnon's role in that process, "Watching how he works, and his skill in handling people and challenges, I learned a lot from that."

For Waiora, the connection to BRNZ runs especially deep, "I've known Sir Richard Faull for years, and his wife Diana's family for longer than that; since childhood!" The formal tie came through some work Waiora was doing with a geneticist at Auckland Hospital. "That was when Richard first asked me to provide a Māori perspective on research and grants he was involved in, and it really grew from there." A primary school teacher by training, Waiora returned to university later in life, and developed a deep knowledge and interest in health and health equity. She says she sees herself as "the person in the middle; I sit in between others," but that her work, which often includes liaising between Māori families and clinicians, is rewarding. "When the stars align, it can lead to wonderful times. The main thing for me is to be empathetic and kind towards people, always. Earning someone's trust takes a long time, but it is a very easy thing to lose. So you have to keep on trying."

The importance of building trust within and between communities is something that resonates with Lloyd too. He often meets people in his congregation and his iwi who are living with mate wareware (dementia), and he says, giving them access to support and trustworthy information is his top priority. "A couple of days after a big BRNZ event in Kaitaia, I met a man in the shopping centre who was worried about his wife's symptoms. I contacted Professor Ngaire Kerse who got back to me a day later with all this information I could pass on. And when Richard and Ngaire spoke to that group of kaumātua, they used language that everyone could digest. That work is very important because it builds relationships."

> Māori researchers within BRNZ's network play a key role in forging those relationships, as Waiora explains, "Makarena Dudley is a good example of this. There was such a sense of

> > LEFT: Co-Director Cliff Abraham and Dr Waiora Port at the BRNZ 2021 conference.

pride amongst the kaumātua in Kaitaia when we went there - one of their own was doing all this great work, and she'd brought these important people with her to speak to them. It was wonderful. But we have to keep pushing, and make sure that researchers actually get the promotions they deserve, so we see more Māori professors." She continues, "I really believe in the Treaty [Te Tiriti o Waitangi], and the closer we get to actually living its principles, and enabling equity for all, the better it'll be for everyone."

"There are lots of people to acknowledge, but you have to start with Sir Richard Faull," says Lloyd. "He's the one who planted the seed, and really kickstarted this transition. He's had some key people around to support him – the likes of Hinemoa [Elder]. They had dreamed of establishing relationships between the university and the Māori community, and now it's happened."

RIGHT: The Venerable Lloyd Popata addresses CoRE members at the BRNZ 2021 Conference.

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"I've met some amazing people here; people driven by their principles, including Professor Peter Thorne and Professor Cliff Abraham," says Waiora. "I know it might sound a bit blasé, but I firmly believe there's nothing we can't do if we pull together and give it our best." Though she admits to feeling sad that BRNZ's time is coming to an end, Waiora is philosophical about its future, "There is a Māori saying along the lines of 'We've gone too far for us to turn back. We must keep going (Tawhiti rawa i tō tatou haerenga atu te kore haere tonu).' And that's how I think we all feel about this. And who knows, maybe it'll just encourage us to think harder and tap into alternative funding sources. The work will continue, because it must."



Our journey towards cultural competency

In Aotearoa New Zealand, Māori have the worst health inequality of any group.

They have a lower life expectancy and higher mortality rates, are less likely to have access to services and get effective treatment, and have on average the poorest health status of any ethnic group in New Zealand.

TO overcome the disparities that exist between the health status and outcomes of Māori and non-Māori, we have a lot of work to do: We need to give Māori access to high quality, culturally appropriate health service, overcome bias in research and practice, and reduce cultural misunderstandings. BRNZ is strongly committed to breaking down these barriers and actively improve the health outcomes for Māori. We have been working hard to incorporate Mātauranga Māori into our research and clinical work, and encourage our members to adapt culturally responsive practices. To support our researchers and clinicians on this journey, we have given them the opportunity to participate in a training programme to improve their cultural competency.

In 2018, BRNZ adopted the Takarangi Cultural Competency programme as a framework for our researchers and clinicians to develop the necessary skills and knowledge to provide culturally competent research and health care services. Led by Whaea Moe Milne and her whānau, the Takarangi Framework offers participants a tool against which they can measure their level of cultural competency and a pathway to further build up their competency.

In 2020, we offered more training opportunities to our members across Aotearoa New Zealand, with Takarangi wānanga held in Tāmaki Makaurau (Auckland), Ōtautahi (Christchurch) and Ōtepoti (Dunedin), as well as a oneday workshop in Christchurch focused on engaging with Māori. After three years on this journey, almost 80 of our researchers, students and clinicians have completed at least one Takarangi workshop.

"By viewing our normal practice in biomedical science, which seems so far away from Māori in some aspects, through the lens of Takarangi, I became enlightened and excited about how we can now start the process of transforming our practice to infuse Mātauranga Māori throughout." Takarangi attendee



"I found the explanation of concepts from [a] Māori perspective extremely helpful. It feels like a step in the right direction to increasing my ability to engage more meaningfully with Māori colleges and participants."

Takarangi attendee

The programme introduces participants to the 14 competencies of the Takarangi framework (for example, te reo, waiata and karakia), and demonstrates how they can assess their current level and reach the next stage of competency. Whaea Moe also places high importance on how the competencies can be applied in a professional context. Several members have now completed the second stage of the training and could focus on extending their knowledge base further and learn about the assessor process in more detail.

It has been three years since we have embarked on our Takarangi journey, and it is clear that cultural competency is an ongoing process. And while we still have a long way to go, we think we are making steps in the right direction towards helping our members and BRNZ as a whole become true Treaty partners, support our Māori researchers and clinicians, and help Māori gain access to high quality, culturally appropriate health care service.



Kua hina te tōtara i Te Waonui a Tāne.

Last year we sadly farewelled our esteemed kaumātua and dear friend, Piripi Daniels, who passed away in July 2020. Piripi was very dear to BRNZ. He was a valued member of our Māori Advisory Board and provided considerable support to many of the Māori research projects and Māori researchers within BRNZ. Although at times he struggled with health problems, he attended as many BRNZ activities and functions as he could, often offering karakia and karakia kai. Piripi had a profound impact on BRNZ. He was committed to sharing his wisdom and acted as a guiding light for us. He always had a whakataukī to share and his command of te reo Māori inspired us all. We will remember Piripi as a humble, generous and thoughtful advisor, friend and leader.

A talented Māori and Pacific workforce

From the beginning of BRNZ, increasing Māori capability and improving Māori health outcomes have been fundamental goals of our Centre of Research Excellence. We are convinced that research done for Māori is best done with and led by Māori – that's why we see our ever-increasing Māori workforce as one of our greatest strengths.

In 2020/21, three Māori PhD students (Alehandrea Manuel, Sophie Mathiesen and Justine Camp) and an Eru Thompson Postdoctoral Fellow (Dr Julie Wharewera-Mika) pursued research at BRNZ.

BRNZ MĀORI PHD SCHOLARS



Justine Camp (Kāi Tahu, Kāti Mamoe, Waitaha):

Understanding the ageing brain in the context of navigation and papakaika. University of Otago, supervised by Associate Professor Anne-Marie Jackson.



Alehandrea Manuel (Ngāti Porou):

Taringa Whakarongo: Older Māori and whānau experiences and perspectives of hearing loss and hearing health care services. University of Auckland, supervised by Associate Professor Elana Curtis and Associate Professor Grant Searchfield.



Sophie Mathiesen (Ngāpuhi):

Enhancing lysosomal function as a treatment strategy in a novel Alzheimer's disease mouse model. University of Otago, supervised by Associate Professor Stephanie Hughes and Professor Cliff Abraham.

ERU THOMPSON POSTDOCTORAL FELLOW



Dr Julie Wharewera-Mika (Ngāti Awa, Ngāi Tuhoe):

Kia ora ai te Iwi – Decolonising clinical practices and therapeutic pathways for Māori living with neurodegenerative diseases. University of Auckland, supervised by Dr Makarena Dudley.

We were also proud to award four summer scholarships to emerging Maori and Pacific researchers, giving them the opportunity to complete a 10-week neuroscience research project supervised by one of our investigators. In 2020, we welcomed these students to the BRNZ whānau:

2020/21 MĀORI SUMMER RESEARCH SCHOLARS

Herewini Iverson (Ngāi Te Rangi, Ngāti Whakaue): A Pilot study to evaluate the Māori Assessment of detecting mate wareware in tangata whenua. University of Auckland, supervised by Dr Makarena Dudley.

2020/21 PACIFIC SUMMER RESEARCH SCHOLARS

Amanda-Rose Sesio Couchman (Letufuga I Safotulafai,



Jasmyn Williams (Ngāi Tahu, Ngāti Tūwharetoa, Uenuku, Ngāti Apa, Ngāti Rangi): Accurate identification of white matter lesions *in the brain*. University of Otago, supervised by Dr Tracy Melzer.

Simina Toimata (Tonga, Cook Islands, Niue): Does soluble amyloid precursor protein-alpha mediate signaling by multiple neurotransmitters in the rat brain? University of Otago, supervised by Professor Cliff Abraham and Dr Bruce Mockett.

BELOW: Brain Research New Zealand Māori rōpū at the 2021 conference in Queenstown.

COMMUNITY ENGAGEMENT





To BRNZ, quality community engagement means working collaboratively with the wider public to realise our vision of lifelong brain health for all New Zealanders. As a Centre of Research Excellence, our core business is cutting-edge science, but it does not happen in a vacuum. By taking it to the people, raising awareness, involving communities in our research and stimulating debate, our research has the power to facilitate change - in individuals, services, and health outcomes.

The CoRE has built strong networks, relationships and initiatives that have been instrumental in encouraging the uptake of our research. Our scientists have shared their findings with community groups, healthcare providers, schools, the media, and the wider scientific community. In 2020 and 2021, many of our event-based initiatives such as Brain Day, Brain Bee and conferences were disrupted by the COVID-19 pandemic. However, the extended lockdowns also led us to develop new, creative ways to engage with the community - some key highlights are set out here.

Engaging community groups

The close collaboration with New Zealand's community groups is central to BRNZ's work and mission. They help us communicate our research findings to the people who need the information most, but their insights and expertise also help us shape our research to make sure it is relevant and conducted in a way that helps the community.

WE are very grateful to many of the key community NGOs such as Alzheimers New Zealand, Dementia New Zealand, Parkinson's New Zealand, Age Concern, and the Stroke Foundation, which have worked with us and generously committed time to support BRNZ and its mission. We developed genuine, respectful and mutually beneficial partnerships which have enriched the CoRE and supported the development of a transdisciplinary approach to its research. As examples, in 2020 and 2021, representatives of each these organisations joined our 2021 Conference to give talks about their own work and share their vision for the future of our partnership. With Dementia New Zealand, we worked on "The Brain Demystified", a video series created

BELOW: BRNZ Co-Directors with community group representatives at the 2021 conference.



in collaboration with Summerset Retirement Villages, in which BRNZ researchers talk about the brain and how to keep it healthy. Our Dementia Prevention Research Clinics and Associate Professor Lynette Tippett also featured in their Knowledge Exchange Webinar Series and at Dementia Auckland's "Dementia Talks" on Brain Health in 2021.

In 2020, BRNZ Principal Investigator Dr Makarena Dudley was awarded the annual Alzheimers New Zealand Fellowship, which Alzheimers New Zealand established to further research on dementia and its impact on individuals, whānau, communities, the health system, economy and society in New Zealand.

Celebrating and invigorating women in science

Within BRNZ, female investigators and students make up more than 60 per cent of our membership. However, many biases and barriers still need to be dismantled: In New Zealand, female academics earn \$400,000 less than their male counterparts throughout their career. Globally, less than 30 per cent of researchers are female.

IN 2020, BRNZ took International Day of Women and Girls in Science on 11 February as an occasion to do more. We supported a campaign by best-selling author Laurie Winkless to get a copy of "Inferior: How Science Got Women Wrong and the New Research that's Rewriting the Story" into every secondary school in New Zealand. Written by Angela Saini, the book celebrates women's contributions to science, and challenges and debunks the biases and gender-based stereotypes in science. It gives girls and women the tools to fight biases and the research that proves that gender or sex does not limit their potential.

We also dedicated February 2020 to send our top female researchers to schools across the country to talk about their careers in science. Research has shown that students who spend time with working scientists have a much more positive impression of STEM careers than those who only hear about it in school, so this seemed like the perfect endeavour for BRN7

Finally, we started a blog series on our website to showcase some of the brilliant female neuroscientists who work at BRNZ. They shared what inspires them, what they love most about their work, and the challenges they have had to overcome.

We hope that with initiatives like this, we can support and promote our female scientists, and at the same time, inspire the future generation of female scientists and show them the amazing things they too can achieve - for themselves, and ultimately, for all of New Zealand.

"One of the greatest challenges I face as a female scientist is to overcome the stereotypic image of a scientist – which I feel is a key driver of imposter syndrome in female scientists."

DR YUKTI VYAS

"Science and particularly neuroscience needs female scientists. There is a huge scope to make a difference to the world, and to have an exciting and longlasting career."

DR RITA KRISHNAMURTHI



"Bias against women in science is still an issue... If (or when) we find ourselves in a position to remove a barrier or reduce the impact of a bias, we need to act in a positive way to break the cycle and effect change when in leadership roles."

DR TONI PITCHER

Being Brainy

ONE of the big success stories of our outreach programme is Being Brainy, a science programme for primary and intermediate schools. It is a teaching resource all about the human brain and is packed with experiments and exciting activities. Since its launch in 2017, Being Brainy has grown steadily under the leadership of Prof Bronwen Connor: Over 400 schools and education providers have signed up for the programme, and our scientists have shared their passion in numerous school visits and events. In 2020 and 2021, we have further developed and extended the programme with a school holiday and events programme, lockdown activities, and a new activity booklet.

While the COVID-19 pandemic interrupted part of our outreach activities, our Being Brainy team tackled the challenge head-on. They went on virtual school visits and starred on TV – Dr Malvindar Singh-Bains talked about the brain on Nanogirl Dr Michelle Dickinson's "Breaking It Down" show on TVNZ's home learning channel. Our team also created "The Being Brainy Lab", a series of science videos for children. The episodes explored how the brain communicates, brain damage, learning and memory, hearing, and Alzheimer's disease. Each video included activities or



Once lockdown restrictions eased in 2020, we thought about ways to reach more children outside of schools as well. We partnered with local libraries in Dunedin and Auckland, and the New Zealand International Science Festival to run Brain Labs, school holiday events for children using our Being Brainy resources and expertise. We have now held 12 of these Brain Labs - including at bigger events such as the STEM Fair at the Museum of Transport and Technology in Auckland and the A&P Show in Gisborne - and have taught hundreds of enthusiastic children (and their parents) about the human brain.

For our Being Brainy volunteers, most of them early career researchers, it is exciting to meet so many curious children, be challenged by their questions, and share what life as a scientist looks like. With programmes like Being Brainy, we want to feed and grow children's curiosity and show them that there are still so many unanswered questions in science - and that they could be the ones answering them.

Brain Research New Zealand's 2021 conference

In 2021, we held an outstanding national conference, bringing together our researchers, clinicians and community partners from across New Zealand to discuss brain research and the future of BRNZ. The conference, held from 13-16 April at the Crowne Plaza Hotel in Queenstown, started with a 2-day meeting of our national Dementia Prevention Research Clinics and a wānanga of our Māori researchers.

THE conference featured sessions on our centre's portfolios, namely stroke, Parkinson's and Huntington's disease, healthy brain ageing and Alzheimer's disease and other dementias. Our investigators and early career researchers were joined by our community partners, who shared their work and unique perspectives. We thank in particular Nita Brown (Stroke Foundation), Stephanie Clare (Age Concern), Tammy Ramsey-Evans (Parkinson's New Zealand), Anne Schumacher (Dementia Wellington), and Catherine Hall (Alzheimers New Zealand) for their support of BRNZ, and for providing their perspectives of the needs by the people in our ageing population and their whanau.

Our early career researchers also had plenty of opportunities to shine in our poster session and our new "Launch My Lab Competition". In the poster session, Courteney Westlake from the University of Otago took away the prize for best poster ("Investigating plasticity-related proteins and the therapeutic potential of sAPP α "), followed by Leon Griner from the Dementia Prevention Research Clinics/University of Auckland ("APOE genotyping of DPRC participants"), and Sophie Mathiesen from the University of Otago ("Investigating enhanced gene transfer to the mouse central nervous system using modified viral vector AAV-PHP.eB").

In our Launch My Lab Competition, six early career researchers ready to move into faculty positions presented their visions for setting up their own lab and captivated their audience with their creativity. Dr Kyla-Louise Horne (University of Otago, Christchurch) snapped up first place for her inspiring pitch titled "Confusing beliefs with

perception". Dr Helen Murray (University of Auckland) took second place with a poetic pitch titled "Neuropathology in contact sport athletes", and Dr Joan Leung won third place with "The neural basis of sensory dysfunction."

On the third day, we celebrated BRNZ and its people in a roaring conference dinner at the Skyline Restaurant. We were treated to speeches by Professor Juliet Gerrard, Chief Science Advisor to the Prime Minister, as well as Professor Suzanne Purdy and Emeritus Professor Warren Tate, who acknowledged the dedication and the work the BRNZ Co-Directors Professor Peter Thorne and Professor Cliff Abraham have put into our Centre of Research Excellence over the years.

A highlight of our programme was a session on the Dementia Prevention Research Clinics, featuring the Faull Lecture. First delivered in 2019 by Professor Mike Dragunow, the Faull Lecture was established to acknowledge Sir Richard Faull's role in co-founding BRNZ and celebrate his contribution to neuroscience. In 2021, Associate Professor Lynette Tippett delivered the Faull Lecture titled "The journey of the Dementia Prevention Research Clinics and their people: Past, present and the future".

We finished the conference with a discussion centred on the future of BRNZ, given our failure to obtained renewed funding from TEC. Thus this conference was the perfect opportunity for everyone to discuss ways forward, ways to stay connected, and to start building our new organisation, the Aotearoa Brain Project - Te Kaupapa Roro o Aotearoa.



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BRNZ partnerships with the community: working together to meet present and future challenges

Age Concern New Zealand - Stephanie Clare, Chief Executive

AGE Concern New Zealand is a nationwide organisation that champions education, support, and engagement for older New Zealanders. Stephanie Clare, their Chief Executive, explains that the organisation grew out of a community drive to help older people. "In the beginning it was just locals getting together to support older people with food, with driving services, with activities, to help meet people's needs," she says, "and over the past 70 years it has grown across the country. There are 35 branches now, from the far north all the way down to Invercargill."

This strong connection with the older community made Age Concern New Zealand an obvious partner for BRNZ, as they developed the Healthy Brain Ageing portfolio. Along with a number of other community organisations, Age Concern New Zealand brought real-world knowledge into the partnership that helped to fine-tune BRNZ's understanding of what life is like as we age, and what people need from

research organisations. "Everyone who is ageing out there wants to age well, and they need the tools and information to do so," Stephanie says. "They're looking, just as much as anybody else, to experts for the answers." The Healthy Brain Ageing portfolio, along with a series of webinars released during 2020, gave people access to that information. Age Concern New Zealand were able to update best practices based on cutting edge research, integrate those best practices into their existing systems, and then give that information to people who were searching for answers on how best to age with health and dignity.

"It has been a brilliant relationship," Stephanie says, "I can't tell you how helpful they've been, or how open and inviting they've been just as people." The open communication between BRNZ and Age Concern New Zealand made this partnership possible, and together they've worked to bridge the gap between research and the people it is meant to help.

"It has been a brilliant relationship. I can't tell you how helpful they've been, or how open and inviting they've been just as people."



HERE at Alzheimers NZ, we are proud to have been working in partnership with Brain Research New Zealand (BRNZ) since the very start. It has been wonderful to build this relationship over the years and see the organisation go from strength to strength, led by Professors Cliff Abraham and Peter Thorne, and supported by Sir Richard Faull - who also happens to be Alzheimers NZ's wonderful Patron.

Dementia is one of our most significant and growing healthcare challenges. More than 70,000 New Zealanders are living with dementia today, and this number will continue to rise sharply, with the numbers of kuia and kaumātua, Pacific and Asian elders affected by dementia growing even faster. The fact remains that we need to do much, much more to better support everyone who is affected by dementia, and having good quality, timely research is a big part of that. It's therefore disappointing to know that despite the size and scale of the issue facing us, there is currently no New Zealand specific prevalence data to inform our response.



Alzheimers New Zealand - Catherine Hall, Chief Executive

The Dementia Mate Wareware Action Plan, which has been presented to government, urges them to (among other things) "increase investment in research on dementia...", with a focus on "culturally appropriate ways of describing and approaching dementia for tangata whenua" and "on what works to support people living with dementia." We need to do more to support people living with dementia to exercise their rights and to participate in research and put these voices at the centre of all research that we do. That is what people living with dementia have been asking for decades.

It has been really encouraging to see the tide start to turn in recent years with a number of BRNZ initiatives which have rightfully put these voices at the front and centre, such as the development of the Mate Wareware App, led by Dr Makarena Dudley. We have lots of fond memories of collaborations over the years - talking to people about dementia beside a big inflatable brain never failed to draw a crowd!

We all have a role to play in achieving a dementia friendly future, and we are looking forward to continuing this work with the committed BRNZ research team.

"The fact remains that we need to do much. much more to better support everyone who is affected by dementia, and having good quality, timely research is a big part of that."

INTERNATIONAL ENGAGEMENT



International partnerships continued to help shape the work of BRNZ during 2020 and 2021, despite the severe international travel restrictions imposed by the COVID-19 pandemic.

Institutional partnerships and global strategies

OVER the last few years, BRNZ has developed a very strong collaborative relationship with neuroscientists and neurologists in China, particularly several key individuals and groups at Huashan Hospital and Fudan University in Shanghai. These included reciprocal symposia and research meetings in Shanghai and New Zealand in 2017-2019, and the signing of a Memorandum of Understanding between BRNZ and the Huashan Hospital of Fudan University in Shanghai, and with the Shanghai Institute for Mental Health. Out of these meetings, collaborative projects were developed and eventually funded through New Zealand and Chinese funding agencies, and a joint research laboratory was established at Huashan Hospital.

To maintain the momentum from these joint meetings during the pandemic, BRNZ and Chinese collaborators took part in a virtual Brain Sciences symposium in March 2021. The Brain Sciences symposium was a stream of the second China-New Zealand NCD Cooperation Forum hosted by the China National Center for Biotechnology Development (CNCBD) and the New Zealand-China Non-Communicable Disease Research Collaboration Center (NCD CRCC). Four New Zealand researchers presented alongside four Chinese researchers and the ensuing discussion of the delegates identified further collaborative research opportunities.

In May 2021, Co-Director Professor Cliff Abraham presented at an International Brain Research Organisation virtual symposium focused on translational neuroscience in the Asia-Pacific region. His focus was of course 'Translational Brain Research' in New Zealand, and he took the opportunity to draw on many aspects of BRNZ's research outcomes and capability as examples of translational neuroscience in Aotearoa.



International collaborative research projects

RESEARCHERS in BRNZ continue to build international collaborations in research areas supported by the CoRE. Even through the COVID-19 pandemic, Dr Helen Murray, a previous BRNZ Postdoctoral Fellow (funded by the Health Education Trust), maintained her active collaboration with Dr Alan Koretsky and Dr Leonardo Belluscio at the National Institutes of Health, USA, investigating the anatomical changes and a potential mechanism of degeneration in the Alzheimer's disease olfactory bulb. Associate Professor Yiwen Zheng from the University of Otago published results of a collaborative study with the China Pharmaceutical University that they established in 2018. This work has focused on identifying biomarkers using metabolomics and developing effective tinnitus treatment from traditional Chinese medicines, and received funding from the HRC Partnership programme for NZ-China NCD and an International Cooperation in Science and Technology project grant from the China Ministry of Science and Technology. Professor Ping Liu continued her collaborative work on



biomarkers for Alzheimer's disease and schizophrenia with colleagues at the Shanghai Mental Health Centre, and also received additional funding for this collaboration from the Ministry of Business, Innovation and Employment (MBIE) via the New Zealand-China NCD-CRCC Programme.

Two other BRNZ researchers also received funding from MBIE via the NZ-China NCD-CRCC Programme for collaborative research projects with Shanghai researchers. Professor Russell Snell has commenced a study with a colleague at Fudan University to understand the genetic changes that underpin the disease symptoms in a new sheep model of early phase Huntington's disease. Professor Tim Anderson has linked with clinical researchers at Huashan Hospital to test whether artificial intelligence computer vision and machine learning performs as well as, or better than, conventional expert clinical assessment in the detection and measurement of motor abnormalities in Parkinson's disease.

World Health Organisation

THE World Health Organisation launched the 1st World Report on Hearing in March 2021 after a substantial delay because of the pandemic. Co-Director Professor Peter Thorne was a member of the core editorial advisory group which worked with the WHO to prepare this evidence-based report. He is also a member of several working groups monitoring the global uptake of the report and measuring success against a number of global public health targets to reduce the prevalence and impact of hearing loss and ear disease in communities.



Awards and accolades

1. Associate Professor Anne-Marie Jackson received

the Ako Aotearoa Sustained Excellence in Tertiary Teaching for the Kaupapa Māori category in 2020. This award acknowledges her development and delivery of Kaupapa Māori physical education and health papers at both undergraduate and postgraduate levels. Anne-Marie was also a co-recipient of the 2020 University of Otago Rowheath Trust Award and Carl Smith medal, which is one of the Universities' top research honours for early career researchers.

2. Professor John Reynolds was the inaugural recipient of the University of Otago Division of Health Sciences Excellence in Education Award, in recognition of his work in redeveloping the Health Sciences First Year programme.

3. Professor Richie Poulton, director of the University of Otago's Dunedin Multi Disciplinary Health and Development Study, was again named in the top 1% of the most-cited researchers in the world by Clarivate Analytics for 2020. Richie is also the second most highly cited researcher in history from the University of Otago, ranked #2046 in the world for top citations according to Google Scholar.

4. Professor Suzanne Purdy was appointed a Companion of the New Zealand Order of Merit in the 2021 Queen's Birthday Honours for her services to audiology and communication science. Suzanne was also awarded the American Academy of Audiology International Award for Hearing in 2021, to acknowledge her contribution to the profession of audiology across her 30+ year career.

5. Professor Ngaire Kerse was appointed a Member of the New Zealand Order of Merit in the 2020 New Year Honours for her services to seniors and health. Ngaire has led multiple studies into improving health and wellbeing for older New Zealanders, in part supported by BRNZ.

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6. Dr Yukti Vyas received the 2020 John Hubbard Memorial Prize from the Physiological Society of New Zealand in recognition of excellence in studies towards a PhD. Yukti also won the Best Elevator Pitch prize at the Postdoctoral Research Forum 2020, held by the Faculty of Medical and Health Sciences at the University of Auckland.

• At our annual BRNZ conference, Courtency Westlake was awarded the prize for best poster, for her work "Investigating Plasticity-Related Proteins and the Therapeutic Potential of sAPPa".

• Dr Kyla-Louise Horne won first place for the inaugural Launch My Lab competition, with her proposal for a lab concept titled "Confusing beliefs with perception".

• Sophie Mathiesen was one of the inaugural recipients of the 20Twenties Young Alumni Awards from the University of Otago for her contribution to science communication. These new annual awards have been established to celebrate the achievements of 20 University of Otago alumni who are still in their twenties.





Student focus

• Karan Govindpani received the 2020 Goddard Prize for best PhD oral presentation at the Virtual Australasian Winter Conference on Brain Research.



- Ann George was selected as a Paul Dudley White International Scholar at the Epidemiology and Prevention/Lifestyle and Cardiometabolic Health 2020 Scientific Sessions Conference, held in Phoenix, Arizona in March 2020. Ann received the award as the presenting author of the highest ranked abstract submitted from New Zealand for her work
- "Health beliefs shaped by experiences of socioeconomic deprivation and psychosocial distress is critical to maintaining lifestyle choices for reducing stroke risk".



In the media

With such a large proportion of New Zealanders learning what they know about science through the media, featuring in newspapers, radio broadcasts, TV and on the internet is one of the most powerful ways to share our research. In 2020/21, our researchers and their work featured in national media on average almost six times a week. Here are some examples of our research being featured during the last year:

- Professor Tim Anderson and Dr Toni Pitcher, researchers at the NZ Brain Research Institute, were featured on RNZ and NZ Herald about their research on the genetic and environmental risk factors that can influence the development of Parkinson's disease.
- Associate Professor Rita Krishnamurthi and Professor Valery Feigin were featured in various media for their research on improving stroke education through their app, the 'Stroke Riskometer'. Trials in a largely Māori and Pasifika population showed the app motivated people to change their lifestyle to reduce their risk of stroke. This translated to a decrease in stroke risk of 3%, or about 300 strokes per year if used by the whole population.
- Dr Helen Murray appeared on TVNZ's Breakfast show and RNZ's Nine to Noon to discuss her research into chronic traumatic encephalopathy (CTE) and its link to repetitive head injury, particularly in players of contact sports.
- Dr Malvindar Singh-Bains talked to Newsroom about her work with youth who are descendants of people with Huntington's disease - a disease that has a 50% chance of inheritance. As co-chair of the Huntington's Disease Youth Organisation of NZ (HDYO-NZ), Malvindar helps young people to decide whether to undergo genetic testing to determine whether they will develop the disease.
- After multiple years of development, Dr Makarena Dudley launched her app, 'Mate Wareware', a Māori-centric resource about dementia. The app is designed to be used by all generations of whanau, from kaumatua to mokopuna, to educate about mate wareware symptoms and risk factors, and how to care for someone with mate wareware. Makarena was interviewed by Māori TV and featured in an episode of New Zealand Herald's 'The Brains Trust: Dementia' series.

- Several of our lead investigators, including Associate **Professor Lynette Tippett, Distinguished Professor Sir** Richard Faull, and Dr Makarena Dudley contributed to the NZ Herald's 'The Brains Trust: Dementia' series, which followed six stories from New Zealand families who are affected by dementia.
- Professor Warren Tate has spent a large portion of his career studying myalgic encephalomyelitis (ME), commonly known as chronic fatigue syndrome. He featured heavily in the news for his discovery of molecular disturbances in ME, debunking the myth that the disorder is psychosomatic, and for highlighting the similarities between ME and 'long COVID-19'.

While the COVID-19 pandemic put the world on pause, our researchers found opportunities to expand their investigations to advance understanding of how COVID-19 may have long-term implications for brain health, and provide crucial advice on maintaining brain health during the pandemic - both physiologically and psychologically.

- Dr Helen Murray talked to Stuff about her research into COVID-19-related changes in the olfactory bulb, the part of the brain connected to the nose. This study was made possible by collaboration with the US National Institute of Health (NIH), who provided the brain tissue samples from COVID-19 patients.
- Dr Malvindar Singh-Bains was featured on RNZ's Nine to Noon to describe some of the neurological symptoms being discovered in COVID-19 patients and emphasised the importance of wearing masks to cover your nose, since the nose is a direct link between the outside world and the brain.



- Professor Ngaire Kerse, Professor Denise Taylor, Dr Gary Cheung, Liz Binns, and Dr Phil Wood were part of a team that developed 'Healthy for Life', a TVNZ special to help older people stay physically active during the COVID-19 lockdown. The special focused on an exercise programme that can be done at home called 'Super7', developed by Denise and Liz at AUT.
- Associate Professor Liana Machado, Associate Professor Louise Parr-Brownlie and Dr Gary Cheung all spoke to the media about the disproportionate effect of the pandemic on our elderly population, and the importance of staying connected and mentally active when access to the outside world is restricted.
- Several BRNZ members wrote opinion pieces for Newsroom during the pandemic. Professor Maurice Curtis wrote about the sense of smell and its connection to neurodegenerative diseases and COVID-19, Associate Professor Grant Searchfield wrote about remote healthcare, and Dr Victor Dieriks wrote about the longterm effects of COVID-19 and the need for a vaccine.

Brain Research New Zealand's researchers are eminent members of the international science community and hold leadership and research advisory positions in many professional bodies, Non-Government Organisations and New Zealand-based charities. Here are some examples of national and international entities that BRNZ researchers dedicated their time and expertise to in 2020 and 2021:

National

- Age Concern Otago
- Alzheimer's Association Otago
- Alzheimers New Zealand Charitable Trust
- Auckland Medical Research Foundation
- Canterbury Medical Research Foundation
- Deep Brain Stimulation (DBS) Committee, Department of Health
- Health Research Council
- Health Research Society of Canterbury
- Healthy Hearts for Aotearoa New Zealand (HHANZ)
- High Performance Sport New Zealand
- Lottery Health Research Committee
- Minds For Minds Research Trust
- · Ministry of Business, Innovation and Employment
- Ministry of Social Development
- Muscular Dystrophy Association of New Zealand
- · National Animal Ethics Advisory Committee
- Neurological Foundation
- Neurology Association of NZ
- New Zealand Association of Gerontology
- New Zealand Health Research Council College of Experts
- New Zealand Physiological Society
- New Zealand Society for Biochemistry and Molecular Biology

- New Zealand Society for Dizziness. Balance and Vertigo Incorporated
- New Zealand Society for Microscopy
- New Zealand Statistical Association
- New Zealanders for Health Research
- Ngā Pae o te Māramatanga
- Northern Region Stroke Network
- Northern Rehabilitation Consortium (NRC)
- Pacific Radiology Research and Education Trust
- Parkinson's New Zealand
- Physiological Society of New Zealand
- Royal Society of New Zealand
- Social Wellbeing Agency
- Stroke Central Region Inc.
- Stroke Foundation
- Te Pou o Te Whakaaro Nui, New Zealand's National Centre
- of Mental Health Research and Workforce Development
- The New Zealand Deafness Research Foundation
- Toi Tāngata Network National Māori Physical Activity
- and Nutrition Network
- Water Safety New Zealand
- Wise Trust
- International
 - Australasian Winter Conference on Brain Research
 - Australia and New Zealand Falls Prevention Society
 - Australian & NZ Society for Sarcopenia & Frailty Research
 - Australian Research Council (ARC)
 - Australian Society of Geriatric Medicine
 - Austrian Research Foundation
 - Biogen Pharmaceutical, Boston, USA
 - · Board of Australian Course in Advanced Neuroscience

- · Canadian Partnership for Stroke Recovery
- Federated Association of Asian and Oceanian Neuroscience Societies
- Human Frontiers Fellowships
- Human Frontiers Science Program
- International Basal Ganglia Society
- International Brain Research Organisation
- International Cannabinoid Research Society
- International Institute for Brain Health, Zagreb, Croatia
- International Parkinson and Movement Disorder Society
- International Society for Cerebral Blood Flow and Metabolism (ISCBFM)
- · International Society for Neuroscience
- International Society to Advance Alzheimer's Research and Treatment (ISTAART)
- · International Stroke Society, USA
- · International Symposium on Neuroprotection and Neurorepair

- Alzheimer's and Dementia
- American Journal of Physiology
- Annals of Neuroscience
- Brain and Neurosciences Advances
- Brain Sciences
- Current Opinion in Neurobiology
- eLife
- European Journal of Neuroscience
- European Medical Journal Neurology
- Frontiers in Neurology
- Frontiers in Neuropharmacology
- Frontiers in Neuroscience
- Frontiers in Psychology
- Frontiers in Systems Neuroscience
- Hippocampus
- International Journal of Molecular Sciences
- · Journal of Alzheimer's Disease
- · Journal of Gerontology: Social Sciences
- Journal of Neurophysiology
- Journal of Neuroscience
- · Journal of Otolaryngology and Hearing and Balance

American Tinnitus Association (ATA)

· Action for Hearing Loss, UK

• Alzheimer's Association, USA

American Academy of Neurology

- Australasian Neuroscience Society
- Australasian Society for the Study of Brain Impairment (ASSBI)

- Medical Research Council, UK
- Ministry of Health, Cook Islands
- National Health and Medical Research Council, Australia
- National Institute for Health (NIH), USA
- National Research Foundation, Singapore
- Rehabilitation, Ageing and Independent Living (RAIL) **Research** Centre
- · Society for Neuroscience, USA
- Stroke Association, UK
- Stroke Society of Australasia
- Wellcome Trust, UK
- World Federation for Neurorehabilitation
- World Federation of Neurology Specialty Group on Neuroepidemiology
- World Health Organisation Global Burden of Disease
- World Stroke Organization

Editorial Boards

BRNZ researchers serve on numerous journal editorial boards. Some examples include:

Medicine

- Journal of Speech, Language and Hearing Research
- · Journal of Stroke Medicine
- Kotuitui: New Zealand Journal of Social Sciences
- MAI Journal
- Molecular Brain
- Movement Disorders Clinical Practice
- Neurobiology of Learning and Memory
- Neuromodulation
- Neuropharmacology
- Neuroscience
- Neuroscience and Biobehavioral Reviews
- Neuroscience Letters
- · Parkinsonism and Related Disorders
- PLOS ONE
- · Scientific Reports Nature
- Thalamus and Related Systems
- The Open Neurosurgery Journal
- The Open Translational Medicine Journal
- World Neurosurgery

OUR PEOPLE

Governance Board

BRNZ is privileged to have the support of prominent New Zealanders and academic leaders who are committed to helping us achieve our goals.

Our Governance Board members in 2020/2021:



Chair of the BRNZ Governance Board (2020).



Professor Kathryn McPherson Deputy Vice-Chancellor at the Auckland University of Technology.

Deputy Vice-Chancellor (Research) at the



Mr Tony Offen

Sir Don Mckinnon

Chair of the BRNZ Governance Board (2020/2021), Dunedin accountant, entrepreneur and member of the Council of the Neurological Foundation of New Zealand.



CRSNZ, Chair of Alzheimers New Zealand Charitable Trust, Honorary Vice-President of Alzheimer's Disease International and Past-Chair of Alzheimer's New Zealand.



The Venerable Lloyd Nau Pōpata Archdeacon of Tāmaki Makaurau.

Pou Tikanga - of Ngāti Kahu of Northland.



..... **Professor Richard Blaikie**

Deputy Vice-Chancellor (Research and Enterprise) at the University of Otago and Professor in Physics.



Professor Richard Barker Pro-Vice-Chancellor (Sciences) at the University of Otago.

Professor Jim Metson

University of Auckland.



Professor Ian Wright Deputy Vice-Chancellor at the University of Canterbury.

Professor John Fraser



Professor Stephen Davis

Professor of Translational Neuroscience at the University of Melbourne, Director of the Melbourne Brain Centre and Co-Chair of the Australian Stroke Alliance.



Professor Mark Bear

Professor of Neuroscience at the Picower Institute for Learning and Memory, Professor in Brain and Cognitive Sciences at the Massachusetts Institute of Technology.



Dean of the Faculty of Medical and Health Sciences at the University of Auckland.

Science Advisory Board

BRNZ's Science Advisory Board is made up of four internationally recognised experts in the neurosciences and neurology:



Professor John Rostas

Emeritus Professor of Biomedical Sciences in the Faculty of Health and Medicine, University of Newcastle.



Professor John Rothwell

Professor of Neurophysiology at the Institute of Neurology, University College London.

Māori Advisory Board

BRNZ is privileged to be able to call on the expertise of our Māori Advisory Board to provide guidance on the funding of neuroscience research that will have a positive impact on Māori health outcomes.



The Venerable Lloyd Nau Pōpata

Archdeacon of Tāmaki Makaurau, Pou Tikanga - of Ngāti Kahu of Northland (Co-Chair).



Associate Professor Emma Wyeth

BSc (Hons), PhD, Director of Te Rōpū Rangahau Hauora Māori o Ngāi Tahu (Ngāi Tahu Māori Health Research Unit) and a lecturer in Māori Health, both in the Department of Preventive and Social Medicine at the University of Otago.



Dr Waiora Port

BA, MA, PhD (Te Aupouri [Ngāti Pinaki], Te Rarawa [Ngāti Maroki]), a respected Kuia with long-standing community knowledge of Māori health issues (Co-Chair).



Associate Professor Louise Parr-Brownlie

.....

BSc, PhD, (Ngāti Maniapoto and Ngāti Pikiao), neurophysiologist and Kaiārahi at the Otago School of Medical Sciences, University of Otago.



Professor Papaarangi Reid

DipComH, BSc, MBChB, DipObst, FNZCPHM (Te Rarawa), Tumuaki and Head of Department of Māori Health at the Faculty of Medical and Health Sciences, University of Auckland.



Dr Cameron Lacey

.....

MB, ChB, PhD, (Te Atiawa), senior lecturer at the Māori/Indigenous Health Institute (MIHI) at the University of Otago, Christchurch.



Professor Wickliffe Abraham

- Co-Director
- BA with highest distinction, PhD; FRSNZ
- Synaptic plasticity, metaplasticity and the neural mechanisms of memory and Alzheimer's disease

Associate Professor Lynette Tippett

- · Associate Director, National Director -Dementia Prevention Research Clinics
- MSc (1st), DipClinPsych, PhD
- The clinical and neuropsychological effects of neurological disorders



Distinguished Professor Sir Richard Faull

- Māori Engagement and Fundraising
- MBChB, PhD, DSc; KNZM FRSNZ
- Neurodegenerative diseases of the human brain



Dr Hinemoa Elder

- Māori Strategy Leader
- MBChB, FRANZCP, PhD



Te Kaanga Skipper (Tainui), Te Roopu Taurima o Manukau



.....

Directorate



Professor Peter Thorne

- Co-Director
- BSc, DipSci, PhD; CNZM

• Diseases of the inner ear and the effects of noise and consequences of ageing on the auditory system



Professor John Reynolds

- Associate Director, Leadership development and capability building
- MBChB, PhD
- The role of neuromodulation and synaptic plasticity mechanisms in brain areas affected by Parkinson's disease and stroke



Professor Tim Anderson

- Clinical Engagement
- MBChB, FRACP, PhD
- Neurology with special interest in Parkinson's disease

Operations team

Alex Sweetman Business Manager Samuel Farr Administrator Dianne Stacevicius Administrator

Ella Fischer Marketing Advisor Sophie Mathiesen Administrator Dr Dean Robinson Research Operations Manager

Dementia Prevention Research Clinics

AUCKLAND

Associate Professor Lynette Tippett Dr Phil Wood Dr Christina Ilse Dr Gary Cheung Dr Kiri Brickell Jane Govender Fay Hall Dr Susan Yates Dr Annabelle Claridge Keith Woods Dr Erin Cawston Celestine Wong Leon Griner Dr Catherine Morgan Professor Ian Kirk Lydia Velzian

CHRISTCHURCH

Professor Tim Anderson Professor John Dalrymple-Alford Dr Tracy Melzer Dr Toni Pitcher Dr John Elliot Dr Campbell Le Heron Karelia Levin Marie Goulden

DUNEDIN

Dr Nick Cutfield Associate Professor Joanna Williams Annabel Dawson Nicola Collie Debra McNamara Dr Margaret Ryan

BRNZ investigators

NAME	POSITION TITLE
Wickliffe Abraham	Professor
Peter Thorne	Professor
John Reynolds	Professor
Lynette Tippett	Associate Professor
Tim Anderson	Professor
Richard Faull	Distinguished Professor Sir
Ruth Empson	Professor
Tim David	Professor
Makarena Dudley	Dr
Ian Kirk	Professor
Ngaire Kerse	Professor
Monica Acosta	Dr
Alan Barber	Professor
Margaret Brimble	Distinguished Professor Dame
Winston Byblow	Professor
Bronwen Connor	Professor
Garth Cooper	Professor
Sarah Cullum	Associate Professor
Maurice Curtis	Professor
Mike Dragunow	Professor
Jian Guan	Associate Professor
Janusz Lipski	Professor
Johanna Montgomery	Associate Professor
Suzanne Purdy	Professor
Grant Searchfield	Associate Professor
Russell Snell	Professor
Cathy Stinear	Associate Professor
Srdjan Vlajkovic	Associate Professor
Debbie Young	Associate Professor
Valery Feigin	Professor
Nicola Kayes	Associate Professor
Denise Taylor	Professor
Andrew Clarkson	Dr
Nick Cutfield	Dr
Dirk De Ridder	Professor
Leigh Hale	Professor
Stephanie Hughes	Associate Professor
Ping Liu	Associate Professor
Liana Machado	Associate Professor
Tracy Melzer	Dr
Pauline Norris	Professor
Louise Parr-Brownlie	Dr
Richie Poulton	Professor
Holger Regenbrecht	Professor
Ted Ruffman	Professor
Phil Sheard	Associate Professor

INSTITUTION University of Otago University of Auckland University of Otago University of Auckland University of Otago University of Auckland University of Otago University of Canterbury University of Auckland Auckland University of Technology Auckland University of Technology Auckland University of Technology University of Otago University of Otago

University of Otago

BRNZ STATUS

Co-Director, Pl	
Co-Director, PI	
Associate Director, PI	
Associate Director, PI	
Directorate member, PI	
Directorate member, PI	
Theme Leader and PI	
Theme Leader and PI	
Theme Leader and PI	
Theme Leader and PI	
Theme Leader and PI	
Principal Investigator	

NAME	POSITION TITLE	INSTITUTION	BRNZ STATUS
Paul Smith	Professor	University of Otago	Principal Investigator
Warren Tate	Professor	University of Otago	Principal Investigator
Joanna Williams	Associate Professor	University of Otago	Principal Investigator
Yiwen Zheng	Associate Professor	University of Otago	Principal Investigator
John Dalrymple-Alford	Professor	University of Canterbury	Principal Investigator
Gary Cheung	Dr	Auckland District Health Board	Principal Investigator
Richard Roxburgh	Dr	Auckland District Health Board	Principal Investigator
Suzanne Barker-Collo	Associate Professor	University of Auckland	Associate Investigator
Erin Cawston	Dr	University of Auckland	Associate Investigator
Peter Freestone	Dr	University of Auckland	Associate Investigator
Michelle Glass	Professor	University of Auckland	Associate Investigator
Catherine Morgan	Dr	University of Auckland	Associate Investigator
Simon O'Carroll	Dr	University of Auckland	Associate Investigator
Reece Roberts	Dr	University of Auckland	Associate Investigator
Henry Waldvogel	Associate Professor	University of Auckland	Associate Investigator
Rita Krishnamurthi	Associate Professor	Auckland University of Technology	Associate Investigator
Anne-Marie Jackson	Associate Professor	University of Otago	Associate Investigator
Andrea Kwakowsky	Dr	University of Otago	Associate Investigator
Ailsa McGregor	Dr	University of Otago	Associate Investigator
Toni Pitcher	Dr	University of Otago	Associate Investigator
Reremoana Theodore	Dr	University of Otago	Associate Investigator
Ari Bok	Dr	Auckland District Health Board	Associate Investigator
Edward Mee	Dr	Auckland District Health Board	Associate Investigator
Barry Snow	Associate Professor	Auckland District Health Board	Associate Investigator
Phil Wood	Dr	Auckland District Health Board	Associate Investigator

Postdoctoral Fellows

NAME	POSITION TITLE	INSTITUTION
Divya Adhia	Post-doctoral fellow	University of Otago
Faraz Ahmad	Post-doctoral fellow	University of Otago
Eliene Albers	Post-doctoral fellow	University of Auckland
Mustafa Almuqbel	Post-doctoral fellow	University of Otago
Christine Arasaratnam	Post-doctoral fellow	University of Auckland
Indranil Basak	Post-doctoral fellow	University of Otago
Rebekah Blakemore	Post-doctoral fellow	University of Otago
Nadia Borlase	Post-doctoral fellow	New Zealand Brain Research Institute
Karen Brewer	Post-doctoral fellow	University of Auckland
Juliette Cheyne	Post-doctoral fellow	University of Auckland
John Cirillo	Post-doctoral fellow	University of Auckland
Victor Dieriks	Post-doctoral fellow	University of Auckland
Beth Elias	Post-doctoral fellow	New Zealand Brain Research Institute
Jenny Hamilton	Post-doctoral fellow	New Zealand Brain Research Institute
Renee Handley	Post-doctoral fellow	University of Auckland
Sam Harrison	Post-doctoral fellow	New Zealand Brain Research Institute

NAME	POSITION TITLE	INSTITUTION
JaeBeom Hong	Post-doctoral fellow	University of Auckland
Kyla Horne	Post-doctoral fellow	University of Otago
Deidre Jansson	Post-doctoral fellow	University of Auckland
Yu (Rena) Jing	Post-doctoral fellow	University of Otago
Owen Jones	Post-doctoral fellow	University of Otago
Yewon Jung	Post-doctoral fellow	University of Auckland
Marijn Kouwenhoven	Post-doctoral fellow	University of Otago
Kevin Lee	Post-doctoral fellow	University of Auckland
Mariana Leriche Vzquez	Post-doctoral fellow	University of Otago
Joan Leung	Post-doctoral fellow	University of Auckland
Rhys Livingstone	Post-doctoral fellow	University of Otago
Sue Lord	Post-doctoral fellow	Auckland University of Technology
Amy McCaughey-Chapman	Post-doctoral fellow	University of Auckland
Nasim Mehrabi	Post-doctoral fellow	University of Auckland
Alexander Merkin	Post-doctoral fellow	Auckland University of Technology
Nicola Merrilees	Post-doctoral fellow	University of Auckland
Bruce Mockett	Post-doctoral fellow	University of Otago
Alexandre Mouravlev	Post-doctoral fellow	University of Auckland
Suzie Mudge	Post-doctoral fellow	Auckland University of Technology
Helen Murray	Post-doctoral fellow	University of Auckland
Daniel Myall	Post-doctoral fellow	New Zealand Brain Research Institute
Pritika Narayan	Post-doctoral fellow	University of Auckland
Imran Niazi	Post-doctoral fellow	Chiropractic College of New Zealand
Shane Ohline	Post-doctoral fellow	University of Otago
Sharon Olsen	Post-doctoral fellow	Auckland University of Technology
Thomas Park	Post-doctoral fellow	University of Auckland
Priya Parmar	Post-doctoral fellow	Auckland University of Technology
Yue (Echo) Pei	Post-doctoral fellow	University of Canterbury
Paulo Pelicioni	Post-doctoral fellow	University of Otago
Usman Rashid	Post-doctoral fellow	Auckland University of Technology
Julie Rope	Post-doctoral fellow	Rope Neuro Rehabilitation
Brigid Ryan	Post-doctoral fellow	University of Auckland
Margaret Ryan	Post-doctoral fellow	University of Otago
Nicola Saywell	Post-doctoral fellow	Auckland University of Technology
Lucia Schweitzer	Post-doctoral fellow	University of Otago
Emma Scotter	Post-doctoral fellow	University of Auckland
Reza Shoorangiz	Post-doctoral fellow	New Zealand Brain Research Institute
Nada Signal	Post-doctoral fellow	Auckland University of Technology
Anurag Singh	Post-doctoral fellow	University of Otago
Malvindar Singh-Bains	Post-doctoral fellow	University of Auckland
Leon Smyth	Post-doctoral fellow	University of Auckland
Meg Spriggs	Post-doctoral fellow	Imperial College London
Andreas Stenling	Post-doctoral fellow	University of Otago
Louise Stubbing	Post-doctoral fellow	University of Auckland
Haruna Suzuki-Kerr	Post-doctoral fellow	University of Auckland
Vanda Symon	Post-doctoral fellow	University of Otago
Martha Tarczyluk	Post-doctoral fellow	University of Auckland
Rachael Taylor	Post-doctoral fellow	University of Auckland
Raviindra Telang	Post-doctoral fellow	University of Auckland

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NAME	POSITION TITLE	INSTITUTION
Christine Tooke	Post-doctoral fellow	University of Auckland
Conor Underwood	Post-doctoral fellow	University of Otago
Nico Vautrelle	Post-doctoral fellow	University of Otago
Yukti Vyas	Post-doctoral fellow	University of Auckland
Kerry Walker	Post-doctoral fellow	Auckland University of Technology
Julie Wharewera-Mika**	Post-doctoral fellow	University of Auckland
Kyla Wood	Post-doctoral fellow	New Zealand Brain Research Institute
Angela Wu	Post-doctoral fellow	University of Auckland
Jane Wu	Post-doctoral fellow	University of Auckland
Xiao-Wen Yu	Post-doctoral fellow	University of Otago
Hu Zhang	Post-doctoral fellow	University of Otago

Students

STUDENT NAME	LEVEL OF STUDY	UNIVERSITY
Moradeke Adesina	Other	University of Auckland
Ramya Murali Adiseshan	Other	University of Auckland
Sara Ahmed	Doctoral Degree	University of Otago
Murad Al Gailani	Doctoral Degree	University of Auckland
Gemma Alder	Doctoral Degree	Auckland University of Technology
Mustafa Almuqbel	Doctoral Degree	University of Otago
Ashkan Alvand	Doctoral Degree	University of Auckland
Jonathan Armstrong	Doctoral Degree	Auckland University of Technology
Chris Attwood	Other	University of Otago
Tin Aung Kyaw	Doctoral Degree	University of Auckland
Ashleigh Baker**	Doctoral Degree	University of Auckland
Mahima Bansal	Doctoral Degree	University of Auckland
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Patents

Book Chapters

8.	Monk R., Connor B. (2020). Cell Replacement Therapy for Huntington's Disease. In Han F., Lu P. (eds) Advances in Experimental Medicine and BiologyStem Cell-based Therapy for Neurodegenerative Diseases. Advances in Experimental Medicine and Biology (vol 1266, pp. 57-69). Springer. DOI: 10.1007/978-981-15-4370-8_5
9.	Smith P.F. (2020). Vestibular compensation as a distributed process. In Fritzsch B. (eds) <i>The Senses: A</i> <i>Comprehensive Reference</i> (vol 6, pp. 609-625). Elsevier B.V DOI: 10.1016/B978-0-12-809324-5.23820-0.
10.	Smith P.F. (2020). Vestibular functions and Parkinson's Disease. In Grayeli A.B., Lopez C., Van Nechel C., Toupet M. (eds) <i>The Role of the Inner Ear in Self and</i> <i>Environment Perception</i> (pp. 51-63). Frontiers Media. DOI: 10.3389/978-2-88963-611-2
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10.	Govindpani K., Fegan V., Turner C., Dragunow M., O'Carroll S., Waldvogel H.J., Faull R.L.M., Kwakowsky A. (2020) Characterising a novel GABA signalling system in the human cerebral vasculature. Australasian Winter Conference on Brain Research (Virtual), August 2020, New Zealand.
11.	Govindpani K., Synek B.J.L., Turner C., Dragunow M., Waldvogel H.J., Faull R.L.M., Kwakowsky A. (2020) Characterisation of a novel GABA signalling system in the human cerebral vasculature. HealtheX 2020, Auckland, New Zealand.
12.	Guévremont D., Tsui H., Logan B., Knight R., Fowler C., Master C.L., Martins RN, Abraham W. C., Tate W. P., Cutfield N., Williams J. M. (2020) Australian Imaging, Biomarkers and Lifestyle (AIBL) Research Group (2020) Plasma microRNA vary in association with the progression of Alzheimer's disease. Alzheimer's Association International Conference, Amsterdam, Denmark.
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14.	Krishnamurthi R. (2020) The epidemiology of ICH - A global perspective from the GBD Study. Joint European Stroke Organisation and World Stroke Organization Conference (ESO-WSO 2020), Virtual.
15.	Krishnamurthi R., Mahon S., Barker-Collo S., Parmar P., Ikeda T., Vandal A., Feigin V. (2020) Effectiveness of health and wellness coaching on lifestyle behavior for primary stroke prevention. Joint European Stroke Organisation and World Stroke Organization Conference (ESO-WSO 2020), Virtual.
16.	Livingstone R.W., Abraham W.C., Williams J.M. (2020) The role of calcium-permeable AMPA receptors in secreted amyloid precursor protein alpha-mediated plasticity. Australasian Winter Conference on Brain Research (Virtual), August 2020, New Zealand.
17.	Manson T. Shao X., Wang D.J.J., Günther M., Tippett L., Dragunow M., Thomas D.L., Suresh V., Morgan C. (2020) Diffusion and multi-echo ASL reveal lower blood-brain interface water permeability in mild cognitive impairment and early Alzheimer's disease. International Society of Magnetic Resonance in Medicine (ISMRM) Annual Conference, Virtual.
18.	Martinez-Ruiz A., Yates S., Cheung G., Dudley M., Krishnamurthi R., Fa'alau F., Cullum S. (2020) Diagnostic accuracy of the 10/66 dementia assessment protocol in Māori, Fijian-Indian, Samoan and Tongan elders with memory problems living in south Auckland, New Zealand. Alzheimer's Association International Conference, Amsterdam, Denmark.

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- 21. Morgan C., Dong Z., Lythgoe D., Tippett T., Melzer T. (2020) Quantitative susceptibility and R2* mapping in mild cognitive impairment and early Alzheimer's disease. International Society of Magnetic Resonance in Medicine (ISMRM) Annual Conference, Virtual.
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- Turner C., McLay J., Curtis M.A., Dragunow M. (2020) 25. Tumour infiltrating T-lymphocyte density varies significantly between meningioma subtypes but does not predict meningioma recurrence. International Academy of Pathology and European Society of Pathology Meeting, Glasgow, UK.
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- Byblow W.D. (2021) Can TMS be used to improve 27. prediction accuracy after stroke? 7th Asian-Oceanian Virtual Congress on Clinical Neurophysiology, 30 January 2021, Kuala Lumpur, Malaysia.
- Cawston E.E., Griner L., Wong CYE., Marais C., 28. Zetterberg H., Williams J.M., Tippett L. & Dementia Prevention Research Clinics NZ (2021) Blood biomarkers for the detection and prediction of disease progression in Mild Cognitive Impairment and Alzheimer's Disease. Brain Research New Zealand Conference, April 2021, Queenstown, New Zealand.

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 - Hamilton J.J., Dalrymple-Alford J.C. (2021) Nonspatial memory and the anterior thalamic nuclei. Australasian Winter Conference on Brain Research (Virtual), August 2020, New Zealand.
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- Horne K-L., Pascoe M., Livingston L., Elias B., 33. Goulden M., Grenfell S., Young B., Blakemore R., Le Heron C., Pitcher T., Myall D., Shoorangiz R., Kuijer R., MacAskill M., Dalrymple-Alford J., Anderson T. (2021) Parkinson's disease non-motor symptoms did not worsen during COVID-19 lockdown. Australasian Winter Conference on Brain Research (Virtual), August 2020, New Zealand.
- Jordan H.J, Che J., Byblow W.D., Stinear C.M. (2021) 34. Rapid and Remote Categorisation of Upper Limb Motor Outcome after Stroke. 2021 ASNR Virtual Annual Meeting, April 5-9, 2021, Virtual.
- Kip E., Bentall L., Underwood C.F., Hughes S.M., Parr-35. Brownlie L.C. (2021) Specific patterns of optogenetic stimulation of glutamatergic motor thalamus neurons improve akinesia in a chronic rat model of Parkinson's disease. Brain Research New Zealand Conference, April 2021, Queenstown, New Zealand.
- 36. Knight L.J., Martis R., Acosta M.L., Donaldson P.J., Lim J.C. (2021) Detection of reduced mitochondrial ROS production but increased ROS levels and oxidative damage in the young xCT knockout mouse retina. Annual Meeting of the Association-for-Research-in-Vision-and-Ophthalmology (ARVO), Vancouver, Canada.

McGeorge A., Cekus L., Byblow W.D., Stinear C.M. (2021) A rapid Upper-Extremity Fugl-Mever assessment tool for patient selection in rehabilitation trials. 2021 ASNR Virtual Annual Meeting, April 5-9, 2021, Virtual.

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- 38. Morgan C., Manson T., Suresh V., Govender J., Jansson D., Thomas D., Shao X., Wang D., Günther M., Dragunow M., Tippett L. (2021) New and emerging magnetic resonance imaging techniques in mild cognitive impairment and Alzheimer's disease. Brain Research New Zealand Conference, April 2021, Queenstown, New Zealand.
- Shivashankar G., Lim J.C., Acosta M.L. (2021) Pro-39. inflammatory cytokines prompt metabolic and functional changes in the retina of hyperglycemic mice. Annual Meeting of the Association-for-Research-in-Vision-and-Ophthalmology (ARVO), Vancouver, Canada.
- Turner C., McLay J., Curtis M.A., Dragunow M. (2021) 40. Meningioma Tumour Infiltrating Lymphocyte Density Differs By Meningioma Type And Predicts Recurrence In Atypical Meningioma. 97th Annual Meeting of the American Association of Neuropathologists, 10-13 June 2021, St Louis, Missouri, USA.

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FINANCIAL STATEMENT

FUNDING SUMMARY FOR THE 19 MONTH PERIOD ENDED 31 JULY 2021

	2020-2021
Funding Received ¹	(\$000)
Tertiary Education Commission grant	7,458
Surplus/Deficit carried forward ²	1,630
Ageing Well National Science Challenge grant	99
Total Funding received	9,187

Expenditure³

Net surplus/(Deficit)	1,228
Total Expenses	7,959
Subcontractors	1,024
Extraordinary Expenditure⁴	17
Travel	198
Postgraduate students	408
Project costs	1,451
Overheads	2,543
Salaries	2,318

Commitments⁵

Project and DPRC commitments	1,228
Total commitments	1,228

*All amounts are shown exclusive of Goods and Service tax (GST)

NOTES

- 1. This financial report is for the period 1st January 2020 to 31st July 2021. This report only contains details of funding and expenditure relating to the CoRE grant that the Centre receives from the Tertiary Education Commission, plus a grant from the Ageing Well National Science Challenge. It does not contain details of philanthropic funding, or operating funding to Centre investigators from other funding agencies.
- In 2020-2021, BRNZ carried forward a net surplus of \$1630K. This surplus has been added to BRNZ's 2020-2021 2. income to fund the CoRE's research programme in 2020-2021.
- This funding summary details funding received and funds distributed to collaborative partners of the CoRE. 3.
- The extraordinary expenditure budget is for Governance and Māori Advisory Board meeting expenses. 4.
- As of 31st July 2021, BRNZ has project and DPRC commitments of \$1228K that will be spent by the end of 2021. 5.

BROAD CATEGORY

Value of CoRE funding from TEC (\$000)
FTEs by category
Headcounts by category
Peer reviewed research outputs by type
Value of external research contracts awarded by source (so
Commercial activities

Students studying at CoRE by level

Number of students completing qualifications by level

Immediate post-study graduate destinations



	DETAILED CATEGORY	YR 6-7
		\$7,458
	Principal investigators	13.4
	Associate investigators	3.52
	Postdoctoral fellows	39.65
	Research technicians	37.7
	Administrative/support	6.1
	Research students	237.55
	Total	337.92
	Principal investigators	52
	Associate investigators	18
	Post-doctoral fellows	74
	Research technicians	63
	Administrative/support	11
	Research students	256
	Total	474
	BOOKS	0
	BOOK Chapters	19
	Journal articles	360
	Other	40
	Tatal	0
	Totat	419
000)	Vote Science and Innovation contestable funds	\$22,169
	Other NZ Government	\$844
	Domestic – private sector funding	\$659
	Overseas	\$508
	Other	\$13,380
	Total	\$37,560
	Number of licenses	0
	Income from licenses	0
	Patent applications	1
	Patents granted	0
	Invention disclosures	0
	Number of new spinouts	0
	Capitalisation value of spinouts	0
	Doctoral degree	166
	Other	87
	Total	252
	Doctoral degree	32
	Other	34
	Total	66
	Further study in NZ	13
	Further study overseas	2
	Employed in NZ	21
	Employed overseas	1
	Unknown	28
	Other	0
	Total	66



E

Rangahau Roro Aotearoa