INTERN REPORT 2023-2024

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INTRODUCTION

Over nine weeks of the 2023/2024 summer break, the Mātai summer internship has given us an experience and an education that is unlike any other.

We were fortunate enough to begin with the Mātai symposium, an event that brought leading experts to Te Tairāwhiti, to share their ground-breaking research with the community. It was an epic event that opened our eyes to the world of research and gave us the opportunity to see where it could take us in the future.

Since then, our weeks on the internship have consisted of leadership skills, research method sessions, Mātauranga Māori teachings, waiata practice, guest lectures, and more. We also worked on individual research projects, which ranged from a vitality study aiming to image 'wairua' to a concussion study looking at the effects of repetitive sub-concussive injuries in sport. We've had the opportunity to work with Mātai researchers and use cutting-edge technology in an environment that encourages curiosity and innovation.

The Mātai internship has deepened our understanding of the role of community and community integration in research, and how this symbiotic relationship can evolve to more equitable outcomes. This report has been collaboratively crafted by all of us to provide insight into the lessons we have learned and the journey we have undertaken together.

Ngā mihi nui,

The Mātai 2023-24 summer interns

SCIENTIFIC SESSIONS

ATTENTION DEFICIT HYPERACTIVE DISORDER - ADHD

Professor Justin Fernandez
Auckland Bioengineering Institute & School of Engineering, University of Auckland
Principal Investigator, Mātai

Professor Justin Fernandez presented the ADHD talks this year, offering valuable insights into a topic seldom covered. The ADHD study at Mātai, conducted within the Gisborne community, aims to identify biological markers for ADHD. Justin's sessions were about what ADHD looks like in the brain, how it can be detected by an MRI scan, and how fidgeting will affect the blood flow around the brain depending on whether you are neurotypical or not. These informative and engaging sessions illustrated the correlation between increased blood flow during fidgeting in individuals with ADHD and decreased blood flow in neurotypical individuals.

We also received an opportunity to attempt an "ADHD test" – which can provide strong evidence as to whether a person is neurotypical or not. This type of equipment is usually not available to us, so this was an exciting part of the internship. Additionally, we were given the option to partake in a free MRI scan to collect data for the ADHD study. This involved one 45-minute scan that was then processed. The image of our brains was then sent back to us to keep. The research being done at Mātai around ADHD is very novel and interesting, so it was a privilege to be a part of these talks and scans.

GENOMICS AND BIOINFORMATICS

Dr William Schierding
Honorary Senior Research Fellow, Mātai
Vision Research Foundation Senior Research Fellow, Department of Ophthalmology, University of Auckland

Dr William Schierding's lecture on "An Introduction to Genetics" provided a captivating learning experience for those of us with limited prior exposure to the subject. Despite our varying levels of familiarity with genetics, William made the topic accessible, understandable, and interesting. He engaged us through interactive discussions and incorporated short, informative videos that ignited our curiosity. This interactive approach not only facilitated comprehension but also served as a gateway to the field of radiogenomics.

Williams' teaching methods, blending interactivity and multimedia elements, demystified genetic concepts and instilled a sense of fascination with the subject matter. Overall, the lecture provided a valuable and engaging introduction, leaving

RESEARCH METHODS

Dr Josh McGeown
Senior Research Fellow, Mātai
Senior Research Fellow, Neurological Foundation

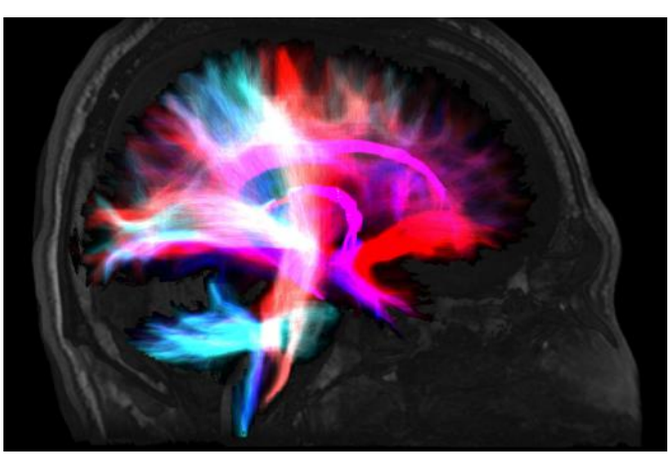
Throughout the internship, Dr Josh McGeown conducted weekly sessions aimed at enriching our understanding of research methodologies. It was very beneficial; Josh presented complex ideas to us in a way that was easily accessible to all, regardless of our academic backgrounds. These sessions encompassed various aspects of research, including formulating research questions, grasping study designs, community engagement strategies, and navigating the ethical approval process alongside a statistical primer. Each session was engaging and interactive, and filled with critical information regarding the research process. The acquired skills were promptly put into practice within our research projects and during journal club presentations. Josh's teachings equipped us with essential competencies that will aid us in our future studies and academic careers.

> **A skill I gained from the internship was how to conduct a literature review. Josh's research method sessions were very helpful for this!**
> Aorere Waaka, second year Psychology student

BRAIN MAP-ME

Dr Maryam Tayebi
Hugh & Moira Green Research Fellow, Mātai

This session with Dr Maryam Tayebi provided insight into how MRI image processing works, as well as the basic overview of how the images are made. Using a set of anonymous data, we got a chance to look at the computer code that goes into making the advanced MRI images. The session merely scratched the surface when it comes into the time and effort that goes into making images, however, it was valuable for us to look into the world of MRI imaging. The images themselves showed the direction of white matter tracts in the brain in a way that made it easy for analysis. For those of us who are currently studying medicine or health, this session was important as it relates closely to the work we may be doing in the near future.

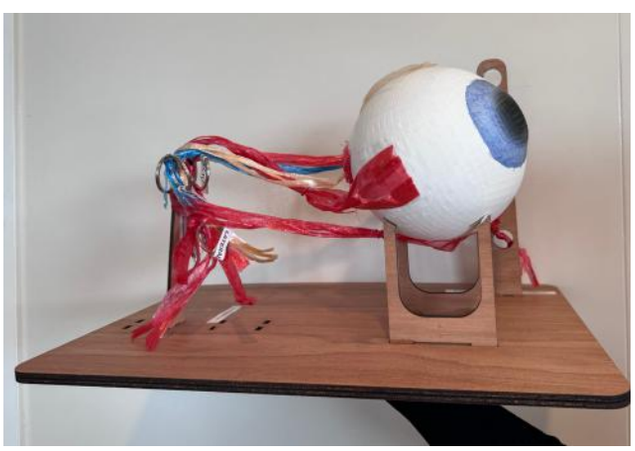


Left: Paige Richter's diffusion processed fibre tracts of her own brain.

HOW MRI WORKS

Dr Samantha Holdsworth
CE & Director of Research, Mātai
Associate Professor, University of Auckland

Dr Samantha Holdsworth led a session on "How MRI Works!" where she introduced us to the basics of MRI technology. She then tasked us to complete an assignment on the topic, allowing us freedom in its format. Rikki, Braden, Olivier, and Aorere expressed their understanding through a waiata. Sofia and Daizee created an interactive game illustrating the functions of different parts of the MRI machine. Paige, Jade, Breanna, and Imogen authored a children's picture book titled "Tiki's Adventure: The Magical MRI Machine." Holly incorporated her pottery skills by making a 3D model of an MRI machine out of clay (which will hopefully be displayed at the new facility). Through this assignment, tailored to our individual styles, we deepened our understanding of MRI technology, recognising the value of personalisation in teaching others.



NEUROPSYCHIATRY AND IMAGING

Dr Gil Newburn
Senior Clinical Fellow, Mātai
Neuropsychiatrist, Gil Newburn Psychiatry

In our neuropsychiatry and imaging sessions with Dr Gil Newburn, we explored different brain networks, and how they can influence our behaviour and thought patterns. The networks we discussed in more detail included the salience network, which plays a role in directing attention and integrating important stimuli, and the default mode network, which is active when someone is not focusing on the outside world and the brain is in an active rest. We learnt how disorders affecting some of these brain networks manifest in psychological conditions and the role of imaging techniques in elucidating their function in cognitive processes.

PACIFIC MODELS OF RESEARCH

Oka Sanerivi
PhD Student, University of Otago
Ngā Māngai Māori Member, Mātai

Oka Sanerivi's lecture on indigenous protections and expression in health services provided invaluable insights for us interns, covering Pacific models of research, cultural safety, and indigenous governance. Oka began by introducing the concept of the Samoan Fale, a traditional structure used for gatherings, to illustrate early governance practices. We were then presented with a definition of cultural safety by Curtis et al. and encouraged to reflect on its implications for providing culturally appropriate care and navigating organisational culture's impact on clinical interactions and service delivery. This prompted us to consider potential biases, assumptions, attitudes, or stereotypes within healthcare organisations. Finally, Oka highlighted indigenous expression within organisations, using Mātai as a primary example. We learned that Mātai aims to address health inequities for Māori by prioritising the needs of their rural community, while also seeking to

DATA MANAGEMENT

Dr Eryn Kwon
Hugh & Moira Green Senior Research Fellow, Mātai
Research Fellow, Auckland Bioengineering Institute

Dr Eryn Kwon taught us about data management and the principles that are followed at Mātai. We learnt about the CARE and FAIR principles of data management. By making sure that collected data is accessible and interoperable, it becomes more valuable as secondary research. When participants come through the doors, they trust researchers with their data, but they maintain ownership and control. Respecting the rights of people, and keeping their data secure instead of on the cloud where it could be compromised, helps us maintain this trust and abide to privacy laws.

JOURNAL CLUB

Facilitated by Dr Maryam Tayebi

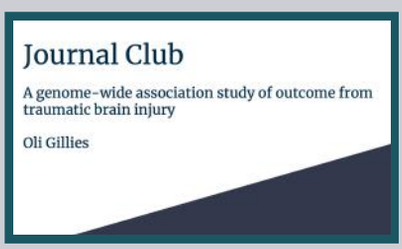
Hugh & Moira Green Senior Research Fellow, Mātai

The Mātai Journal Club gatherings were very important to our internship experience. We had to interpret and discuss scientific journal articles of our choice with the other interns and Mātai staff. Throughout the workshops, we had the chance to put the knowledge and abilities Josh had given us in his lectures into practice. We had to communicate our knowledge and conclusions to the audience, in an understandable and efficient way, which was a big learning takeaway from Journal Club. Through this experience, we improved our presentation skills and talents in our efficiency in finding and analysing journal articles, using the right search engines. We were also encouraged to participate in these sessions as listeners, posing queries and improving our comprehension of the scientific topics discussed.

Rikki Noble, 3rd year software engineering student, presenting his journal club paper to the intern cohort.

A snapshot Into our journal club topics

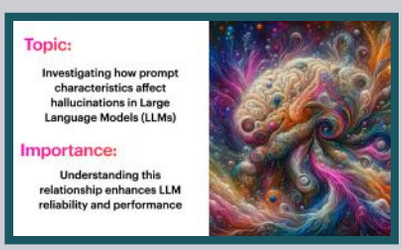
Sofia Zame



Oli Gillies

Tyler Lillis

Imogen Amor Bendall



Kyle McVey

Jacquie Shanks

GUEST LECTURERS

Zak Holdsworth

Hint Health, U.S.A

Zak Holdsworth came to talk to us about his business, Hint Health, which is working to implement AI in the healthcare sector. He talked about how AI is an advancement for our future and will help to improve patient care and doctors' efficiency through its use in consultations. His business aims to dictate a doctor's consultation so that the doctor can spend more time talking to their patients and building a more personal relationship instead of having to focus on note taking. We thoroughly enjoyed learning about how AI is being integrated into the healthcare system as it allowed us to get an idea of how our jobs will be affected/aided in the future. This session also catered to our backgrounds as it merged software applications and healthcare which allowed all of us interns connect to at least one of the aspects of this presentation. This talk opened the eyes of our intern cohort to the future possibilities of AI integration into jobs. AI advancement is a recent development and being able to see how Zak worked with this technology to create a business, which we wouldn't have thought possible not that long ago, was inspiring.

Dr Graham Wilson

Honorary Clinical Associate Professor, University of Otago
Ophthalmologist, Gisborne, New Zealand
Principal Investigator, Mātai

Dr Graham Wilson is a local Ophthalmologist and a Principal Investigator at both Mātai and the Dunedin study. It was amazing for him to spare some time in his extremely busy schedule to talk to us about possible indicators of eye diseases from eye scans. He opened with a general discussion about the greatest inventions in the medical space which had us all thinking. He led us into the Dunedin study which has over 1,000 participants that are followed throughout their life getting complete check-ups. Recently celebrating its 50th year, the Dunedin study is an incredible study that aims to better understand the impacts of events on individuals lives over an extended period. Dr Wilson also talked about similar studies making us all reflect on our lives and what made us who we are. Engaging with Dr Wilson was a remarkable experience, and we are exceedingly fortunate to have his expertise in our local community.

Professor Holly Thorpe
University of Waikato
Hiria Parehuia Julia Philip-Barbara

Professor Holly Thorpe and Hiria Parehuia Julia Philip-Barbara (Ngāti Porou) shared insights into their team's qualitative research methods during their presentation on the project titled "Research into the health and wellbeing impacts of adverse weather conditions." This collaborative effort involves Te Weu Tairāwhiti, Waipapa Taumata Tau at the University of Auckland, Manatū Hauora, and the Ministry of Health. Alongside a wider team of local researchers including Josie McClutchie (Project Manager), Haley Maxwell, and Dayna Chaffey, Holly and Hiria conducted interviews and focus groups across the Tairāwhiti region.

Their discussion shed light on the inherent skills required for effective interviewing, many of which individuals naturally possess, such as active listening. Holly emphasised the significance of community voices alongside statistical data, while Hiria offered insights gleaned from facilitating interviews for the project and shared practical tips based on her experiences. They underscored the importance of conducting ethical and trauma-informed research, particularly in communities impacted by recurrent extreme weather events, and discussed various approaches employed to establish safe and supportive environments for sharing personal narratives.

This session provided a revealing glimpse into the diverse methodologies of research and emphasised the myriad avenues through which valuable data can be obtained, beyond traditional quantitative research methods.

Simeon Alfred
Maurice Alfred
Tai Tech & Aroha AI

Simeon and Maurice Alford came to talk to us about the field of Artificial Intelligence, focusing on Large Language Models (LLMs) like Claude, GPT-3, GPT-4, and open-source variants. He explained LLMs' complex training, which involves extensive data processing to mimic language. We learnt that these models are essentially just massive zip files of the internet and use statistics to predict each word to string together sentences. The talk also covered AI's progress in

image generation, where models generate complex visuals from a prompt. Through examples, we were shown the importance of prompt engineering, asking things in a way that is very clear and concise to ensure the best output. A key takeaway was a suggestion to be more proactive about seeking information over passive social media consumption, he recommended platforms like X (formerly Twitter) for more reliable news, urging us to stay informed about future technological advancements.

Dr Katharine Holdsworth

Microsoft, U.S.A

Dr Katharine Holdsworth made a journey back home to Tairāwhiti, all the way from America. During her visit, she shared insights into her career in the tech industry, which began with her studies in electrical engineering at Canterbury which led her to her current position at Microsoft in America. She emphasised the significance of continuous learning and underscored the importance of the tech field. Katharine actively engaged with us, sparking our interest in the tech sector, particularly for those pursuing tech-related degrees. Moreover, she helped individuals not studying tech-related subjects understand how the tech sector could play a role in their future careers and how they too could find opportunities within it.

COMMUNITY ENGAGEMENT

IMAGE OF THE FUTURE

Near the start of the internship, Mātai held the inaugural Image of the Future Symposium at the War Memorial Theatre in Tairāwhiti Gisborne.

This event was a great way to start our internship, as we were able to hear talks from local, national, and international experts from different scientific fields.

We were also able to work as a team to assist the Mātai staff to ensure smooth running of the event. We mingled with the community, including high school students who were involved in the scientific poster competition. This created an opportunity for invaluable whakawhanaungatanga among interns, staff, speakers and the community.

We were able to have one-on-one conversations with the speakers, which allowed us to further delve into topics which we may not have otherwise known about. It was eye-opening to see the many spaces that our studies could potentially evolve into in the future, based on the examples we were seeing from the experts presenting on stage.

The symposium was a phenomenal event, rarely seen in smaller communities such as Te Tairāwhiti, and it was definitely a highlight for us.

Tyler Lillis, Jakob Brown, & Paige Richter

Daizee Rawls, & Sofia Zame, with Bree Allan (Mātai, marketing & events)

Braden Fowell & Rikki Noble, presenting at the inaugural conference

MANAWARŪ

On our Wednesday mornings, we would head to Manawarū for a variety of different kōrero and activities. Manawarū is a cafe and initiative set up through Turanga Health, centred around whakawhanaungatanga. The cafe offers free coffee and some food for a kōrero aiming to help the community with their struggles by starting a conversation and facilitating relationships and connection. There is an amazing crew that work there, dedicated to helping people, and uplifting their community. In our time at Manawarū, we were involved in decorating the space for the Christmas and new year's period, entertaining the rangatahi from Elgin school, creating a song, and listening to many stories behind the creation of the different spaces that they have in their buildings. Here we learnt the value of giving back, collaboration, pūrakau, and more. Overall, it was a fantastic experience with a special initiative.

Left: Interns entertaining rangatahi from Elgin School with window art. Right: Paige Richter having fun with Christmas decorations.

TŌNUI COLLAB

TŌNUI Collab invited us Mātai Interns to support the Kōhine Robotics Expo. It was a celebratory finale of the mahi done throughout the year, during numerous wānanga-ā-kanohi for the teams of Year 6 - 9 girls from kura across Te Tairāwhiti. Participants came from Kawakawa Mai Tawhiti, Makarika, Hatea-a-Rangi, Māngātuna, Whāngārā, Pātūtahi, and Gisborne Intermediate (Ngā Manu a Rēhua). This kaupapa was created to address the disparity of kōhine Māori in tech, and allow them to experiment with VEX IQ Robotics; develop confidence with a range of technologies; learn about study and career pathways in tech; and hear from wāhine thriving in tech. Jacquie attended as our Mātai Intern representative, and enjoyed spending the day learning about coding, alongside this up and coming generation of talented kōhine Māori. She had great conversations with the girls, and enjoyed helping throughout the day.

TĀIKI E!

The wonderful team at Tāiki E had us over for an afternoon of creative fun.

Tāiki E is a dynamic hub dedicated to people eager to tackle pressing social and environmental challenges through entrepreneurship.

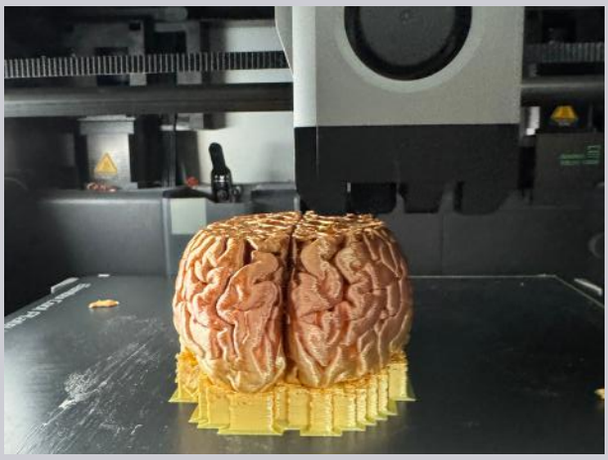
It is a place where social entrepreneurs, creatives, impact investors, community developers, and whānau committed to change can come together.

They believe in collectively working towards creating a culture of impact in Tairāwhiti by developing opportunities for community to engage in impact initiatives and to inspire and empower community to lead their own innovative solution development processes.

Tāiki E has a range of rooms and activities that one can engage with, with a wide range of tools that include a 3D printer, laser cutter, a recording studio room for podcasts or music, a tool shed, simulators, VR headsets for immersion, and more.

> **6 hours later, and 200 grams less of filament - and bravo ..... a half scale exact replica of my brain!**
> Joseph Ross-Ward, fourth year Biomedical Engineering student

Holly Flyger and Joseph Ross-Ward with their 3D brain figure



3D brain in the process of creation in a 3D printer

Braden Fowell and Aorere Waaka recording waiata in the studio room

WEEKLY WAIATA

Weekly waiata sessions were held at the Te Whatu Ora Tairāwhiti chapel, which helped us form new friends and connections to others, particularly with Te Ao Māori, and our inner wairua. Furthermore, it gave us a chance to practice and present our own Mātai waiata. This was an impactful part of our internship at Mātai, and we greatly appreciate Te Whatu Ora Tairāwhiti pakeke for hosting it.

92%

OF INTERNS STATED THAT
WAIATA WAS A HIGHLIGHT
OF THE INTERN PROGRAMME

Aorere Waaka, Braden Fowell, Rikki Noble, and Olivier Cassidy practicing waiata externally

Some of the interns pictured with Te Whatu Ora Tairāwhiti pakeke

MĀTAURANGA MĀORI

One of our major focuses over the internship was to incorporate a Te Ao Māori lens into our research. Part of this was accomplished through our Mātauranga Māori sessions every Thursday with Leigh Potter and Davidson Taylor, featuring several guest speakers.

Each Mātauranga Māori session had a particular focus on a specific area of Māoridom, which was then translated into our clinical research here at Mātai, university, our local communities, and by extension into our everyday lives. These sessions provided a snippet of just a few of the domains within Te Ao Māori including pepeha, waiata, tāonga pūtētere, tikanga, mahi toi, and pūrākau just to name a few. We were very fortunate to be learning this knowledge from some local experts and more importantly it was knowledge about our own whenua here in Tairāwhiti.

Most of our Mātauranga experiences were a first for many, so we were privileged to have these opportunities. Our sessions were often interactive and engaging which helped us physically interpret our learnings. From waiata, practicing traditional Māori instruments (tāonga pūtētere), to exploring the toi upon Tītīrangi Maunga with Nick Tupara, our Mātauranga Māori sessions were a highlight for all of us and we are lucky to have had these experiences.

A big mihi goes out to all our Mātauranga guest speakers including Nick Tupara, Owen Lloyd, Rawiri Keelan, Chris Douglas-Huriwai, and Karaitiana Taiuru.

Chris Douglas-Huriwai facilitates an interactive session around tāonga puoro.

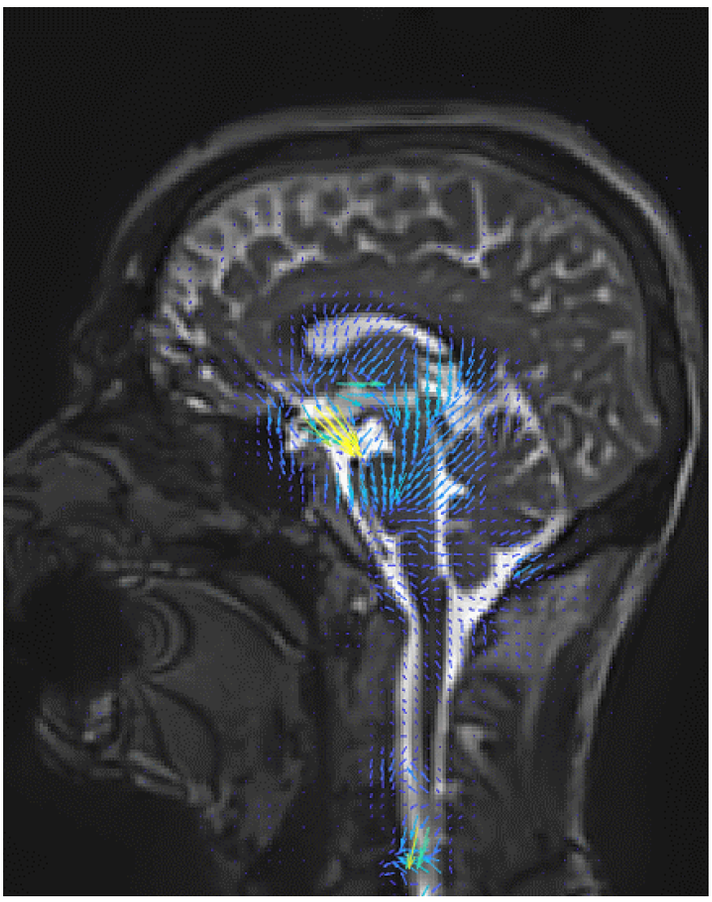
INTERN PROJECTS

TAIRĀWHITI CHILD WELL-BEING STUDY

The Mātai Tairāwhiti study is a world-first longitudinal child health study. The study takes place in the Tairāwhiti region and is composed of 50 tamariki from rural Aotearoa, New Zealand, 20 of which are children who have previously participated in the study. The long-term aim of the Tairāwhiti study is to image with magnetic resonance imaging (MRI) a cohort of participants from childhood until they reach adulthood, simultaneously tracking health outcomes through their lives. To address the inadequate amount of representative data in New Zealand, the Tairāwhiti study aims to provide a normative data base and modelling that is more reflective of the New Zealand, Tairāwhiti population. This database may subsequently serve as predictive and preventative models in paediatric medicine. As interns undertaking this study, we had to understand and address the goals and ethics of the study ensuring that we have made it clear why we want to scan a cohort of tamariki over a long period of time. We then went onto planning the co-design hui and drafting both a letter and list of potential key-stakeholders. This meeting would be essential for addressing the ethics, types of data collection, and any concerns pertaining to the Tairāwhiti study. Finally, after a two-year gap for our research participants, we were fortunate to be able to assist with some of the re-scans. Although we have worked toward enhancing the study, it is a highly significant and long-term study that will continue to need constant support and work.

Jade Keelan and Zara Potter watch and learn while MRI technologist Taylor Emsden scans a research participant for this study

DOES EXERCISE CHANGE YOUR BRAIN?



One of the Mātai Interns participated in the Exercise Study, investigating how heart activity influences brain movement during rest and exercise.The goal of the study is to establish the healthy range of brain motion under these conditions and use the data to create a model correlating brain fluid and tissue movement with heart rate, blood pressure and more. Amplified Magnetic Resonance Imaging (aMRI) magnifies brain micro-movements caused by heart pumping, aiding and distinguishing between healthy and diseased states. The current project focuses on organising and cleaning data from previous years, facilitating future research by providing an organised system for comparing, adding, and accessing data, protocols, and literature. The streamlined approach enhances the study's overall value and supports efficient access to background information for researchers and interns.

Above: Participants were scanned with amplified MRI (aMRI) pre- and post-exercise to determine the effect of altered physiology on brain motion.

EXTRAOCULAR MUSCLE MOVEMENTS ANATOMIC EYE RIG

This research project was proposed by the teaching staff at the University of Auckland to teach early medical students the difficult concepts behind the eye's movements, and cranial nerves. After a starting prototype, a workable model was produced thanks to the generosity of Tāiki E Hacklab space. Their facility allowed for the fabrication of 3D printed and laser cut parts, as well as the necessary equipment for construction. The project achieved success with the creation of a large, cost-effective model, laying the foundation for potential future enhancements and refinements using the acquired materials and knowledge.

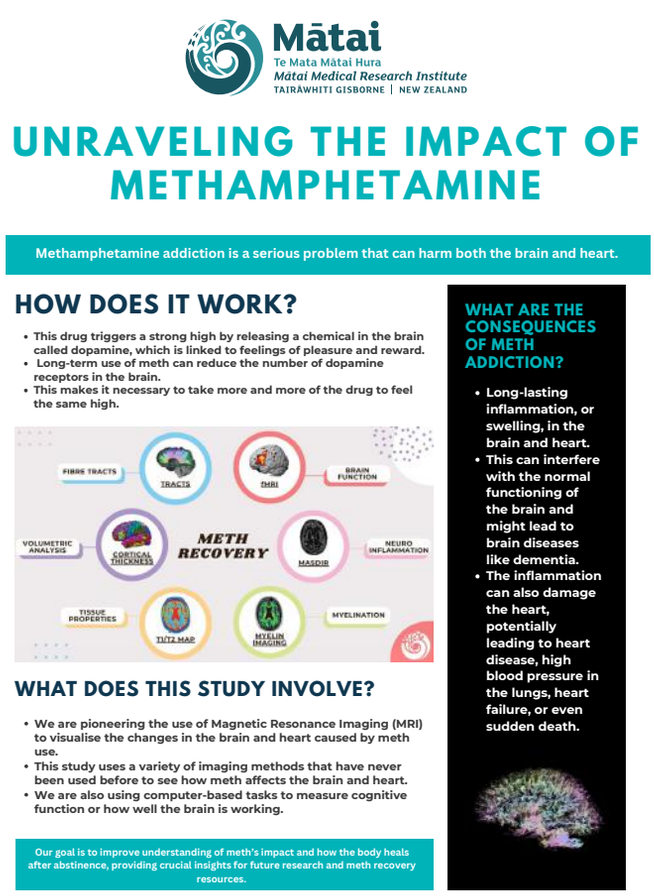
REPETITIVE HEAD IMPACTS IN SPORT AND MRI FINDINGS: A REVIEW

Breanna Ferris, Braden Fowell, Sofia Zame, and Imogen Amor Bendall working on their systematic review

This project was aimed to help those working on the Matai Rugby mTBI/ Concussion Study to see where their findings fit within the current literature around this topic. We completed a systematic review looking at studies that used MRI to study possible relationships between sport-related repetitive head impacts over the course of a season and changes to the brain. The aim of this review was to understand what literature already existed on the topic, and to help Josh figure out his next steps in his research.

REPETITIVE HEAD IMPACTS IN SPORT AND MRI FINDINGS: A REVIEW

The methamphetamine research project was designed to understand the structural, functional, and molecular changes to the brain and heart during a period of abstinence. Using various MRI sequences, we can uncover what changes occur in the brain. Within Gisborne, there is little opportunity for help during recovery and relapse rates are high, causing perpetuating cycles of hardship for whānau. One of the interns had a vital role during the data collection stage of this project. The intern helped contact and organise participants who were due for their scans. It's through their cooperation, we hope to expand and further understand potential treatment options. By engaging in this project, the intern learned valuable skills that translate into their life and the knowledge gained will help those around them.



Breanna Ferris, Daizee Rawls, & Tumanako Jones created a poster on the methamphetamine project

TBI WITHIN A NEW-ZEALAND CONTEXT

The research project titled Traumatic Brain Injury (TBI) within a New Zealand context had one of our interns working with fellow researcher Katie Blackburne as the project lead. This project allowed the intern to learn more about the incidence rates, causes, and outcomes of TBI in New Zealand. The intern learnt how to complete a literature review including writing a report of the findings from relevant journal articles based on specific questions that the project lead requested to have investigated within the literature. This project also allowed the intern to learn how to effectively search scholarly databases, such as PubMed, to find journal articles to review and learn about TBI research in a NZ population.

RADIOGENOMICS OF TBI STUDY

The goal of the radio genomics project was to explore how genetics can influence the outcomes of traumatic brain injury and neurodegenerative diseases, focusing on glaucoma. The project was split into three parts: the first was a comprehensive literature review on how genetics effects the outcome of traumatic brain injury, focusing on whether the articles found an association between genetics and a bad outcome. The second part was another literature review on how genetics effects your risk of glaucoma. The final part was to gather all the specific genes and specific SNPs (Single Nucleotide Polymorphism) from both literature reviews and compare the findings. This research project offers a remarkable learning opportunity for anyone with even a minor interest in genetics.

MALE PERPETRATORS OF INTIMATE PARTNER VIOLENCE

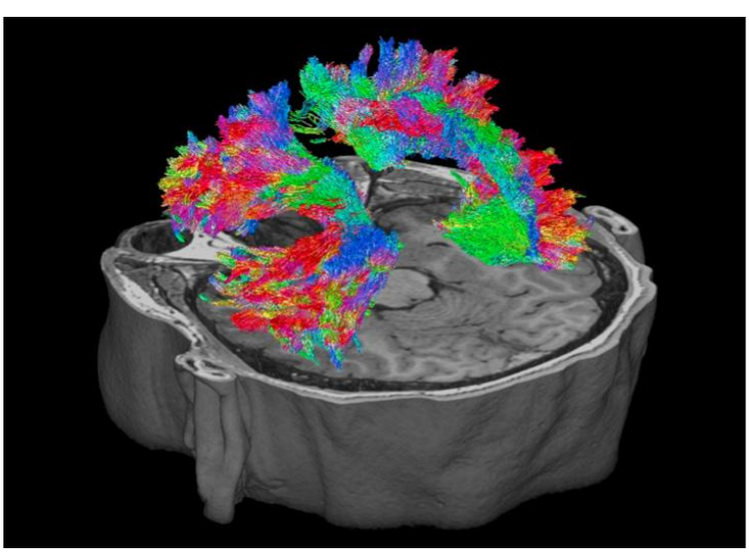
Intimate partner violence is an ongoing issue worldwide, with rates being notably high in Aotearoa. The purpose of this research project was to begin to understand and start to design a study regarding the prevalence of traumatic brain injury (TBI) in male perpetrators of intimate partner violence. A literature review was conducted for the purpose of both personal understanding and to begin to organise the existing literature to find gaps, and a starting point for new research. This started broad and was narrowed down to brain and TBI specific literature regarding IPV. Once gaps were identified, in collaboration with the research lead (Dr Gil Newburn) a study design was developed. It was an incredible learning experience, and a range of new skills were developed to take back to our university studies.

TRACING THE FOOTPRINTS OF HYPOXIC-ISCHEMIC ENCEPHALOPATHY IN BIRTH MRI DATA

This project aimed to explore brain MRI for Hypoxic-Ischemic encephalopathy (HIE). HIE is a condition where an infant loses oxygen to the brain around the time of birth. The study investigated how the timing of MRI pictures affected the brain damage seen in an image of the infant's brain. This could help clinicians better understand how to diagnose mild HIE and how the injuries caused by HIE progress over time.

DTI/NETWORK REVIEW OF A TBI CASE

Alongside Dr Gil Newburn, we completed a DTI/network review of a 55-year-old patient with a history of recurrent mild Traumatic Brain Injuries (mTBIs), the most recent occurring 18 months ago. Diagnosing and treating mTBIs pose challenges due to the limited changes visible on conventional MRI, which fail to detect microscopic white matter alterations. This can lead to underestimation and unexplained consequences of TBIs. To address this, we used DTI and brain network review to identify these changes in relation to symptoms, using a case example. Despite initial difficulties with fMRI image processing, we focused on DTI and analysed white matter tracts, revealing reduced connectivity in various regions such as the Superior Longitudinal Fasciculus, Fornix, and Uncinate Fasciculus. These changes potentially explained symptoms such as memory issues, slowed information processing, and inappropriate emotional regulation and fight/flight response in the patient.



> **This project deepened my understanding of imaging modalities, complexities of TBIs, and the potential for improved symptom comprehension and targeted treatments through detailed scan analysis for TBI patients.**
> Phoebe Wyands, fifth year medical student

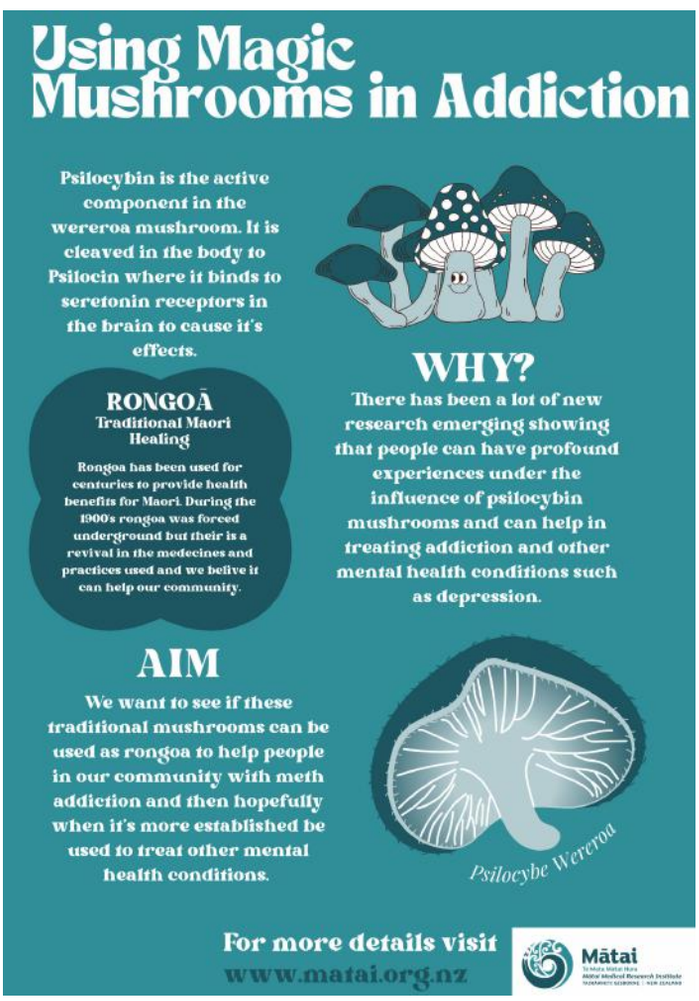
Advanced brain MRI employing a technique known as Diffusion Tensor Imaging (DTI) enables the visualization of white matter fiber tracts (often referred to as 'brain wiring') to investigate symptoms of Traumatic Brain Injury (TBI) like memory problems and diminished processing capabilities.

TU WAIRUA – WERAROA MUSHROOM STUDY WITH RANGIWAHO MARAE

This research initiative aims to address the urgent issue of methamphetamine addiction in the Tairāwhiti region, where rates of addiction are disproportionately high. Our focus is on exploring the therapeutic potential of traditional Māori medicine, specifically Weraroa mushrooms, as a novel approach to tackling this complex challenge. Given the inadequacy of current treatments for addiction and mental health issues, our commitment is driven by a desire to contribute meaningful solutions and improve outcomes in the region.

To lay the groundwork for our research, we are conducting a comprehensive review of existing literature. This involves examining journal papers and utilising reputable tertiary libraries and search engines such as PubMed, Scopus, and Google Scholar. Through this review, we aim to establish a robust understanding of the therapeutic potential of traditional psychedelics, particularly Weraroa mushrooms. However, obtaining ethical clearance presents a significant challenge due to the current classification of psychedelics as class A drugs. Engaging with regulatory bodies and demonstrating the potential benefits of our research are crucial steps in overcoming this obstacle.

Despite these challenges, our commitment to advancing our understanding of traditional Māori medicine remains unwavering.



Olivier Cassidy created a poster for the use of weraroa mushrooms, and project aim.

By navigating the research landscape and addressing ethical considerations, we aim to contribute to the development of more effective interventions for methamphetamine addiction and related mental health issues in the Tairāwhiti region. This endeavor underscores our dedication to holistic and culturally informed approaches to healthcare and well-being.

HOW DO WE IMAGE VITALITY WITH THE USE OF MRI STUDY

The Vitality study aims to shift our perspective on health from a deficit-focused view to one of abundance. This project takes a cultural approach to health, drawing from a traditional and holistic Māori approach. We integrate Western tools, including our MRI machine at Mātai, with our traditional approach to measure one's abundance and vitality. Unlike the conventional healthcare system that focuses on identifying deficiencies and restoring or improving health, the Vitality study seeks to uplift the well-being of individuals, even those who are already considered healthy. To achieve this, we are collaborating with Teina Moetara, a respected iwi leader, who has developed a Māori framework that strengthens vitality and abundance by fostering connections to one's identity, environment, spirit (wairua), and people.

As interns on this innovative health and research project, our main responsibility was to develop an MRI imaging protocol. This protocol is crucial for conducting a pilot study to test the feasibility of the project. To lay the foundation for the study, we conducted a comprehensive literature review on MRI and vitality. Given the limited literature on MRI imaging of vitality, we specifically focused on monks and yoga, as spiritual practices like meditation and yoga are believed to contribute to a state of abundance and vitality. Through our literature review, we identified common brain regions that will be incorporated into our imaging protocol as a focus when searching for a biomarker for vitality.

Braden Fowell, Aorere Waaka & Jade Keelan, pictured with iwi leader Teina Moetara

SPORTS DAY

We would end every week with a Friday afternoon sports session. This offered us a chance to get away from the workplace and enjoy the Gisborne sun, as well as a great team bonding activity. We engaged in various sports each week, such as football, netball, basketball, and tennis. It became evident through these activities that we had a group of very talented and competitive interns.

LEADERSHIP DEVELOPMENT

ROOKIES

For first-time Mātai interns, the leadership workshops served as a way for us to learn about becoming better leaders. Stu Potter, the session presenter, engaged us in lively discussions about current affairs, situational awareness, design thinking, coaching, the importance of innovation, self-identity, and much more. These sessions gave us a space to discuss important subject matters and be pushed outside of our comfort zone in a way that inspired growth. Consensus among all the interns is that Stu's sessions were fun, thought provoking, and engaging.

Most sessions were dedicated to inventive thinking. A great example of this was our design thinking session where Stu challenged us to imagine an event Mātai could hold at the new site and then propose said idea to random members of the public. This was a new and exciting challenge for a lot of us, as it demanded that we work as a team as well as interact with the community in a way that represented Mātai appropriately. We were encouraged to gather feedback from Gisborne locals on how we could improve on our ideas.

Another significant aspect of Stu's sessions focused on the direct development of leadership skills. Stu illustrated effective leadership through real-world examples, often highlighting local leaders from Tairāwhiti who have made substantial contributions to the community. Learning about these individuals was crucial as it added a sense of relevance and significance to the sessions within the Tairāwhiti context.

To summarise, the rookie leadership sessions were engaging and helped us to think more in-depth about our values and beliefs. Stu's energetic presentation style and relatable content challenged us to become better leaders.

Sofia Zame, Breanna Ferris, Phoebe Wynands, Zara Potter, Imogen Amor Bendall, Aorere Waaka, & Joseph Ross-Ward performing their self-made group song on Mātai

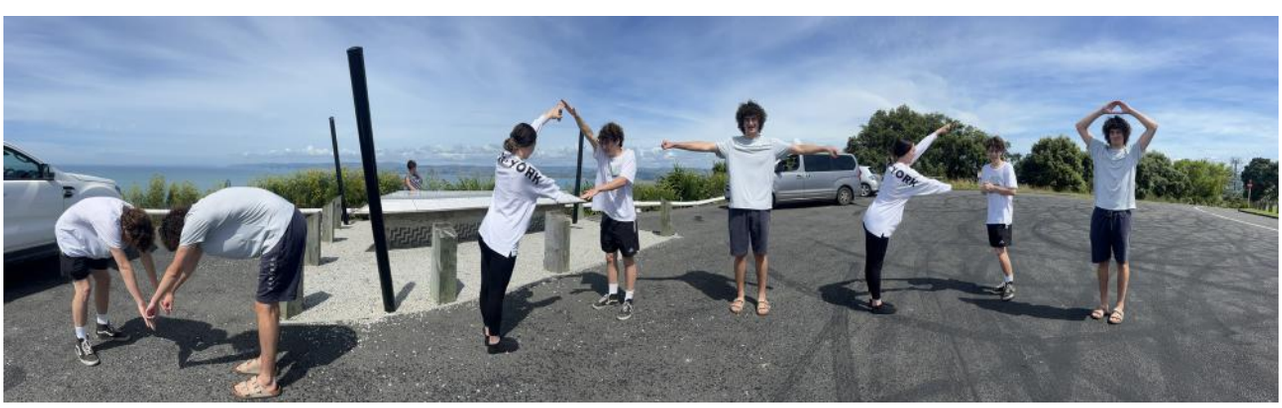
VETS

For the second round of our internship program, we were fortunate to engage in a leadership initiative led by Stu Potter, aimed at shifting our focus from individual leadership (“Me”) to collective leadership (“We”). Stu’s leadership program played a pivotal role in guiding Paige, Rikki, and Braden through a transformative journey, encouraging them to contemplate not just how they function as leaders but also how they can serve and lead within their community.

Under Stu’s guidance, we delved into various sessions covering design processes, Belbin team roles, and the GROW coaching model. These sessions provided us with the opportunity to step outside our comfort zones, particularly in leading our first-year interns. This experience equipped us with valuable insights on how to lead our peers with respect and trust.

The VET interns unanimously attest to the insightful, practical, and unique nature of Stu’s leadership sessions. One particularly memorable session involved the creation of an “Amazing Race” for our rookie interns, designed to stimulate creative thinking about the future of the new Mātai campus build. Tasks included spelling “Mātai” with their bodies atop Titirangi, singing the Mātai waiata at Waikanae Beach, and recounting the story of the Te Maro statue on Titirangi hill.

The overwhelmingly positive feedback from the interns highlighted the strengthened connections among them and a deeper understanding of Tairāwhiti’s history.



The VET leadership sessions served as a platform for us to refine our leadership skills, grasp the principles of design processes, and reflect more profoundly on our individual leadership styles. We extend our gratitude to Stu Potter and Trust Tairāwhiti for providing us with this enriching opportunity. Being part of this Kaupapa was a privilege, and we wholeheartedly believe that we are now better positioned to lead in our respective fields and contribute to our community.

WHERE TO FROM HERE?

Moving into the future, we have strived to educate other young people from our community about careers in the STEM industry. After being provided this one-of-a-kind opportunity through the Mātai internship, our cohort have been equipped with tools and skills to be future leaders in this space.

As we take our newfound knowledge, we demonstrate that young people can and will make a difference.

The Mātai internship has allowed us to build on our passions, while simultaneously reinforcing the value of community, and highlighting the possibility to move home to Tairāwhiti to work. This has helped to ensure the future development of local STEM industries, as we have a drive to bring our skill sets home to uplift our community, providing opportunities to get other where we are today.

ACKNOWLEDGEMENTS

We extend our heartfelt appreciation to the generous supporters who have played a pivotal role in making this internship a reality and to all those who continue to support our ongoing journey of exploration and learning.

We are grateful to the following organisations for their incredible contribution to the Internship Fund:

Hugh Green Foundation
Te Puni Kōkiri
The University of Auckland
Trust Tairāwhiti
Turanga Health
QUEST Enterprise Trust
Vision Research Foundation

Furthermore, we would like to express our sincere gratitude to the EIT - Te Pūkenga Te Whatukura team for graciously providing us with the space for this programme. We also extend our thanks to Taiki-E for generously allowing us to use their HackLab.

We are deeply grateful to the wonderful session leaders, scientists, iwi & community leaders, researchers, clinicians, operations & admin support staff, and collaborators — whose dedication and collaboration have been instrumental in making this programme a great success.

Without the collective contributions of each and every one of you, we would not have had the extraordinary opportunity to learn and grow within the Tairāwhiti community.

Ngā mihi nui,
The Mātai 2023/2024 summer interns

For more information on the Mātai Summer Internship Programme, see:

www.matai.org.nz/summer-internships/

Mātai

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

2023/2024 Summer Interns

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William Batten
Jakob Brown
Olivier Cassidy
Breanna Ferris
Holly Flyger
Oli Gillies
Tūmanako Jones
Jade Keelan
Tyler Lillis
Kyle Mcvey
Rikki Noble
Zara Potter
Paige Richter
Daizee Rawls
Joseph Ross-Ward
Jacquie Shanks
Tom Talbot
Aorere Waaka
Phoebe Wynands
Sofia Zame

The 2023/2024 Mātai Summer Internship Report has been assembled by the group of interns who participated in the programme, showcasing their collaborative efforts and findings.