Understanding Adolescent Risk-taking

By Keryn O'Neill, MA, PGCertEdPsych, Knowledge Manager

To better support rangatahi, it helps to understand what's going on in their brains, their bodies, their social circles, and their world. There is much discussion about adolescent risk-taking behaviour. Research has provided some insights to help us understand what is going on during this time of rapid change, and why we might see rangatahi trying new things and taking risks.

Adolescence

Adolescence is a time of transition from childhood to adulthood. Rangatahi become gradually less reliant on their parents and evolve into independent members of the community.[1] Adolescence begins at puberty and involves many changes – physical, psychological, emotional and social, as well as changes in the brain.[2] Changes also occur in the world around adolescents. For example, where they spend their time, and the expectations others have of them can undergo change.

The end of adolescence is marked by moves toward adult social roles (e.g. living independently, working) and legal status (e.g. being recognised as an adult by law[3]) These social roles can differ across cultures.

To successfully make this transition towards independence, rangatahi need to learn many things; they need to explore their environment and have new experiences.[4]

First we will look at some of the brain changes taking place that may affect behaviour and risk-taking, then at the context for these changes.

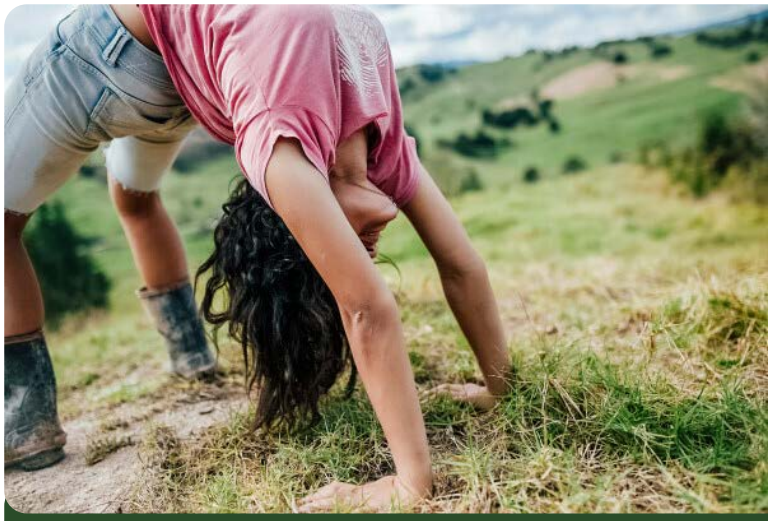
Brain development in adolescence

Rangatahi undergo important changes to both the structure and function of their brain. Two key structural changes are (1) the synaptic pruning of brain connections that haven't been used, making their brains more efficient and more like adult brains, and (2) the myelination of axons, which enables the brain to send messages more quickly and efficiently.[5] This means that during adolescence grey matter (cell bodies of neurons) decreases, and white matter (myelinated axons) increases, across the brain.[6]

Connections within and between brain regions also change, contributing to new ways of thinking and behaving.[7] While during childhood connections are largely among nearby brain regions, in adolescence regions further away from each other become more interconnected. When many brain regions function at the same time it is called "functional connectivity".[8] These functional networks support more complex thinking and behaviour than any one brain region could alone.[9] It's not simple though – adolescent brain changes unfold differently in different areas of the brain. And different regions reach maturity at different ages.[10] For example, during adolescence some areas of the brain (e.g. the nucleus accumbens) will decrease in grey (unmyelinated) matter while other areas will increase in grey matter before reaching a peak and then decreasing (e.g. the amygdala).[11]

One factor often thought to influence risk-taking in adolescence is the fact that different neurotransmitters, including serotonin and dopamine, begin to affect the brain differently.[12] Neurotransmitters are the specific chemicals that carry electrical impulses from one neuron to another.[13] Dopamine levels increase in the striatum in adolescence, becoming stable by early adulthood. In the past, this has been narrowly understood to explain impulsivity and risk-taking in adolescence, but research now also indicates increased dopamine is important for memory and learning.[14] Greater activity in the striatum and adolescents' sensitivity to reward help rangatahi to learn from and remember their experiences.[15]

In some situations rangatahi are more sensitive to rewards than adults – risk taking is more exciting for them.[16] It helps to understand this. But reward is only part of the picture. Studies have now found that when rangatahi face risk, there is more activity in several areas of the brain (ventromedial prefrontal cortex, anterior insula and dorsomedial prefrontal cortex, and striatum). This indicates that adolescent risk-taking is not only influenced by the potential rewards (which might be the case if there was increased activation only in the ventral striatum).[17] We are increasingly understanding the other factors which come into play at this age.



Adolescents' sensitivity to reward help rangatahi to learn from and remember their experiences.

The brain and behaviour: caution needed

Our understanding of adolescent brain development has grown considerably in recent years, shedding further light on the opportunities and challenges of this stage of development. Having knowledge of what's going on in the brains of our rangatahi can help us to better understand them and their needs.

However, it's important to keep the limitations of this knowledge in mind. For example, that "there is not a 1:1 correspondence between a particular brain region and a particular behavior."[19] Brain regions do not work in isolation, instead, behaviour results from many interconnected areas of the brain.[20] Links between brain activation differences and mental processes, or real world behaviour are not proven.[21] Rangatahi behaviour is influenced by sociocultural factors as well as biological maturation.[22]

To really understand what's happening for rangatahi we need to consider these brain changes in context. We must take into consideration "the interconnectedness of the individual and their environment."[18] Although a lot is changing within rangatahi themselves, this is only part of the picture in understanding their development. Their environments and relationships with others are also changing during adolescence, and these can influence the nature and extent of any risk-taking. As with any behaviour, risk-taking does not occur in a vacuum, with many factors influencing its occurrence.

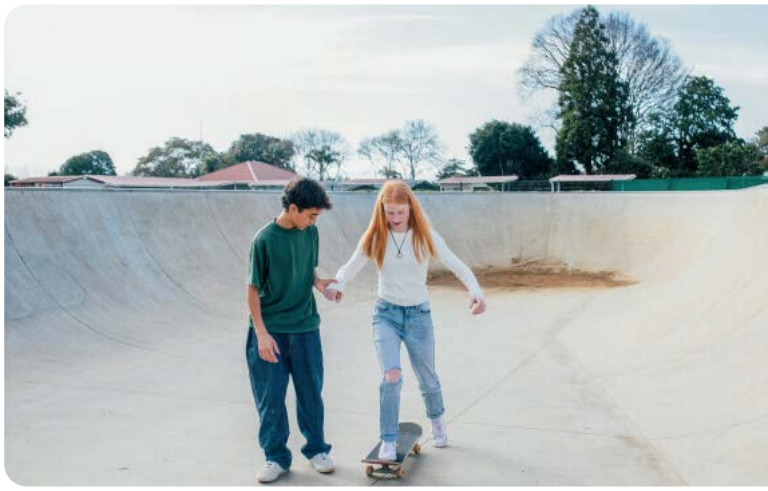
Risk

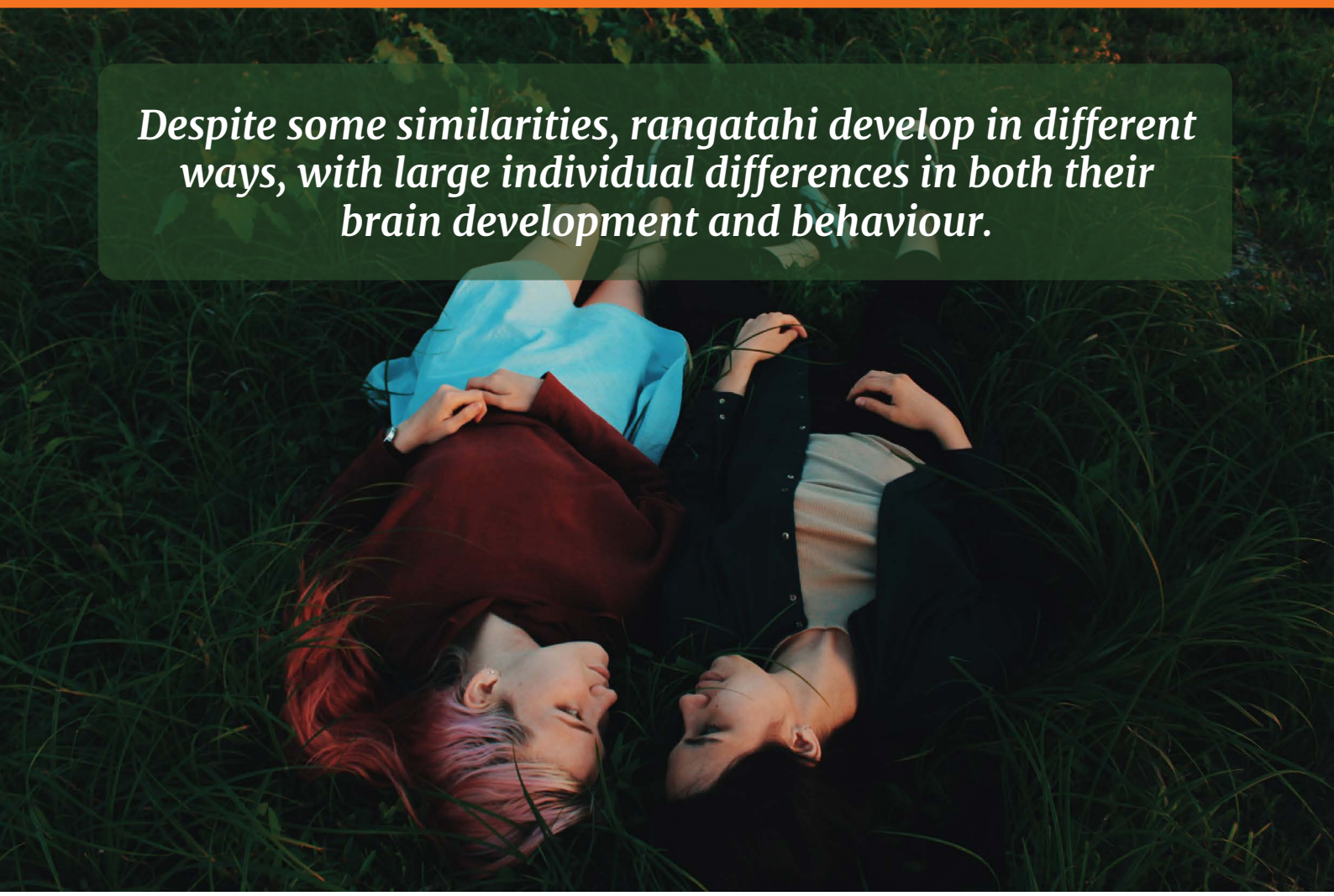
Risks have two main features. These are (1) "uncertainty" and (2) "the potential for an undesirable outcome."[23]

The type of risks that adolescents might take can be divided into several different categories. Writing about risk-taking often focuses on socially unacceptable behavior including having unprotected sex, binge drinking or violence,[24] however, this is only one aspect of it. Some researchers separate risk-taking into either positive or negative categories. Positive risks are those which are constructive and socially acceptable; examples include auditioning for the school play, trying out for a sports team, learning to drive, or helping a peer. Negative risks are dangerous and/or illegal, for example trying alcohol or other drugs.[25] Positive or adaptive risk-taking tends to be associated with sensation seeking, whereas negative or maladaptive risk-taking is characterised by poor impulse control.[26]

Risk-taking can also be classed as either impulsive and reactive, or intentional and reasoned. Contrary to what many might think, much adolescent risk-taking is intentional and planned in advance.[27]

It's worth remembering that "focusing solely on negative risks reinforces a deficit-based perspective of adolescence that discredits young people's potential to be thriving, contributing members of society."[28]





Despite some similarities, rangatahi develop in different ways, with large individual differences in both their brain development and behaviour.

Sensation–seeking & impulsivity

Two concepts related to adolescent development are sensation seeking, and impulsivity.

Sensation-seeking involves interest in new or exciting experiences and seems to peak during adolescence.[29] A study of people aged 10-30, across 11 countries, found that on average sensation-seeking was at its highest around 19 years of age.[30] Other studies found it peaked earlier, between 15-18 years.[31]

Impulsivity is the tendency to act in ways that are less planned or thought through.[32] Its two main components are "acting without thinking… (and) impatience, or the tendency to prefer a sooner, smaller reward, instead of a larger, later reward".[33] Impulse control usually improves gradually from childhood into adulthood and is associated with the development of the prefrontal cortex.[34] In other words, impulsivity lessens over this time. Regardless of age, there are individual differences in impulsivity.[35]

Theories on risk-taking

A number of theoretical models have been developed to better understand risk-taking in adolescence. Two prominent models are the 'dual systems' and the 'maturational imbalance' models. While there are differences between them, both view the interaction between increased reward sensitivity in adolescence, and the more slowly developing cognitive control system, as resulting in a temporary period of increased risk-taking.[36] In these models, rangatahi are wildly excited by risk-taking, but not yet always able to 'put the brakes on'. This thinking has informed much of the discussion in recent years, however, many now consider that this doesn't provide a full explanation of the factors affecting adolescent risk-taking.[37]

There have been a number of criticisms of these models. In particular, the idea that this imbalance occurs for all rangatahi has been questioned, given the large individual differences among rangatahi, both in terms of their biological development, and their behaviour.[38]

The Lifespan Wisdom model views adolescent risk-taking as necessary to develop into adulthood.[39] This model separates adaptive risk-taking (characterised by sensation seeking) from maladaptive risk-taking (characterised by poor impulse control).[40]

The "Developmental Neuro-ecological risk taking" model suggests that as rangatahi get older they are exposed to more risky environments. As whānau, school, and the law allow them more independence they face increased risk and harder decision making. In this model this contributes to increased risk-taking as rangatahi naturally explore their environment; a factor that other models have usually neglected.[41] In this view, it is (1) risk exposure and (2) individual differences in self-control which influence risk-taking behaviour.[42]

Taken together, differing theories show that risk-taking is influenced by many factors and can't be described by a simplistic explanation.[43] Ways of understanding rangatahi that include their environment "paint a fairer picture of adolescents, not just as individuals with unfinished brains and raging hormones, but as active learning agents who are exploring a new and uncertain world."[44]

...as rangatahi get older they are exposed to more risky environments.

Individual differences

Research on adolescents has often focused on 'averages' across groups of young people, which can hide important individual differences in development.[45] Despite some similarities, rangatahi develop in different ways, with large individual differences in both their brain development and behaviour, as such "there is no average adolescent".[46] Genes and environment both play a role in these differences.[47]

Similarly, there are huge individual differences in risk-taking behaviour among adolescents.[48] Not all rangatahi take risks, and for those who do, this will happen in some situations and not others.[49]

For example, individual differences in sensitivity to rewards combined with different experiences during development (e.g. a supportive or a chaotic home environment) influence the way rangatahi approach risk taking.[50] Gender makes a difference too, with risk behaviour, on average, higher among young men than young women.[51] Psychological and neurobiological differences as well as differing opportunities contribute to individual differences in risk-taking behaviour.[52]

Risk-taking that is concerning occurs in only a minority of rangatahi; typically those who have

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had poor impulse control and behaviour difficulties since early childhood.[53] Such differences seem to continue through into adolescence and early adulthood,[54] influencing outcomes in many areas. Increased dopamine activation means that these differences in cognitive control can get bigger during adolescence.[55]

Negative risk taking typically decreases in adulthood, due to both the greater responsibilities of adulthood as well as an improved ability to manage emotions and behaviour.[56]

Rates of adolescent risk-taking behaviour vary across different countries, despite some aspects of psychological development being universal. This indicates that the environment influences rangatahi behaviour, and risk-taking "is not the inevitable by product of the period's neurobiology." [57]

Environmental factors influencing risk-taking

Increased independence. Adults typically grant rangatahi more freedom and this is found across many cultures.[58] Parents may provide less monitoring and by later adolescence young people may be living independently. Policy and law also influence the opportunity for adolescents to engage in different types of risk-taking behaviour, for example, the legal age at which alcohol can be bought.[59]

The presence of their friends.[60] Some types of risk are more likely to occur when rangatahi have friends present, for example they are more likely than an adult to have a car accident when carrying a passenger.[61] They are also more likely to try alcohol and other drugs with friends, compared to being alone.[62] The influence of friends can also be a positive one, for example if their friend discourages them from risky behaviour.[63]

Drinking alcohol. Alcohol affects decision-making abilities and the ability to regulate behaviour.[64] A study of young adults found that the combination of peers and alcohol affected brain connectivity during risk-taking tasks leading to brain activity that was less mature; the researchers suggest the effects of alcohol and peer presence would be even stronger among younger adolescents.[65]

Lack of sleep. Very common among rangatahi, not getting enough sleep is associated with more risk-taking, including alcohol and other drug use, violence, unsafe road behaviours and sexual risk taking.[66] When rangatahi don't have enough sleep, studies have found that they are more likely to behave in risky ways, and they have less connectivity between the emotional and decision-making areas in their brain.[67]

Stress. Even among adults, stress increases risky decision making. Adolescents face many stressors including physical changes, conflict with others, and academic demands.[68] Negative emotional states, such as feeling threatened, influence risk-taking behaviour.[69]

Conclusions

Adolescence is a time of many changes, physically, socially and emotionally. There are significant

Environmental factors influencing risk-taking

increased independence | *drinking alcohol*
the presence of friends | *lack of sleep* | *stress*

changes to the brain. Physiological changes, including those of the brain, do not occur in isolation and the context and purpose of these changes is important to understand.

How an adolescent develops through this time depends on many factors, including their genes, prior experiences and relationships as well as the experiences and support available to them during adolescence.

Risk-taking in adolescence is influenced by many things,[70] including:

> Social and biological changes of adolescence

> Large individual differences in both adolescent brain development and in risk taking behaviour. In particular, some have pre-existing difficulties with impulse control which might intensify in adolescence

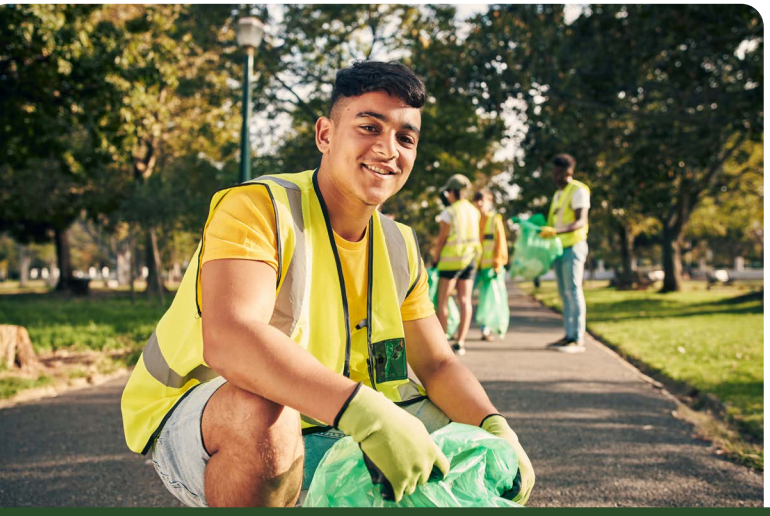
> Situation specific factors (e.g. being with friends, using alcohol, lack of sleep, heightened emotions)

Risks themselves can vary along several dimensions, including:

> Adaptive or maladaptive

> Reasoned or reactive

Rangatahi are undergoing incredible changes and are predisposed to explore and learn about their world. For some, this can result in dangerous behaviour, but it can also lead to positive prosocial and creative activities.[71]



Endnotes

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You can find a fully referenced version of this article on our website.

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Another Way of Looking at Teens: Positive Youth Development

Supporting the Well-being of our Rangatahi

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Glossary of Māori terms:

Rangatahi
youth; younger generation

He Pitopito Kōrero

Whakamana i te tamaiti

Every childhood matters. That's why we speak up about the importance of brain development in the early years. Brainwave's vision is that all children in Aotearoa / New Zealand are valued and nurtured so they can reach their full potential. We are a charitable trust that aims to educate everyone involved in the life of a child about the importance of early experiences on brain development and their lifelong impact. Brainwave has no political or religious affiliations and is known for relying on strong evidence and for the scientific integrity of all its material.

From the Chair

Casey-Plunket
OUTGOING CO-CHAIR

Tēnā koutou katoa,

I joined Brainwave as a trustee in 2008. At that time, most of the trustees were either health professionals like Simon Rowley or people with both a passion for the Brainwave kaupapa and talents or skills that could be put to use operationally, as part time presenters, fundraisers or content generators – Judy Bailey and Sue Younger come to mind. I joined Lope Ginnen as a second lawyer on the board, with the intention of strengthening its governance capability. Of course, I was also hooked on the Brainwave message when I joined, and that only increased as time went on. Today's board is broadly similar in its make up to that of the late noughties. The big difference is that we have a very capable and dedicated group of full and part time staff and Kaiako who are fully capable of doing the work without us, led of course by the inspirational Huia Hanlen. This has given the trustees some time to work on strategic direction. It has been very gratifying to see the success of our push in a more bicultural direction, without losing our passion for the science that underlies it all.

CEO update

Huia Hanlen
KAIHAUTU

Tēnā koutou katoa,

This year Brainwave celebrates 25 years since its inception. Over the years, many people have given generously of their time and efforts to strengthen Brainwave, whether as an employee, trustee or kaiako / educator. I would like to acknowledge all of the Brainwave team over the years, and importantly, our funders and donors, without whom we wouldn't have been able to continue. Ka nui taku mihi atu ki a koutou katoa.

Our board members have adopted a model of governance that is intended to reflect the partnership between Tangata Whenua and Tangata Tiriti; to ensure Brainwave is diverse in its thinking and capabilities. We are advised that our work with whanau Māori using kaupapa Māori approaches, specifically a wananga; *He Hikoi Mahara,* as a prelude to our *Tiakina te Tamaiti* workshop is really meaningful and impactful, in supporting understanding of both tūpuna practices and what science tells us is happening in the developing brain during the early years.

Along with continuing all the work we currently do, we have been very excited to have started work with Pacific Island communities and begin to develop approaches that reflect their diverse knowledge bases as well. We have also developed two new programmes for adults about rangatahi / adolescent development, including the impact of the early years on this stage of life; *Resilient Rangatahi* and *He Rangatahi, Hei Raukura.*

In March 2023, we hosted our biennial Brainwave Conference – *He Mokopuna Pae Ora / Creating Intergenerational Wellbeing*. The speakers were each incredibly powerful in their messaging, which ranged from high-level systems approaches to community-based initiatives that support families to raise tamariki with love and care. This just highlights that it does "take a village" and we all have a role to play to whakamana i te tamaiti.

New kaiako

We welcome two new kaiako, Min MacFater and Michael Frew, to Brainwave Trust. They are trained to facilitate *He Hīkoi Mahara* wānanga, *Tiakina Te Tamaiti* and *Nurture Our Tamariki* workshops. MIchael is based in the Central North Island (Tūrangi) and Min is based in Northland (Whāngarei).

For bookings: 09 528 3981 | bookings@brainwave.co.nz

Brainwave Hui, Oranga, March / Poutū-te-rangi 2023

Thanks a million

We're chuffed to have the Bethell Family Partnership recently join us, offering untagged operational funding support. One Foundation and Aotearoa Gaming Trust are fresh funders to Brainwave Trust who have allowed us to purchase new laptops for Kaiako working in communities. Lottery Community and Pub Charity are loyal funders who help with operational salaries — the work essential to support our work on the ground. The Wright Family Foundation and the Duncan Trust, allow us to offer workshops in our communities. Every bit counts and we are so grateful to all our donors, grant and philanthropic funders who support our mahi, improving outcomes for tamariki.

If you would like to make a contribution to Brainwave Trust Aotearoa and the work we do:

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Special thanks to our key funders:

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