Stronger Brains Submission to the South Australian Royal Commission into Domestic, Family and Sexual Violence

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Introduction

Many of our youth and young adults living with trauma from domestic, family and sexual violence have difficulty completing education and gaining and sustaining employment through mental ill-health, poor brain function and impaired social and emotional wellbeing. Alarmingly, adverse experiences in childhood are risk factors for perpetuating a cycle of violence in adulthood. (Appendix 1: Biological and neurological consequences of violence)

This submission proposes a novel, disruptive solution to the insidious intergenerational problem of domestic, family and sexual violence through an Australian science-based therapeutic brain strengthening model delivered by Stronger Brains. We can and must help young victims live healthier and more productive lives by healing their trauma, in order to have any chance of reducing the inter-generational cycle of abuse and violence and strengthening families and communities.

Organic brain health of children and young people impacted by trauma

In a recent interview on ABC Radio Professor Patrick McGorry, Professor of Youth Mental Health at Melbourne University and Founding Director of Headspace stated "in Australia in 2007, 26% of teenagers and young adults suffered mental health problems. In 2022 that figure has risen to 40% (two in five). Having mental health problems in this age group puts you most at risk for poor mental health across the lifespan." **Poor mental health has consequences for families and society.**

A large-scale study at the University of Essex revealed that the effects of traumas when inflicted in the early years are particularly damaging to vital neural pathways in the brain. Stronger Brains understands the machinery of these neural pathways; our program of brain exercises is designed to repair damage and improve performance of these pathways. (Appendix 2: How childhood trauma rewires vital neural pathways)

Major social drivers for domestic, family and sexual violence are having contact with the youth justice system and/or adult justice system; experiencing abuse and violence in childhood and young adulthood; having low socioeconomic circumstances; living in out-of-home care and/or being homeless; having substance addictions; - all compounded by limited support for people suffering poor mental health. Professor McGorry states "A lot of mental health services are understandably demoralized and don't have enough support. Support for mental health is the weakest part of the Health System." (Appendix 3: Youth justice exacerbates intergenerational violence)

Separation from family, culture and land has been highly destructive for Aboriginal people and their culture and its effects are trans-generational. Many of the social drivers listed above impact Aboriginal and Torres Strait Islander peoples. They are disproportionately over-represented in youth justice systems and prisons. (Appendix 4: Aboriginal circumstances and world-view post colonization)

World-leading neuroscientist, Emeritus Professor, Dr Michael Merzenich, *co-founder and Director, Stronger Brains* has proven that a poorly functioning brain can be trained back to health. Merzenich regarded as "the father of brain plasticity" has been elected to two National US Academies and is the winner of many prestigious prizes, including the 2016 Neuroscience Kavli Prize (equivalent to the Nobel) for 40 years of brain research, proving that the brain is plastic and with the right stimulus can change throughout life not just in early childhood. Like a muscle the brain has the ability to transform and heal even when it has experienced trauma and chronic stress. Merzenich is a co-inventer of the cochlear implant.
www.michaelmerzenich.com/bio/ www.strongerbrains.org

In a 2023 podcast, Professor Merzenich describes what drives us in the work of Stronger Brains: "We are primarily trying to help individuals that struggle, that is to say are at risk for progression to develop mental illness or go on to criminal misbehaviour, and in other ways are going to struggle in life. We are trying to identify them at a relatively young age and engage them to help them by a combination of educating them about their brains, helping them in social and emotional behaviour and control – all brain plasticity-based - and then address issues relating to their organic brain health and function …

which is limited and controlled by their neurological development and performance abilities."

"The brain organizes itself in ways that account for how we evolve as performers – you can say neurologically. All of us don't have such a good start in life, but the brain is massively plastic, so most of the faults and limitations that apply to any person at any age in life, are to a substantial extent reversible, and **in a young person usually almost completely reversible, 'overcomeable'**. So, we are trying to help young people that are destined to struggle to move forward in a life that is not so perilous, not so struggle-loaded. (It's really cool by the way)."

"The shocking thing about schools everywhere is that there is no real brain education. There is no real concern for the organic health or functional status of the brain. Kids go to school in the USA and there is an eye and ear check, and a physical check – where is the brain check? The most important thing a kid brings to school is within the skull. It is assumed that everyone has a good brain because they have one, and that is ridiculous. In fact, **we should be continuously monitoring and sustaining and growing the operational functional status of the organ inside your skull and we should be doing that from cradle to grave, but … at least doing that continuously for the period that the child is in school.** But we don't, we step past it and we actually don't deal with problems in the brain at any level, at any point of health until a person can't control themselves – we call it mental illness or neurological disease or disorder. All of these can be turned around. … **We all have the capacity to make our brains more useful, more powerful and capable of doing more things to create a more operational, powerful person**."

"As soon as the child, or anybody, understands they have that capacity, and stops wasting their time being mad, or feeling disrespected or being oppositional or being upset or being variously distressed, they're better off. So, it's critical that that be established and it should be established in every individual child because it is a fact of the brain. … Understanding that what you do affects where your brain goes is critical, and every child should understand that there are certain things they do that are destructive to their neurology. We deliver this information in a class. … At Stronger Brains we know the value of giving a child a growth mindset – a positive attitude about your self-worth. Kids negative self-appraisal is the basis of continuous self-

inflicted damage in the brain. So, you have to establish a more correct perspective about their prospects; and they have wonderful prospects once they understand that the brain is plastic and they are not stuck in the position they are in, they can go somewhere, they can be better next week, they can be a lot better next year, but of course they have to go through a progression of engaging their brain to make it stronger and more effective."

An example of a behaviour that is destructive to the brain: "I can demonstrate neurologically that if I am cruel to someone or someone is cruel to me, it is a crystal-clear double negative, both brains suffer, both brains are degraded by that operation at any systematic level. **So, it is important for a child to understand that.** For a child to understand that being helpful to other people, being positive to people, is a kind of brain food – not just for you but the person that you are being helpful to."
https://dsai.podbean.com/e/prof-mike-merzenich-on-startups-neuroplasticity-chatgpt-the-future-of-humanity?trk=public_post_comment-text

Stronger Brains Ltd.

Stronger Brains is a pioneering, registered Australian charity and Public Benevolent Institution (founded 2016) focused on empowering ALL children and young people to develop their strongest brains for learning and for life by building new brain pathways and networks harnessing brain plasticity (underpinned by world-leading science). Working with schools and institutions we have accumulated substantial statistically significant, quantitative evidence that the toxic impacts of Adverse Childhood Experiences such as trauma, abuse and neglect can be reversed, and damaged neural pathways can be recovered and strengthened.

Professor Merzenich and his team have developed brain training exercises to support many brain-related conditions across the human lifespan. This research has been tested by independent organisations and by Merzenich's Brain Research Institute in hundreds of random controlled trials. https://www.brainhq.com/world-class-science/the-proven-benefits-of-brainhq/ https://www.brainhq.com/world-class-science/information-researchers/

Neuroplasticity supports and enables learning

At Stronger Brains our scientists know how the brain's machinery operates to control various critical brain functions: focus, attention, brain speed, working memory, social cognition, language and listening, vision and action control, impulse control and decision making (executive functions) - all functions which support, enable and empower learning. Focusing attention, staying alert and motivated **helps the brain produce chemicals** called neurotransmitters that are learning-enabling. These learning-enabling neurotransmitters chemically 'wire' neuronal synapses together (brain plasticity in action) strengthening critical brain functions and markedly improving the brain's operational effectiveness.

When some or all of these learning-enabling neurotransmitters are limited ('down-regulated') through chronic stress and trauma, the brain is less able to pay attention, stay alert and remain focused.

When a person is able to pay attention, the brain becomes increasingly capable of making fine distinctions or 'differentiating'. When the brain is able to focus, pay attention and operate at speed it is more capable of controlling impulses, making better decisions (improved executive functions) and learning. Crucially, improved organic brain health and stronger executive functions reduce the risk of serious offending, addiction, violent behaviour and other mental and personality disorders.

We also know that because of brain plasticity you can drive the brain in a negative direction with stimuli such as drugs, stress, trauma, bullying, violence, sexual abuse, neglect and more. In infancy and childhood, violence and neglect are really damaging because social bonding underlies good mental health throughout life.

Neuroplasticity is the key to achieving healthy brain function leading to better resilience and sustained growth. Stronger Brains works with children and young people (8 to 24 years) with multiple adverse childhood experiences (ACE's) (Appendix 1), those in youth justice environments, ATSI, culturally and linguistically diverse (CALD), neurodiverse, foetal alcohol affected (FASD), in fact all children and young people including neurotypical youth.

Current mental health programs

A consequential and disheartening deficit in mental health programs is that they fail to address the **neurological** processes underlying cognitive and social-emotional functioning in people affected by trauma, despite thirty years of breakthroughs of epic proportions in brain plasticity research. Much of the current thinking of "what works" is subjective and in our opinion out of date.

It is critical to integrate the science of brain plasticity in facilitating better outcomes for youth whose brains are underdeveloped and impaired, and whose cognitive difficulties lead to poor impulse control and regulation and poor decisions.

Stronger Brains model

The Stronger Brains model operates as a three-stage process:

- wide-spread online brain screening to identify individuals whose brains need healing from a trauma-ladened life or who are otherwise struggling with life's challenges- **brain assessments**;
- daily **trauma-informed wellbeing and empowerment** practice (in a safe space) (designed by our co-founder and Director Ms. Wendy Haigh) to neuroplastically recover optimum brain health; together with a novel **brain education** curriculum (designed by Professor Merzenich);
- students engage in a daily **'brain gym' exercise** period to broadly physically and functionally improve and advance their cognitive performance abilities (designed by Professor Merzenich).

The Stronger Brains program can usually substantially renormalize brain function in as few as 30 hours of brain gym exercises supported by our wellbeing and empowerment program. Delivery is generally over 20 weeks; mostly in a school setting, but also within youth justice as required. (Appendix 5: Stronger Brains model)

Universal assessments to measure brain health

Stronger Brains' brain assessments can be up-scaled to all South Australian youth to identify individuals impacted by domestic, family and sexual violence and other challenges and privations.

A lot of children and young people will not talk about violence in their families or in their lives for a variety of reasons: can't always identify violence; don't want to report because they may get a family member into trouble, etc. Notably, our brain assessments can identify effects of trauma even when individuals have not demonstrated behaviour indicating a trauma history.

Our assessments are designed to determine the operational capabilities of brain systems to determine specific strengths and weaknesses. W*e are not seeking a diagnosis*; instead through a series of online tests we determine whether certain brain areas are functioning effectively.

Stronger Brains' assessments *are different to neuropsychological assessments.*

EEG's can be performed where appropriate.

Everyone's brain is unique. From each student's brain assessment, we DIRECTLY set up a neuroplastic training strategy (in the form of a personalized wellbeing and empowerment program and a personalized online brain gym exercise program) to rewire the brain, adaptive to individual performance. Individuals build their own capacity at their own pace.

Disrupting the intergenerational cycle of violence

Stronger Brain's scalable therapeutic, brain-focused model provides a **much-needed paradigm shift** in addressing the intergenerational cycle of violence in our communities. We are healing trauma in young brains with astonishing success, at minimal cost and time. Our program can be tailored to support youth at high risk of engaging in low level criminal activity, and we have experience working in the youth justice system.

Through healing and recovering from the effects of abuse and neglect, communities will also reduce the prevalence of chronic diseases.

There is an imperative for early intervention and prevention "building a fence at the top of the cliff as opposed to sending an ambulance to the

bottom of the cliff". Stronger Brains can intervene by assessing brain function, educating youth about their brains, and healing and improving functionality of damaged brains, **all the while supporting families.**

Our Stronger Brains brain-based intervention rolled out widely to young people offers the opportunity to reduce and even prevent most forms of intergenerational domestic, family and sexual violence in our communities.

Engagement with families

An important restorative need in healing from trauma and violence is to have a supportive and caring family. We seek engagement with our students' families *through community support networks* to establish a partnership, explaining the Stronger Brains program and teaching which behaviours drive brains in positive and negative directions. Without an understanding of the root causes of poor brain health, parents and carers are ill-equipped to contribute to improvements in the care, safety and personal growth of their children and young people. We aim to help parents and caregivers recover a sense of family. Families are vital for supporting students transitioning from our program.

It is vital to acknowledge and understand how Aboriginal and Torres Strait Islander "responsibility to nurture, protect and teach children *has been fractured and dismantled under colonization*, and how much of the learning of children today comes from the witnessing of acts of violence in institutional situations, in families and communities, and in Western media." In working with ATSI communities it is important to recognize "the roles of men, women and more particularly Elders in the generational responsibility of nurturing children and the manner in which Aboriginal children were taught proper behaviour." [1]

We collaborate with families and their support systems, to provide a safe space for those in detention or transitioning out of detention. We go beyond families and we are proposing a new model for long term detainees to become mentors in youth justice centres, as a pathway for success for all **before** young people return to the community.

We provide pathways to young people well beyond our program.

Stronger Brains' impact

Stronger Brains is impacting policy and is being recommended by leaders in education, health, and human services in Australia, the UK, USA and Canada.

Former President of the British Medical Association and first UK Clinical Director for Children, Sir Al Aynsley-Green wrote in 2019: "New work by Merzenich and Haigh is showing that disordered brain "wiring" can be reversed through new ways of stimulating the brain..... I see this to be one of the most important and exciting opportunities in neurodevelopment today."

Our work offers a paradigm shift in treatment approaches, aligning directly with the very latest, objective scientific evidence of "what works" in supporting children facing adversity to thrive, enabling behavioural change, and empowering at-risk youth to be ready to face life's challenges. No other program in Australia achieves what Stronger Brains is achieving and the most vulnerable children in need improve the most.

We are hoping to achieve long term world-leading change at a population health level (like the stop smoking campaign) whereby Australia will lead the world in neuro-education, reversing the impacts of adversity on children and families, breaking the cycle of intergenerational disadvantage.

A Stronger Brains initiative undertaken with young people at-risk of long-term unemployment is our 'Rewire the Brain' Project (RTB) which was awarded by the Department of Social Services in 2018-2019 to **test if neuroplasticity-based interventions could improve employment outcomes for young people at high risk of long-term unemployment by improving cognitive deficits.** Currently, no other programs target cognitive deficits in youth at high risk of long-term unemployment. (Appendix 6. Stronger Brains Program Results) TTL Impact Report

Within Australia Stronger Brains has been helping children and young people in out-of-home care; the juvenile justice system; schools; and employment, disability, and youth mental health services throughout

NSW and Queensland. (Appendix 6: Stronger Brains Program Results) (Attachment 1: Stronger Brains Evidence – 2024)

In education Stronger Brains has been successfully supporting positive school change, including improved student attendance, reduced disruptive behaviour and reduced bullying.

Stronger Brains is listed on the South Australian Department for Education and Training 'External Wellbeing Directory' and on the Australian Council for Educational Research (ACER) 'Wellbeing Program Guide'.

We are working on a new initiative in 2025 to partner with Western Sydney Wanderers (WSW) – an A League soccer club - to identify youth at risk of low-level engagement in criminal activity, anti-social behaviour and substance abuse in the Western Sydney region, aiming to provide alternative pathways for them. Individuals identified as 'at-risk' through Stronger Brains brain assessments engage in football clinics lead by WSW for personal empowerment and skills building, and undertake Stronger Brains brain education and brain training to improve relationships and behaviour, build trust and resilience, and develop sports, learning and job skills to divert them from criminal justice and reduce recidivism. Our brain assessments can detect indications of risk (including addictions) **before there is any evidence of anti-social or criminal behaviour.** (Appendix 7: Stronger Brains and Soccer)

Impacts of the Stronger Brains program influences every aspect of daily life. At school, at home, in sports, and in relationships a greater sense of belonging, engagement, motivation and positive behaviour fosters growth of resilient, calm, and socially confident individuals, empowered to learn with a growth mindset.

As a result of social media, the internet, cyber bullying, online gaming, Covid 19 and other unprecedented impacts on the brain health of our young people of today there is an urgent need to introduce Stronger Brains' brain health curriculum to all students, teaching how the brain works and identifying activities that drive brains in positive and negative directions.

Stronger Brains program in youth justice

Under the heading *"A rights-respecting approach to youth justice and child wellbeing reform across Australia*" a recent 'Save the Children' report states: "The current approach to youth justice in Australia is clearly not working. Across Australia, youth justice systems harm children and young people, fail to uphold their rights, are not evidence-based, and are ineffective in preventing offending and reoffending. They are discriminatory, reinforce intergenerational cycles of disadvantage, and perpetuate the shameful over-representation of Aboriginal and Torres Strait Islander children and young people in youth justice." [2]

Stronger Brains can offer an alternative, remedial justice model for children and youth already in the justice system. Basically, our early intervention and prevention model (using universal screening in schools) is a long-term approach, and our remedial model is a short-term model for existing offenders. In response to South Australian Attorney General's "Minimum Age of Criminal Responsibility (MARC) – Alternative Diversion Model" Stronger Brains prepared a discussion paper, which can be provided.

Trauma-informed training for people working with young offenders

Stronger Brains staff can deliver professional development opportunities for 'trauma-informed practice training' to lawyers, justice support workers, custodial officers and police working closely with young offenders. **There is an urgent need right now,** and personnel dealing with young offenders are recommending it.[3, 4]

Summary - Reducing and preventing domestic violence in South Australia

In the same way that South Australia has become a world leader in addressing the complex needs of the autistic community, including young people, I believe South Australia could be a world-leader in tackling the entrenched problems of childhood trauma inflicted in violent and abusive family situations which leaves so many of our state's young people vulnerable to unsafe, dysfunctional lives, and at high risk of perpetrating violence as adults.

As a state and national measurement framework, universal assessments of the brain health and operation of our children and young people would serve as an early indicator to prevent progression to poor mental health.

Finally, we expect this opportunity would result in a paradigm shift in both education and the juvenile justice system to a brain-based, neurologically-informed approach.

Widespread implementation of the Stronger Brains program would have a significant social and economic impact, reducing pressure on existing government and non-government employment, health, education, justice and social services across South Australia (and Australia).

References

1."*Trauma Trails: Recreating Song Lines – The Transgenerational Effects of Trauma in Indigenous Australia*", Judy Atkinson. *Spinifex Press*. 2002

2.Putting Children First: A rights respecting approach to youth justice in Australia". *Save the Children Report*. April 2023

3. "Trauma and the Law: Applying Trauma-Informed Practice to Legal and Judicial Contexts". Dr. Cathy Kezelman AM and Dr. Pam Stavropoulos. Blue Knot Foundation 2016 https://www.communitylegalqld.org.au/wp-content/uploads/2016/10/blue_knot_paper_trauma_informed_practice.pdf

4. "Young people with acquired brain injury: Preventing entrenchment in the criminal justice system". Gaye Lansdell, Bernadette J Saunders and Anna Eriksson, Trends and Issues in Crime and Criminal Justice No. 650, June 2022 https://www.aic.gov.au/sites/default/files/2022-06/ti650_young_people_with_acquired_brain_injury.pdf

Contacts

Ms. Wendy Haigh, Co-founder and Director Stronger Brains, [redacted]

Ms. Helen Johnson, Stronger Brains Program Manager for South Australia, [redacted]

Appendix 1. Biological and neurological consequences of child abuse

In 1997 the long-term US Adverse Childhood Experiences Study (ACE Study) examined 17,000 Californians and looked at 10 adverse childhood experiences (ACEs) including physical, emotional and sexual abuse, physical and emotional neglect, household dysfunction such as divorce, domestic violence, an alcohol or a drug addicted family member, or one who was in gaol. ACEs were indeed a precursor to mid-life chronic disease and for the majority of victims led to a shortened life span. The ACE study showed that abuse in childhood leads to all kinds of at-risk and self-destructive behaviours that additionally compromise health and life outcomes.[1]

The 50-year New Zealand Dunedin Longitudinal Study noted that poor brain health at age 3 was a reliable predictor of poor life outcomes and economic burden across the lifespan.[2]

These findings highlight the urgency for repairing the neurological damage inflicted on abused children and young people who have been subjected to or have witnessed domestic violence in order to give society any hope of stopping the intergenerational cycle of violence. Of most concern is that young people with brains affected by trauma make poor decisions and often end up in the criminal justice system. A person who heals the damage to their brain has a lower likelihood of harming others, a lower chance of suffering life-threatening chronic diseases and a lower chance of being incarcerated.

Discoveries in neuroscience explain how a brain exposed to trauma and toxic stress is affected, leading to bad decisions, poor life choices, and addictions to numb the pain:

- Toxic stress, especially in childhood, can automatically trigger the brain's survival instinct – fight/flight/freeze/fawn response.
- Entire human operating system goes into defence mode and the emergency response system takes over from normal operating system which goes on standby.
- All key brain functions are affected – processing speed, focus and attention, short and long-term memory, executive functions, social cognition.
- This in turn affects every aspect of life e.g., ability to do maths or process language, ability to learn, job success, relationship

success, self-esteem, confidence, motivation, decision-making, addictions, mental and physical health.

- Planning, impulse control and self-regulation systems - **executive functions** are all impaired

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Executive functions (EFs) are a family of top-down mental processes that make it possible for us to pay attention and stay focused; reason and problem solve; exercise choice, discipline, and the self-control to avoid being impulsive, rash, or reacting without thinking; see things from different perspectives; mentally consider alternatives, see how different ideas or facts relate to one another, and reflect on the past or consider an imagined future; and flexibly adjust to change (Professor Adele Diamond). The central focus of normalising a struggling brain is to **normalise executive functions.**

In "The Bullied Brain. Heal Your Scars and Restore Your Health" (Dr Jennifer Fraser, 2022) Professor Michael Merzenich (Stronger Brains co-founder and Director) writing in the Foreword about Dr Fraser's research says: "What most of us have not appreciated until recently is that these [traumatising] behaviours have serious neurological consequences for both the bullied and the bully". Of even more far-reaching consequences: "Abuse creates a cycle whereby the abused *victim's damaged brain becomes abusive either to self or others*". These facts highlight the urgency for repairing the neurological damage of our abused children and young people in order to give us any hope of **stopping** the intergeneration cycle of abuse and violence. Neuroscience has proven that a poorly functioning brain can be trained back to health through the power of brain plasticity which can positively change lives.

Trauma in the brain can even occur in utero and Professor Merzenich appeals to society to "Take care of and manage the brain health of Mothers".

1. " Relationship of Adverse Childhood Experiences in Adult Medical Disease, Psychiatric Disorder, and Sexual Behaviour: Implications for Healthcare", Vincent J Felitti and Robert F Anda. Chapter 8 in "The Impact of Early Life Trauma on Health and Disease. The Hidden Epidemic". *Cambridge University Press*. 2010
2. "Childhood maltreatment predicts adult inflammation in a life-course study", Andrea Danese, Carmine M Pariante et al. *PNAS 23 January.* 2007

Appendix 2. How childhood trauma rewires vital neural pathways

The world's largest study of childhood trauma on brain development conducted by Dr Megan Klabunde, University of Essex has revealed how trauma rewires vital neural pathways, disrupting neural networks involved in self-focus and problem-solving. The research used AI to re-examine hundreds of fMRI brain scans and identify patterns.[1]

The study revealed that under-18's who experienced abuse will likely struggle with emotions, empathy and understanding their bodies. The study predicted difficulties may emerge in school caused by memory for hard mental tasks, and decision making.

The study identified a marked difference in two large-scale brain systems in traumatized children; the central executive networks (CEN) and default mode network (DMN).

The CEN are involved in executive functions and goal-oriented, cognitively demanding tasks. CEN is crucial for rule-based problem solving, actively maintaining and manipulating information in working memory and making decisions in the context of goal-directed behaviour. Based on current cognitive demands, the CEN flexibly divides into two subsystems connecting to other networks: the default mode network DMN for introspective processes and the dorsal attention network for perceptual attention.

The DMN and the associated posterior insula are involved in how people sense their body, their sense of self and their internal reflections. New studies are finding the DMN plays an important role in most mental health problems, and may be influenced by experiencing childhood trauma.

The study found the CEN in traumatized children is more active than in healthy children, which means that children with trauma histories tend to ruminate and relive terrible experiences when triggered (introspective DMN).

Dr Klabunde said: "Our brain findings indicate that childhood trauma treatments appear to be missing an important piece of the puzzle. … Currently, science-based treatments for childhood trauma primarily focus on addressing the fearful thoughts and avoidance of trauma

triggers. This is a very important part of trauma treatment. However, our study has revealed that we are only treating one part of the problem…Trauma therapies in children should also address how traumas impact on one's body, sense of self, emotional/empathetic processing, and relationships". *Stronger Brains addresses these crucial aspects through our trauma-informed wellbeing education and training which is part of our Personal Empowerment Program (PEP)* (Appendix 5). "This is important to do since untreated symptoms will likely contribute to other health and mental health problems throughout the lifespan."

Importantly, Dr Klabunde concluded "It is hoped the research will help hone new treatments for children who have endured mistreatment. This could mean therapists focus on techniques that rewire these centres to rebuild their sense of self." *Stronger Brains online brain exercises support neuroplastic change to build a sense of self.* (Appendix 5)

1."World's largest brain study reveals how trauma rewires vital neural pathways". University of Essex, 5 Feb 2024 https://www.news-medical.net/news/20240205/Worlds-largest-brain-study-reveals-how-childhood-trauma-rewires-vital-neural-pathways.aspx

Appendix 3. Youth justice exacerbates intergenerational violence

Young people under 18 years with poor mental health, suffering trauma through adverse childhood experiences (ACE's), failing in their education, living in out-of-home care, are homeless or living in the most disadvantaged, socio-economic circumstances are at risk of interacting with the youth justice system at some time. These individuals cannot control their impulses and make poor decisions (poor executive functions).

Children and young people who have contact with youth justice experience complex and intersecting challenges and barriers, including those related to their environment, health and development, education and employment.[1]

Many children entering the youth justice system have an acquired brain injury. Punitive treatment can only add to these adversities, further impairing social and emotional wellbeing and cognitive function. Many experience the youth justice system as a revolving door.[2] Protracted and frequent incarceration is a major risk factor for engaging in domestic and community violence and further recidivism.

Expecting (as some jurisdictions are proposing) that a young person who has committed an offence should demonstrate that he or she can curb impulsive, undisciplined behaviour is "pie in the sky" without effective, brain-based interventions to change the individual's brain health and operation. These kids are in fight-flight-.. with bodies full of cortisol for instant reaction to **any sign** of perceived danger, and what's sad is that <u>they don't want to be in that anxious, nervous state.</u> They need help! Necessitating that 'to stay out of the justice system' they must demonstrate restraint **will fail**. Children and young people do not have the cognitive resources to curb impulsive behaviour and show restraint without expert brain-based help. However, they can develop these resources through Stronger Brains science-based program and our impact can be demonstrated showing that the worst offenders develop superior functional capability.

In South Australia we must strive to keep our young people from interacting with youth justice services if we are to have any hope of breaking the intergenerational cycle of violence, thus keeping future families and communities safe.

At the very least, we must raise the minimum age of criminal responsibility to 14, more in line with international standards for the rights of children.

1. "Putting Children First: A rights respecting approach to youth justice in Australia" pp 17-22. *Save the Children Report*. April 2023
2. "How can a 10 year old be sent to prison in Australia?" Grand Rounds Online – Melbourne Children's Hospital, 19 August 2020
https://www.bing.com/search?q=Grand+Rounds+Online+%E2%80%93+Melbourne+Children%E2%80%99s+hospital%2C+%E2%80%9CHow+can+a+10+year+old+be+sent+to+prison+in+Australia%3F%E2%80%9D+19+August+&form=ANNNB1&refig=db93bed0bedb4f7b8e702333e590584e&pc=U531

Appendix 4. Aboriginal circumstances and world-view post colonization

Separation from family, culture and land has been devastating for Aboriginal people and its effects are trans-generational.

Quoting from a seminal book by Emeritus Professor Judy Atkinson, "Land is a story place. Land holds the stories of human survival across many generations. Land shapes people just as people shape their country." [1]

"In Aboriginal communities there is a recognition of those who have gone before and their contribution to the whole of who they are, of the connectedness and communications between people and country and between the corporeal and non-corporeal world." [1]

"These are the interrelationships, interdependencies, interconnections and continuities that form the whole. These interrelationships must be considered in any developing understanding of the traumatic impacts of colonization where irrevocable intrusion has occurred, and continues to occur, into the soul and fabric of relationships that people had with each other and their country." [1]

In examining the **transgenerational consequences** of colonization, the disruption to family and community relationships must be considered.

Trauma disrupts relationships between people. In fact, this has been so for Aboriginal men and women and many Aboriginal groups across Australia.

In Aboriginal Australia before Cook, "the most cherished possession of men were women, children and their sacred heritage. For women it was men, children, their domestic circle plus their sacred heritage." (Berndt and Berndt 1988) [1]

The fractured relationship of men and women **as partners** are also important in understanding the dysfunction in Aboriginal families and communities today.

"Ceremony was (and is) central to Aboriginal life. Ceremonies were used to establish the sense of creative power after being made to feel

powerless, and to help heal the distress that accompanies natural disasters and as a consequence of human conflict." [1]

"The essence of "being Aboriginal" was the dynamic process of engaging in communal activities of communicating, expressing, managing conflict, which would often be challenging, and invariably entertaining."

"The wilful denigration and destruction of Aboriginal ceremonial responsibilities and process by the colonizers has therefore had profound transgenerational effects on the people of this land."

"Aboriginal people have been prevented from engaging in ceremonial process for healing from trauma. The distressed feelings that accompany loss, death and devastation remain as destructive forces within this land and the people."

"In traumatized populations, lore collapses. Environments and the relationships within them become chaotic and unstructured. They collapse into lorelessness. In this sense, according to Aboriginal worldviews or ways of being in the world, health/wellbeing and lore or law cannot be separated."

"In many cases people had lost their knowledge of the whole Self and their sense of life purpose [arising from trauma]. Initially, people felt that life had no meaning; often they were in a crisis of cultural and spiritual identity."

The single most important restorative need for people who have been victimised is rebuilding a sense of family and community in healing.

1. "***Trauma Trails: Recreating Song Lines – The Transgenerational Effects of Trauma in Indigenous Australia***", **Judy Atkinson**. *Spinifex Press*. 2002

Appendix 5. Stronger Brains model

Universal screening: to measure brain health and function (discussed more fully in main text).

Brain education curriculum: educates students about their brains, empowering them to understand why they act the way do, how they can change the way they act (through the power of brain plasticity) and that they are in-control of this change process. Our program teaches oppositional youth how anti-social and criminal behaviours and addictive substances and practices harm their brains.

Wellbeing and empowerment activities: improve the organic brain health through a series of 'child-safe' exercises and activities that support positive behaviour, social and emotional wellbeing, empathetic processing, sense of self, and relationships. This aspect of the Stronger Brains Program leads to better planning and impulse control and better learning outcomes. Improved organic brain health reduces the risk of serious offending, addiction and other mental and personality disorders.

Our trauma-informed wellbeing and empowerment program is a strong suite, designed to achieve neuroplastic change. Following a successful professional business career in high tech, Wendy Haigh, our co-founder and Director, decided to follow her passion of helping children, young people and families in need through leadership roles at The Children's Hospital, Westmead, and then at Australia's oldest charity, The Benevolent Society. There, a philanthropist-funded study demonstrated that particular forms of intensive brain training designed by Professor Merzenich and his team could 'rescue' most severely stressed children by building new neural pathways to reverse the toxic impacts of Adverse Childhood Experiences such as trauma, abuse and neglect. Those inspiring results changed Wendy's life and she is now focused on empowering ALL children and young people to develop their strongest brains for learning and for life. Wendy understands how trauma affects the brain and she knows how 'feeling safe' underpins sound wellbeing and social and emotional relationships.

Neuroplastic training strategies: brain gym exercises adaptive to each student to specifically remediate any identified weaknesses and

strengthen neurological performance further restores organic brain health, instilling a growth mindset and building resilience.

Daily training with these progressively more challenging exercises can usually substantially renormalize brain function in as few as **30 hours over 20 weeks** of cognitive training leading to ***measurable*** improvements in brain capacity for focus, attention, brain speed, executive function, working memory, social cognition, language and listening, vision and action control, impulse control, decision making and addictive behaviours. Progressive training accelerates the rate at which the brain changes.

Data recorded from the daily practice are tracked and reported in real-time and used to adapt the student's wellbeing and empowerment program and online brain gym exercise program for personalized support as each student's neurological performance changes.

Cognitive training exercises are delivered through an internet-connected computer, tablet or Smartphone, and take 30-60 minutes per day for as long as it takes to restore normalcy (usually around 20 weeks with regular student engagement).

At the end of the program, brain health and operational function are assessed to quantitatively measure **impact**.

Coaching/Mentoring: like a personal trainer, the brain coach or mentor motivates, recognizes and rewards achievement and celebrates progress of each trainee along their journey.

Professional development: for all school and organisational staff we offer professional development training on: trauma, mental health and social and emotional wellbeing, with extended training for key staff who wish to implement the program under our **train-the-trainer** model. Key staff range from teachers to teachers' aides and wellbeing officers. Ideally staff are computer literate. Alternatively, we can implement the program, but we prefer to build school and organisational capacity.

Program development: We work with school and organisation/institution leaders to tailor the program to best meet their

school, student and curriculum needs. We can scale up/down, addressing few/many students, even whole school or institution.

Wraparound support: addresses any practical impediments to progress such as homelessness, employment/job skills etc. in collaboration with other organisations.

Brain health training: to parents, carers and community members.

Appendix 6. Stronger Brains program results

Federal trial of Stronger Brains under Try Test and Learn (TTL) Fund

SUMMARY OF KEY FINDINGS from TTL "Rewire the Brain. Final Report to DSS August 2022: "The Stronger Brains "Rewire the Brain" neuro-development model has demonstrated that it can be successfully administered to drive significant cognitive function improvements (neuroplastic change) to a number of priority investment groups and some of the most disadvantaged Australians. The Australian Social Value Bank measured the Net Social Benefit as over $1.64 M, a benefit-cost ratio of 1.6, … validating that the neuro-development model delivers considerable social value, making sense economically as well as socially." TTL Impact Report

For "Rewire the Brain" we worked with 364 young people (16-24 years) including ATSI, youth with disabilities, CALD, and young people not in education and training including some with suicidal tendencies, refugees and other vulnerable groups at risk of long-term welfare dependence, addressing the needs of young people who had been exposed to major adverse life events and likely to have experienced toxic stress (36% of participants reported ACE scores of 4 or more).

Evaluated by Universities of Melbourne, Queensland, and Griffith, key findings demonstrated compelling evidence that the Stronger Brains program has multiple positive impacts in young people for improved wellbeing, mental health, and social-emotional learning, education, job skills and employment.

Notably, participants with severe or very severe mental wellbeing at the start of the program fell within the normal range after training: depression 86% of students; anxiety in 75%; and stress in 78% in less than 6 months.

Participants had substantial improvements in brain function with increases in focus and attention 66%, processing speed 61%, working memory 63%, problem solving and decision making (executive functions) 66%, people skills 44% - all skills critical for education and training, and securing and retaining employment.

Evidence showed significant improvements in self-esteem, confidence, resilience, motivation, job readiness, education and employment outcomes, and sustained improvements in brain health and mental wellbeing. Participants rated the program highly at 4.5 out of 5 in terms of satisfaction.

Norfolk Village State School (NVSS), Brisbane

Stronger Brains partnered with NVSS (grades 3 -6) to deliver better outcomes for children with complex, challenging and disruptive behaviours, their staff and families by piloting an inhouse model called "The Engine Room". We provided pro bono consulting and coaching services to build staff, parent/carer capacity within the school, and support for children who attended the Engine Room.

From the school: "We have seen significant improvement in each of these student's ability to self-regulate and therefore learn. The program has been highly successful and supported these students in avoiding exclusion and being able to re-engage in learning. One of the unexpected outcomes of this trial is the positive mindsets of staff, parents, students and community which becomes apparent in working with these students".

Ms Cappi White, National Winner, National Excellence in Teaching Awards (Australia) 2018, after using Stronger Brains in NVSS: “Neuroscience is amazing because we now know that the brain can change, and that you can positively alter the trajectory of our most vulnerable by using the Stronger Brains program. That was literally what we saw. It was mind blowing. It was crazy! Imagine if we got this right and supported our young people to flourish, we could *break the cycle of intergenerational dependence*.”

Broader achievements supporting youth mental health and community

From positive results achieved in like-projects above we strongly anticipate our Stronger Brains model to assist marginalized at-risk youth to a pathway of health and growth: building resilience, stronger mental health, stronger executive functions (vital for staying out of trouble and reducing recidivism and strengthening cognitive functions that aid learning), building capacity across education and vocation to develop life skills, gain and sustain employment, and build confidence

with a growth mindset for successful, safer life outcomes. We expect to demonstrate improved mental health outcomes for **all** participants. (Attachment 1. Stronger Brains evidence - 2024)

Stronger Brains programs have successfully supported students, teachers and families in difficult situations addressing grief, loss and family separation, relationship skills, including family and peer relationships, and emotional engagement with teachers.

Importantly, the Stronger Brains program is able to reveal issues of body-image and eating disorders. Our team is competent to mentor students, and advise schools of appropriate services as required. However, generally schools deal with services for interventions once a problem is identified.

Several of the brain exercises train *response withholding* and *impulse control*. As expected, initially these exercises are not favoured by many students since both skills require sustained attention which is difficult for them. However, with coaching, students are guided to understand the value of the exercises. Without good impulse control (requiring strong executive functions) setting limits and setting personal boundaries are not easily achieved. Stronger Brains **always improves executive function** whenever a student engages reasonably effectively with the program.

Health-promotion is supported within Stronger Brains since both physical health and brain health are important elements of the wellbeing training and activities and the daily brain education curriculum.

Cyber safety and gaming problems are improved when executive function improves. We provide education as needed on device safety, protecting privacy, screen-time and spending money online.

We see positive changes in school culture and reduced bullying behaviour when we provide *education* about the effects of bullying on the brain and *strengthen* executive functions.

Appendix 7: Stronger Brains and Soccer

Stronger Brains and Soccer

Cognitive Conditioning Players and coaches understand the importance of physical conditioning to excel in sports. Many are now coming to appreciate that cognitive conditioning is as, or more, important.

After all, it's the brain that controls the movement of the body and the split-second decisions made on the field.

Speed and Accuracy Brain speed and accuracy play a central role in sports. When a player reacts to a pass, a shot, a block, a drive, or other movements on the field, the player must go through several split-second steps engaging both the mind and the body. We break that response into five steps, we call "using your RADAR" — **R**ecognize something happened, **A**ttend to what happened, **D**ecide what to do, **A**ctivate that decision with a message from the brain to the body, and **R**eact physically.

> *Harry Kane became England's World Cup hero by training his brain – just like his own sporting idol... New England Patriots' star quarterback Tom Brady, [who] has said of his brain training: "TB12 BrainHQ targets brain speed and accuracy, so quicker and better split-second decisions become instinctual."*
> **London Daily Star 6/25/18**

For example: In his 2018 role as the lead striker for England's World Cup team, Harry Kane talked about the importance of his Brain training in quickly and accurately seeing opportunities and acting on them. Soccer is filled with moments when speed and accuracy are the difference between winning and losing. It's a game of split seconds and inches.

Core Training for Soccer Stronger Brains offers dozens of computerized exercises and regimens that target just about every major system of the brain.

Training for soccer starts with five exercises that target the speed and accuracy of the visual processing system. This is core training. Dozens of other exercises target other cognitive skills that can contribute to peak performance on and off the field.

Our Brain exercises quickly and continuously personalize to each user (using smart algorithms to adjust stimuli based upon all your prior performance data).

The exercises get harder when you are having a good day, and ease off when you are having a bad day, to keep pushing you through your current threshold of performance to new levels of your "personal best."

Cognitive Abilities A wide range of cognitive abilities play a critical role across virtually all sports and positions, including:

Processing Speed	**Multiple Object Tracking**	**Memory**
Reaction Time	**Useful Field of View**	**Decision-making**
Visual Search	**Peripheral Vision**	**Balance**
Visual Acuity	**Attention**	**Mobility**

Performance at each such cognitive task can be changed, with the right kind of training. That training is the Stronger Brains Program.

Why Stronger Brains? What makes us unique is the science. Stronger Brains is built on the foundation of the science of brain plasticity – the brain's ability to change chemically, structurally, and functionally in response to sensory and other inputs.

Stronger Brains was designed by the world's leading experts in brain plasticity to harness that natural plasticity to make the brain perform better. Hundreds of university-based scientists came together to design, test, refine and validate the exercises and assessments you will use in the Stronger Brains Program.

In fact, there are now more than 150 peer-reviewed science and medical journal articles about the wide range of benefits of the brain exercises and assessments across varied populations. Those benefits include gains in standard measures of cognition (e.g., speed, attention, memory, decision-making) and generalization to real world activities (e.g., balance, gait, driving, everyday tasks).

Stronger Brains is a great way to measure cognitive performance and improve it by taking a baseline on each exercise the first time you use it, and continuously monitor performance and progress over time.

*Average study results on standard measures, illustrated as applied to soccer. Individual results will vary.

The Stronger Brains Program
School Evidence

STRONGER BRAINS

The science and evidence behind the Stronger Brains Program?

New Discoveries

First: The brain is just like your body. It grows in power as a function of how you USE it. And it NEEDS exercise.

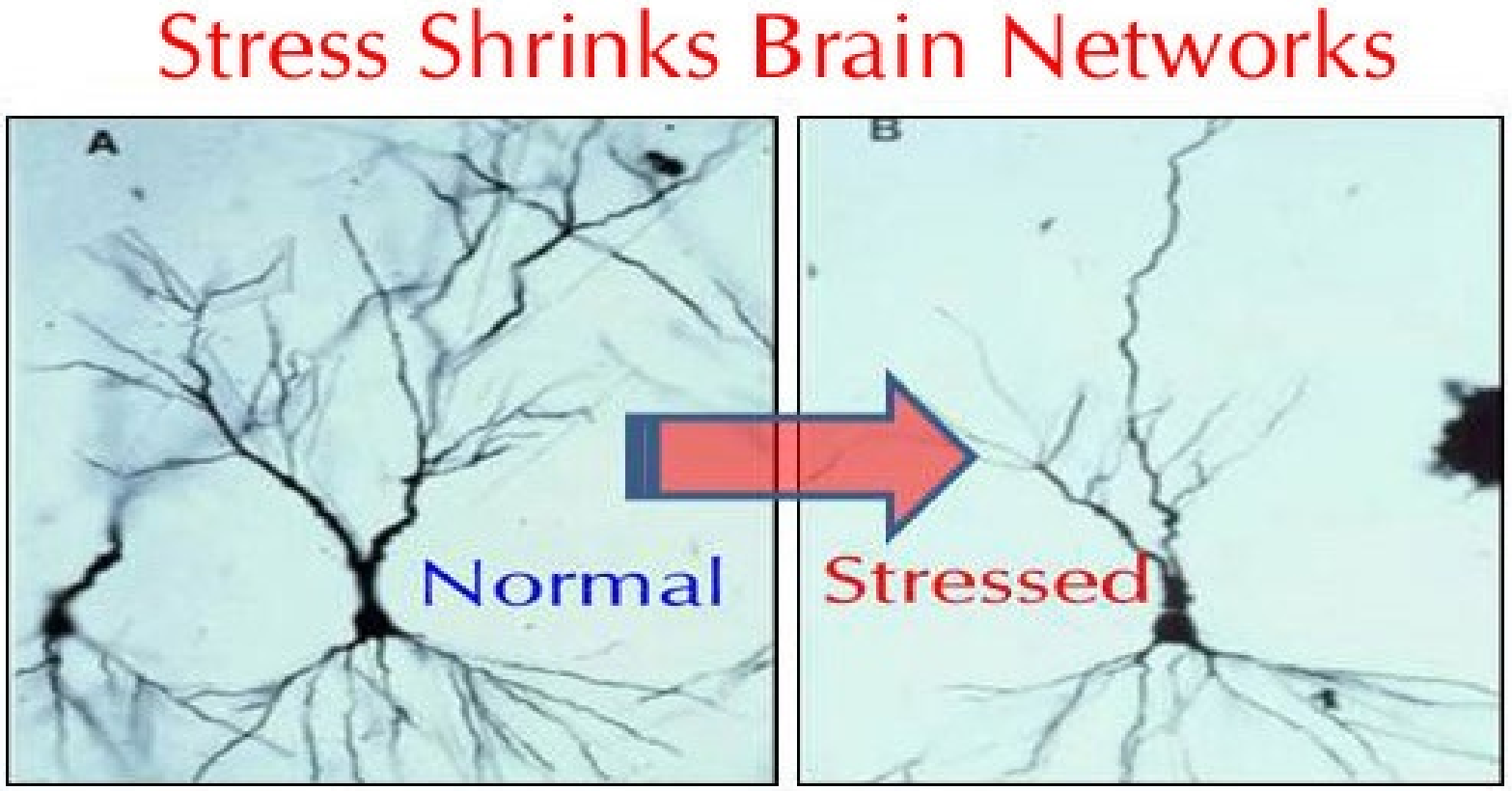
Second: The processes that control brain plasticity are ALL REVERSIBLE.

Third: Many factors that can arise in life ACTIVELY DEGRADE brain performance and HEALTH.

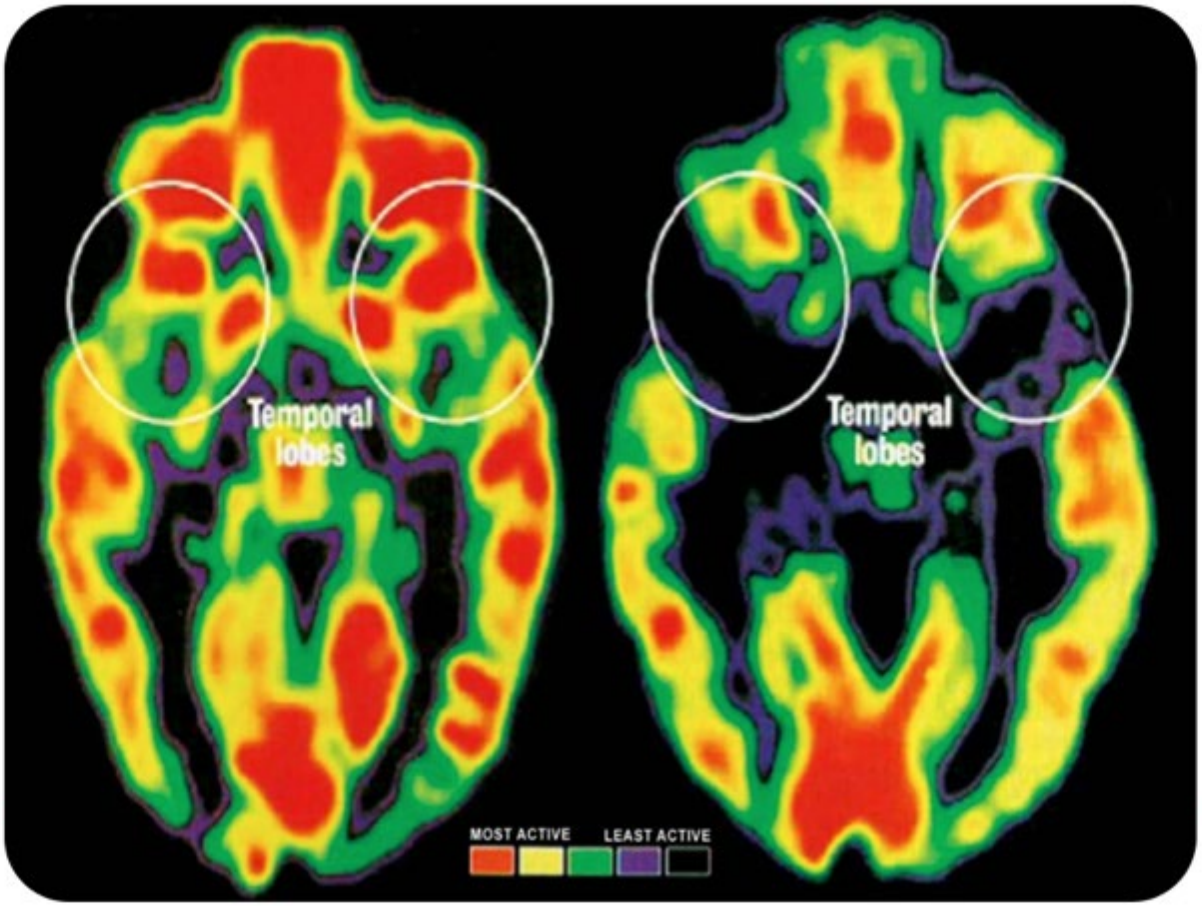
Fourth: The neurological 'weaknesses' and 'distortions' that plague struggling individuals can usually be overcome via appropriate brain exercise.

Five. THIS IS NOT GUESSWORK. Outcomes can be OBJECTIVELY seen, documented and measured.

We now know why students with stressful childhoods struggle to learn



We can now see the difference



Healthy Brain

Unhealthy Brain

The good news

The brain is 'plastic' and like a muscle, can be strengthened.

Through regular brain training exercises, we can build brain capacity to function at increased levels.

For your students, it may look like:

- increased confidence and self-esteem
- improved behavior or better self regulation
- improved relationships at school and at home
- focus and attention increases
- increased ability to make good decisions
- working memory increased
- improved ability to learn
- improved education outcomes

COGNITIVE TRAINING TRANSLATED INTO LEARNING SKILLS

Brain Functional Area	Cognitive Training	Skills Translation
Executive Control – *The mental processes that enable us to plan, focus attention, remember instructions, and juggle multiple tasks successfully*	Reasoning, Working memory, Self-control, Cognitive flexibility	Self-control, Comprehension, Decision-making, Problem solving, Logical thinking, Planning
Focus & Attention *The ability to focus on important details while ignoring distractions. The alertness and stamina of an individual to stay on task*	Concentration, Tracking, Visual discrimination, Improved performance	Task focussed, Prioritising work, Meeting deadlines, Attention to detail
Processing Speed *The time it takes an individual to do a mental task*	Auditory processing, Visual processing, Navigation	Listening skills, Learning and interpreting new information, Problem solving
Working Memory *Working memory governs our ability to retain and manipulate distinct pieces of information over short periods of time*	Recall, Greater number of tasks, remembered, Navigation, Visual working memory	Multi-tasking, Remembering instructions, Retaining information, Problem solving
Social Cognition *Our ability to interpret and process social information, including facial expressions*	Interpreting emotions, Awareness of others, Interpreting body language	People skills, Communication, Taking initiative, Team work,

The evidence of The Stronger Brains Program

*All reporting is de-identified and all data and personal information gathered from participants for all Stronger Brains training and research study initiatives is managed in accordance with guidelines issued by the National Health and Medical Research Council, as approved by the Information Commissioner (s95A of the Privacy Act) of the Australian Government.

Stronger Brains requires that all collaborative partners strictly adhere to the same regulatory and ethical standards at all times.

Results:

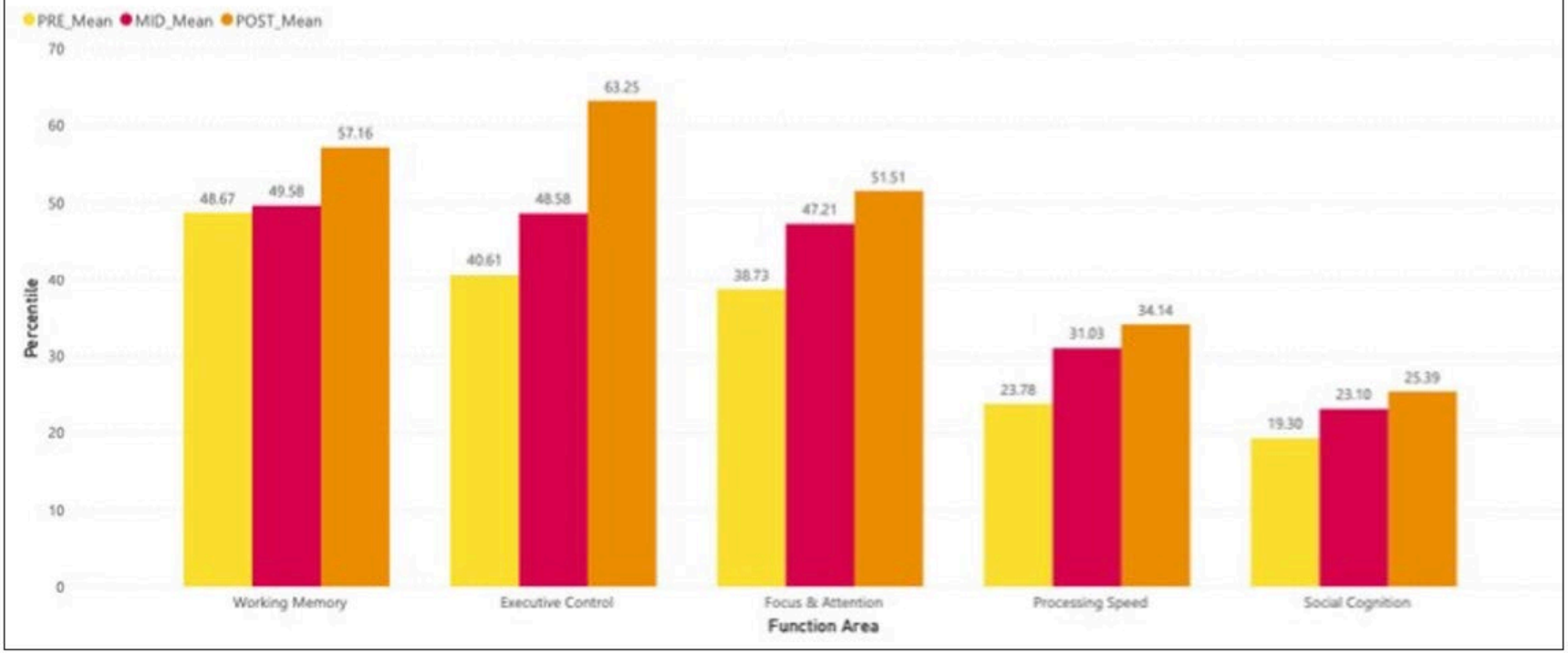
Australian Primary and Secondary school results,
UK Primary School and
Australian 16-24 year olds at high risk of long-term unemployment

Results from 16-24 year old's at risk of long term unemployment

This figure represents the functional area averages for the whole cohort at baseline, midpoint and post training assessment [N=77-103]. Baseline results are shown in yellow, midpoint in red and post training in orange. The number of participants per functional area along with p-values are outlined in the key. **Group data demonstrated significant changes from pre and post training across 3 key areas including Executive Control, p<.00[N=80], Focus & Attention, p<.00[103], and Processing Speed, p<.02 [98]. A clear linear relationship between baseline, midpoint and post-training assessment can also be seen for the remaining areas demonstrating improvements**

Cognitive Assessment Data

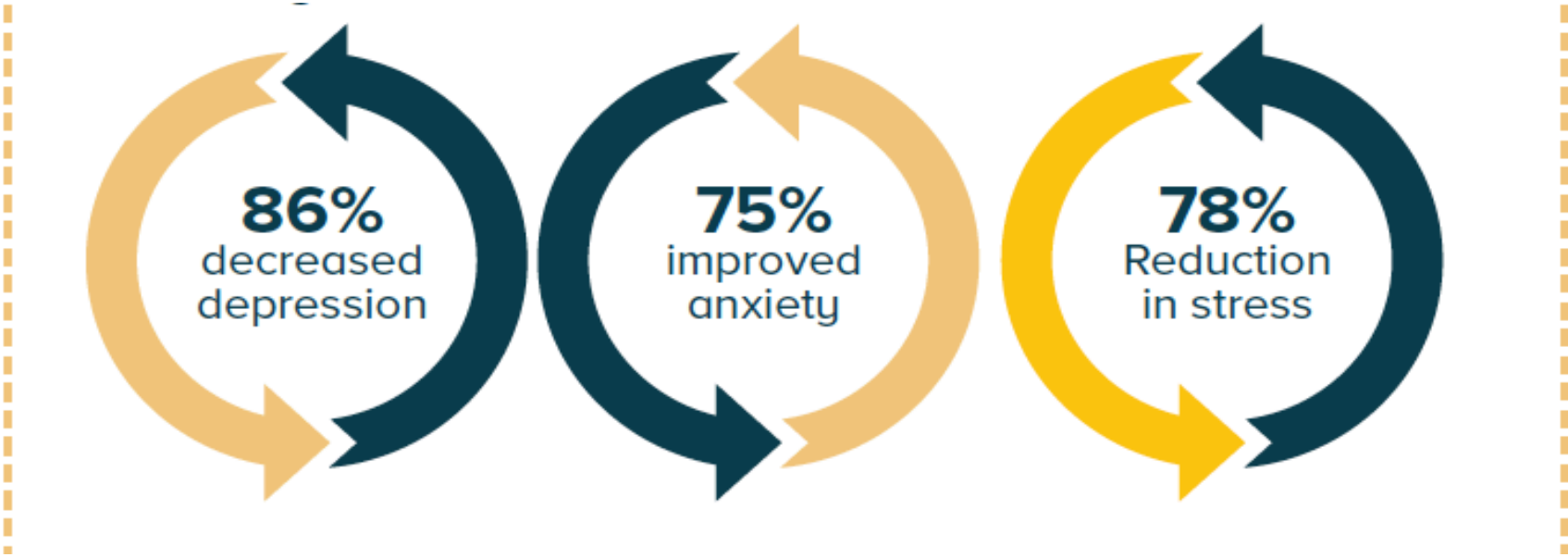
Function Area	Number of Participants	P_value
Executive Control	80	0.00
Focus & Attention	103	0.00
Processing Speed	98	0.02
Social Cognition	77	0.24
Working Memory	91	0.14



Results from Stronger Brains Try, Test & Learn Project

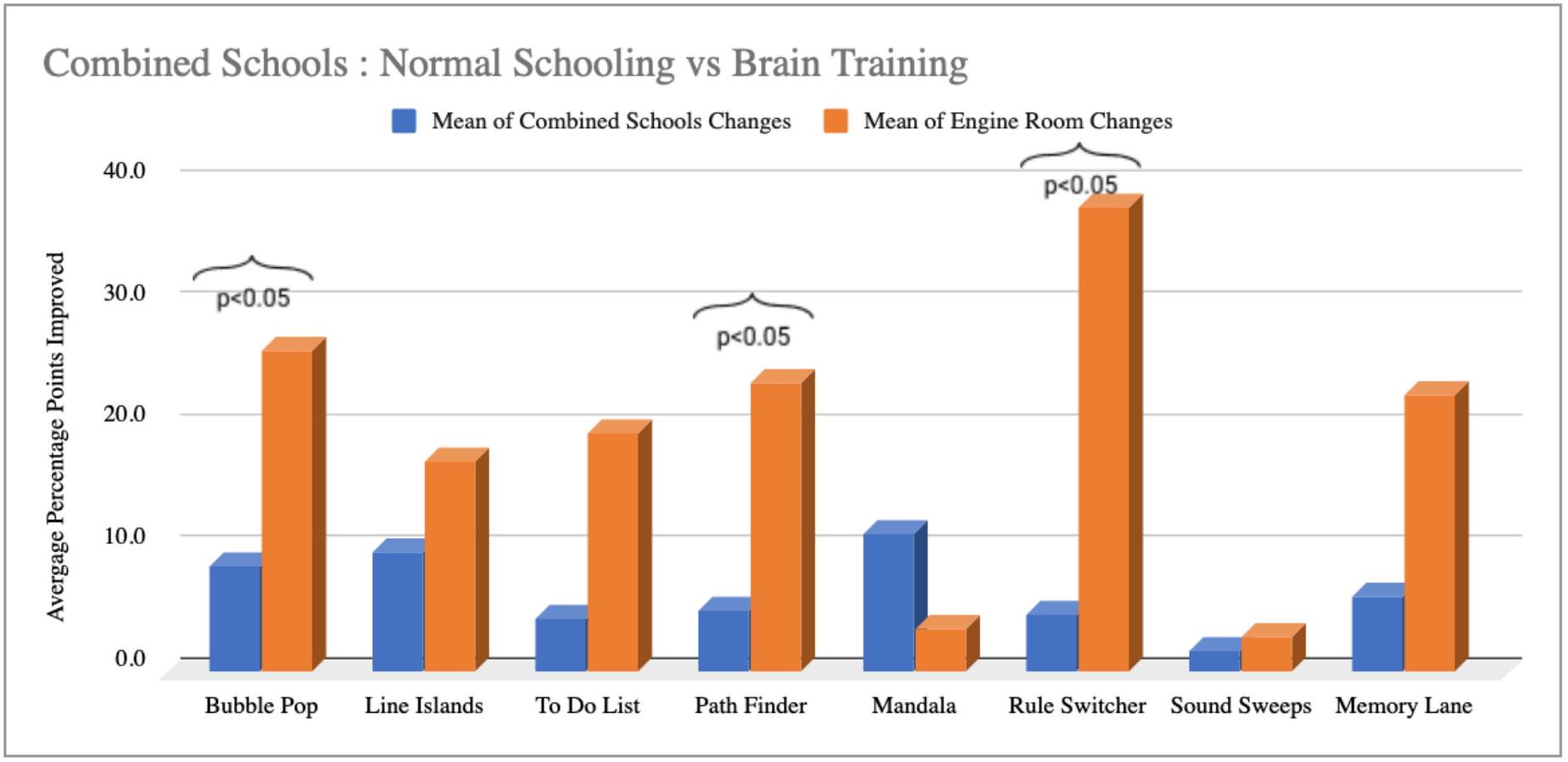
16-24 year old's at risk of long term unemployment

RESULTS SHOW: Participants with severe or extremely severe mental wellbeing at the start show significant improvements



Results from UK Primary School

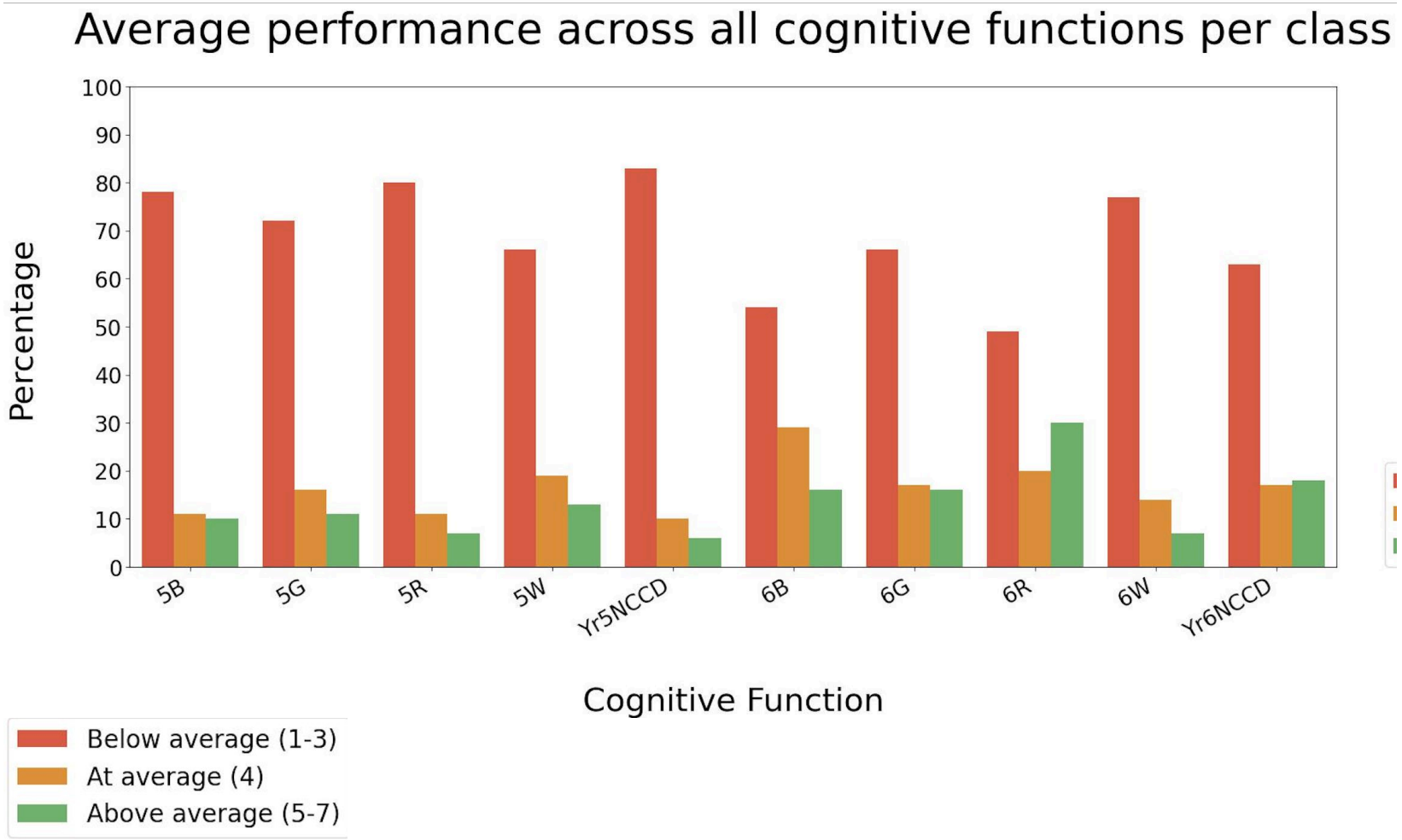
Engine Room (intensive) model



Results from Australian Catholic Primary School

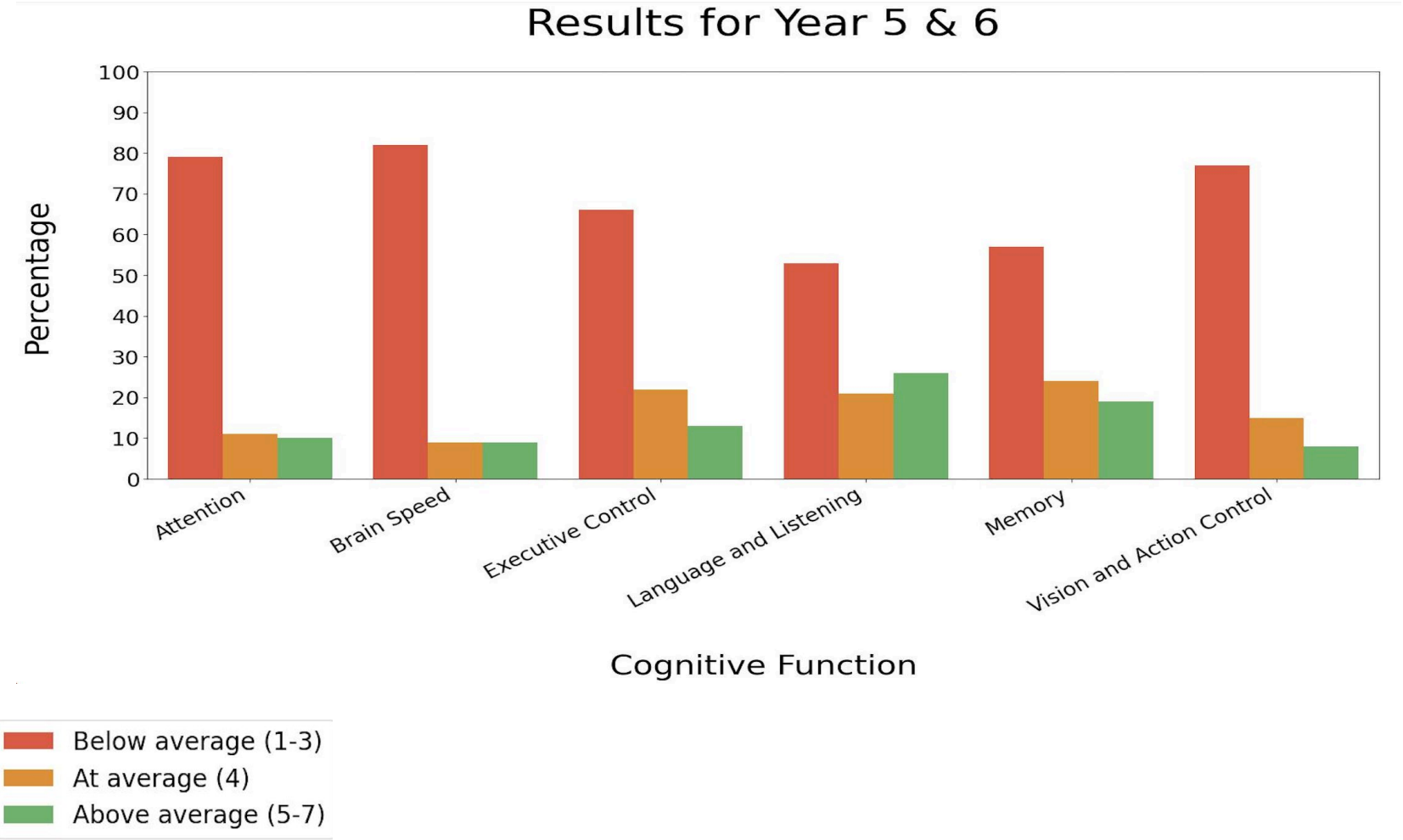
Brain health screening assessment by class (222 students)

Years 5 and 6 combined averages



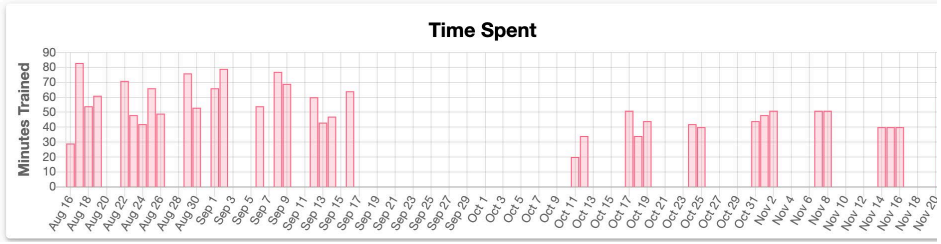
Results from Australian Catholic Primary School

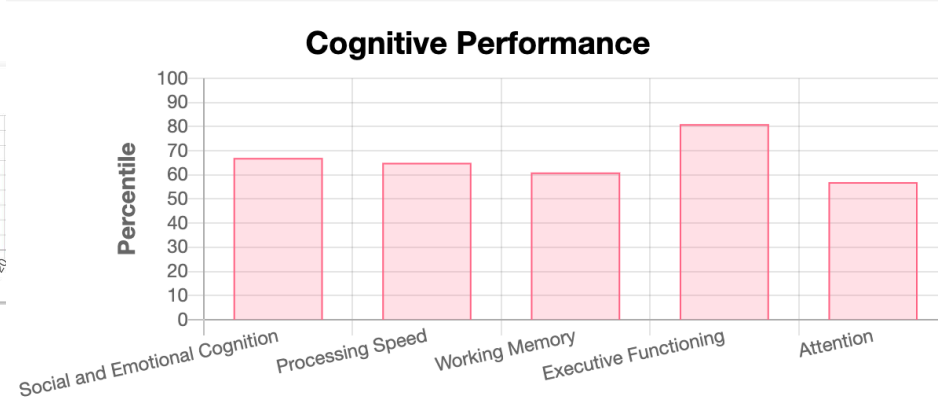
Brain health screening assessment by cognitive function (222 students)



Results from Australian State Secondary School

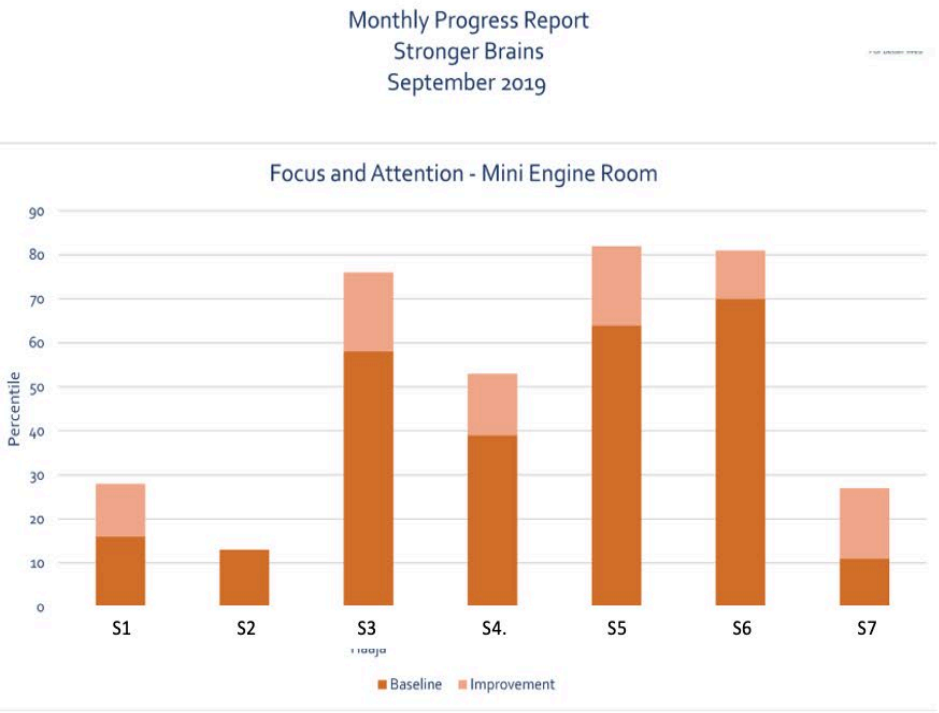
Individual results by cognitive function (1 student – hours trained: 31.24)

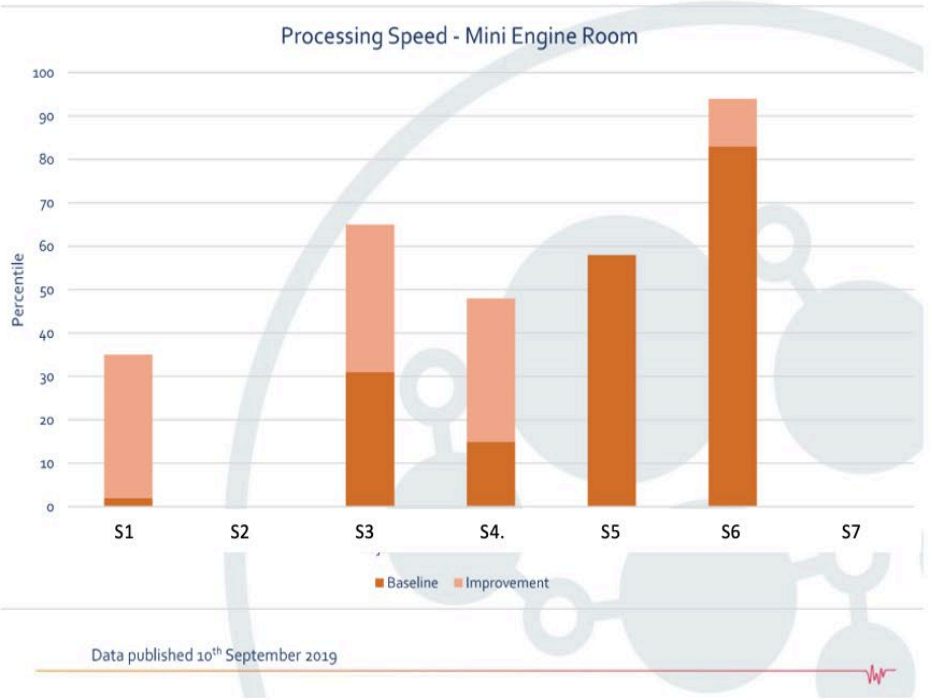




Results from Australian State Primary School

Intensive model (7 students)





Results from Australian State Primary School

Improvements in Behaviour

Reduction in Behaviour and Suspension Days Actioned

Behaviour Action Summary

Date Range: 29 January 2018 to 9 March 2018

Summary

Action Type	Female		Male		Overall	
	Total	Students*	Total	Students*	Total	Students*
Follow Up	18	8	56	36	74	44
Support & Intervention	1	1	6	6	7	7
Suspension 1 to 10 days	3	3	14	13	17	16
Suspension 11 to 20 days	0	0	1	1	1	1
Decision to Exclude	0	0	2	2	2	2
Recommended Exclusion	0	0	2	2	2	2
Totals Count	**22**	**10**	**81**	**48**	**103**	**58**

* Represents the number of unique students involved in the action total.

Behaviour Action Summary

Date Range: 29 January 2019 to 8 March 2019

Summary

Action Type	Female		Male		Overall	
	Total	Students*	Total	Students*	Total	Students*
Follow Up	12	10	27	20	39	30
Support & Intervention	0	0	8	7	8	7
Suspension 1 to 10 days	0	0	9	7	9	7
Totals Count	**12**	**10**	**44**	**29**	**56**	**39**

* Represents the number of unique students involved in the action total.

Treating the silent disability