Decision-Making, Emotion and Behaviour Regulation in 18-to-25 Year-Olds

A Neurodevelopmental Perspective

Ms Jody Kamminga, Dr Travis Wearne, Dr Liz Vuletich, Dr Santuri Rungan, Dr Jenny Sohn, Dr Tamara Morris, Dr Amelia Lewis, Associate Professor Fiona Kumfor, Dr Warrick Brewer and Associate Professor Paul Gray

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Bugmy
Bar Book

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Cover art: 'Barrigun-biibaan'

The front and back covers show artwork by Jeremy Worrall (Wright), Ngarabal/Gamilaraay.

Artist's description: This artwork is a representation of cultural safeguards.

It is to show how our mob look after each other, how we wrap around those in our community that need care. Behavioural regulation can be hard to manage and requires a community to help support the individual and the family around them. I tried to show this with the artwork. It features a spear shield and 2 size 12 ceremonial Boomerangs used in ceremony; the shield itself is cut from the tree, its markings are an adaptation to the traditional markings of the shield.

This is to safeguard our culture and to show our intention to look after our younger community members. The sky above the community circle shows the ways in which these practices can affect our young ones. The brown flowing linework shows the flow of time and the journey of cultural connection, whilst the hatchwork in the bottom centre is the fibres between the weaves that hold our families together.

I hope this artwork encourages reflection from those whom are not familiar with our community practices; to take time to consider the unique circumstances of neurodivergence and its effects on behavioural regulation, and the role family, community and culture plays in caring for these young people.

Publisher's acknowledgement

The publishers of the *Bugmy* Bar Book acknowledge the Aboriginal and Torres Strait Islander peoples of Australia and pay respect to their Elders, and their ongoing custodianship of Country. We acknowledge the diversity of Aboriginal and Torres Strait Islander communities, and the inalienable rights of Aboriginal and Torres Strait Islander peoples to freely determine their political status, and freely pursue their economic, social and cultural development.

Warning

This publication may contain names of Aboriginal and Torres Strait Islander people who have passed.

Bugmy
Bar Book

www.bugmybarbook.org.au

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Acknowledgement of Country

The authors* acknowledge the Aboriginal and Torres Strait Islander peoples of Australia and pay respect to their Elders, and their ongoing custodianship of Country. We acknowledge the diversity of Aboriginal and Torres Strait Islander communities and their right to self-determination, to be free from discrimination on the basis of cultural or political status, and to enjoy and maintain their cultures. We also recognise the social determinants of incarceration and the over-policing and over-incarceration of Aboriginal and Torres Strait Islander people, including children and young adults, in Australia's judicial systems.[1] We acknowledge that this is contextualised by historical and ongoing trauma and violence inflicted by colonisation, racism and oppression of Aboriginal and Torres Strait Islander peoples across Australia. While these harms and the need to shift to a focus on rehabilitation and healing have been recently addressed comprehensively in a separate *Bugmy* Bar Book report,[2] this report actively considers the perspective of young adults who identify as Aboriginal and Torres Strait Islander, through all stages of their development, and paying attention to the developmental harms associated with incarceration.

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* Jody Kamminga and Travis Wearne share joint lead authorship of this report. For a statement on authors' expertise and positionality, see Appendix.

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1 Incarceration in Australia Since 1967 (*Bugmy* Bar Book Research Paper, 2022).

2 Vanessa Edwige and Paul Gray, *Significance of Culture to Wellbeing, Healing and Rehabilitation* (*Bugmy* Bar Book Research Paper, 2021).

1. Introduction

Context: Navigating Young Adulthood from a Neurodevelopmental Perspective

[1] The authors acknowledge for the purpose of rule 31.23 of the Uniform Civil Procedure Rules 2005 (NSW) that they have read the Expert Witness Code of Conduct in schedule 7 to the Rules and agree to be bound by it.

[2] This report has been commissioned by the *Bugmy* Bar Book.[3] Its purpose is to provide a neurodevelopmental overview of the ages 18 to 25 years, a period referred to as 'young adulthood'. This period has unique psychosocial considerations that are distinct from the teenage and adult years. Many young adults are undergoing self-exploration, striving for personal independence, and developing a stronger sense of identity and purpose in the world whilst navigating adult responsibilities relating to vocation, interpersonal relationships, and financial responsibilities. This period also has unique physical and biological considerations: although legally recognised as an adult, the young adult brain has not yet reached full maturation.

[3] Most published research on young people and adults and their involvement in the justice system is focused on neurodevelopmental disorders (e.g., Intellectual Disability or Fetal Alcohol Spectrum Disorders (FASD)).[4] This report, however, offers specific consideration of the time of young adulthood as a unique developmental period that is distinct from that of the mature adult. The focus of the report is on executive abilities mediated by the frontal lobes of the brain, including emotion regulation, impulse control, decision-making, social cognition, and risk-taking, as these aspects of cognition and areas of brain function are still forming during this period. Neurodevelopment sits within a continuum, and its trajectory is influenced by a range of protective or harmful early life experiences as well as social, cultural, historical and political factors. For young adults, these experiences can influence the risk of behaviours that may lead to involvement with the justice system.

[4] This report specifically addresses the following:

a) The progression of neurodevelopment from conception to adulthood.

b) Distinctions in brain development between young adults (aged 18–25 years) and those over 25 years.

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3 *Bugmy* Bar Book <https://bugmybarbook.org.au/>.

4 See, e.g., Eileen Baldry et al, 'Reducing Vulnerability to Harm' (2013) 10 *Journal of Policy and Practice in Intellectual Disabilities* 222; Carol Bower et al,. 'Fetal Alcohol Spectrum Disorder and Youth Justice: A Prevalence Study Among Young People Sentenced to Detention in Western Australia' (2018) 8(2) *BMJ Open*) e019605; Iain Perkes et al, 'Traumatic Brain Injury Rates and Sequelae: A Comparison of Prisoners with a Matched Community Sample in Australia' (2010) 25(2) *Brain Injury* 131.

c) The neurodevelopment of young adults in relation to executive functioning, emotion and behaviour regulation, and social cognition, and how these may be involved in decision-making and behaviour.

d) The role of positive and negative life experiences and social determinants on neurodevelopment in young adults.

e) The potential impacts of incarceration on neurodevelopment for young adults.

f) The potential for neurodevelopment in young adults to support change and rehabilitation

[5] This report draws on existing published research where possible, but the authors acknowledge significant gaps relating to the impact of neurodevelopment in this unique cohort, especially as it relates to its intersection with the justice system. The majority, if not all, published research is based on a Western and Eurocentric worldview. This view tends to emphasise characteristics and behaviours of the individual — in this case, the young adult — as being 'the problem', or defective in some way, without considering the broader context in which they function. This individualistic and deficit-based approach was specifically criticised within an Australian judicial context by Hopkins et al (2023),[5] who argued that these deficit narratives present disadvantage as an inherent quality of being Aboriginal or Torres Strait Islander, rather than being a consequence of colonial oppression and structural forces bearing upon Indigenous peoples over multiple generations. We also suggest that such a view tends to underpin system and processes focused on 'treatment' of the young adult, with limited consideration of the significant influence of broader social, cultural, environmental and political contexts of their lives, from a neurodevelopmental perspective. This also limits the potential role of such factors in effective responses to antisocial behaviour that promote healing and rehabilitation. By taking a neurodevelopmental perspective, we highlight the importance of sustained effort to provide a safe, relational and enriching environment into young adulthood, particularly in the context of the adverse childhood experiences and cumulative disadvantage that shape brain development and function. We emphasise the importance of nurturing care, and highlight the negative impacts of physical containment and control as it relates to incarceration. This report outlines the value of taking a neurodevelopmental approach for decisions about responding to antisocial behaviour across childhood and adolescence and into young adulthood.

[6] This perspective is relevant to all young adults, but we particularly note the unique social, cultural, political and historical context of Aboriginal and Torres Strait Islander peoples, and the ongoing impacts of colonisation, including over-representation in justice systems. We note particularly that these First Peoples' knowledge systems have been historically overlooked and continue to be marginalised, while custodial and detention systems continue to disproportionately target, and harm their children and young people. We also acknowledge the neglect of Aboriginal and Torres Strait Islander knowledge systems in science, and the challenges this represents in psychology, including in theory, assessment and treatment.[6] These knowledge gaps must be addressed. Ways to approach that task include greater investment in Aboriginal and Torres Strait Islander scholarship,

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5 Anthony Hopkins et al, 'Indigenous Experience Reports: Addressing Silence and Deficit Discourse in Sentencing. (2003) 46(2) *UNSW Law Journal* 615.

6 APA (n 5), 'Apology' (2017).

developing conceptual frameworks, valid assessment tools and measures, and evidence-based responses to promote social and emotional wellbeing within the judicial setting.

[7] In developing this report, the authors have integrated child development theory with knowledge relating to negative as well as positive influences on neurodevelopment and subsequent risk of engaging with the justice system. Theory is informed by research and expert knowledge of trauma, healing, and culture. We explicitly consider the factors that may influence neurodevelopment for Aboriginal and Torres Strait Islander children and young people, such as connection to family, community, Country and culture. We have tried to create space throughout this report for Aboriginal and Torres Strait Islander constructions of development and wellbeing, in addition to non-Indigenous constructions and the neuroscience evidence.

Challenging The Dominant Deficit Narrative: Considering Social, Political and Historical Context

[8] The authors acknowledge the ongoing role of disciplines and professions in shaping socio-legal structures, as well as the role of these structures in producing and perpetuating inequities in our society, including particularly those experienced by Aboriginal and Torres Strait Islander people and communities.[7] This includes the role of psychological knowledge and practice frames, which tend to construct experiences of wellbeing and ill-health, and responses to them, from an individualistic perspective that diminishes the role of social, political and historical factors, and similarly places responsibility upon individuals or marginalised communities, rather than within these broader social structures.

[9] The nature of the challenge is made clear by Thrift and Sugarman (2019):

> Taken together, the emphasis on choice, demand that citizens be self-reliant, increased risk, and expectation that we be adept at forecasting it, stigmatizes failure as self-failure for which one is him- or herself solely culpable. If an individual fails to plan appropriately or access the right service at the right time and, as a result, ends up without adequate health coverage, funds for his or her child's college education, life or disability insurance, or is destitute in old age, he or her has no one to blame but him- or herself.[8]

[10] Edwige and Gray (2021), drawing on the insights of Chandler and colleagues,[9] also emphasise the need to consider structural factors that may impair or promote wellbeing, rather than solely individual ones. With these observations in mind, we emphasise the need to resist interpretations of the neurodevelopmental research on individualistic or deterministic terms as underpinning individual 'failings'. Rather, it is important to

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7 A Wright et al, 'Attachment and the (Mis)apprehension of Aboriginal Children: Epistemic Violence in Child Welfare Interventions' (2004) 32(2) 175*Psychiatry, Psychology and Law 175*.

8 Erin Thrift and Jeff Sugarman, 'What is Social Justice? Implications for Psychology' (2019) 39(1) *Journal of Theoretical and Philosophical Psychology* 1, 11.

9 Edwige and Gray, *Significance of Culture* (2021) (n 2), citing Michael J Chandler and William L Dunlop, 'Cultural Wounds Demand Cultural Medicines' in Margo Greenwood et al(eds) *Determinants of Indigenous Peoples' Health in Canada: Beyond the Social* (Canadian Scholars' Press Inc, 2015).

acknowledge the social, political and economic factors which shape the developmental experiences and trajectories of individuals, families and communities, and to take shared responsibility for those environments, and their neuropsychological and behavioural impacts. As Thrift and Sugarman (2019) go on to note:

> A widespread error in psychology is that failing to recognize the constitutive force of our sociopolitical and economic institutions has led to fixing features of persons to human nature rather than to the institutions within which they become persons.[10]

[11] Thrift and Sugarman (2019) add that, In a general sense, not specific to, but inclusive of, interactions with justice systems:

> Individuals' predicaments cannot simply be chalked up to a failing of individual choice and often have to do with access to opportunities, how opportunities are made available, the capacity to take advantage of opportunities offered, and a host of factors regarding personal histories and the vicissitudes of lives.[11]

[12] In this report we challenge interpretations of the literature that individualise or even pathologise issues that are, at their root, sociopolitical and economic.[12] We offer this as an explanation of the way these factors come to be embodied and reflected in the behaviours of individuals, and to emphasise both the importance of, but also the potential of, improved institutional conditions and responses for individual and collective wellbeing and thriving.

A Statement on Human Rights

[13] International human rights instruments provide a critical framework for the responsibilities and approaches of States and the systems they establish. State signatories are expected to integrate these rights frameworks into all systems, including the justice system. Relevant human rights instruments include the United Nations (UN) *Universal Declaration of Human Rights*,[13] the *International Covenant on Civil and Political Rights*,[14] the UN *Declaration on the Rights of Indigenous Peoples* (UNDRIP),[15] as well as the *Convention on the Rights of Persons with Disabilities*.[16] These instruments establish fundamental rights and freedoms, and the responsibilities of adopting States to uphold and promote these rights, without discrimination, regardless of race, sex, disability, or religious or political status. They include basic rights relevant to criminal justice systems, including the right to equal

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10 Thrift and Sugarman 'Social Justice' (n 8) 13.

11 Ibid 11.

12 Ibid.

13 *Universal Declaration of Human Rights* GA Res 217A (III), UN GAOR, UN Doc A/810 (10 December 1948).

14 *International Covenant on Civil and Political Rights*, opened for signature 16 December 1966, 999 UNTS 171 (entered into force 23 March 1976).

15 UN *Declaration on the Rights of Indigenous Peoples* (UNDRIP), GA Res 61/295, UN Doc A/RES/61/295 (2 October 2007, adopted 13 September 2007).

16 *Convention on the Rights of Persons with Disabilities*, opened for signature 13 December 2006, 2515 UNTS 3 (entered into force 3 May 2008).

protections under the law, the presumption of innocence, and other features associated with due process and procedural fairness.

[14] While this report is focused on broad neurodevelopment, the authors also note the disproportionate impact of adult and juvenile justice systems on people with disability, including neurodevelopmental disability, and emphasise the need for deep understanding and reasonable accommodations to ensure human rights are promoted and protected in these contexts. When the neurodevelopmental picture of young adults includes cognitive disability (e.g. Intellectual disability or FASD), risk of offending may be further amplified. Article 13 of the Convention on the Rights of Persons with Disabilities (CRPD) outlines the importance of ensuring equal and effective access to justice for those with disability, including through the provision of accommodations where required.

[15] Given the neurodevelopmental frame of this paper, the authors also note the United *Nations Convention on the Rights of the Child* (UNCRC),[17] which frames the responsibility of States including Australia, and institutions to children and young people as rights holders. Collectively, this includes an obligation to include as a primary consideration the best interests of children and young people in all actions that affect them, considering holistically all rights within the convention, and both short- and long-term implications.[18] This means taking into consideration, and upholding to the fullest extent possible, all of the rights outlined in the UNCRC, and recognising both the immediate and lifelong implications for children and young people, individually and collectively, emphasising the interrelationships across rights contained within the UNCRC. In particular, guidance materials note that:

> The Committee has repeatedly stressed that the Convention should be considered as a whole and has emphasized its interrelationships, in particular between those articles it has elevated to the status of general principles (articles 2 [non-discrimination], 3 [best interests], 6 [maximal development] and 12 [views of the child]). Thus, the principles of non-discrimination, maximum survival and development, and respect for the views of the child must all be relevant to determining what the best interests of a child are in a particular situation, as well as determining the best interests of children as a group.[19]

[16] For Aboriginal and Torres Strait Islander children, this particularly includes consideration of their cultural rights, as outlined in Article 30 of the UNCRC. We note that determinations about the best interests of Aboriginal and Torres Strait Islander children cannot be made independent of considerations of enjoyment of their cultural rights, and the right of individual children to enjoy those rights in their community.[20]

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17 *Convention on the Rights of the Child*, opened for signature 20 November 1989, 1577 UNTS 3 (entered into force 2 September 1990).

18 Rachel Hodgkin and Peter Newell, *Implementation Handbook for the Convention on the Rights of the Child* (UNICEF, 3rd ed, 2007). Available at <https://digitallibrary.un.org/>.

19 Ibid 37.

20 UN Committee on the Rights of the Child, General Comment No 11: Indigenous Children and Their Rights under the Convention, CRC/C/GC/11, 12 February 2009.

[17] Relevant to this report, consideration of the UNCRC reflects a developmental standpoint, including implications for neurodevelopment, as the developmental scaffolding relevant to considering the neurodevelopmental implications for young people aged 18–25. We note particularly the evidence linking early experiences, including early adverse childhood experiences and child protection involvement, school exclusions, and interactions with youth justice systems, and later justice system involvement, including by those in this 18–25 age bracket. These child-focused institutions — schools, child protection and youth justice — remain a critical site for the rights of children and young people and the neurodevelopmental environment provided to emerging and future young adults. We emphasise that these systems should consider the downstream implications of policies and practices across childhood, enacting those that promote positive and enriching neurodevelopmental environments, laying the foundations for future wellbeing, both individually and collectively, for our communities and society. We note particularly that the UN Committee on the Rights of the Child has identified that 'exposure to the criminal justice system has been demonstrated to cause harm to children, limiting their chances of becoming responsible adults', urging States to develop comprehensive child justice policy that reflects the rights of children and young people and the developmental evidence.[21]

[18] Australia is lagging behind international standards in maintaining (and in one case, reinstating) an age for criminal responsibility below 14 years of age. The Committee on the Rights of the Child explicitly justifies their recommendation to increase the minimum age to at least 14 years of age on the grounds of child development and neuroscience evidence, noting the still-developing frontal cortex and other factors associated with the onset of adolescence as compromising a child's ability to understand the consequences of their actions or comprehend criminal proceedings. Responses should divert children away from justice system involvement and provide individualised supports that meet their needs. Failure to do so is likely to compound the trauma, disadvantage and adversity experienced by young adults, undermining ongoing neurodevelopmental processes and outcomes, and contributing to poorer life course outcomes, including increased likelihood of future justice system involvement.

[19] Consistent with this rights framework, we position this report in a neurodevelopmental context, understanding the rights framework as creating an obligation for states to enact policies that promote developmental outcomes to the fullest extent possible across the life course, and particularly across childhood and adolescence when neurodevelopmental processes are at their most flexible. From this perspective, we particularly note the significant neurodevelopmental implications associated with custodial settings and the use of dehumanising practices throughout adolescence, particularly for children in early adolescence, as well as the healing potential of tailored approaches that promote relationships and scaffold more positive developmental trajectories.

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[21] UN Committee on the Rights of the Child, General Comment No 24: *Children's Rights in the Child Justice System*, UN Doc CRC/C/GC/24 (18 September 2019), para 2.

Summary Messages: Introduction		
	**1**	Young adulthood (18–25 years) represents a unique stage of development. Although legally recognised as adults, young people are still undergoing neurodevelopment, especially in brain areas responsible for decision-making, impulse control, and emotional regulation.
	2	Early adversity, trauma, and lack of supportive environments can negatively affect brain maturation and without opportunity for healing can increase risk for harmful behaviours that can lead to involvement with the justice system.
	3	Standard approaches often focus on individual 'deficits' without considering the broader social, historical, political, and cultural factors. This is especially true for Aboriginal and Torres Strait Islander young people, who are over-represented in justice settings.
	4	Aboriginal and Torres Strait Islander knowledge systems have been excluded from mainstream research and policy. Inclusion is essential to creating more culturally safe and effective approaches.
	5	Approaches that prioritise relationships, safety, and identity formation are more likely to promote long-term wellbeing and reduce reoffending, especially when grounded in an understanding of neurodevelopment.
	6	International conventions, such as the UN Convention on the Rights of the Child, require governments to protect young people's rights, consider their neurodevelopmental stage, and provide environments that support healthy development.
	7	Certain practices, such as detaining children under 14 years contradict international standards and neurodevelopmental science.
	8	A neurodevelopmental approach urges a shift away from punitive systems toward support, connection, and long-term rehabilitation.

2. Neurodevelopment: From Conception to Adulthood

This section provides an overview of brain development from conception into adulthood. Unless otherwise stated, the following is based on neurodevelopment occurring under ideal or 'thriving' conditions, whereby the environment and developmental context support optimal physical, cognitive, and emotional growth. We consider the impact of environmental, cultural and societal factors on neurodevelopment, and expand further in subsequent sections of the report (See Sections 3 and 4).

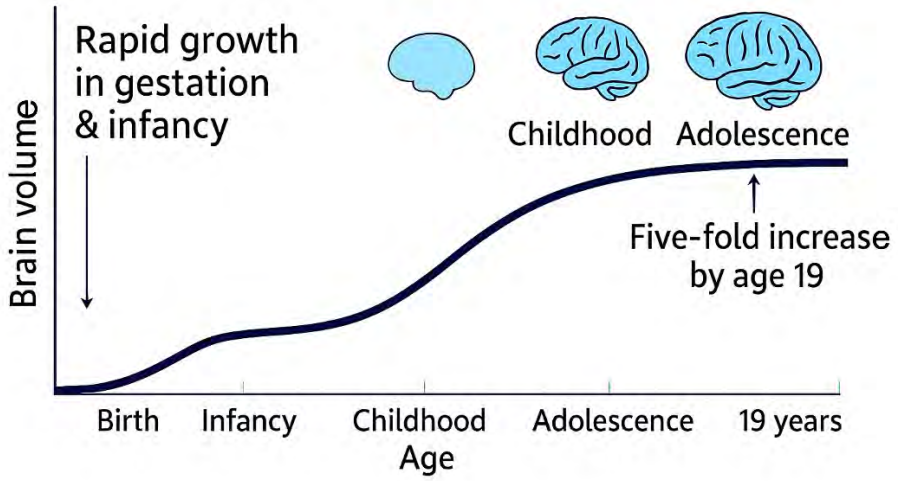

Figure 1: Brain growth during development. Changes in early brain development throughout pregnancy, childhood and adolescence. Image source: adapted from Gilmore, Knickmeyer and Gao (2018) (n 22).

Overview of Early Brain Development

[20] The development of the human brain begins shortly after conception and continues well into adulthood. Brain growth progresses rapidly in the prenatal stage, with most neurons (i.e., brain cells) and the structure of the cortex forming before birth (Figure 1).[22] This early foundation is followed by significant changes throughout infancy, childhood, and adolescence. This involves changes in brain size, surface area, and the folding of the cortex, which gives the brain its characteristic appearance. By approximately age 19, the brain's volume has increased five-fold since birth.[23]

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22 J H Gilmore, R C Knickmeyer and W Gao, 'Imaging Structural and Functional Brain Development in Early Childhood' (2018) 19(3) *Nature Reviews Neuroscience* 123.

23 Anna M Hedman et al, 'Human Brain Changes Across the Life Span: A Review of 56 Longitudinal Magnetic Resonance Imaging Studies' (2012) 33(8) *Human Brain Mapping*, 1987.

[21] In simple terms, the brain is organised such that the back portions, including the occipital, parietal and temporal lobes, are responsible for basic sensory functions such as vision, touch, and hearing, respectively (Figure 2). The frontal region of the brain (frontal lobe), is responsible for controlling higher-level complex processing, planning and the regulation of behaviour (i.e., executive functioning). Longitudinal neuroimaging studies show that brain development follows a specific sequence. The posterior regions develop first, while more complex regions, such as the frontal lobes and their associated networks, mature last.[24] These brain areas have been associated with decision-making (including risk-taking), emotions, and executive functioning.

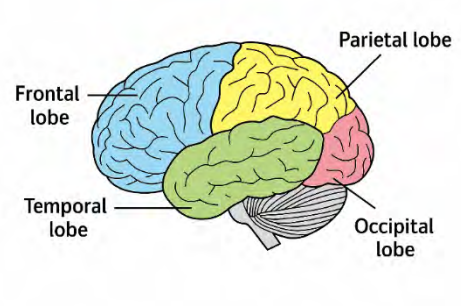

Figure 2: Structure of the adult human brain, showing the four major lobes. The back part of the brain (i.e. occipital, parietal and temporal lobes) develop first, while the frontal lobe develops last. Developed by the authors.

Brain Development Throughout Adolescence and Beyond

[22] Before advanced neuroimaging techniques, it was believed that brain development peaked during adolescence, an idea stemming from the fact that the brain reaches its adult size by age 10 and its maximum weight by age 19 (Figure 3). However, research in the late 1990s and early 2000s challenged this view. We now know that brain development continues well throughout adolescence and young adulthood, with some aspects of brain maturation continuing into the late twenties.[25]

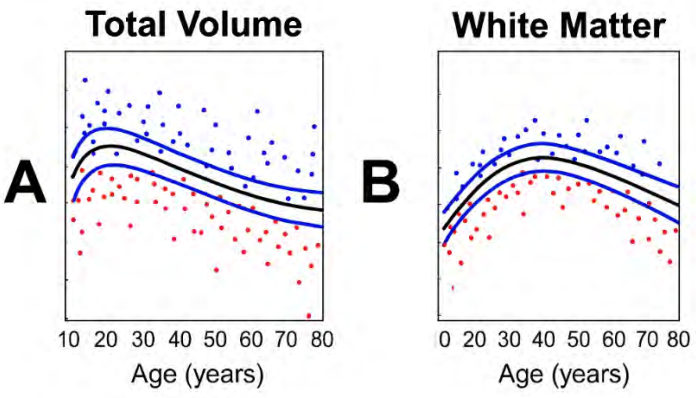

Figure 3: Changes in brain volume and white matter throughout the lifespan. Development of white matter (the connections between brain regions) continues well into young and middle adulthood. Adapted by the authors from Narvacan et al (2017) (n 25).

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[24] Nitin Gogtay et al, 'Dynamic Mapping of Human Cortical Development During Childhood Through Early Adulthood' (2004) 101(21) *PNAS* 8174.

[25] R A I Bethlehem et al, 'Brain Charts for the Human Lifespan' (2022) 604(7906) *Nature* 525; J N Giedd et al, (1999). 'Brain Development During Childhood and Adolescence: A Longitudinal MRI Study' (1999) 2(10) *Nature neuroscience* 861; E R Sowell et al, 'Longitudinal Mapping of Cortical Thickness and Brain Growth in Normal Children' (2004) 24(38) *Journal of Neuroscience* 8223; Karl Narvacan et al, 'Evolution of Deep Gray Matter Volume Across the Human Lifespan' (2017) 38(8) *Human Brain Mapping* 3771.

[23] The transition from adolescence to young adulthood is marked by ongoing changes to key brain regions, including the frontal, parietal, and temporal lobes. For instance, the hippocampus, which is involved in memory, and the amygdala, which regulates emotional processing, continue to develop during this period. These changes do not occur evenly. Areas like the amygdala and nucleus accumbens (which is responsible for reward processing) mature earlier than the prefrontal cortex, the region involved in complex decision-making.[26] The prefrontal cortex of the frontal lobes is the last brain area to mature. In addition to structural changes, the functional connections between brain regions (also known as white matter) continue to develop throughout young adulthood (Figure 3).[27]

[24] There is no clear consensus on when the brain reaches full maturation. Brain function efficiency, particularly in the frontal lobes and the connections with this area, continues to improve beyond age 25.[28] After age 25, brain changes continue, but at a much slower pace than the rapid development seen in late adolescence and early adulthood. In fact, the development and refinement of white matter connections in the brain continues throughout the entire lifespan.[29] The continued reorganisation and development of neural networks ultimately affects brain function, cognitive abilities, and behaviour. An overview of these brain changes is shown in Figure 4.

Early Childhood 0 to 6 years	School-Aged 6 to 16 years	Adolescent 12 to 18 years	Young Adult 18 to 25 years	Middle Adulthood 25 to 65 years	Older Age 65+ years
Synapses and connections increase rapidly	Networks continue to increase in frontal, parietal and temporal lobes	Networks in frontal lobes continue to increase and strengthen	Frontal lobes fully develop and reach full volume	Overall volume of brain starts to decrease	Brain shrinkage and volume loss
Used synapses increase rapidly	Temporal lobes reach peak volume	White matter tracts continue to increase	White matter continues to increase	Frontal and temporal lobes start to reduce in volume	Thinning of cortex, esp. in frontal and temporal lobes
Unused synapses are minimised		Areas of brain involved in reward and emotion continue to develop	Brain reaches maximum weight (approx. age 19)	Progressive decline in grey matter volume	Shrinkage of prefrontal cortex, hippocampus and cerebellum
Weight of brain increases				Posterior brain regions become more static	Enlargement of ventricles
					Brain lowest weight after age 86

Figure 4: Changes in brain structure throughout the lifespan from infancy to older age.
Chart created by the authors.

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[26] Kathryn L Mills et al, 'Developmental Changes in the Structure of the Social Brain in Late Childhood and Adolescence' (2014) 9(1) *Social Cognitive and Affective Neuroscience* 123.

[27] Nicou U F Dosenbach et al, 'Prediction of Individual Brain Maturity Using fMRI' (2010) 329(5997) *Science* 1358; Damien A Fair et al, 'Functional Brain Networks Develop from a "Local to Distributed" Organization' (2009) 5(5) *PLoS Computational Biology* e1000381.

[28] C Lebel et al, 'Microstructural Maturation of the Human Brain from Childhood to Adulthood' (2008) 40(3) *NeuroImage* 1044.

[29] Adam V Dvorak et al, 'An Atlas for Human Brain Myelin Content Throughout the Adult Life Span' (2021) *Scientific Reports, 11*, Article 269.

3. Neurodevelopment in Young Adulthood: Executive Functioning, Emotional and Behavioural Regulation and Social Cognition

[25] There is broad consensus that the most significant brain development during young adulthood involves the structural and functional refinement of the frontal lobes, particularly the prefrontal cortex. This section examines the way neurodevelopmental trajectories influence executive functioning, emotional regulation, and social cognition, and their implications for behaviour, including decision-making.

Executive Functioning

[26] Executive functioning refers to a set of cognitive skills that support goal-directed behaviour, including planning, reasoning, and decision-making.[30] Adolescence and young adulthood are particularly sensitive periods for the development of these skills.[26] Executive functioning is often categorised into 'cold' and 'hot' domains, each reflecting different developmental trajectories.

[27] 'Cold' executive functions involve logic and reasoning in emotionally neutral situations. They include planning, working memory, concept formation, and flexibility in thinking, which are regulated by the dorsolateral prefrontal cortex.[31] These abilities develop steadily throughout adolescence, reaching maturity by the late teenage years.[32] For example, cognitive flexibility,[33] response inhibition,[34] and working memory[35] show significant improvements during early adolescence and stabilise during the mid-teens.[36] Logical

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30 Sarah-Jayne Blakemore and Suparna Choudhury, 'Development of the Adolescent Brain: Implications for Executive Function and Social Cognition' (2006) 47(3–4) *Journal of Child Psychology and Psychiatry, and allied Disciplines* 296.

31 Akira Miyake et al, 'The Unity and Diversity of Executive Functions and Their Contributions to Complex 'Frontal Lobe' Tasks: A Latent Variable Analysis' (2000) 41(1) *Cognitive psychology* 49; D T Stuss and D F Benson, 'Neuropsychological Studies of the Frontal Lobes' (1984) 95(1) *Psychological Bulletin* 3.

32 Kean Poon, 'Hot and Cool Executive Functions in Adolescence: Development and Contributions to Important Developmental Outcomes' (2018) 8 *Frontiers in Psychology* 2311.

33 Eveline A Crone et al, 'Switching Between Spatial Stimulus–Response Mappings: A Developmental Study of Cognitive Flexibility' (2004) 7(4) *Developmental Science* 443.

34 Mariëtte Huizinga, Conor V Dolan and Maurits W van der Molen, 'Age-Related Change in Executive Function: Developmental Trends and a Latent Variable Analysis' (2006) 44(11) *Neuropsychologia* 2017.

35 Angela Prencipe et al, 'Development of Hot and Cool Executive Function During the Transition to Adolescence' (2011) 108(3) *Journal of Experimental Child Psychology* 621.

36 Dvorak et al 'Atlas' (2021) (n 29); Lebel et al 'Microstructural Maturation' (2008) (n 28).

reasoning also stabilises at about age 16, which is why individuals at this age are often seen as having adult-like cognitive abilities.

[28] 'Hot' executive functions, in contrast, involve decision-making in emotionally charged situations, which requires regulation of emotions, stress, and social pressures while concurrently engaging in planning, self-control and flexible thinking. These functions are governed by the ventromedial and orbitofrontal regions of the prefrontal cortex. These regions develop more gradually, often reaching maturity in the mid-twenties.[37] Abilities such as the evaluation of risks and decision-making under pressure remain less developed in young adults as compared with older adults.

[29] A study by Cohen et al (2016) investigated the developmental differences in executive functioning across age groups. Adolescents (13–17 years), young adults (18–21 years), and older adults (22+ years) were assessed on a cognitive control task under either neutral or emotionally charged conditions. While cognitive control improved from adolescence to young adulthood in neutral settings, young adults performed similarly to adolescents — and worse than older adults — when faced with emotional cues and triggers. This example underscores the delayed maturation of 'hot' executive functions during young adulthood.[38]

[30] The brain regions responsible for 'hot executive functions' are frequently associated with the neurobiology of behaviours that may increase the likelihood of contact with the justice system, including among young adults. For example, Padon et al (2022) examined brain differences between young men aged 18 to 21 who had previous justice system involvement (and were in an 'open regime' at the time of participation) and neurotypical peers of the same age, educational level and socioeconomic background. They found that the group with justice system involvement had a smaller orbitofrontal cortex, a region linked to 'hot executive functions'. The authors suggested that this may reflect variations in brain development and dysregulated emotional control processes regulated by this region.[39] The size of the orbitofrontal cortex has also been implicated in individuals involved with intimate partner violence[40] and individuals who engage in persistent patterns of impulsive, aggressive, or emotionally dysregulated behaviour.[41]

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37 Blakemore and Choudhury, 'Development' (2006) (n 30); D G Smith, L Xiao, and A Bechara, 'Decision Making in Children and Adolescents: Impaired Iowa Gambling Task Performance in Early Adolescence' (2012) 48(4) *Developmental Psychology* 1180.

38 Alexandra O Cohen et al, 'When Is an Adolescent an Adult? Assessing Cognitive Control in Emotional and Nonemotional Contexts' (2016) 27(4) *Psychological Science* 549.

39 Iván Padrón et al, 'Contribution of Brain Cortical Features to the Psychological Risk Profile of Juvenile Offenders' (2022) 14(2) *European Journal of Psychology Applied to Legal Context* 93.

40 Ángel Romero-Martínez et al, 'Executive Dysfunction and Cortical Variations Among Intimate Partner Violence Perpetrators and the Association with Sexism' (2024) 19(1) *Social Cognitive and Affective Neuroscience* nsae046; Juan Verdejo-Román, 'Structural Brain Differences in Emotional Processing and Regulation Areas between Male Batterers and Other Criminals: A Preliminary Study' (2018) 14(4) *Social Neuroscience* 390.

41 Yaling Yang and Adrian Raine, 'Prefrontal Structural and Functional Brain Imaging Findings in Antisocial, Violent, and Psychopathic Individuals: A Meta-Analysis' (2009) 174(2) *Psychiatry Research: Neuroimaging* 81.

Emotion and Behaviour Regulation

[31] The ability to regulate emotions and control behaviour is fundamental to wellbeing and healthy relationships. These processes are governed by the prefrontal cortex and its connections with emotional centres of the brain, such as the amygdala and nucleus accumbens. The connection between the prefrontal cortex and the amygdala supports emotional regulation, while the prefrontal cortex's links to the nucleus accumbens are essential for reward processing.

[32] Since the prefrontal cortex develops well into the mid-twenties, neurotypical younger adults often experience challenges with emotional regulation and impulsive behaviour. This is particularly evident in contexts involving risk-taking. Risk-taking behaviour follows a U-shaped curve: increasing during adolescence, peaking in the late teens, and declining during young adulthood. While individuals aged 18–21 engage in fewer risky behaviours than adolescents, they still take more risks than older adults (21+ years).

[33] Several factors contribute to the differences in risk-taking across age groups. Sensation-seeking — the drive to seek novel and exciting experiences — increases during adolescence and remains elevated until the early-to-mid twenties.[42] Sensitivity to rewards is also heightened during this period; neural circuits involved in reward processing, such as the nucleus accumbens, continue to mature until at least age 21.[43] In contrast, impulse control and resistance to peer influence, governed by the prefrontal cortex, develop more gradually and continue to improve into adulthood.[44]

[34] The imbalance between strong reward-seeking and slower-developing self-control is central to the 'dual systems' model of adolescent and young adult behaviour.[45] This model suggests that these brain differences are a typical part of adolescent and young adult development rather than necessarily being pathological or abnormal. The heightened sensitivity to rewards, coupled with underdeveloped mechanisms for impulse control, leads to increased risk-taking and impulsive decisions during adolescence and early adulthood. As the prefrontal cortex matures, individuals become better equipped to weigh rewards

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42 Elizabeth P Shulman et al, 'The Development of Impulse Control and Sensation-Seeking in Adolescence: Independent or Interdependent Processes?' (2016) 26(1) *Journal of Research on Adolescence* 37; Laurence Steinberg et al, 'Age Differences in Sensation Seeking and Impulsivity as Indexed by Behavior and Self-Report: Evidence for a Dual Systems Model' (2008) 44(6) *Developmental Psychology* 1764.

43 Dosenbach et al, 'Prediction of Individual Brain Maturity' (n 27); Leah H Somerville, Rebecca M Jones, and B J Casey, 'A Time of Change: Behavioral and Neural Correlates of Adolescent Sensitivity to Appetitive and Aversive Environmental Cues' (2010) 72(1) *Brain and Cognition* 124.

44 Jason Chein et al, 'Peers Increase Adolescent Risk Taking by Enhancing Activity in the Brain's Reward Circuitry' (2011) 14(2) *Developmental science* F1–F10; K P Harden and E M Tucker-Drob, 'Individual Differences in the Development of Sensation Seeking and Impulsivity During Adolescence: Further Evidence for a Dual Systems Model' (2011) 47(3) *Developmental psychology* 739; Daniel Romer et al, 'Can Adolescents Learn Self-Control? Delay of Gratification in the Development of Control Over Risk Taking' (2010) 11(3) *Prevention Science* 319.

45 Laurence Steinberg, 'A Dual Systems Model of Adolescent Risk-Taking' (2010) 52(2) *Developmental Psychobiology* 216.

against potential negative consequences, resulting in a natural decline in risky and impulsive behaviour with age. This developmental pattern is common across all young people.

[35] When taken with the information presented above, since young adults' hot executive and behavioural systems continue to mature, their ability to regulate emotions and make rational decisions simultaneously is less developed and therefore less effective than that of older adults. Thus, in high-pressure situations, or where there is a perceived physical or psychological threat (e.g. during an argument or in reaction to a stressful/distressing event), young adults may be more susceptible to their emotions 'getting the better of them', increasing the chance of reacting without thinking and decreasing the chance of making rational and measured decisions.

Social Cognition

[36] Social cognition encompasses the skills needed to navigate interpersonal interactions, and includes processes such as emotion perception, mentalising (theory of mind), and decision-making in social contexts. These abilities allow individuals to interpret others' emotions, intentions, and motivations, forming the foundation for judgments about trust, fairness, altruism, and social behaviours.[46] They are generally associated with a network of brain structures referred to as the 'social brain', and include the prefrontal cortex, the anterior temporal cortex, and the amygdala.[47] The structures of the social brain continue to develop throughout adolescence and young adulthood. For example, the volume and thickness of the medial prefrontal cortex decreases into the early twenties, while the thickness of the anterior temporal cortex increases throughout younger adulthood before declining in the early twenties.[48] Such changes suggest potential delayed maturation of social cognition skills throughout young adulthood.

[37] Emotion perception refers to the ability to recognise and interpret others' emotions using cues such as facial expressions, tone of voice, and body language. While the basic ability to recognise simple emotional expressions (e.g. happiness or anger) is present across adolescence and adulthood, young adults often struggle with more complex emotional tasks, particularly in high-pressure contexts. For example, research indicates that individuals aged 18–21 exhibit less self-control when responding to negative social–emotional cues, compared with those over 21.[49] These findings suggest that emotional sensitivity and regulation continue to mature into the mid-twenties.

[38] Emotional empathy — the ability to share and experience the emotion of another person — develops throughout childhood and is generally considered mature by early adolescence. Cognitive empathy, such as mentalising or theory of mind, is the ability to understand others' perspectives, intentions, and social motivations. This skill develops through adolescence and young adulthood as individuals gain more social experiences and

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46 Chris D Frith and Tania Singer, 'The Role of Social Cognition in Decision Making' (2008) 363(1511) *Philosophical Transactions of the Royal Society B: Biological Sciences* 3875.

47 Sarah-Jayne Blakemore, 'The Social Brain in Adolescence' (2008) 9 *Nature Review Neuroscience* 267.

48 Mills et al, 'Developmental Changes' (2014) (n 46).

49 Lebel et al (2008) 'Microstructural Maturation' (n 28).

better distinguish between themselves and others. Cognitive empathy continues to increase and plateaus during young adulthood.[50]

[39] As the prefrontal cortex is still maturing, young adults may not consistently interpret social cues with the same nuance or accuracy as older adults. Emotional arousal or stress can further influence young adults' mentalising abilities, leading to less accurate or less stable interpretations of others' intentions. By the mid-twenties, these abilities tend to stabilise, supporting more sophisticated and consistent social understanding and reasoning. For example, prosocial moral judgement increases from late adolescence into the early twenties.[51] Moral decision-making, in which prosocial behaviour is based on societal norms and stereotypes (i.e. stereotypical prosocial moral reasoning) continues to increase throughout the third decade of life.[52] While there are some exceptions,[53] complex and sophisticated aspects of social cognition tend to continue to develop throughout the young adult period.

[40] Like all domains of cognition, and perhaps more directly, social cognition does not develop in isolation. It is shaped by broader social, cultural, and environmental contexts as well as relationships which scaffold neurodevelopment. In turn, context and relationships influence the way emotions are expressed, regulated, and perceived, as well as the behavioural schemas and social expectations that guide interactions. Neurodevelopment reflects a dynamic interplay between external experiences, such as cultural norms and social relationships, and internal processes, such as brain maturation and emotional regulation. Understanding this interaction is essential for appreciating the variability in social cognition across individuals and communities.

Neurodevelopment of Young Adulthood: Potential **Implications for Police and Court Settings**

[41] While those aged 18 and above are typically considered adults, the scientific and clinical evidence differentiating the transition between adolescence and adulthood is not so clear-cut. Cognitive, emotional, and social abilities continue to evolve throughout young adulthood, with ongoing development in areas such as executive functioning, emotional regulation, and impulse control. This developmental context has significant implications for the way young adults are understood and treated within the justice system, particularly in relation to decision-making and behaviour:

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50 Liam Dorris et al, 'Cognitive Empathy Across the Lifespan' (2022) 64(12) *Developmental Medicine & Child Neurology* 1524; Béatrice Tousignant, Fanny Eugène, and Philip L Jackson, 'A Developmental Perspective on the Neural Bases of Human Empathy' (2017) 48(A) *Infant Behavior & Development* 5.

51 Nancy Eisenberg et al, 'Age Changes in Prosocial Responding and Moral Reasoning in Adolescence and Early Adulthood' (2005) 15(3) *Journal of Research on Adolescence* 235.

52 Nancy Eisenberg et al, 'The Development of Prosocial Moral Reasoning and a Prosocial Orientation in Young Adulthood: Concurrent and Longitudinal Correlates' (2014) 50(1) *Developmental Psychology 58*.

53 Béatrice Tousignant et al, 'A Comprehensive Assessment of Social Cognition from Adolescence to Adulthood' (2017) 43 *Cognitive Development* 214.

a) **Emotion regulation in a perceived threat situation:** While young adults may demonstrate adult-like reasoning in neutral situations, their ability to regulate emotions and make decisions in high-stress or emotionally charged environments is less developed. This can impact responses when they are experiencing perceived physical or emotional threat, such as during conflict, or in interactions that include some element of jeopardy, such as police contacts, or when being questioned by police. Young adults may exhibit less stable or controlled responses to social–emotional cues, compared with older individuals.

b) **Risk-taking tendencies:** Risk-taking behaviour tends to peak during late adolescence and early adulthood, driven by heightened reward sensitivity and underdeveloped impulse control. These tendencies may contribute to impulsive behaviours without full consideration of long-term consequences.

c) **Social and emotional understanding:** Young adults may struggle to fully comprehend the social and emotional consequences of their actions, particularly in peer-influenced or emotionally charged scenarios. This has implications for incidents occurring in groups and involving peer pressure, where their decision-making may differ from that of older adults.

[42] Overall, young adults are more susceptible to impulsive, emotionally driven decisions, particularly in high-stress environments. As the prefrontal cortex continues to develop, decision-making continues to mature until the mid-twenties, when the prefrontal cortex reaches full maturation. After about age 25, decision-making is generally more considered and regulated, reflecting stabilisation of the brain systems for emotional and cognitive integration. Consequently, in some ways, adults within the 'young adult' category may be more like adolescents in their behaviour and brain development, particularly when considering the individualised developmental context.

Neurodevelopment in Young Adulthood: Perspectives and Considerations

[43] Research from the past two decades has shown that brain development continues well into young adulthood. However, understanding the unique neurobiology of the 'young adulthood' age group is challenging due to limitations in existing studies. Most neurodevelopmental research focuses on children and teenagers; very few examine brain developments beyond adolescence. As a result, young adulthood brain development remains relatively under-explored. Even in studies that extend beyond the teenage years, few explicitly compare young adults with other age groups. Typically, participants over 18 are grouped into a broad 'adult' category, with little differentiation or consideration between young adults (18–25) and those older than 25. There are also inconsistencies in the way researchers define adolescence and adulthood. Some studies classify teenagers up to age 19 as adolescents, while others consider individuals over 17 to be adults.[54] This means an 18-year-old might be categorised as an adolescent in one study and as an adult in another, complicating the process of identifying specific developmental milestones in brain, cognitive, and social development.

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[54] Stephanie Burnett et al, 'The Social Brain in Adolescence: Evidence from Functional Magnetic Resonance Imaging and Behavioural Studies' (2010) 35(8) *Neuroscience & Biobehavioural Reviews* 1654.

[44] Additionally, young adults who come into contact with the justice system disproportionately include those who have experienced factors that may attenuate neurodevelopment. Indeed, brain development is not solely determined by genetics; it is profoundly shaped by the physical, social, cultural, and political environment. The neurodevelopmental environment — particularly relationships with responsive adults — plays a critical role in shaping the internal experience of both the physical and the mental world. This reciprocal process means that while the brain is influenced by its environment, it also actively engages with it, as when adapting to avoid negative cues and reinforcing positive interactions; this, in turn, shapes key relationships and contexts that support neurodevelopment. Through such processes, culture (as well as other social and political factors) comes to play a critical role in common biological processes. Thus, culture can be considered a broad social factor through which the 'developmental niche', the specific environment for development, is structured and organised.[55]

[45] While this is relevant for all children, in Australia the opportunity for a developmental niche for Aboriginal and Torres Strait Islander children, organised by culture, warrants extra consideration. Political and systemic factors have historically undermined Aboriginal and Torres Strait Islander self-governance and cultural continuity, particularly through policies that disrupted family structures. These policies continue to have lasting effects, particularly within the education system, where children spend a significant part of their formative years. Often structured within a Western framework, the education system does not adequately reflect Aboriginal and Torres Strait Islander cultural values, contributing to the marginalisation of culturally informed neurodevelopmental opportunities.[56]

[46] Neuroscience literature has tended to almost exclusively favour a Western view that conceptualises brain development and function in isolation from its environment and context — a narrative we now understand to be incomplete.[57] Recently, however, an international collaboration (including an Aboriginal and Torres Strait Islander scholar) has offered an Indigenous perspective on brain development and function.[58] Illes et al(2025) emphasise that the brain is not a static structure but is continually shaped by its environment, including cultural and social forces. Indigenous perspectives such as 'Two-Eyed Seeing' recognise the deep connections between brain health, community, land, and spirituality. Through this lens, the negative impact of colonialism, trauma, and systemic inequalities on neural development and mental health is clear. This perspective considers the influence of cultural practices such as oral traditions and storytelling on memory and cognition, and provides a holistic, relational understanding of the brain, beyond reductionist Western models, thus enhancing neuroscience and psychological practice globally.[59]

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55 J Illes et al, 'Two-Eyed Seeing and Other Indigenous Perspectives for Neuroscience' (2025) 638(6) *Nature* 58; Charles M Super and Sara Harkness, 'The Developmental Niche: A Conceptualization at the Interface of Child and Culture' (2022) 26(3) International Journal of Behavioral Development 267.

56 Arathi Sriprakash, Sophie Rudolph and Jessica Gerrard, *Learning Whiteness: Education and the Settler Colonial State* (Pluto Press, 2022).

57 Daryl E M Fujii, 'Incorporating Intersectionality in Neuropsychology: Moving the Discipline Forward' (2023) 38(1) *Archives of Clinical Neuropsychology* 154.

58 Illes et al 'Two-Eyed Seeing' (2025) (n 55).

59 Ibid.

[47] Neurodevelopment does not occur in a vacuum. Positive and adverse life experiences can shape the neurodevelopmental trajectory, with significant impacts on the risk of offending behaviour in young adulthood (18-25 years). These impacts are explored in the next section.

Summary Messages: Neurodevelopment in Young Adulthood	
1	Neurodevelopment continues into the mid-twenties. While legal adulthood begins at age 18 years in Australia, key brain regions, especially those involved in decision-making, emotional control, and social understanding, continue to develop until at least age 25.
2	Young adults may show reasoning like adults in calm situations, but may have disproportionate difficulty doing so under pressure. In emotionally charged or stressful environments, decision-making tends to be more impulsive and emotionally reactive due to ongoing brain maturation.
3	Risk-taking is typical in young adults. Heightened reward sensitivity and a desire for excitement peak in the late teens and early twenties. This, combined with typically less-developed self-control, can lead to impulsive behaviour, especially in the context of peer pressure.
4	Social understanding is still developing. While emotional empathy is usually in place by adolescence, skills such as perspective-taking and moral reasoning continue to mature in early adulthood, affecting the way young adults interpret and respond to social cues.
5	Environmental and cultural contexts matter. Brain development is shaped by relationships, community, culture, and early experiences. For Aboriginal and Torres Strait Islander young people, systemic barriers and lack of culturally safe environments can limit opportunities for healthy brain development.
6	The justice system often overlooks neurodevelopmental science. Although young adults are treated as fully responsible adults in legal settings, they are still in a sensitive developmental period. This has important implications for policing, sentencing, and rehabilitation.

4. Early Life Experiences Impact Neurodevelopment in Young Adults

[48] From the developmental and neuroscience literature we know that earlier life experiences have a crucial role in shaping later neurodevelopment.[60] Early life experiences can be categorised as either protective or adverse. Protective early life experiences enhance and optimise neurodevelopment by meeting a child's physical, cognitive, social, and emotional needs during critical periods of brain growth. By contrast, early life experiences that are known to adversely impact neurodevelopment hold the potential to hinder and disrupt a young person's neurodevelopmental trajectory, with enduring effects on physical health, emotion regulation, cognition, and behaviour, social participation and mental health during young adulthood and beyond. For example, in a large-scale longitudinal study, Carozza et al (2025)[61] investigated the way early-life environments shape the white matter (i.e., the connections between brain regions) in the developing adolescent brain. The authors found that the presence of adverse childhood experiences *and* the absence of protective factors were linked with lower white matter integrity throughout the brain. This also led to reduced performance on cognitive tasks of receptive language and mental arithmetic skills. This study also found that social determinants (e.g. income and education) were related to white matter integrity within the brain,[62] highlighting the critical role of the environment in shaping brain development. These positive or adverse early life experiences, in addition to other environmental and social disadvantages contribute to pathways that increase the likelihood of involvement with the justice system.[63]

Intergenerational Transmission

[49] Our experiences and environments interact with our genes in both positive and negative ways, and over time. This means factors such as culture, social surroundings, and life context can influence the way the brain grows and develops.[64] Intergenerational transmission of life experiences occurs through biological, psychological, social and cultural pathways that influence the way caregivers pass down traits, behaviours and patterns to children. Biologically, life experiences can alter gene expression through epigenetic

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60 Jennifer Hays-Grudo and Amanda Sheffield Morris, 'The Intergenerational Transmission of ACEs and PACEs' in J Hays-Grudo and A S Morris, *Adverse and Protective Childhood Experiences: A Developmental Perspective* (American Psychological Association, 2020) ch 4, 69–84; Sofia Carozza et al, 'Whole-Brain White Matter Variation Across Childhood Environments' (2025) 122(15) *PNAS* e2409985122.

61 Carozza et al 'Whole-Brain White Matter' (2025) (n 60).

62 Ibid.

63 *First Nations Youth and the Justice System* (Fact Sheet, Transforming Indigenous Mental Health and Wellbeing Project 2022), summarising Helen Milroy et al, 'First Nations Peoples and the Law' (2021) 50(3) *Australian Bar Review* 510.

64 Illes et al 'Two-Eyed Seeing' (2025) (n 55); Carozza et al 'Whole-Brain White Matter' (2025) (n 60).

modifications, where environmental factors 'switch on or off' certain genes without changing the DNA sequence.[65] These epigenetic markers can be inherited, predisposing future generations to similar physiological or behavioural responses. Psychologically, early interactions between caregivers and children shape attachment styles and emotional regulation, which influence the way children respond to stress and later engage in relationships as adults. These attachment patterns often influence individuals' engagement in relationships as adults, and are frequently reproduced across generations, as children tend to model the relational and interpersonal styles they have experienced.[66] Families and communities play a role in socialising and reinforcing the child's attitudes, beliefs and coping strategies, creating patterns that persist across generations. Shared environmental factors, such as cultural practices, social determinants, and community systems, can either buffer or exacerbate challenges across generations.[67] Through this interplay of biological predispositions, learned behaviours and environmental reinforcement, life experiences create lasting effects that shape the ways in which future generations navigate their own lives. This process of transmission can foster resilience or vulnerability, depending on the conditions and supports present within families and communities.

[50] Banushi et al(2025)[68] present a comprehensive review of the molecular mechanisms underpinning the generational transmission of trauma, with a clear focus on epigenetic processes, particularly in stress-regulatory genes, and the way these modifications may be inherited across generations. The authors stress that epigenetic changes mean that genes are amenable to change, and warn against the assumption that trauma is always passed down in a fixed way, as this kind of thinking can lead to stigma. Instead, they suggest using approaches that focus on healing, which can positively alter gene expression to break the cycle of trauma being passed from one generation to the next.[69]

Protective Early Life Experiences

[51] The strength of relationships and availability of quality resources that enable access to enriching opportunities are the cornerstones of healthy neurodevelopment. These positive early-life experiences provide the stability and nurturing needed for a child to thrive, and foster resilience and emotional regulation that can be drawn upon during adolescence and young adulthood, and in the face of adversity. Importantly, many of these positive experiences overlap with human rights and the rights of Indigenous children. Much of the

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65 Eamon Mccrory, Stephane A De Brito, Essi Viding, 'The Impact of Childhood Maltreatment: A Review of Neurobiological and Genetic Factors' (2011) 2(48) *Frontiers in Psychiatry* 1.

66 Jennifer Hays-Grudo and Amanda Sheffield Morris, *Adverse and Protective Childhood Experiences: A Developmental Perspective* (American Psychological Association, 2020).

67 Hays-Grudo & Morris, 'Intergenerational Transmission' (2020) ch 4 (n 60); Pat Dudgeon et al, *Connection Between Family, Kinship and Social and Emotional Wellbeing* (Australian Institute of Health and Welfare Report, Cat. no. IMH 4, 2021).

68 Blerida Banushi, Jemma Collova, and Helen Milroy, 'Epigenetic Echoes: Bridging Nature, Nurture, and Healing Across Generations' (2025) 26(7) *International Journal of Molecular Sciences* 3075.

69 Ibid.

knowledge about the impact of protective early-life experiences originates in developmental theory and can be conceptualised as pertaining to either relationships or resources.[70]

[52] Infants are biologically predisposed to form key relationships with caregivers.[71] The foundational mechanism in the development for secure attachment is co-regulation, whereby a caregiver supports an infant and young child to manage their emotional and physiological states through attuned, responsive interactions.[72] Over time, these interactions enable the child to internalise regulatory strategies, creating neural pathways that support emotional and behavioural regulation.[73] The caregiver's timely and consistent responses to the child's emotional needs help modulate the child's stress response systems – the autonomic nervous system (ANS) and hypothalamic–pituitary–adrenal (HPA) axis) – leading to the development of a balanced stress response.[74] Self-regulation then becomes an extension of these early experiences; as the child develops, they can independently manage stress, control impulses, and regulate affect. Healthy, nurturing and secure relational bonds with a caregiver also promote optimal development of the prefrontal cortex.[75] As children mature into young adulthood, their ability to manage stress, form positive social bonds, navigate adversity, and develop a heightened sense of self is influenced by these early experiences.[76]

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70 Adapted from: Hays-Grudo & Morris, 'Intergenerational Transmission' (2020) ch 4 (n 60); Cher X Huang et al, 'Positive Childhood Experiences and Adult Health Outcomes' (2023) 152(1) *Pediatrics* (Evanston) 1; Christina Bethell et al, 'Positive Childhood Experiences and Adult Mental and Relational Health in a Statewide Sample: Associations Across Adverse Childhood Experiences Levels' (2019) *JAMA Pediatrics*, 173(11), e193007–e193007.

71 Caroline Homer, 'Impact of Incarceration for Mothers and Babies' (Expert Report to Legal Aid NSW, Burnet Institute, 8 February 2023).

72 A N Schore, *Affect Regulation and the Origin of the Self: The Neurobiology of Emotional Development* (Routledge, 2015).

73 Ruth Feldman, 'The Adaptive Human Parental Brain: Implications for Children's Social Development' (2015) 38(6) *Trends in Neurosciences* 387.

74 Megan Gunnar, and Karina Quevedo 'The neurobiology of Stress and Development' (2007) 58(1) *Annual Review of Psychology* 145.

75 Beatrice Beebe, Frank Lachmann, and Joseph Jaffe, 'Mother–Infant Interaction Structures and Presymbolic Self- and Object Representations' (1997) 7(2) *Psychoanalytic Dialogues* 133; R A Thompson, 'Socialization of emotion and emotion regulation in the family' in J J Gross (ed), *Handbook of Emotion Regulation* (2nd ed, Guilford Press, 2014) 173; McCrory et al 'Impact of Childhood Maltreatment' (2011) (n 65); Katie A McLaughlin et al, 'Child Maltreatment and Neural Systems Underlying Emotion Regulation' (2015) *Journal of the American Academy of Child & Adolescent Psychiatry, 54*(9), 753; Allan N Schore, 'Effects of a Secure Attachment Relationship on Right Brain Development, Affect Regulation, and Infant Mental Health' (2001) 22(1–2) *Infant Mental Health Journal* 7; Schore, *Affect Regulation* (2015) (n 72); Daniel J Siegel, *The Developing Mind: How Relationships and the Brain Interact to Shape Who We Are* (3rd edn, Guilford Press, 2020).

76 Joseph P Allen et al, 'Attachment and Adolescent Psychosocial Functioning' (1998) 69(5) *Child Development* 1406; Schore, *Affect Regulation* (2015) (n 75).

[53] Importantly, while attachment might develop differently across cultures,[77] that which fosters nurturing and responsive relational bonds between the child and caregiver(s) results in optimal neurodevelopment into adulthood by providing an internal working model that serves as a template for future relationships.[78] During adolescence, increased independence and greater influence from peers emerge, but enduring, responsive adult relationships still provide a 'safety net' for development during this period, through the provision of guidance and advice. Social interactions with friends provide children with opportunities to learn, play, and have fun. Positive peer relations can reduce stress, help to protect from or mitigate bullying, and provide a source of comfort and acceptance beyond the family unit. Community engagement, cultural identity and religious group affiliation foster a sense of belonging and connection to others and provide opportunities to observe and model positive behaviour and empathy. They can also be a source of stress reduction, support, and healing during times of distress. Trusted non-parent adult figures, such as family members, teachers or community members, serve as emotional supports and provide guidance when primary caregivers are not available. This can help reduce psychological distress and the likelihood of engaging in high-risk activities.

[54] Beyond relationships, protective early life experiences can also be considered in terms of access to key resources;[79] they broadly correspond with social determinants of neurodevelopment and brain health.[80] A physically and emotionally safe home environment, along with access to nutritious food, supports overall wellbeing and neurodevelopment. Enriched educational settings provide opportunities for cognitive development, social skill acquisition, and cultural identity formation. Schools not only facilitate learning but also provide a setting that enhances development of social skills, emotion regulation and executive function. Artistic, creative, or intellectual pursuits provide an outlet for self-expression and identity exploration. These activities contribute to routine consistency and foster a sense of achievement and self-esteem. Completion of schooling is linked to further opportunities for continued learning and career opportunities. Being involved in organised sports or having regular physical activity optimises health, including brain health. It can also provide social connection and help with emotion regulation, thus acting as a protective factor for stress and mental health symptoms. Predictable home environments with fair and

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77 Heidi Keller, 'Universality Claim of Attachment Theory: Children's Socioemotional Development Across Cultures' (2018) 115(45) *Proceedings of the National Academy of Sciences* 11414; G Liotti, 'Trauma, Dissociation, and Disorganized Attachment: Three Strands of a Single Braid' (2004) 41(4) *Psychotherapy: Theory, Research, Practice, Training* 472.

78 Mary D. Salter Ainsworth, 'Infant–Mother Attachment' (1979) 34(1) *American Psychologist* 932; Diana Baumrind, 'The Influence of Parenting Style on Adolescent Competence and Substance Use' (1991) 11(1) *Journal of Early Adolescence* 56; Mary D. Salter Ainsworth et al, *Patterns of Attachment: A Psychological Study of the Strange Situation* (Erlbaum, 1978); John Bowlby, *Attachment and Loss*, vol 1, Attachment (Basic Books, 1969); John Bowlby, 'Attachment and Loss: Retrospective and Prospective' (1982) *52*(4) *American Journal of Orthopsychiatry* 664; Cindy Hazan and Phillip Shaver, 'Romantic Love Conceptualized as an Attachment Process' (1987) 52(3) *Journal of Personality and Social Psychology* 511.

79 Bethell et al 'Positive Childhood Experiences' (2019) (n 70); Hays-Grudo & Morris, 'Intergenerational Transmission' (2020) ch 4 (n 60); Huang et al 'Positive Childhood Experiences' (2023) (n 70).

80 See, e.g., Deanna M Barch and Joan L Luby, 'Understanding Social Determinants of Brain Health During Development' (2023) 180(2) *American Journal of Psychiatry* 108; Fujii (2023) 'Incorporating Intersectionality' (n 57).

consistent rules help children understand boundaries, establish routines, and develop self-regulation skills. The nature of these developmental contexts adjusts to developmental stage. In early childhood, structured routines foster language development, socialisation, hygiene and self-care skills, while in adolescence, they provide a framework for understanding social expectations and personal responsibility.

Positive Early Life Experiences in Aboriginal and Torres Strait Islander Communities

[55] While the above may have transcultural relevance, additional protective factors for Aboriginal and Torres Strait Islander peoples are important from early in life;[81] these factors optimise the wellbeing, and thus the neurodevelopment, of children and young adults and beyond. Rather than having a singular bond with a primary caregiver, as early attachment theory grounded in Western developmental psychology theorised, we now know Aboriginal and Torres Strait Islander children are nurtured through extended kinship systems, where caregiving is distributed among multiple trusted relatives, Elders, and community members.[82] These relationships foster a profound sense of connectedness, collective responsibility, and safety — qualities consistent with the developmental aims of attachment theory but expressed through different cultural modalities. In this way, child wellbeing and development are grounded in a network of connections: to family, community, Country, culture, and Ancestors.[83] These relational structures form the foundation for identity, belonging, and emotional security from early infancy, and are intimately tied to a child's ability to remain embedded in their cultural environment.[84]

[56] One useful conceptualisation is the Social and Emotional Wellbeing (SEWB) framework[85] (Figure 5), recently highlighted by Edwige and Gray in their *Bugmy* Bar Book report, *The Significance of Culture to Wellbeing, Healing, and Rehabilitation*.[86] Applying a neurodevelopmental perspective to the SEWB framework, cultural identity and collective selfhood foster optimal neurodevelopment. Optimal neurodevelopment is contingent on the quality and strength of interdependence and interconnections between seven domains: body and mind, family/kinship, community, culture, land/Country, and spirituality/ancestors. These relationships provide a foundation for safety, belonging, and care, essential to healthy neurodevelopment of a child, young person and young adult.

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81 Kerry Arabena, '… *Country Can't Hear English* …' A guide supporting the implementation of cultural determinants of health and wellbeing with Aboriginal and Torres Strait Islander peoples (Karabena Publishing, 2020).

82 Wright et al, 'Attachment and (Mis)apprehension' (n 7).

83 Ibid.

84 Ibid.

85 Pat Dudgeon et al, Social and Emotional Wellbeing: A Review (Lowitja Institute, 2025); Graham Gee et al, 'Aboriginal and Torres Strait Islander Social and Emotional Wellbeing' in in Pat Dudgeon, Helen Milroy and Roz Walker (eds) *Working Together: Aboriginal and Torres Strait Islander Mental Health and Wellbeing Principles and Practice* (2nd ed, 2014) ch 4, 55–68.

86 Edwige and Gray, *Significance of Culture* (2021) (n 2).

Figure 5: The Social and Emotional Wellbeing (SEWB) Framework for conceptualising selfhood and the health and wellbeing of Aboriginal and Torres Strait Islander peoples. After Gee et al (2014) (n 85).

[57] Denial of access to such resources places additional burden and the risk of stress and distress on Aboriginal and Torres Strait Islander peoples, including young adults.[87] This is discussed in the following section. Dudgeon et al (2025)[88] provide a full summary of protective and risk factors in relation to the SEWB framework. The framework recognises the concurrent and cumulative influence of social, political, cultural, and historical determinants of health, including ongoing harms of colonisation such as structural racism and cultural dispossession,[89] many of which are established factors influencing brain health and neurodevelopment.[90]

Adverse Early Life Experiences

[58] The term 'adverse childhood experiences' (ACEs) refers to adverse events that occur within the first 18 years of life. These include various experiences of abuse (physical, emotional, sexual); neglect (physical, emotional); and household dysfunction (caregiver separation/divorce, household mental illness or substance misuse, and witnessing

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87 Pat Dudgeon et al, *Connection to Community* (Australian Institute of Health and Welfare Report, Cat. no. IMH 9, 2022); Dudgeon et al, *Connections Between Family* (2021) (n 67); Ebony Verbunt et al, 'Cultural Determinants of Health for Aboriginal and Torres Strait Islander people: A Narrative Overview of Reviews' (2021) 20(1) *International Journal for Equity in Health* 181.

88 Dudgeon et al *Social and Emotional Wellbeing* (2025) (n 86); Gee et al 'Wellbeing' (2014) (n 85).

89 Dudgeon et al (2025) (n 86).

90 See, e.g. Barch and Luby (n 80); Fujii (2023) 'Incorporating Intersectionality' (n 57).

domestic violence).[91] Over time, this definition has broadened to include the impact of bereavement.[92] The *Bugmy* Bar Book chapters summarise extracts of evidence-based research relating to the impacts of adverse childhood experiences.[93]

[59] Relational trauma (often referred to as disrupted attachment), can occur when the bond with a caregiver is weakened, inconsistent, or absent in infancy and childhood. This may be a result of caregiving that is neglectful or emotionally unavailable, inconsistent or unpredictable, or harmful.[94] This can often relate to the caregiver's own experiences with developmental, intergenerational and/or transgenerational trauma or adverse early life experiences, including household dysfunction and systemic disadvantage, manifested through poverty, overcrowded housing, food insecurity, and limited access to healthcare, which place chronic stress on families and carers. This stress can diminish capacity for consistent and responsive caregiving, which is essential to healthy relational development.[95] Despite growing evidence of the adverse impacts of systemic determinants on individual and family wellbeing, psychology and mental health practitioners and programs tend to focus on individuals and parent–child or family relationships without regard to the social and political determinants and contextual factors that affect their lives.[96]

[60] For Aboriginal and Torres Strait Islander children and families, the deliberate disruption of cultural practices and disruption of families and communities through colonial policies such as the Stolen Generations, over-policing of families by child protection, policing of Aboriginal and Torres Strait Islander people, and marginalisation from intergenerational wealth, have disrupted networks of connection. This has led to relational trauma, intergenerational trauma, disconnection from culture, disruption of parenting practices, and intergenerational disadvantage.[97] The disruption of important relationships caused by these systemic and policy factors must be recognised when considering the neurodevelopmental context of young adults aged 18 to 25 who encounter the justice system.

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91 Vincent J. Felitti et al(1998). 'Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults: The Adverse Childhood Experiences (ACE) Study' (1998) 14(4) *American Journal of Preventive Medicine* 245.

92 Jiong Li et al, 'Mortality After Parental Death in Childhood: A Nationwide Cohort Study from Three Nordic Countries' (2014) 11(7) *PLoS Medicine* e1001679; Luecken, L. J., & Roubinov, D. S. (2012). 'Pathways to Lifespan Health Following Childhood Parental Death' (2012) 6(3) *Social and Personality Psychology Compass* 243.

93 *Bugmy* Bar Book (n 3).

94 Kristin Valentino et al, 'Mother-Child Play and Emerging Social Behaviors among Infants from Maltreating Families' (2006) 42(3) *Developmental Psychology* 474; Liotti, 'Trauma' (2004) (n 77); McLaughlin et al, 'Child Maltreatment' (2015) (n 75).

95 Stephen R Zubrick et al, *The Western Australian Aboriginal Child Health Survey: The Health of Aboriginal Children and Young People*, *Volume 1* (Telethon Institute for Child Health Research, 2004).

96 Pat Dudgeon et al, *Voices of the Peoples* (National Empowerment Project, National Summary Report, 2014).

97 Judy Atkinson, *Trauma Trails, Recreating Songlines: The Transgenerational Effects of Trauma in Indigenous Australia* (Spinifex Press, 2002); Milroy et al (2021) (n 63).

[61] It is well-understood that exposure to chronic stress due to adverse early life experiences, including relational trauma, is associated with atypical development of the hypothalamic–pituitary–adrenal (HPA) axis, which regulates the body's response to stress.[98] Dysregulation of the HPA axis can persist into adolescence and young adulthood, particularly when opportunities for healing and intervention are not provided. This chronically elevated stress response, together with related neurobiological changes, shapes neurodevelopment and negatively impacts emotion regulation, cognitive function, mental health and social outcomes into young adulthood.[99] Importantly, there is a cumulative effect, meaning that the greater number of adverse early life experiences, the higher the risk of long-term negative outcomes.[100]

Impact on Neurodevelopment

[62] The cumulative impact of adverse early life experiences leads to significant neurobiological changes across nervous, endocrine, and immune systems. Chronically elevated levels of stress are associated with increased inflammatory markers and decreased immunity, which are linked to chronic illness in adulthood.[101] Of relevance to young adults, there is an increased risk of engaging in behaviours associated with poorer health outcomes, including smoking, heavy alcohol use, and sexual risk taking.[102] Neurodevelopmentally informed approaches aim to reduce harm by creating safe and supportive environments that help young people's brains and behaviour to continue to develop in healthy ways. These approaches recognise the two-way relationship between brain development and the environments young people are part of, including their physical

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98 McLaughlin et al, 'Child Maltreatment' (2015) (n 75); Eamon J McCrory, Mattia I Gerin, and Essi Viding, 'Annual Research Review: Childhood Maltreatment, Latent Vulnerability and the Shift to Preventative Psychiatry – The Contribution of Functional Brain Imaging (2017) 58 (4) *Journal of Child Psychology and Psychiatry* 338; Schore 'Effects of a Secure Attachment' (2001) (n 75).

99 Victor G Carrion et al, 'Diurnal Salivary Cortisol in Pediatric Posttraumatic Stress Disorder' (2002) 51(7) *Biological Psychiatry* 575; McCrory et al, 'Impact of Childhood Maltreatment' (2011) (n 65).

100 Karen Hughes et al, 'The Effect of Multiple Adverse Childhood Experiences on Health: A Systematic Review and Meta-Analysis' (2017) 2(8) *The Lancet Public Health* e356; McCrory et al, 'Impact of Childhood Maltreatment' (2011) (n 65).

101 Ronald Glaser et al, 'Stress-Induced Immunomodulation: Implications for Infectious Diseases?' 281(24) JAMA 2268; Hughes et al 'Multiple Adverse Experiences' (n 100); Janice K Kiecolt-Glaser et al, 'Chronic Stress and Age-Related Increases in the Proinflammatory Cytokine IL-6' (2003) 100(15) *PNAS*, 9090; Sonia J Lupien et al, 'Cortisol Levels During Human Aging Pedict Hippocampal Atrophy and Memory Deficits

' (1998) 1 *Nature Neuroscience* 69.

102 Shanta R Dube et al, 'Cumulative Childhood Stress and Autoimmune Diseases in Adults' (2009) 71(2) *Psychosomatic Medicine* 243; Felitti et al 'Childhood Abuse' (1998) (n 91); Hughes et al 'Multiple Adverse Experiences' (n 100); Melissa T Merrick et al, '*Vital signs:* Estimated Proportion of Adult Health Problems Attributable to Adverse Childhood Experiences and Implications for Prevention — 25 States, 2015–2017' (2019) 68(44) *Morbidity and Mortality Weekly Report* 999; Márcia Novais et al, 'When Problems Only Get Bigger: The Impact of Adverse Childhood Experience on Adult Health' (2021) 12 *Frontiers in Psychology,* Article 693420.

surroundings, relationships, and broader social and political contexts. When responses ignore these developmental needs, they can make things worse. Vulnerable young people may be placed in unsafe settings where stress is not eased by supportive relationships, making it harder for these young people to develop a strong sense of identity and belonging.

[63] Exposure to adverse early life events and related chronic stress affects the brain during critical periods of its development, particularly for specific brain regions. For example, imaging studies indicate reduced hippocampal volume (reduced memory and learning), hyperactivity of the amygdala (heightened emotional reactivity and stress sensitivity), and atypical frontal lobe connectivity and activation (impacted executive function and behaviour regulation) in adults who have experienced adverse early life experiences such as abuse.[103] School-aged children who have experienced adverse life events may show difficulty with inhibitory control, planning and organisation, cognitive flexibility, and sustained attention,[104] which in turn can affect their ability to learn and result in externalising behaviours.[105] Research indicates that cumulative effects of adverse early life experiences are associated with reduced school engagement, reduced school attendance, discontinuation of secondary education, and unemployment in young adulthood.[106] Young adults who have experienced adverse life events demonstrate difficulties with memory, problem-solving, decision-making, cognitive flexibility and impulse control.[107] Additionally, adults who experienced adverse early life experiences demonstrate increased attention to, and brain activity in response to, negative facial expressions, suggesting hypersensitivity to threat-related cues.[108]

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[103] As reviewed in McCrory et al, 'Impact of Childhood Maltreatment' (2011) (n 65); Martin H Teicher and Jacqueline A Samson, 'Annual Research Review: Enduring Neurobiological Effects of Childhood Abuse and Neglect' (2016) 57(3) *Journal of Child Psychology and Psychiatry* 241.

[104] Karen J Bos et al, 'Effects of Early Psychosocial Deprivation on the Development of Memory and Executive Function' (2009) 3 *Frontiers in Behavioral Neuroscience* 16; Seth D Pollak et al, 'Neurodevelopmental Effects of Early Deprivation in Postinstitutionalized Children' (2010) 81(1) *Child Development* 224.

[105] Daniel S Pine et al, 'Attention Bias to Threat in Maltreated Children: Implications for Vulnerability to Stress-Related Psychopathology' (2005) 162(2) *American Journal of Psychiatry* 291.

[106] Mark A Bellis et al, 'Adverse Childhood Experiences and Sources of Childhood Resilience: A Retrospective Study of Their Combined Relationships with Child Health and Educational Attendance' (2018) 18(1) *BMC Public Health* 792; Christina D Bethell et al, 'Adverse Childhood Experiences: Assessing the Impact on Health and School Engagement and the Mitigating Role of Resilience' (2014) 33(12) *Health Affairs* 2106; Marilyn Metzler et al, 'Adverse Childhood Experiences and Life Opportunities: Shifting the Narrative' (2017) 72 *Children and Youth Services Review* 141.

[107] Matthias Majer et al, 'Association of Childhood Trauma with Cognitive Function in Healthy Adults: A Pilot Study' (2010) 10 *BMC Neurology* 61; Rosanne Op den Kelder et al, 'Executive Functions in Trauma-Exposed Youth: A Meta-Analysis' (2018) 9(1) *European Journal of Psychotraumatology* 1450595; Pia Pechtel and Diego A Pizzagalli, 'Effects of Early Life Stress on Cognitive and Affective Function: An Integrated Review of Human Literature' (2011) 214(1) *Psychopharmacology* 55.

[108] Dante Cicchetti and W John Curtis, 'An Event-Related Potential Study of the Processing of Affective Facial Expressions in Young Children Who Experienced Maltreatment during the First Year of Life' (2005) 17(3) *Development and Psychopathology* 641; Seth D Pollak and Doris J Kistler, 'Early Experience Is Associated with the Development of Categorical Representations for Facial Expressions of Emotion' (2002) 99(13) Proceedings of the National Academy of Sciences of the United States of America 9072.

[64] Critically, for many young adults who have experienced adverse early life experiences, the optimal trajectory of neurodevelopment outlined in earlier sections is disrupted, reflecting a 'double disadvantage'. While the development of specific cognitive abilities, and the experiences of adversity in early life, are unique to each young adult, it is reasonable to expect emotion regulation and executive abilities, especially those most relevant during emotionally charged situations (e.g., 'hot' executive functions that are required during perceived threat to psychological or physical safety), to be disproportionately impacted, compared with other young adults who have not experienced cumulative childhood adversity. The activation of prefrontal processes has implications for the way we respond in 'hot' or stressful situations throughout life, including those associated with parenthood. These responses shape the environment for subsequent generations.[109] All this points to the longer-term social benefit of conditions that support healing, and environments that help buffer experiences of stress — and, conversely, the cost of exacerbating stressors.

Mental Health

[65] Chronically dysregulated HPA-axis stress response predisposes adults (including young adults), who have experienced cumulative childhood adversity, to a reduced threshold for managing situations perceived as psychologically or physically threatening. This can cause symptoms such as:

a) **Emotional reactivity:** aggressive outbursts, oppositional or antisocial behaviour, or 'hyper-sensitivity'.[110]

b) **Disassociation:** mentally detaching from a situation or interaction and having memory loss of the experience.[111]

c) **Learned helplessness:** passive compliance due to feeling powerless that may look like difficulty with decision-making, assertiveness, or autonomy in a situation.[112]

[66] These experiences, and the resultant behaviours, can negatively impact interpersonal relationships, impulse control, and increased vulnerability to exploitation and adverse outcomes. They also predispose young adults to a higher risk of mental health challenges such as depression, post-traumatic stress disorder (PTSD), anxiety, dissociative disorders and personality vulnerabilities, and suicidal ideation or attempts.[113] Exposure to adverse

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[109] Center on the Developing Child at Harvard University, *From Best Practices to Breakthrough Impacts*: *A Science-Based Approach to Building a More Promising Future for Young Children and Families* (Report, 2016).

[110] McCrory et al 'Annual Research Review' (2017) (n 98); B Perry, 'Memories of Fear: How the Brain Stores and Retrieves Physiologic States, Feelings, Behaviors, and Thoughts from Traumatic Events', in J Goodwin and R Attias (eds), *Splintered Reflections: Images of the Body in Trauma* (Basic Books, 1999) 9–38.

[111] Schore 'Effects of a Secure Attachment' (2001) (n 75).

[112] Perry 'Memories of Fear' (1999) (n 110); Schore ibid (n 75).

[113] Liotti, 'Trauma' (2004) (n 77); McLaughlin et al, 'Child Maltreatment' (2015) (n 75); McCrory et al 'Impact of Childhood Maltreatment' (2011) (n 65); McCrory et al 'Annual Research Review' (2017) (n 98); Perry 'Memories of fear' (1999) (n 110); Schore 'Effects of a Secure Attachment' (2001) (n 75); Robert F Anda et al, 'Adverse Childhood Experiences, Alcoholic Parents, and Later Risk of Alcoholism and Depression'

events in childhood is also associated with severe and treatment-resistant mental health conditions.[114]

[67] A body of literature associates cumulative, adverse early-life experiences with diagnosis of personality disorders in adulthood (e.g. borderline personality disorder or antisocial personality disorder), including for young adults.[115] However, the conceptualisation of personality disorders is largely influenced by Western psychiatric frameworks,[116] and behaviours observed through this lens may be understood differently in non-Western cultures.[117] Crucially, use of such deficit-based and individualistic labels generally fails to consider the broader social, historical and political determinants that contribute to these challenges in the first place. These labels tend to situate the cause of the issues (and therefore the 'disorder') within the individual, then target the individual for treatment; this may have limited impact if the wider systems around that person continue to cause harm. This is true for many Aboriginal and Torres Strait Islander people, who continue to be subjected to social, historical, and political forces shaped by colonialism, and for people of other minoritised groups, such as refugees, who may experience disadvantage in different ways. Overall, pathologising young adults as 'personality disordered' reinforces stigma, increases risk of social exclusion, and does not align with a culturally informed perspective of neurodevelopment in which trauma and culture are both salient.[118]

(2002) 53(8) *Psychiatric Services* 1001; Mark A Bellis et al, 'Life Course Health Consequences and Associated Annual Costs of Adverse Childhood Experiences across Europe and North America: A Systematic Review and Meta-Analysis' (2019) 4(10)*The Lancet Public Health* e517; Daniel P Chapman et al, 'Adverse Childhood Experiences and the Risk of Depressive Disorders in Adulthood' (2004) 82(2) *Journal of Affective Disorders* 217; Shanta R Dube et al, 'Childhood Abuse, Household Dysfunction, and the Risk of Attempted Suicide Throughout the Life Span: Findings from the Adverse Childhood Experiences Study' (2001) 286(24) *Journal of the American Medical Association* 3089; Marcia J Kaplan and Nadya A Klinetob, 'Childhood Emotional Trauma and Chronic Posttraumatic Stress Disorder in Adult Outpatients with Treatment-Resistant Depression' (2000) 188(9) *Journal of Nervous and Mental Disease* 596.

114 Dube et al 'Childhood Abuse' (2001) (n 113). *Edward A Walker et al, 'Predictors of Outcome in a Primary Care Depression Trial' (2000) 15(12) Journal of General Internal Medicine 859.*

115 For example, Elizabeth A Schilling, Robert H Aseltine Jr and Susan Gore, 'Adverse Childhood Experiences and Mental Health in Young Adults: A Longitudinal Survey' (2007) 7 *BMC Public Health* 30; Laura Lacomba-Trejo et al, 'Adverse Childhood Experiences and Coping Strategies: Do They Make a Difference in Psychopathic and Altruistic Traits?' (2024) 43 *Current Psychology* 30926; Allen G Ross et al, 'Adverse Childhood Experiences Leading to Narcissistic Personality Disorder: A Case Report' (2024) 24 *BMC Psychiatry*, Article 842.

116 Elsa F Ronningstam et al, 'Cultural Aspects in Symptomatology, Assessment, and Treatment of Personality Disorders' (2018) 20(4) *Current Psychiatry Reports* 22.

117 Iris T Calliess, W Machleidt and Marc Ziegenbein, 'Personality Disorders in a Cross-Cultural Perspective' (2005) 20(S2) *European Psychiatry* S116.

118 Marc Ziegenbein et al, 'Personality Disorders in a Cross-Cultural Perspective: Impact of Culture and Migration on Diagnosis and Etiological Aspects' (2008) 4(1) *Current Psychiatry Reviews* 39; I T Calliess, W Machleidt and M Ziegenbein (2005) (n 117).

A Broader Perspective of Early Life Adversity

[68] Adverse early life experiences encompass a wider range of factors than those on which much of the peer-reviewed literature focuses: *abuse* (physical/emotional/sexual); *neglect* (physical/emotional); and *household dysfunction*.[119] Taking a 'social determinants' perspective of neurodevelopment, numerous other environmental and situational disadvantages that are beyond the control of the young child and their family can contribute to chronic stress and can arguably be considered under the umbrella of adverse early life experiences. Many are summarised in existing *Bugmy* Bar Book chapters.[120] They include: homelessness; incarceration of a caregiver; institutionalisation; interrupted school attendance and suspension; socioeconomic marginalisation and poverty; and social exclusion. For children with a refugee or asylum-seeker background,[121] additional early adverse life experiences can include: exposure to trauma; social disadvantage; and other forms of social exclusion, including racism. This observation converges with literature that suggests refugee communities may experience a greater number of adverse experiences in childhood, with significant implications for lifelong wellbeing, health and socio-economic outcomes in adulthood.[122]

[69] For Aboriginal and Torres Strait Islander children, young people, and young adults, unique forms of adverse early life experiences associated with past and ongoing experiences of colonialism include systemic racism, intergenerational trauma relating to the Stolen Generations,[123] cultural dispossession,[124] and the ongoing harms from past and current government policies.[125] There is an emerging body of literature that links racism and the legacy of colonisation with poorer health outcomes, including neurodevelopmental and

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119 Felitti et al 'Childhood Abuse' (1998) (n 91).

120 *Bugmy* Bar Book chapters <https://bugmybarbook.org.au/>.

121 Ibid, 'Refugee Background'.

122 Winnie Lau et al, 'Adjustment of Refugee Children and Adolescents in Australia: Outcomes from Wave Three of the Building a New Life in Australia Study' (2018) 16 *BMC Medicine* 157; Belinda J Liddell et al, 'Mechanisms Underlying the Mental Health Impact of Family Separation on Resettled Refugees' (2021) 55(7) *Australian & New Zealand Journal of Psychiatry* 699; Bushra F Nasir et al, 'Traumatic Life Events and Risk of Post-Traumatic Stress Disorder among the Indigenous Population of Regional, Remote and Metropolitan Central-Eastern Australia: A Cross-Sectional Study' (2021) 11(4) *BMJ Open* e040875; Yamuna M Wickramasinghe et al, 'Burden of Adverse Childhood Experiences in Children Attending Paediatric Clinics in South Western Sydney, Australia: A Retrospective Audit' (2019) 3(1) *BMJ Paediatrics Open* e000330.

123 *Bugmy* Bar Book (n 120) 'Aboriginal and Torres Strait Islander Stolen Generations and Descendants'.

124 Ibid 'Cultural Dispossession Experienced by Aboriginal and Torres Strait Islander Peoples'.

125 Cyndy Baskin, Carol Strike and Bela McPherson, 'Long Time Overdue: An Examination of the Destructive Impacts of Policy and Legislation on Pregnant and Parenting Aboriginal Women and Their Children' (2015) 6(1) *International Indigenous Policy Journal* Article 5; Yin Paradies et al, 'Racism as a Determinant of Health: A Systematic Review and Meta-Analysis' (2015) 10(9) *PLoS ONE* e0138511; Abbey Radford et al, 'Examining Adverse Childhood Experiences (ACEs) within Indigenous Populations: A Systematic Review' (2022) 15(2) *Journal of Child & Adolescent Trauma* 401.

brain health.[126] However, the extent and cumulative impact of the adversities on neurodevelopment is under-researched and represents a critical limitation of the existing literature.[127] Notwithstanding, it is logical and reasonable to suggest that the harmful legacy of colonisation and racism contributes to a chronic stress response for Aboriginal and Torres Strait Islander children, young people, and young adults. This additional burden of colonial adversity also contributes to the higher rates of abuse, neglect and household dysfunction experienced by Aboriginal and Torres Strait Islander children, compared with non-Indigenous children. Furthermore, structural inequalities in education, economic opportunities, and housing perpetuate cycles of disadvantage, further influencing developmental outcomes.[128] As noted above, social and emotional wellbeing perspectives, developed by Aboriginal psychologists, emphasise the importance of connections to self, family and kin, community, culture, Country, and spirituality, for Aboriginal and Torres Strait Islander people.[129] This aligns with healing literature, as discussed by Edwige and Gray (2021).[130]

Out-of-Home Care

[70] The authors acknowledge the report by Shields and Ellis, commissioned by the *Bugmy* Bar Book, on the impacts of institutionalisation,[131] which considers the out-of-home care (OOHC) of children. We accept the findings of the research and expert opinions set out in that report and recommend that it be read in conjunction with this report.

[71] Additionally, aligned with Edwige and Gray (2021),[132] we acknowledge the important work by Professor Megan Davis for the *Family is Culture* report on Aboriginal and Torres Strait Islander children and young people across New South Wales in OOHC. In particular, we refer to 'care criminalisation':

> placing a child in OOHC increases his or her risk of being involved in the juvenile justice system. This risk, known as 'care-criminalisation', arises from the fact that children are often charged with offences against carers or residential home staff due to conduct that would not be criminalised if they occurred in the child's home environment. Care criminalisation also results from placement instability, a lack of cultural connection and a lack of secure accommodation for children in custody and seeking bail. The

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126 Paradies et al 'Racism as a determinant' (2015) (n 125); Radford 'Examining ACEs (2022) (n 125); Chelsea Watego, David Singh and Alissa Macoun, *Partnership for Justice in Health: Scoping Paper on Race, Racism and the Australian Health System* (Discussion Paper, The Lowitja Institute, 2021).

127 Baskin et al 'Long Time Overdue' (2015) (n 125); Paradies et al 'Racism as a determinant' (2015) (n 125); Radford 'Examining ACEs (2022) (n 125).

128 Kalinda Griffiths et al, Clare Coleman, Vanessa Lee and Richard Madden, 'How Colonisation Determines Social Justice and Indigenous Health: A Review of the Literature' (2016) 33(1) *Journal of Population Research* 9–30.

129 Dudgeon et al *Social and Emotional Wellbeing* (2025) (n 85).

130 Edwige and Gray, *Significance of Culture* (2021) (n 2).

131 Robyn Shields and Andrew Ellis, *Impacts of Institutionalisation* (Research Report, *Bugmy* Bar Book, 2024).

132 Edwige and Gray, *Significance of Culture* (2021) (n 2).

> failure of the child protection and juvenile justice systems to adequately address the issue of the cross-over of children between OOHC and juvenile justice is extremely concerning, as this issue has intergenerational consequences for the Aboriginal community. This 'drift' of children from OOHC into the juvenile justice system is of paramount concern to the Aboriginal community, as Aboriginal children are more likely to be affected by this phenomenon due to their gross over-representation in the OOHC system. Involvement in the juvenile justice system perpetuates a cycle of disadvantage and child removals that must be halted in order to reduce the entry of Aboriginal children into the OOHC system in the longer term.[133]

[72] The aim of this section is to apply the above information specifically to the young adulthood neurodevelopmental period.

[73] Exposure to adverse early life experiences such as abuse, neglect, and household dysfunction significantly increases the likelihood of children entering OOHC systems, including foster care and residential placements. Research indicates that placement instability is related to a higher burden of childhood adversity, which exacerbates trauma, hinders developmental outcomes, and increases the risk of further disadvantage.[134] In Australia, children in OOHC care exhibit disproportionately high rates of mental health issues; trauma-related symptoms often stem from early adversity.[135] These early adversities can also impede educational attainment and employment opportunities, leading to socioeconomic disadvantages in adulthood.[136] Young adults transitioning from OOHC face significant challenges, including homelessness, unemployment, and difficulties in accessing support services.[137] For Aboriginal and Torres Strait Islander young adults, the experience of OOHC has the added element of colonial trauma, with disruption of cultural connections and community ties during placements further exacerbating feelings of identity loss and social isolation.[138] Additionally, Aboriginal and Torres Strait Islander care leavers

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133 Megan Davis, *Family Is Culture: Independent Review Into Aboriginal and Torres Strait Islander Children and Young People in Out-Of-Home Care in New South Wales* (Independent Review into Aboriginal Out-of-Home Care in NSW, Final Report, October 2019) 37.

134 Stephen Tregeagle et al, 'Previous Life Experiences and the Vulnerability of Children Adopted from Out-of-Home Care: The Impact of Adverse Childhood Experiences and Child Welfare Decision Making' (2018) 96 *Children and Youth Services Review* 55–63; Hilary Miller and Kristel Alla, *Understanding the Mental Health and Wellbeing of Children in Out-of-Home Care* (Report, Emerging Minds, 2024).

135 Berhe Sahle et al, *Summary of Interventions to Prevent Adverse Childhood Experiences and Reduce Their Negative Impact on Mental Health: An Evidence-Based Review* (Centre of Research Excellence in Childhood Adversity and Mental Health, 2020).

136 Ernestine C Briggs et al, 'Trauma Exposure, Psychosocial Functioning, and Treatment Needs of Youth in Residential Care: Preliminary Findings from the NCTSN Core Data Set' (2012) 5(1) *Journal of Child & Adolescent Trauma* 1.

137 Mike Stein, 'Young People's Transitions from Care to Adulthood in European and Postcommunist Eastern European and Central Asian Societies' (2014) 67(1) *Australian Social Work* 24.

138 Elizabeth Fernandez, Jung-Sook Lee and Patricia McNamara, *Understanding the Experience and Outcomes of Aboriginal and Torres Strait Islander Children in Out-of-Home Care during the Twentieth Century* (University of New South Wales, 2018).

experience higher incidences of homelessness and economic instability compared to their non-Indigenous counterparts.[139]

Juvenile Justice

[74] In Australia, children and young people who are incarcerated or who are under youth justice supervision experience a disproportionately higher burden of adverse early life experiences. These include abuse, neglect, household dysfunction, as well as grief, loss, and other forms of social disadvantage such as homelessness, involvement with child protection services, substance misuse and mental illness.[140] Such factors are widely recognised as contributing to pathways into the justice system.[141] Additionally, the experience of detention itself can be a profoundly traumatic experience for young people. The restrictive and often punitive environment of detention facilities can exacerbate pre-existing trauma, resulting in heightened levels of anxiety, depression, and PTSD.[142] These symptoms reflect the underlying chronic and/or acute activation of the stress-response (i.e., HPA-axis) which, as outlined in earlier sections, can potentially alter the neurodevelopmental trajectories of young adults and contributing to longer-term negative outcomes in adulthood and beyond. Furthermore, the disruption of familial and social connections during critical developmental periods can impede formation of healthy relationships and social skills, which are essential for successful reintegration to society.[143]

[75] Due to the historical and contemporary harms of colonisation, Aboriginal and Torres Strait Islander children and young people are disproportionately represented in the juvenile justice system.[144] This over-representation exacerbates existing inequalities, leading to further disadvantage and marginalisation of Aboriginal and Torres Strait Islander communities.[145] As Milroy and colleagues (2021) observe:

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139 Jasmin Jau et al, 'The Housing Pathways and Experiences of Aboriginal and Torres Strait Islander Youth as They Transition from Out of Home Care in Victoria and Western Australia' (2022) 5 *International Journal on Child Maltreatment: Research, Policy and Practice* 319.

140 Marissa Veld, Jennaya Montgomery, and Josh Kraindler, Vulnerable Young People: Interactions Across Homelessness, Youth Justice and Child Protection: 1 July 2011 to 30 June 2015 (AIHW Report, 2016); Australian Institute of Health and Welfare, *National Data on the Health of Justice-Involved Young People: A Feasibility Study 2016–2017* (AIHW Report, 2018).

141 Milroy et al (2021) and Fact Sheet (2022) (n 63).

142 Carly B Dierkhising, Susan J Ko and Jane Halladay Goldman, *Trauma-Informed Juvenile Justice Roundtable: Current Issues and New Directions in Creating Trauma-Informed Juvenile Justice Systems* (National Child Traumatic Stress Network, 2013).

143 Elizabeth S Barnert, Raymond Perry and Robert E Morris, 'Juvenile Incarceration and Health' (2016) 16(2) *Academic Pediatrics* 99.

144 Milroy et al (2021) and Fact Sheet (2022) (n 63).

145 Judy Atkinson, *Trauma-Informed Services and Trauma-Specific Care for Indigenous Australian Children* (Closing the Gap Clearinghouse, Australian Institute of Health and Welfare & Australian Institute of Family Studies, 2013).

> Offending behaviour lies at the end of a continuum of risk. This continuum includes exposure to intergenerational and current trauma within the historical context of genocide, and the ongoing issues of generational poverty, social disadvantage and discrimination.[146]

[76] Furthermore, incarceration during childhood disrupts the cultural continuity of Aboriginal and Torres Strait Islander communities in Australia. Considering the SEWB framework, such experiences sever children and young people from their familial ties, community connections, and cultural practices, leading to a loss of cultural identity and belonging. This disconnection, as outlined by Edwige and Gray (2021),[147] is a barrier to healing and rehabilitation — and, we suggest, hampers optimal neurodevelopment.

Neurodevelopmental Disorders

[77] Neurodevelopmental disorders refer to a variety of conditions that affect brain development from birth and persist throughout the lifespan. These include autism spectrum disorders (ASD), FASD,[148] intellectual disability, and attention deficit hyperactivity disorders (ADHD), as well as specific learning and communication disorders.[149] Acquired brain injury[150] during childhood can also impact neurodevelopment. Broadly, these neurodevelopmental conditions can lead to difficulties in communication (verbal and written understanding and expression); learning, cognition (specific aspects or global); and emotion and behaviour regulation, which impact aspects of everyday and social functioning. This definition reflects difficulties beyond what is expected for other children, adolescents, and young adults whose brains are, naturally, still developing. Differential diagnosis can be challenging, as symptoms of each specific disorder often overlap; multiple neurodevelopmental conditions often occur together, resulting in a cumulative impact on behaviour and function.[151] The rate of neurodevelopmental disability is thought to be so

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146 Milroy et al (2021) (n 63).

147 Edwige and Gray, *Significance of Culture* (2021) (n 2).

148 *Bugmy* Bar Book (n 120) 'Fetal Alcohol Spectrum Disorders (FASD)'.

149 Kristen P Morie et al, 'Mood Disorders in High-Functioning Autism: The Importance of Alexithymia and Emotional Regulation' (2019) 49 *Journal of Autism and Developmental Disorders* 2935; Barbara A Wilson, Jill Winegardner, Caroline van Heugten and Tamara Ownsworth (eds), *Neuropsychological Rehabilitation: The International Handbook* (Psychology Press, 2017).

150 *Bugmy* Bar Book (n 120) 'Acquired Brain Injury'.

151 Jack Hollingdale et al, 'The Cumulative Impact of Attention Deficit Hyperactivity Disorder, Autism, and Intellectual Disability for Young People' (2024) 68(9) *Journal of Intellectual Disability Research* 1062; Shannon Lange et al, 'Fetal Alcohol Spectrum Disorder: Neurodevelopmentally and Behaviorally Indistinguishable from Other Neurodevelopmental Disorders' (2019) 19 *BMC Psychiatry, Article* 322; Johnny L Matson and Rachel L Goldin, 'Comorbidity and Autism: Trends, Topics, and Future Directions' (2013) 7(10) *Research in Autism Spectrum Disorders* 1228; Manabu Saito et al, 'Prevalence and Cumulative Incidence of Autism Spectrum Disorders and the Patterns of Co-Occurring Neurodevelopmental Disorders in a Total Population Sample of 5-Year-Old Children' (2020) 11 *Molecular Autism, Article* 35.

disproportionately high amongst those in a custodial and judicial setting that routine screening has been called for in Australia[152] and internationally.[153]

[78] The aetiology of neurodevelopmental disorders is a complex interplay of genetic and environmental factors.[154] Environmental factors are conceptualised as social determinants, including socio-economic factors, opportunities for education and access to healthcare, and other sources of potential stressors such as exposure to adverse early life experiences including abuse, neglect, and household dysfunction. Each of these factors can heighten developmental vulnerabilities for those with neurodevelopmental disorders.[155] Further, the structural inequities which go beyond individual choices and are rooted in broader social, political, and economic systems (e.g. embedded in laws, policies, and institutional practices) contribute to social determinants and disproportionately disadvantage and harm Aboriginal and Torres Strait Islander people.[156] The authors of this report are of the opinion that these factors contribute to the increased risk of being diagnosed with neurodevelopmental disorders.

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[152] Bower et al 'Fetal Alcohol Spectrum' (n 4); Senate Standing Committees on Legal and Constitutional Affairs, Parliament of Australia, *Value of a Justice Reinvestment Approach to Criminal Justice in Australia* (Final Report, 20 June 2013); Elizabeth Jane Elliott, 'Young Offenders Must Be Screened for Fetal Alcohol Spectrum Disorders before Sentencing' *The Conversation* (19 August 2015).

[153] Seena Fazel, Kirsten Xenitidis and Jeremy Powell, 'The Prevalence of Intellectual Disabilities among 12,000 Prisoners: A Systematic Review' (2008) 31(4) *International Journal of Law and Psychiatry* 369; Glynis H Murphy, Jeff Gardner and Mark J Freeman, 'Screening Prisoners for Intellectual Disabilities in Three English Prisons' (2017) 30(1) Journal of Applied Research in Intellectual Disabilities 198.

[154] Torkel Carlsson et al, 'Early Environmental Risk Factors for Neurodevelopmental Disorders: A Systematic Review of Twin and Sibling Studies' (2021) 33(4) *Development and Psychopathology* 1448; Agnieszka Gidziela et al, 'A Meta-Analysis of Genetic Effects Associated with Neurodevelopmental Disorders and Co-Occurring Conditions' (2023) 7 *Nature Human Behaviour* 642.

[155] Timothy G Moore et al, 'Early Childhood Development and the Social Determinants of Health Inequities' (2015) 30(suppl 2) *Health Promotion International* ii102–ii115 https://doi.org/10.1093/heapro/dav031; Islam, Mohammad I Islam et al, 'Thriving Beyond Adversity: A Prospective Longitudinal Cohort Study Using a Strength-Based Approach Depicts Indigenous Adolescents with Less Adverse Childhood Experiences (ACEs) Had Fewer Neurodevelopmental Disorders (NDDs)' (2024) 14(11) *Behavioral Sciences* 1047.

[156] Stephen R Zubrick et al 'Social Determinants of Social and Emotional Wellbeing' (2014) in Dudgeon, Milroy and Walker, *Working Together* (n 85) ch 6.

Summary Messages: Early Life Experiences	
1	Early experiences shape neurodevelopment. Safe, nurturing environments help children build strong emotion regulation and thinking skills. By contrast, trauma, neglect, and unstable environments can disrupt brain development and lead to long-term challenges in decision-making, emotional control, and learning.
2	The effects of childhood adversity can persist into adulthood. Stressful experiences like abuse, poverty, family violence, and instability increase the risk of mental health issues, risk-taking behaviours, and involvement with the justice system later in life.
3	Supportive relationships are powerful protective factors for young adults. Strong early relationships with caregivers, extended family, and community can help buffer children from stress and facilitate resilience. In adolescence and young adulthood, friendships, mentors, and community connections remain critical.
4	Culture and community matter. For Aboriginal and Torres Strait Islander young adults, connections to Country, kinship systems, culture, and spirituality are vital to wellbeing and brain development. Disconnection from these through colonisation, racism, or government systems can cause harm across generations.
5	Placing children in OOHC increases risk of harm and disadvantage as they become young adults. Children in care - especially Aboriginal and Torres Strait Islander children - are more likely to experience instability, trauma, and later involvement in the justice system. These experiences can further disrupt identity, belonging, and mental health.
6	Justice responses often overlook neurodevelopmental needs. Young people exposed to early adversity may be labelled with mental illness or personality disorders. This can pathologise their behaviour instead of addressing the social and neurodevelopmental harms that led them there.
7	Trauma can be passed across generations. Adverse experiences can affect the way genes work, how people parent, and how communities respond to stress. However, healing is possible: healing relationships, safe environments, and cultural connection can interrupt these cycles.

5. Impact of Incarceration on Young Adults

[79] In acknowledgement of the report on institutionalisation by Dr Shields AM and Dr Ellis,[157] the authors recommend that this section be read in conjunction with their report. The aim of this section is to apply this information specifically to the young adulthood developmental period. We emphasise that a neurodevelopmental approach aligns with a 'healing' frame in response to crime, promoting conditions that provide an experience of safety, relationships to buffer stressors and scaffold development, and promote positive identity and belonging.[158] The ongoing and complex legacies of colonisation significantly contribute to the over-representation of Aboriginal and Torres Strait Islander peoples in custody in Australia,[159] leading to an almost tenfold increased risk of incarceration compared with the general adult population.[160] Edwige and Gray (2021)[161] provide an essential overview of the significance of culture to wellbeing, healing, and rehabilitation for Aboriginal and Torres Strait Islander people.

[80] Young adulthood is a critical phase of continued brain development in which the interplay of biological and environmental factors significantly influences subsequent behaviour and functioning. Custodial settings constitute one environmental factor that can disrupt healthy neurodevelopmental trajectories and amplify the risk of adverse outcomes. For young adults with existing disadvantages, incarceration frequently exacerbates these vulnerabilities. Confinement, by its nature, imposes deprivation, stripping young adults of access to positive and protective factors and limiting opportunities necessary for adaptive adult social and civic life. Incarceration disrupts critical social and familial connections, diminishes autonomy, and fosters cultural disconnection, especially for Aboriginal and Torres Strait Islander individuals.

[81] Further, it is well known that social isolation,[162] deprivation,[163] and restrictive practices, as well as impoverished conditions, affect the brain and produce a range of cognitive and behavioural deficits. There is also evidence that institutionalisation and deprivation can impact brain development in children.[9] The use of spit hoods, a practice reintroduced in the Northern Territory in children and young people in detention and police custody, has been described as 'inherently dehumanising' and to 'have the potential to cause distress and can

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157 Shields and Ellis, 'Impacts of Institutionalisation' (2024) (n 131).

158 Edwige and Gray, *Significance of Culture* (2021) (n 2).

159 Milroy et al (2021) and Fact Sheet (2022) (n 63).

160 Australian Institute of Health and Welfare, 'Adults in Prison' (Web Article, 15 November 2023). <https://www.aihw.gov.au>.

161 Edwige and Gray, *Significance of Culture* (2021) (n 2).

162 Ying Xiong et al, 'Social Isolation and the Brain: Effects and Mechanisms' (2023) 28(1) *Molecular Psychiatry* 191.

163 Charles A Nelson, 'A Neurobiological Perspective on Early Human Deprivation' (2007) 1(1) *Child Development Perspectives* 13.

pose a risk of asphyxiation and death'.[164] We consider such a practice, at a minimum, to be a form of deprivation and restrictive practice that carries the likely impact of additional traumatisation within a context that may already be experienced as traumatising by the child or young person.

[82] From a neurodevelopmental perspective, as outlined in earlier sections, chronic or acute stress response activation as a result of (cumulative) trauma can impact cognition, emotion regulation and behaviour into young adulthood and beyond. With specific reference to the experience of incarceration, Meijets et al (2018)[165] assessed the attention and executive functioning of males during their first week of imprisonment and then retested the same individuals after three months of their sentence. They found that risk-taking increased and attention had deteriorated during this time, which they interpreted as being reflective of reduced self-control. For young people specifically, Umbach et al (2018)[166] assessed whether incarceration affected emotion regulation, emotion recognition and cognitive control in males aged 16 to 18 years. After four months of incarceration, they found a significant deterioration in cognitive control and emotion recognition and regulation during this time. Aligning with neurodevelopmental, trauma, and healing–informed approaches to rehabilitation within a justice context, these authors also found that a psychological program of cognitive behaviour therapy and mindfulness was able to buffer some of the changes to cognitive control and emotion regulation during this period.

[83] Literature also suggests that young people with a history of incarceration often struggle to find housing and employment,[167] and struggle to participate in conventional social groups,[168] contributing to broader social exclusion from a young age. While these difficulties are similarly faced by older adolescents and young adults, taking a neurodevelopmental perspective, these outcomes, as well as those relating to cognitive, emotional and behavioural consequences, would arguably worsen as a function of decreased age of incarceration. Therefore, although detention is often framed as necessary for public safety, its impact on the development (including neurodevelopment) of young people and young adults is seemingly counterproductive to its aims, at both individual and societal levels.[169] Further, it is our opinion, based on our understanding of neurodevelopmental influences, that the unique set of circumstances that affect young adults' responses and outcomes to incarceration highlights the need for tailored,

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164 Australian National Preventive Mechanism, 'Joint Statement: Reintroduction of Spit Hoods for Children in the NT Is Not the Answer' (Statement, October 2024).

165 Jesse Meijers et al, 'Reduced Self-Control after 3 Months of Imprisonment; A Pilot Study' (2018) 9 *Frontiers in Psychology* 69.

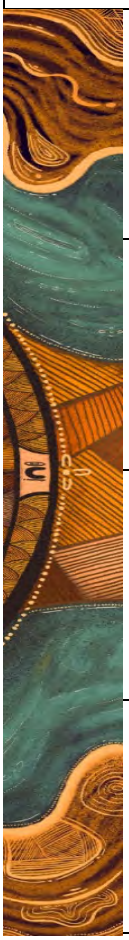
166 Rebecca Umbach, Adrian Raine and Natalie R Leonard, 'Cognitive Decline as a Result of Incarceration and the Effects of a CBT/MT Intervention: A Cluster-Randomized Controlled Trial' (2018) 45(1) *Criminal Justice and Behavior* 31.

167 Bernburg, Jón Gunnar and Marvin D Krohn, 'Labeling, Life Chances, and Adult Crime: The Direct and Indirect Effects of Official Intervention in Adolescence on Crime in Early Adulthood' (2003) 41(4) *Criminology* 1287.

168 *Bugmy* Bar Book (n 120) 'Social Exclusion'.

169 James McGuire, '"What Works" to Reduce Re-Offending: 18 Years On' in Leam A Craig, Louise Dixon and Theresa A Gannon (eds), *What Works in Offender Rehabilitation: An Evidence-Based Approach to Assessment and Treatment* (Wiley-Blackwell, 2013) ch 2, 20–49.

neurodevelopmentally informed approaches within the justice system. This is discussed further in the next section.

Summary Messages: Impact of Incarceration		
	**1**	Incarceration during young adulthood can negatively impact neurodevelopment. The ages of 18 to 25 are a sensitive time when emotional regulation, decision-making, and identity are still forming. Custodial environments can interrupt these processes and increase the risk of long-term cognitive and emotional difficulties.
	2	Isolation and deprivation in custody exacerabe the already harmful outcomes of custodial settings for children and young adults. Restrictive settings, like solitary confinement or the use of spit hoods, can retraumatise young people and further impair self-control, emotion regulation, and attention.
	3	Incarceration often compounds existing disadvantage. Young people with a history of trauma, poverty, or disrupted care are particularly vulnerable to the negative effects of imprisonment, especially Aboriginal and Torres Strait Islander youth, who are disproportionately incarcerated.
	4	A neurodevelopmentally informed, healing-focused approach is needed. Supporting relationships, cultural identity, and tailored rehabilitation can reduce harm and support recovery, helping young people reintegrate and thrive.

6. Impact of Neurodevelopment on Rehabilitation in Young Adults

[84] Individualised, therapeutically driven, risk/need–responsive approaches to rehabilitation have demonstrated the greatest impact on reducing recidivism in young adults aged under 25.[170] A rehabilitative model that aligns with an evidence-based understanding of neurodevelopment, especially with respect to the continuing maturation and refinement of the frontal networks responsible for executive functioning, is crucial. These networks play a key role in skills essential for navigating legal and social contexts, such as impulse control, consequential thinking, and emotional regulation. Such an approach also takes into consideration the malleability of identity development in young adults,[171] where young people test and explore various roles, behaviour, and relationships. This creates a unique opportunity for interventions that can support positive identity shifts and reinforce desistance from criminality.

[85] Neurodevelopmental evidence provides important insights to inform how we effectively respond to young people involved in the justice system, promoting healing and the development of emotion regulation and executive function, reducing recidivism and promoting rehabilitation and improved individual and community outcomes. Any rehabilitative strategy, including diversion, that requires the young adult to engage in executive functions (e.g. forward planning, decision-making, emotion regulation) in an un-scaffolded way that does not consider the continued neurodevelopment of the frontal lobes that underpins these abilities may inadvertently lead to the accumulation of an adverse record of offending, as the young adult may struggle to keep up with requirements. This is particularly the case for those who have not had the opportunity to learn or see this modelled in their life. This in turn, may increase the young adult's likelihood of ongoing justice system involvement. Thus, maximising the benefit of rehabilitative responses will necessarily involve a 'wraparound' model that includes community-based health along with social and cultural responses that strengthen emotion regulation and executive function skills, foster connections, and address social stressors.

[86] Individually tailored interventions that consider the unique trajectory and experiences of the individual are important for young adults involved with the justice system,[172] particularly when some form of disadvantage forms part of their neurodevelopmental picture (e.g. neurodevelopmental disorder, developmental trauma, adverse early life experiences, and/or systemic disadvantage). Rehabilitation efforts should integrate broader

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170 Meijers et al, 'Reduced Self-Control' (2018) (n 165).

171 Kathryn Monahan, Laurence Steinberg and Alex R Piquero, 'Juvenile Justice Policy and Practice: A Developmental Perspective' (2015) 44 *Crime and Justice* 577.

172 Matthew Rocque, Allison Serwik and Janelle Plummer-Beale, 'Offender Rehabilitation and Reentry during Emerging Adulthood: A Review of and Introduction of a New Approach' in Laura M Padilla-Walker and Larry J Nelson (eds), *Flourishing in Emerging Adulthood: Positive Development during the Third Decade of Life* (Oxford University Press, 2017) 510.

environmental factors influencing neurodevelopment, including family, peer networks, education, trauma, and social and cultural connections. This is especially vital for Aboriginal and Torres Strait Islander young adults, whose wellbeing is intricately tied to 'threads of life' including connections to family, kin, community, culture and Country.[173] Aligning with the body of work by Edwige and Gray (2021),[174] healing-informed, culturally responsive approaches, grounded in Aboriginal and Torres Strait Islander knowledge and practices, are essential to supporting long-term positive outcomes for Aboriginal and Torres Strait Islander young adults who have justice involvement. There are several key areas of potential intervention that could promote positive neurodevelopment and circumvent the impact of earlier disadvantages and adversities. Much of the literature is based on young people aged under 18, but the solutions are equally, if not more, relevant to those aged up to 25.

Facilitating Quality Relational Bonds

[87] Recognising the role of early attachment and relational bonds with significant caregiver(s) in offending behaviour has important implications for intervention strategies. Healing from disrupted relational bonds through trauma-informed interventions can reduce the risk of reoffending. Programs that focus on strengthening emotional regulation, interpersonal skills, and addressing unresolved trauma can be particularly beneficial for individuals with histories of relational instability. When positive developmental supports such as family stability, education, or cultural ties are disrupted, peer influences become even more significant.[175] The importance of peer relationships, and the susceptibility to both negative and positive peer influences, comprise a unique factor in this age-group that should be taken into account when considering potential intervention efforts.[176] Interventions that promote positive peer networks and restructuring of family dynamics can promote change that minimises the behavioural problems that pose a risk of recidivism.[177] Meta-analytic research suggests that family system–based treatment can have an impact on desistence in younger persons involved with the criminal justice system.[178]

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[173] Nicole Hewlett et al, 'Development of an Australian FASD Indigenous Framework: Aboriginal Healing-Informed and Strengths-Based Ways of Knowing, Being and Doing' (2023) 20(6) *International Journal of Environmental Research and Public Health* 5215.

[174] Edwige and Gray, *Significance of Culture* (2021) (n 2).

[175] Julie Shaw, 'Why Do Young People Offend in Children's Homes? Research, Theory and Practice' (2014) 44(7) *British Journal of Social Work* 1823; Claire Taylor, *Young People in Care and Criminal Behaviour* (Jessica Kingsley Publishers, 2006) 88.

[176] John Leverso, William Bielby and Lynette F Hoelter, 'Back on the Streets: Maturation and Risk Factors for Recidivism among Serious Juvenile Offenders' (2015) 41 (1) *Journal of Adolescence* 67.

[177] For a review see: Scott W Henggeler and Amie J Sheidow, 'Empirically Supported Family-Based Treatments for Conduct Disorder and Delinquency in Adolescents' (2012) 38(1) *Journal of Marital and Family Therapy* 30.

[178] Jeff Latimer, 'A Meta-Analytic Examination of Youth Delinquency, Family Treatment, and Recidivism' (2001) 43(2) *Canadian Journal of Criminology* 237; Craig S Schwalbe et al, 'A Meta-Analysis of Experimental Studies of Diversion Programs for Juvenile Offenders' (2012) 32 *Clinical Psychology Review* 26.

Promoting healing, coping, adaptive skills and self-regulation

[88] Many young people in the justice system have mental health challenges and neurodevelopmental differences, which can complicate engagement with intervention programs. While it is acknowledged that earlier life experiences can shape the development of coping, psychological resilience, and self-regulation, there remain opportunities for further growth in young adulthood due to ongoing neuroplasticity in brain regions responsible for higher-level cognition and behaviour (namely, hot and cold executive abilities). This means that with the right support and environment, young adults still have the capacity to strengthen their decision-making, emotional regulation, and problem-solving skills. The malleability of young adults, both neurocognitively and psychosocially, offers a rich setting for exerting positive influence and behaviour change. Research suggests that learning to adaptively respond to stress and threats can induce neurobiological adaptations, reducing vulnerability to severe mental health conditions and promoting overall wellbeing.[179]

[89] To best understand the young adult who is before the courts, decision-makers require an understanding of the developmental, cultural, behavioural, and educational factors of the individual and their broader developmental context, including social and other determinants of both offending and, conversely, wellbeing. Such a holistic (or 'wraparound') approach properly acknowledges factors which may be out of the individual's immediate control but nonetheless influence their behaviour, including behaviour which may lead to their encountering the justice system.

[90] Culturally responsive and trauma-informed approaches that enhance social supports and resilience are essential for these young adults.[180] Edwige and Gray (2021)[181] provide an essential overview of the significance of culture to wellbeing, healing, and rehabilitation for Aboriginal and Torres Strait Islander people that is relevant to this specific cohort of young people. We support and respectfully defer to this source in relation to the research and opinion relating to rehabilitation for young people of Aboriginal and Torres Strait Islander background.

Neurodivergence and Neurodevelopmental Disorders

[91] Chronological age as a proxy for neurodevelopmental maturity is likely to grossly misrepresent young adults who are involved in justice settings. There is a significant over-representation of neurocognitive and neurodevelopmental disorders among young people involved in the justice setting; estimates range from 25% to 40%.[182] As outlined in section 3, the presence of a neurodevelopmental disorder can further impact the emotional, social, and cognitive functioning of young adults, and this is further compounded by additional

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179 Jordan M Nechvatal and David M Lyons, 'Coping Changes the Brain' (2013) 7 *Frontiers in Behavioral Neuroscience* 13.

180 Lauren M Sippel et al, 'How Does Social Support Enhance Resilience in the Trauma-Exposed Individual?' (2015) 20(4) *Ecology and Society* 10.

181 Edwige and Gray, *Significance of Culture* (2021) (n 2).

182 Baldry et al, 'Reducing Vulnerability to Harm' (n 4); Bower et al 'Fetal Alcohol Spectrum' (n 4); Jane McCarthy et al, 'Characteristics of Prisoners with Neurodevelopmental Disorders and Difficulties' (2016) 60(3) *Journal of Intellectual Disability Research* 201; Perkes et al, 'Traumatic Brain Injury Rates' (n 4).

adversities and disadvantages. Similarly, interruptions to development can affect brain maturation and associated executive functioning, social cognition, and behaviour. The presence of these conditions, and the potential for their simultaneous and cumulative occurrence, should not be viewed as predictive of criminality but rather as important contextual factors that inform intervention needs. Failure to properly assess and support neurodivergent individuals can lead to misdiagnoses, inappropriate interventions, and increased risk of involvement with the justice system.

Psychological and Neuropsychological Assessment

[92] Psychological, neuropsychological and cognitive assessments can enable the young adult, and those within the justice system, to understand that young adult's offending behaviour. They can provide valuable insights into the unique environments, upbringing, social, political and historical determinants that have shaped the individual's life trajectory and may have contributed to their involvement with the justice system.

[93] Neuropsychological assessment can, in addition, diagnose previously undetected brain conditions; this may provide context to the person's behaviour and can help to inform appropriate treatment and rehabilitation, including diversionary programs and community supports (e.g. under the the National Disability Insurance Scheme).

[94] Psychological and neuropsychological assessments that do not adequately contextualise the neurodevelopmental trajectory of young adults may, however, lead to overlooked conditions, misdiagnosis, over-pathologising or under-diagnosis of young adults. This may ultimately lead to inappropriate and ineffective neurodevelopmental and justice system interventions,[183] including approaches such as coercive interventions, or to missed opportunities for tailored therapeutic approaches that may be more effective in producing positive outcomes for the individual and the broader community.

[95] Among justice-involved populations there are significant complexities associated with the proper conceptualisation of neurocognitive challenges. This includes culturally responsive and safe psychological practice for assessment and treatment of young adults who are from culturally and linguistically diverse backgrounds[184] and those who identify as Aboriginal and Torres Strait Islander.[185] For the latter, neuropsychological assessment and cognitive testing should draw on Aboriginal and Torres Strait Islander knowledge systems and constructions of social and emotional wellbeing and internal mental states, supported by culturally valid and evidence-based assessment and treatment approaches.

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[183] Pat Dudgeon and Roz Walker, 'Decolonising Australian Psychology: Discourses, Strategies, and Practice' (2015) 3(1) *Journal of Social and Political Psychology* 276.

[184] Fujii, D. E. M. (2018). 'Developing a Cultural Context for Conducting a Neuropsychological Evaluation with a Culturally Diverse Client: The ECLECTIC Framework' (2018) 32(8) *Clinical Neuropsychologist* 1356; Fujii (2023) 'Incorporating Intersectionality' (n 57).

[185] Dudgeon et al, *Voices of the Peoples* (2014) (n 96); Dudgeon et al, 'A History of Indigenous Psychology' in Dudgeon, Milroy and Walker, *Working Together* (n 85) ch 3, 39–54.

[96] Culturally safe practice is a central focus of professional practice standards and inherent competencies for psychologists,[186] though there is little in the evidence base within Australian neuropsychology and cognitive testing to guide neuropsychology and cognitive assessment practice when working with Aboriginal and Torres Strait Islander people, including young adults.

[97] Using the Australian Health Practitioner Regulation Agency (Ahpra) framework, cultural safety is defined as:

> the ongoing critical reflection of health practitioner knowledge, skills, attitudes, practising behaviours and power differentials in delivering safe, accessible and responsive healthcare free of racism.[187]

[98] Among other aspects, central to the definition of cultural safety is to explicitly:

> acknowledge colonisation and systemic racism, social, cultural, behavioural and economic factors which impact individual and community health.[188]

[99] While the practitioner strives to enact cultural safety,[189] the determination of whether culturally safe care is provided remains with Aboriginal and Torres Strait Islander communities and service users. When working with Aboriginal and Torres Strait Islander young adults with suspected cognitive impairment that may be contributing to their offending behaviour, it is essential that psychological and neuropsychological assessments are conducted in ways that reflect culturally responsive practice. Assessments should be grounded in Aboriginal and Torres Strait Islander understandings of social and emotional wellbeing and should recognise the role of social, cultural, historical, and political factors in shaping neurodevelopment.

[100] Psychologists and neuropsychologists conducting these assessments should demonstrate an ability to engage in culturally responsive practice, as outlined in professional standards and regulatory frameworks such as the Ahpra and industry-specific competency guidelines. This includes ongoing reflection on the limitations of standardised cognitive assessments and consideration of culturally appropriate formulations, interpretations, and recommendations. When requesting or conducting an assessment, it may be appropriate to consider the following:

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186 Australian Health Practitioner Regulation Agency ('Aphra'), *Aboriginal and Torres Strait Islander Health Strategy* (2020–2025) <www.ahpra.gov.au>; Psychology Board, Aphra *Standards and Guidelines* (reviewed 24 March 2025).

187 Aphra, *Health Strategy* (n 186).

188 Ibid.

189 See, e.g. Aphra's cultural training project: Psychology Board, Aprha, *Cultural Safety Accreditation and Continuing Professional Development Upskilling Framework and Strategy 2025–2027*.

a) Whether the assessing psychologist or neuropsychologist has experience working with Aboriginal and Torres Strait Islander peoples and demonstrates cultural responsivity in their practice. To assist in understanding this, it may be relevant to ask the practitioner to explicitly describe the *process* by which they seek to enact cultural safety, as merely stating it as a fact is insufficient. For example, the practitioner might explain how they seek to embed culturally safe practices as they engage with a client and relevant others such as family; the assessment process including cognitive testing; interpretation and formulation; and when providing feedback to the client and family as well as to service providers and the court.

b) Whether the assessment process meaningfully includes the young adult's views and or the perspectives of family or community members.

c) How the psychologist or neuropsychologist addresses the limitations of cognitive testing, such as acknowledgment that they are based on Western constructs of cognition and rely on Western normative data as the reference to ascribe cognitive 'impairment', and explicit consideration of the way this impacts their use in relation to assessment of the specific Aboriginal and Torres Strait Islander young person.

d) Whether the assessment draws on culturally grounded frameworks (e.g., Social and Emotional Wellbeing [SEWB][190] or the Australian FASD Indigenous Framework),[191] where relevant.

e) Whether treatment recommendations consider cultural and healing-based supports.

[101] Where possible, seek feedback from the young adult about their experience of the assessment process, as ultimately, the experience of cultural safety is determined by the young adult being assessed.

[102] When taking a trauma- and healing-informed approach, psychological, including neuropsychological, assessment may help young adults who have engaged in offending behaviour make sense of their actions, often for the first time, by linking their socio-environmental challenges to cognitive, emotional, and behavioural patterns. At a systems level, this knowledge about the young adults' story that led them to justice involvement presents as an opportunity to put supports in place that meet the young person's needs.

[103] Both diversion and restorative approaches aim to address and repair the harms caused by criminal acts on individuals and communities. Diversion programs that emphasise accountability, reparation, and community reintegration can harness the neurodevelopmental potential of young adults to support prosocial development and meaningful community engagement, ultimately reducing recidivism. Such programs are most effective when they integrate therapeutic, culturally responsive, trauma and neurodevelopmentally informed practices. They are particularly relevant for young adults, who still have significant neurodevelopmental plasticity and are brimming with potential, yet are on a path to further disadvantage as a result of systemic social, political and health factors outside their control.

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190 Dudgeon et al *Social and Emotional Wellbeing* (2025) (n 85).

191 Nicole Hewlett et al, 'Development of an Australian FASD Indigenous Framework: Aboriginal Healing-Informed and Strengths-Based Ways of Knowing, Being and Doing' (2023) 20(6) *International Journal of Environmental Research and Public Health* 5215.

Conclusion

[104] Collectively, there is a need to place understanding of neurodevelopment at the forefront of evidence-based rehabilitation strategies to support young adults in the justice system. These young adults exist in a unique epoch, where there is potential to rectify some of the previous neurobiological, psychosocial, and systemic disadvantages and promote healing and learning opportunities to set them on a more balanced and prosocial trajectory into adulthood. A system-led justice outcome which integrates neurodevelopmental evidence, trauma- and healing-informed care, and culturally responsive rehabilitation will better support individuals, be more likely to reduce recidivism, and support long-term wellbeing for individuals, their families and communities.

Summary Messages: Rehabilitation	
1	Rehabilitation is most effective when it is developmentally tailored. Young adults' brains, particularly areas responsible for decision-making and emotional regulation, are still developing. Therapeutic, healing informed individualised programs that support these skills and take neurodevelopment into account are more likely to reduce reoffending.
2	Supportive relationships and identity-building matter. Positive connections with caregivers, peers, community and culture can help young adults develop resilience and shift away from offending. Interventions that strengthen these bonds and promote healing from trauma are especially powerful.
3	Assessments must be culturally safe and neurodevelopmentally informed. While psychololologists and neuropsychologists can strive to enact cultural safety, ultimately this determination lies with the experience of the young adult who identifies as Aboriginal and Torres Strait Islander.
4	Psychological and neuropsychological assessments should consider the young person's cultural background, life experiences, and neurodevelopmental stage. Social, historical, and political determinants should also be considered. Without this holistic and contextualised perspective, assessments risk misdiagnosis and inappropriate interventions, particularly for Aboriginal and Torres Strait Islander young people.
5	Healing-informed, wraparound approaches support long-term change. Programs that combine mental health support, cultural connection, community supports and engagement, and therapeutic intervention provide the best chance for young adults to experience optimal neurodevelopment and engage in prosocial behaviour.

Appendix:
Author Expertise and Positionality

Ms Jody Kamminga[192] is of British and Dutch descent. Trained as a clinical neuropsychologist, she has worked in public health services for over a decade across brain injury, mental health and drug and alcohol services within New South Wales. She is an Aphra Board Approved Supervisor for general psychologists and neuropsychology registrars. Jody's clinical interests relate to developing and establishing best-practice and equitable neuropsychology services, with an emergent focus on decolonising practice and centring Aboriginal and Torres Strait Islander perspectives. In 2020, Jody co-chaired the national neuropsychology conference in partnership with the Australian Indigenous Psychology Association (AIPA)[193] which had a focus on decolonising neuropsychology and Indigenous psychology.[194] Jody was privileged to have lived in Fitzroy Crossing, Central Kimberley region of Western Australia for two years, where she co-developed and established two Social and Emotional Wellbeing (SEWB) services in the Fitzroy Valley. She has since returned home to Awabakal Country (Newcastle) to commence a PhD in decolonising neuropsychological practices with Aboriginal and Torres Strait Islander peoples, under Aboriginal and Torres Strait Islander governance. Framed by a decolonising perspective, Jody provides clinical neuropsychology consultation with young Aboriginal and Torres Strait Islander peoples who intersect with the justice setting. Jody additionally holds a part-time research fellow position with the Australian Indigenous Psychology Education Project (AIPEP),[195] under Aboriginal and Torres Strait Islander governance by Clinical Psychologist Belle Selkirk (Noongar) and Professor Pat Dudgeon AM (Bardi), Australia's first Aboriginal and Torres Strait Islander psychologist.

Dr Travis Wearne is a clinical neuropsychologist and academic. He holds Bachelor of Psychology (First Class Honours), Master of Clinical Neuropsychology and Doctor of Philosophy (PhD) degrees. He is also an Ahpra board-approved supervisor for general psychologists and neuropsychology registrars. He was awarded his PhD in 2016 (Macquarie University) and subsequently completed a postdoctoral fellowship in social cognition and traumatic brain injury at the University of New South Wales. His research focuses on theoretical and applied issues with respect to brain behaviour relationships in social and

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192 Jody Kamminga and Travis Wearne share joint lead authorship of this report.

193 Australian Indigenous Psychologists Association ('AIPA') website. <https://indigenouspsychology.com.au/>

194 Australian Psychological Association ('APA'), 'Indigenous psychology and decolonising neuropsychology in Australia' (On-demand Event, 2022). <https://psychology.org.au/event/23699>

195 AIPA (n 4).

emotional functioning, particularly following acquired brain injury. He has over 40 research publications, two book chapters and has procured approximately $4 million in research funding. Dr Wearne has over 14 years of teaching experience in tertiary education across undergraduate, honours and postgraduate levels. He joined Western Sydney University as a Senior Lecturer in Clinical Neuropsychology in 2021 before joining the School of Psychology Sciences at Macquarie University in June 2024, teaching specifically into the Master of Clinical Neuropsychology program. He was recently announced as the incoming Director of the Master of Clinical Neuropsychology program, commencing July 2025. He is also active in the International Neuropsychological Society (INS), he sits on the executive committee for the Australian Society for the Study of Brain Impairment (ASSBI), and he is the current Vice President for the Australasian Society for Social and Affective Neuroscience (AS4SAN). Clinically, he has extensive experience across mental health, neurodevelopment, brain injury, neurology, and rehabilitation contexts. He regularly provides expert opinion and testimony to Courts and Tribunals throughout Australia.

Dr Liz Vuletich is a clinical neuropsychologist of white settler origin (British decent), who was born, raised and educated on Mparntwe (Alice Springs). Having completed a Masters in Clinical Neuropsychology and PhD from the University of Western Australia she is endorsed to practice in the area of Clinical Neuropsychology. Liz is also an Aphra Board Approved Supervisor, and has regularly supervised MPsych trainees and registrars over the past 12 years. She is privileged to have spent her formative years in the bush, often on long trips to the central and western desert regions with her family, accompanied by Aboriginal Elders. These experiences planted a seed of deep appreciation of the resilience and importance of Aboriginal knowledges and culture and, as a young white person, the need to listen more. During her time at university, she enjoyed working as a tutor and lecturer within the UWA School Indigenous Studies. Through that work, Liz forged a friendship with Belle Selkirk (Noongar Clinical Psychologist), who has been instrumental in sharing knowledges which have guided Liz to seek continued supervision relating to her commitment to allyship and to continued reflexive, decolonising practices in her work. She undertakes regular supervision to support this learning, with Jaru Bunuba Clinical Psychologist, Tanja Hirvonen. Liz has worked across a number of settings within the Western Australian public health services and the private sector since 2006. This has included working in senior leadership roles within WA Health (A/Director, Neurosciences Unit, & Specialist Neuropsychology Coordinator, Neurosciences Unit) alongside her most recent role, as a founding director of a large group private psychology practice. Since 2009, Liz has predominantly engaged in work within the forensic and medicolegal setting and has a particular focus on access to culturally responsive neuropsychological services for Aboriginal and Torres Strait Islander peoples who are overrepresented in the justice system. She is well versed in criminal legal proceedings and regularly undertakes work as an Expert Witness across various jurisdictions in Western Australia and the Northern Territory. Through her work, she regularly travels to regional and very remote regions across Australia as she feels very strongly about equitable access to services, and working collaboratively with community.

Dr Santuri Rungan is of South African Indian descent and immigrated to New Zealand in late childhood and later in adulthood to Australia. Dr Rungan is a dual-trained general paediatrician and community paediatrician who works on Gadigal land. Dr Rungan has a strong research background having graduated with a Bachelor in Science and having over 20 years of experience in this area and 17 publications. Dr Rungan is a full-time clinician-researcher in the public sector and is employed by Sydney Local Health District where she works closely with children, young people and communities. Dr Rungan is the clinical lead for a school-based integrated care (SBIC) program called 'Kalgal Burnbona' developed in partnership with the Aboriginal community and schools. Dr Rungan has completed a Masters inPublic Health and Tropical Medicine and is completing a PhD on 'Childhood Behavioural Problems — Partnerships between the Health and Education Sectors'. Dr Rungan is currently the Senior Clinical Advisor for Youth Health and Wellbeing at NSW Health. Dr Rungan is committed to lasting solutions that lead to equitable education, health, wellbeing and social outcomes for children and young people across the lifespan.

Dr Jenny Sohn was born in South Korea and migrated to Nugunnawal Country (Canberra) during her primary school years. Through her medical training in community paediatrics, she has accumulated experience working in diverse settings such as hospitals, health centres and school clinics throughout Sydney Local Health District, South Eastern Sydney Developmental Disability Health Service, and Sydney Children's Hospital Network. In 2024, she had the privilege of working at La Perouse Aboriginal Paediatric Clinic. Jenny is a UNSW Conjoint Associate Lecturer, holds an Associate Fellowship of Higher Education Academy and is currently completing a Master of Public Health at UNSW. Her passion lies in optimising health outcomes of children through a collaborative, inter-agency approach and she has completed a research project with the Population Child Health Research Group at UNSW, evaluating the General Practitioner-Paediatrician integrated care model across NSW and Victoria.

Dr Tamara Morris originates from South Africa, where she trained as a paediatrician working to improve equity of access to healthcare throughout her career. Since her recent arrival in Australia, Dr Morris is privileged to work almost exclusively with young people at Youthblock a Youth healthcare service, and Aboriginal Medical Services Redfern providing care for young people in Redfern in Sydney. Dr Morris's work intersects with social and legal services to improve healthier outcomes for young people.

Dr Amelia Lewis is a clinical neuropsychologist of white settler background, with Anglo-Australian and Italian heritage. She works in community paediatrics, providing neurodevelopmental assessment and support to children and their families. Through her clinical work and academic training, including a Master of Health Policy, Dr Lewis has developed a critical awareness of how colonial legacies and systemic inequities shape the experiences of Aboriginal and Torres Strait Islander children within the health system. She is committed to listening, learning, and acting in partnership with Aboriginal families and communities to create culturally safe, equitable pathways for neurodevelopmental support.

Associate Professor Fiona Kumfor is a Clinical Neuropsychologist and academic at the University of Sydney. Her research focuses on how the brain supports social and interpersonal functioning, and how brain impairment can compromise these abilities. She is also interested in the intersection between clinical populations and the law. Her research is conducted across a range of syndromes including dementia, brain injury as well as in healthy adults.

Dr Warrick Brewer AM is a non-indigenous Clinical Neuropsychologist who currently works as a sole practitioner in his practice- Neurotech: Neuropsychological Services, established in 1995. In addition to formal assessments for brain injury and disease, intellectual disability and the impact of mental illness and substance abuse on functioning, he also conducts neurodevelopmentally informed therapeutic interventions, particularly for forensic clients. He appears in Court regularly as an expert witness, predominantly for the Office of Public Prosecution and for Child Protection. He completed Psychology Honours at James Cook University of Nth Queensland in 1991, then his Masters in Neuropsychology at the University of Melbourne in 1993, followed by his Ph.D in 1999 through the Mental Health Research Institute of Victoria, in affiliation with both the Departments of Psychology and of Psychiatry at the University of Melbourne. His professional research and clinical training with the Melbourne Neuropsychiatry Unit focused on tracking and understanding the development of neurodevelopmental disorders, particularly psychosis, from a neuropsychological perspective. This has led to a more recent focus on predicting violence. He also worked as a clinician at John Cade Unit- Royal Park Hospital (later the Adult Mental Health Rehabilitation Unit) for 7 years. His work is published in over 100 national and international peer-reviewed publications and he has also won various awards. He also has extensive experience presenting research and running workshops nationally and internationally.. Until October 2023, he was an Honorary Associate Professor & Principal Research Fellow in the University of Melbourne Department of Psychiatry also, in the Centre for Youth Mental Health, located at Orygen Youth Health- Parkville, where he pioneered a Youth Mental Health Neuropsychology Service that ran for over 10 years. Over that time he also pioneered the specialist Intensive Case Management Team for the Early Psychosis Prevention & Intervention Program. His work was supported by a 5-year NH&MRC Career Development Award. More recently was Chair of the Victorian Section College of Clinical Neuropsychologists. He has supervised and lectured to under-graduate and post-graduate Medical and Psychology students across all Victorian Universities along with clinical neuropsychology and allied health staff for over 20 years.

Associate Professor Paul Gray is a Wiradjuri academic focused on child protection systems and practice, advocating for the rights and interests of Aboriginal children and young people, their families and communities. With formal qualifications in Western psychological science, his work is also informed by Indigenous scholarship which challenges dominant frames and asserts Indigenous knowledge systems and perspectives, including within the discipline of psychology. Paul has worked as a psychologist and in policy and project roles with the NSW Department of Communities and Justice, and served as the Executive Leader of Strategy, Policy and Evidence at AbSec (NSW Child, Family and Community Peak

Aboriginal Corporation), the Aboriginal child protection peak organisation in NSW, prior to joining the Jumbunna Institute for Indigenous Education and Research at the University of Technology, Sydney, as Associate Professor, leading their child protection hub. Paul completed a DPhil in Experimental Psychology at St Catherine's College, Oxford, investigating the relationship between early maltreatment and adolescent social and emotional processes. Paul is co-chair of the Family Matters National Leadership Group, and serves as an independent member of the Aboriginal and Torres Strait Islander Leadership Group for Safe and Supported: National Framework for Protecting Australia's Children 2021-2031, and the Early Childhood Care and Development Policy Partnership and Social and Emotional Wellbeing Policy Partnership as part of the National Agreement on Closing the Gap. and is a Director of the Australian Indigenous Psychologists Association. His work is supported by funding from the Australian Research Council for the ARC Centre of Excellence for Indigenous Futures (Project ID: CE230100027).

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