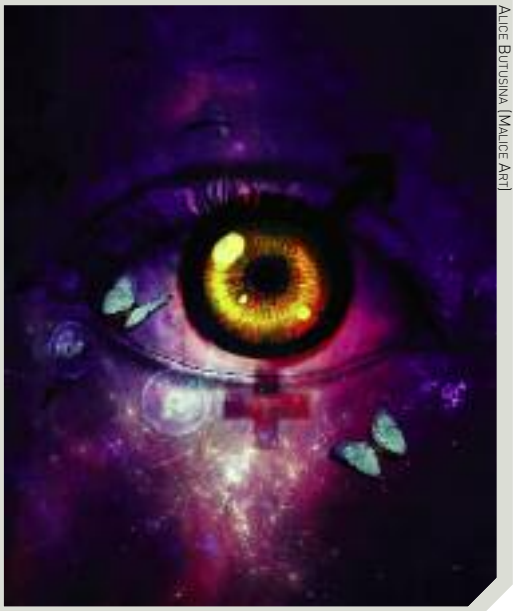
ARTICLE

Brain injury and crime

Ryan Aguiar suggests that neuropsychology needs to think differently

On 1 August 1966 former US marine Charles Whitman killed 16 people and wounded 32 others by firing rifles, a shotgun and handguns from the 28th floor observation deck of the Tower of the University of Texas in Austin. The shooting spree lasted well over an hour and ended only when Whitman was shot dead by an Austin Police Force officer.



ALICE BUTUSINA (MALICE ART)

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Later it became known that several hours prior to the shooting from the Tower, Charles had already killed his mother and his wife, leaving behind notes giving the reason for his actions.

What makes this tragic event of interest from a neuropsychological perspective is that at autopsy, Charles Whitman was found to have an astrocytoma (a brain tumour) in the region of the amygdala (a small almond-shaped structure involved in, among other things, emotion regulation and the fight-and-flight response). Predictably, psychiatric and neurological opinion on the relationship of the tumour to Whitman's actions on that day remained irreconcilable. Nearly 50 years on from the discussions at the Connally Commission, are we any closer to clarity on the relationship of neuropsychological factors to violent offending behaviour? Despite the advances in neuroscience, in particular affective neuroscience, do we have robust neuropsychological models to understand violent offending behaviour?

Why should crime matter to neuropsychology?

Quite simply, brain injury, like mental illness and substance misuse, is overrepresented in the prison population relative to the population in general. There is a growing recognition of the significance of brain injury within incarcerated populations (Williams et al., 2015). Research across different cultures and age groups has shown a link between brain injury and offending, with longitudinal studies identifying early life brain injury as a risk factor in offending during later life (Hughes et al., 2015; Leon-Carrion & Ramos, 2003).

Yet with our present state of knowledge we are far from establishing a causal link between brain injury and offending behaviour. At best our current understanding allows us to identify some risk factors for offending behaviour present in individuals living with brain injury. One such factor is cognitive impairment – in the form of impaired executive function, learning, working memory and communication (Cohen et al., 1999; Wood & Liossi, 2006). Another factor is the loss of inhibition and self-regulation arising out of damage to the orbitofrontal and ventromedial areas of the frontal lobes – resulting in impulsivity, lack of interpersonal sensitivity and impulsive reactive aggression (Blair 2001; Blair & Cipolotti, 2000; Brower & Price, 2001; Fuster, 1999). There is also a view that this loss of executive control arising from damage to the anterior brain results in loss of a natural bias away from aggression and towards more appropriate alternative responses (Berthoz et al., 2002; Blair, 2001). More complex models looking at social competence and social information processing impairments (see Yeates et al., 2007) have been put forward to provide a framework to explore the relationship between aggression and brain injury (Ryan et al., 2015).

A deficit focus

I would argue that our view of the brain injury/offending behaviour relationship is far too narrow. This relationship is generally seen as arising out of a 'deficit or impairment', either in cognitive abilities, inhibitory control and regulation, stimulus response reversal learning, and in affective-empathetic responsivity. The search for that

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underpinning neuropsychological variable risks reducing the complexity of offending behaviour in brain-injured people to a linear relationship between impairment and offence. To balance against this, studies in this area do acknowledge the role of socio-economic factors, personality variables and environmental influences on offending behaviour. However, the absence of a unifying framework makes it difficult to integrate the neuropsychological variables into a coherent model.

I argue this very point when calling for a social cognitive approach to aggression post-brain injury (Aguiar, 2013). There is already a matrix of risk factors that are well-established and known to underpin offending behaviour, and neuropsychology must work out how its own variables can be incorporated. The offender's historical and dynamic risk, the contextual factors that precede an offence (such as the offender's criminogenic needs) and clinical issues (such as paranoia, emotional instability or indeed impulsivity) are surely vital.

The integrated theory of sexual offending from Ward and Beech (2006) is an example of a framework that could incorporate neuropsychological variables into offending behaviour. It allows for an exploration of the confluence of biological, ecological (social cultural and personal circumstances) and neuropsychological factors that continuously interact with each other to prompt, maintain and escalate offending behaviour.

A framework like this could enrich neuropsychological inquiry into offending behaviour in many ways. It allows the clinician to explore how factors antedating any neuropsychological event influenced the development and function of the neuropsychological system (e.g. ADHD, childhood brain injury, autistic spectrum disorders). It allows us to explore how – in the context of such developmental factors and ecological variables – damage to neuropsychological function alters the person's functioning to produce a distinct set of clinical symptoms, such as explosive rage, impulsivity or deficits in empathy, that lead to offending behaviour. Most importantly it provides a valuable framework to explore the developmental trajectory of offenders with childhood brain injuries as against those with adult-onset brain injury. Researchers and clinicians can now pursue an alternative line of inquiry when faced with an offence committed by an individual with brain injury. Would the neuropsychological factor in question exert the same influence on the person's behaviour if they had a different set of historical, dispositional and clinical risk factors? This approach would provide valuable insights in the management and rehabilitation of the brain injured offender.

Back to Charles Whitman

The challenge for such an integrated model is to test it within the legal context of criminal responsibility and mitigation.

Returning to the case of Charles Whitman, it comes as no surprise that the medical community at the time was unable to reach a consensus on the significance of the astrocytoma to his actions on that fateful day. The absence of a robust model to incorporate neuropsychological factors in to a fuller explanatory framework was always going to risk polarising medical opinion into either over- or under-attributing a causal link for the astrocytoma. Charles Whitman had bouts of intense rage in the year preceding the shooting spree. A University of Texas campus psychiatrist Charles consulted wrote '…oozing with hostility…something seemed to be happening to him and that he didn't seem to be himself'. Dr Heatley, the psychiatrist Charles Whitman consulted, further noted: 'He readily admits having overwhelming periods of hostility with very minimum provocation.' There is little doubt that the astrocytoma impinging on the amygdala was

Meet the author

'As a clinical neuropsychologist working in a forensic setting, I am often called on to prepare reports for the courts on criminal matters involving offenders with brain injury. I am struck by how many of my colleagues in the field of neuropsychology, clinical psychology and psychiatry fail to integrate the evidence from neuropsychology and forensic psychology when expressing opinions about the brain-injured offender. As a consequence the offender's neuropsychological factors are at times overemphasised at the expense of other factors that underpin their offending behaviour. I believe this chasm reflects the lack of convergence in the neuropsychology and forensic psychology literature in the case of brain injured offenders. The need to integrate the two fields is even greater when working clinically with the brain-injured offender.

'I would like this article to stimulate more joined-up working between the academic and clinical fields of neuropsychology and forensic psychology. I would like to see more scientific publications and conferences that pull together the psychology of offending behaviour and neuropsychology to advance the filed of forensic neuropsychology so that we have a better understanding of risk, offending behaviour and treatment of the offender with brain injury.'

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significant in these rage attacks. The link between the two is well established (Blair, 2007; Blair, 2010; Pardini et al., 2014) However, was rage alone sufficient to result in the systematically planned violence, first on members of his own family and then random members of the public?

Working from the framework above, one can incorporate a number of factors in his background into a formulation of Charles Whitman's violence that August day. His life was certainly not an ordinary one: from witnessing severe domestic violence between his parents from a young age, to being subjected to physical and emotional abuse from his authoritarian father and then being financially dependent on him, to having had exposure to guns from a young age and abusing amphetamines and prescribed dextroamphetamine, to being expelled from the Marines, an identity he so cherished. Against this developmental backdrop, in the months leading to his killings, Charles was under quite a lot of stress from the difficult break up of his parents' marriage, his persistent headaches and bouts of rage (possibly related to the astrocytoma). Charles knew something was wrong with him. He wrote in his suicide note about 'being a victim of many unusual and irrational thoughts'. He also wrote that he wanted an autopsy to be conducted upon his body to determine if there was a biological reason for his headaches and his aggression.

We will never really know what lay behind Charles Whitman's actions that day. However, what his case points to is the multifactorial nature of violent crime. To use linear models (albeit well-informed ones) to account for such behaviour in individuals with neuropsychological impairment would leave our understanding of risk in this group of offenders incomplete. An integrated model will allow us to pull together a much richer formulation by bringing neuropsychological thinking into forensic evaluations of the offender with brain injury. Ultimately, irrespective of the putative value of the astrocytoma to his actions on that day, had Charles Whitman survived the shooting, society would still need to judge his actions and make a judgement on his future risk. At that point, society would expect greater convergence in professional opinion.

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Meeting complex needs

To turn the focus back to neuropsychology, what effect would advancements in our knowledge of neuropsychology and affective neuroscience bring to bear on Charles Whitman's case had it occurred in the present and he survived to face trial? First, let's rule out a verdict of 'not guilty by reason of insanity'. The level of planning and organisation that went into the killings and the murder of his family prior to the shooting leave little doubt about Charles Whitman's intentions. Yet there is also little doubt that he was suffering. Had he not had the astrocytoma and the accompanying episodes of rage and headaches, would things have turned out differently? This is not to absolve Whitman of responsibility for his actions on that day. However I do believe that in the present day, his defence team would have a strong case to present evidence in mitigation based on what we now know about the relationship between the amygdala and emotional function.

As for Whitman's sentence, there would be a compelling case for his detention in a secure psychiatric hospital rather than prison. A hospital order would allow for treatment of the tumour and a thorough evaluation of its impact on his behaviour post-treatment, his risk and ultimately the effect it would have on protecting the public. Further his detention in hospital would allow for a full evaluation of the various factors that came together to result in his actions on that fateful day, including the relationship between the neuropsychology of his tumour and the volitional and executive control (Kröber, 2009) he might have exerted over his actions. It is here that an integrated model would have maximum impact.

Irrespective of the putative role of neuropsychological factors in criminal offences, psychological intervention must still address the coping and problems-solving skills of the offender, their attitudes to the offence and to violence, build their emotion regulation skills, and increase their understanding of any underlying mental illness. This is an essential part of the forensic risk-reduction intervention. The neuropsychological impairment of offenders with brain injury adds an extra layer of complexity to these cases, which simply cannot be met within the prison service. This is a role for clinical neuropsychologists within specialist secure psychiatric hospitals. Clinical neuropsychology must step assertively into the field of forensic mental health care and claim its rightful expertise in the assessment and management of offenders with brain injury.

Ultimately as psychologists, in cases such as this, we are faced simultaneously with 'an offender' 'the legacy of brain injury' and 'risk'. At the heart of all three is an offence or a potential offence, and the need for public protection. If we do not have the appropriate psychological models to address all three, we will find ourselves falling short in our ability to meet the needs of these complex cases.