

9 Options: forensic and criminal

Revision summary

INTRODUCTION

Forensic psychology is the application of psychological theories and studies to understand and treat criminal behaviour. The forensic psychologist may work with the offender or victim, and could work in hospitals, prisons, the police or universities. The prison population of England and Wales quadrupled in size between 1900 and 2018 (House of Commons Library, 2019). Approximately 29% of offenders will reoffend (Ministry of Justice, 2017), therefore psychologists seek to understand what is causing people to behave criminally and how we can reduce reoffending.

Definitions and measuring crime

Crime is any act that breaks the law, yet what acts are seen as criminal changes dependent on history or cross-cultural differences. For example, homosexual activity was illegal in the UK until 1967, and is still illegal in some African and Asian countries. The Home Office divides crime into six categories: violent (including sexual); acquisitive (theft); vandalism and criminal damage; fraud and forgery; religiously or racially motivated; and drug offences. Psychologists measure crime with official statistics (police records published by the Home Office) and surveys completed by victim and offenders. Yet there is still a 'dark figure of crime', an unreported amount of crime that means no one method is truly accurate.

Types of offenders

According to Hazelwood and Douglas (1980), who were top-down offender profilers in the FBI in America, there are two types of offenders: organised and disorganised. Organised crimes are usually planned with little evidence left at the crime scene, whereas disorganised are the opposite. Therefore, the organised criminal is usually psychopathic, of above average intelligence, married, employed, educated, charming and understands right from wrong – such as Ted Bundy. By contrast, the disorganised criminal tends to be young, has a mental health condition, takes drugs or alcohol, is of below-average intelligence, lacks communication skills, lives alone and has an unstable family background (physical or sexual abuse) – such as Jack the Ripper.

Psychological explanations

Psychological explanations of criminality focus on cognition, personality, faulty thought processes or incomplete stages of development. Kohlberg's (1968) moral development stages suggest there are six stages across three levels that we all go through in the same order. The first is pre-conventional, where we make moral judgements based on how the decision affects us personally (punishments and rewards). In the conventional stage, we make moral judgements based on how we are viewed by society and to maintain social order. Lastly, the post-conventional stage is where we make

Key research

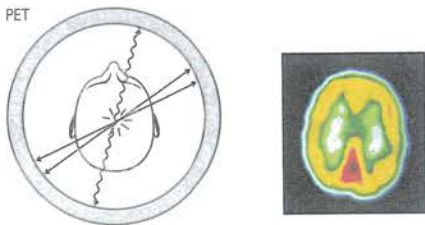
Raine *et al.* (1997) Brain abnormalities in murderers

Method: A quasi laboratory experiment with the IV being not guilty by reason of insanity (NGRI) murderers and non-murderers. These participants were matched for age and gender, and with six in each group of 41 having schizophrenia (matched pairs design). They used positron emission tomography (PET) scans and a continuous performance task (CPT) task to control thoughts while brain activation was measured.

Results: NGRI murderers were found to have abnormal asymmetrical activation in the amygdala, thalamus and hippocampi, which are linked to violence. They also had lower activation in the prefrontal cortex than the controls.

Evaluation:

- +M: Matched pairs design (controls dispositional EVs)
- +E: Informed consent gained (all agreed to PET scans)
- D: Quantitative (no detail in reasons for murder)
- S: Small sample (41 NGRIs and 41 controls)



A brain scan highlighting the areas of the brain activated during a specific task, like in Raine's (1997) experiment

judgements based on abstract values, individual rights and ethical principles. Kohlberg uses moral dilemmas, such as the Heinz dilemma (is it right to steal a life-saving drug?) to assign a stage. Kohlberg *et al.* (1973) found that a group of violent youths were more likely to be in the pre-conventional stages than non-criminals.

Biological explanations

Some psychologists have searched for a criminal gene. Mednick *et al.* (1984), in a Danish adoption study, found that there was a significant relationship between biological fathers and their offspring being convicted, even when the child had been adopted by a non-convicted parent. Another genetic explanation is that having XYY chromosomes rather than XY (male) chromosomes could make 'supermales' more violent. Thompson and Thompson (1986) found males with XYY were six times more likely to be imprisoned than those with XY. Yet in reality crime is more likely to be polygenetic (multiple genes are accountable for complex behaviour).

Brain localisation could be used to explain criminal behaviour (see Chapter 6 Biopsychology); the limbic system, for example, is responsible for emotions and behaviour. In 1966, Charles Whitman murdered his wife and mother along with 14 strangers. He left a note requesting an autopsy, which showed a brain tumour on his amygdala (responsible for aggression and fear). Raine and Yang (2006) carried out a review into regions of the brain responsible for anti-social behaviour and moral decision-making, and identified the prefrontal cortex (responsible for impulsivity and immaturity), amygdala, angular gyrus and cingulate.

Debate: Free will vs determinism

Determinism argues our behaviour is caused by forces outside our control, whether internal (biological determinism) or external (environmental determinism). Yet there would be moral issues for the legal system if biological determinism were true, such as being able to hold people accountable. There is also a neuroethical dilemma, as if we know who is at a greater risk of being a criminal then we should intervene to prevent this. In the case of Charles Whitman, the brain tumour had a role to play, but not all people with brain tumours become criminals. Blaming the tumour also ignores Whitman's father, who physically abused his wife and children. Free will would suggest that we choose, control and change our behaviour, yet some argue this is an illusion. Psychological explanations normally align with soft determinism, acknowledging that therapeutic methods can be effective in preventing criminals from reoffending. Ultimately, how far are we responsible for our own behaviour?

And now...

Turn over to read 'Crime, brain scans and the future of justice', an article taken from the *Psychology Review* magazine. Read it carefully with this topic in mind, and think about how you might apply some of what you learn from it to your exams (focusing on AO2 and AO3).

Crime, brain scans and the future of justice

An interview with Adrian Raine

Adrian Raine today



Adrian Raine is professor of criminology, psychology and psychiatry at the University of Pennsylvania. He is well known for his study on brain abnormalities in murderers. We asked him some questions about this research and other areas of interest to him.

We believe you started out as an accountant for British Airways. What led you from there to becoming a professor of psychology?

AR: It's a long story. From the age of 15 I felt I knew two things about myself: (a) I was good at adding up numbers, and (b) I was very boring. So I put two and two together — boring, numbers — and was determined that accountancy would be a good fit for me. I did not enjoy school and so I left Darlington, my home town, at the age of 18 to train to become an accountant with British Airways in London.

The trouble was, it really *was* boring. I felt very despondent — I'd really messed up. I did not know what to do, and I had no clue about an alternative career. But one Saturday morning I was rummaging around in W. H. Smith's and I came across this book called *Sanity, Madness, and the Family*, written by a Scottish existential psychiatrist called R. D. Laing. It was all about how

schizophrenia was caused by faulty parental communication.

It was a revelation to me — so that's why I was so messed up. That chance book finding galvanised me into applying to university to study psychology, with the ultimate goal of becoming a psychiatrist and treating patients with schizophrenia. That last bit did not materialise, but it did result in me becoming a psychologist. Looking back, I see two take-home messages. First, paths in life are not always straight; sometimes you have to zig-zag around a bit and make mistakes to find your calling. Second, it's a bit scary how completely chance events can radically shape our lives. How much control do we really have?

How did the classic study on murderers not guilty by reason of insanity (Raine et al. 1997) come about?

AR: Here we go again...another chance event. I was at a conference presenting some of

my work on violence and crime. A member from the laboratory of Dr Monte Buchsbaum bumped into my poster, and commented how they had begun to collect brain scans of murderers. Would I be interested in joining them as their primary research was not violence, but schizophrenia? I jumped at the chance.

The accused murderers were being referred to us because their defence suspected that there may be something amiss with their client, and the judges in these cases approved that they could be released for a brain scan. We had their informed consent to conduct the scan, and we scanned them using the same procedures that were being used in an ongoing study of schizophrenia patients and normal controls. That was really invaluable to us as we were then able to carefully match the murderers to control subjects on a number of important variables, including psychosis. In retrospect I just feel so lucky that chance events went well for me.

Do you worry about how people may interpret the findings of this study, i.e. they may draw the conclusion that murder is biologically determined? So, in your view, is that true?

AR: If people draw the conclusion that there is, in part, a biological brain basis to homicide, they would be correct. Our murderers, as a group, had poorer functioning in the prefrontal cortex — the 'guardian angel' that controls impulsive behaviour and regulates emotion.

If, however, they were to draw the alternative conclusion that all homicides are solely caused by brain dysfunction, they would be very wrong. To me, the violent offender is like a jigsaw puzzle, made up of lots of difference pieces: social, cultural, psychological and biological. Poor frontal lobe functioning is just one piece of a complex jigsaw puzzle that makes up the violent offender, albeit an important piece.

If you could do the 1997 study again, are there any changes you would make?

AR: There are lots of things I'd like to change. Since 1997 we have learned that it's not just brain functioning that is different in violent offenders, but also brain structure. So I would want to conduct an anatomical MRI to conduct a physical examination of murderers' brains.

Second, I'd measure psychopathy in order to compare psychopathic murderers with non-psychopathic murderers, as we think that psychopathic murderers are more 'cold-blooded'. Do they, for example, have structural and functional abnormalities in brain areas involved in empathy and compassion?

Third, I would like to take DNA in order to get a better understanding of the genetic factors underlying the brain differences that we observed.

Finally, and much more importantly, I'd like to get a much larger sample of murderers that would include serial killers and mass murderers. We did well at the time to scan 41 murderers, but we know so little about

these important sub-types of murderers from a biological perspective.

Did you have any notable murderers in your study?

AR: One of our murderers was a serial killer (Randy Kraft) who killed 64 people over a 12-year period, almost without being caught. In fact, he was really unlucky to be apprehended. He was driving really late one night on the freeway and, of all things, he made an illegal lane change. It was Randy's unlucky night. The California Highway patrol pulled him over to give him a traffic violation ticket. They only became suspicious when they found a dead body in the passenger seat.

You might think that he would be like the one-off murderers who had poor frontal lobe functioning, but in fact he showed very good frontal lobe functioning. I think it makes sense. Here we have a man who could carefully plan his murders — finding a victim, carrying out the murder, disposing of the body — and then get up to go to work as a computer consultant. You have to have something going for you in order to kill so many people without getting caught, and Randy had a good prefrontal cortex that allowed him to plan, regulate and control his behaviour. It goes to show that prefrontal dysfunction is most likely to characterise those murderers who are impulsive and lacking emotion-regulation.

We gather that, when conducting this study, you looked at a PET scan of your own brain and found your brain was

similar to that of the murderers. How did you interpret this?

AR: That was a surprise. I really had not expected this. At that point we had grouped our subjects into three categories: (1) normal, (2) murderer, (3) serial murderer. Comparing my scan to these three groups, I fell into the serial killer group. I got a sinking feeling. What if in the future we used information like this to indefinitely detain those who are viewed to be a risk to society? I'd be the first person to be detained. That's why I, as a person, feel pensive about the idea that in the future we can predict, based on social, psychological and biological information, who among us is a future violent offender.

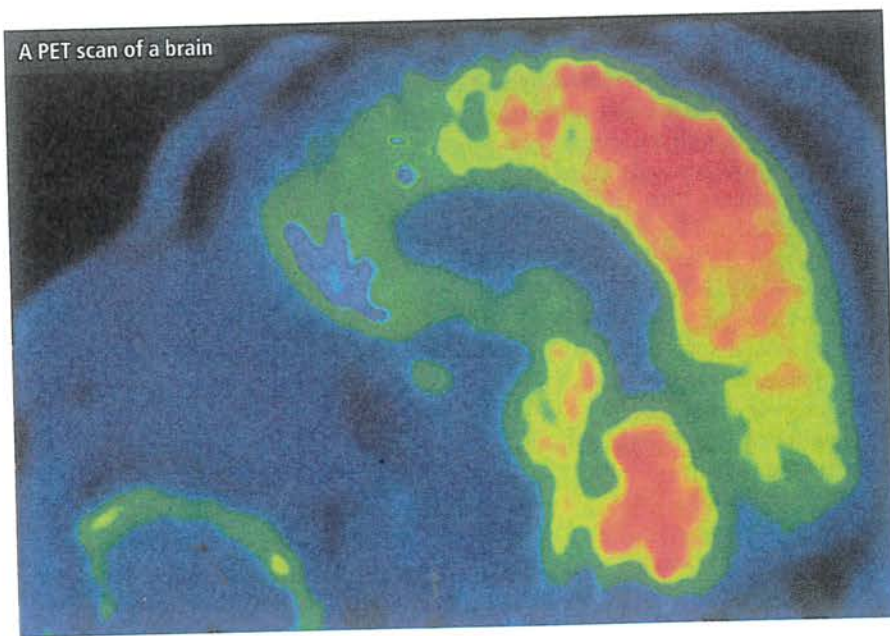
But as a scientist, I also recognise that this might be the way that society goes, and that might mean that as a whole we are all better off even if I am the loser...the greater good of the greater number — utilitarian moral decision-making. And yet, how do we balance this with the presumption of innocence and Blackstone's principle in criminal law that 'It is better that ten guilty persons escape than that one innocent suffers'?

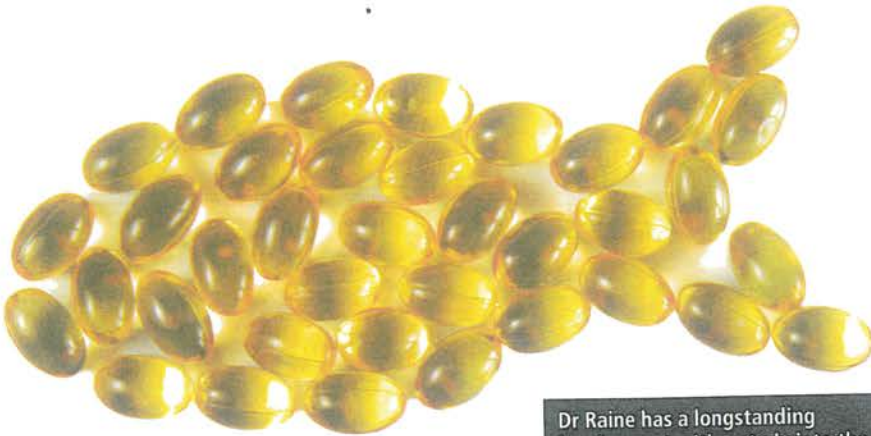
This suggests that we might, fairly reliably, be able to identify murderers from their brain scans. What are the implications of this for how the justice system deals with criminals?

AR: Have you ever seen that movie starring Tom Cruise called *Minority Report*? It was made in 2002, and is set in 2054 and it's about how at that time we can identify future murderers and arrest them even before they have committed the murder that they would have perpetrated if it was not for our intervention. I recently spoke at a conference where they showed this film and I talked about whether this could happen in the future, based on where current scientific findings appear to be headed. I think it could, and that makes me nervous. But I feel we need to discuss these issues now, so we can be better prepared.

So let me ask you this. It's now 2034. You have a 10-year-old boy called Johnny. In 2034 we collect so much more data on everyone: social, psychological and medical. We take that data and apply advanced statistical procedures to predict which children will turn out to become violent criminal offenders. I meet you and give you the bad news: 'Your little Johnny has a 60% chance of growing up to become a violent criminal offender.' But then I give you the good news: 'We

A PET scan of a brain





Dr Raine has a longstanding involvement with a study into the effects of omega 3 (i.e. fish oil) on crime and antisocial behaviour

have devised state-of-the-art residential care intervention programmes for him that have a 60% chance of success.' Question: What will you decide? Do nothing and let your little Johnny destroy his life and the lives of his future innocent victims? Or lose him to a residential treatment programme for 2 years with no sure certainty it will help?

Your research has looked at many variables that may be associated with crime, such as gender, omega-3, sleepiness, sensation-seeking. If you had to elect one key variable that explains crime, which one would it be and why?

AR: Oddly enough, that's something I'm writing about right now. If I had to pick just one factor (and of course there are many, not one), it would be disruption to the neural circuitry underlying moral decision-making. We have now identified this neuro-moral circuit, sub-regions within the prefrontal cortex: the amygdala, the angular gyrus, the insula and the anterior cingulate. These are the same structures implicated in antisocial and criminal behaviour.

At its heart, criminal behaviour is fundamentally immoral — not doing the right thing in life where others get hurt. But the question then becomes: 'If the brain areas controlling moral behaviour are broken in offenders, for reasons beyond their control, then how moral is it of us to punish them as much as we do?'

You are the director of the Mauritius Child Health study, a very ambitious and interesting project. This study is quite a contrast to the study of murderers, since it aims to explore environmental influences. Can you tell us about the study?

AR: Yes, it is very different to my research on homicide, but my heart and soul has been in this study for many years. It actually started

well before the study on murderers. My PhD supervisor, Peter Venables at the University of York, had set up a study on child health and development in Mauritius, a small tropical island in the Indian Ocean. When he retired in 1988 he asked me to take over.

It's basically a study of 1,795 3-year-old children who we have followed up repeatedly in order to understand the causes of crime, how it is passed on from one generation to another, and what we can do about it. We have a lot of findings from the study. For example, poor nutrition early in life results in cognitive impairments that predispose to later antisocial behaviour. Poor fear conditioning at age 3 (a proxy measure for amygdala functioning) predicts adult crime at age 23.

But the finding I'm most interested in is from an intervention we did at age 3 where we gave better nutrition, more physical exercise, and a cognitive stimulation to some of the kids. The intervention lasted for 2 years until age 5. Compared to controls, the kids who experienced this environmental enrichment showed more alert and aroused brain functioning at age 11, and also a 34% reduction in criminal offending at age 23.

Biology is not destiny. We can change the brain basis to criminal offending by psychosocial interventions early in life. The ethical question this raises is: 'How early in life should we screen and intervene for future crime in those children who are in greatest need of brain enhancement?'

What are you doing now on the Mauritius study?

AR: Right now we are studying the teenage offspring of the original kids. In our intervention study the kids got two portions of fish extra per week. Could that be a reason for the brain and behavioural improvement

References

- Raine, A. (2013) *The Anatomy of Violence: the biological roots of crime*, Allen Lane.
- Raine, A., Buchsbaum, M. and LaCasse, L. (1997) 'Brain abnormalities in murderers indicated by positron emission tomography', *Biological Psychiatry*, Vol. 42, pp. 495–508.

we found? I've completed a randomised controlled trial on omega-3 (a long-chain fatty acid critical for brain structure and function) where we gave children a fruit juice drink every day that contained 1 gram of omega-3.

We found not just that it reduced antisocial behaviour at the end of the treatment, but it also reduced antisocial and aggressive behaviour 6 months after the end of the treatment. We've been replicating these findings in Philadelphia and Singapore where I also do research. This sub-area of psychonutrition is only just beginning, but I think it could have a promising future. The next step is to see if omega-3 can reduce violence in young offenders, and we have initial evidence that it can.

What is one of the most satisfying projects in your academic life, and one of your biggest disappointments?

AR: I think they are linked. On the satisfaction side I received a contract from Penguin Random House to write a book for the public on the work I do. I was excited about this because as academics we write rather technical papers for a narrow audience, and a trade book allows you to connect with a much bigger audience, like the people reading this article. Called *The Anatomy of Violence*, it came out in 2013.

At that time Howard Gordon (who wrote a thriller TV series called *Homeland*) thought it could be a great TV series. So 20th Century Fox bought the rights and spent \$10 million on a TV pilot. I was a consultant on the pilot, a fictional story that starred Dr Adrian Raine (not me, but someone playing me using my name and with an 's' added). 'I' was working for the FBI to help a young female detective track a serial killer. It was ultra-exciting, but what was ultra-disappointing is that Fox only turn half of their pilots into a TV series, and mine did not make it. It was a real downer. But overall I'm delighted that all sorts of people all over the world have read the book and enjoyed it — that has given me great satisfaction.

Knowledge check

Checking key terms

Write the meaning of each key term from the article.

Prefrontal cortex		MRI scans	
Psychopathic ('cold-blooded') vs non-psychopathic murderers		Neuro-moral circuit	
DNA		Randomised control trial (RCT)	
PET scans		Psycho-nutrition	

Multiple-choice questions

Check your knowledge with these multiple-choice questions.
Circle the correct answer to each question.

- Raine's breakthrough moment in his career came when he met a scientist scanning the brains of:
 - depressive patients
 - murderers
 - anxious patients
 - people with schizophrenia
- According to the author, the biological basis to the underlying cause of murderers' behaviours involves:
 - dysfunction in the prefrontal cortex
 - dysfunction in the parietal lobe
 - dysfunction in the visual cortex
 - dysfunction in the heart
- Which area of the brain does Raine refer to as 'the guardian angel' that controls impulsivity and also regulates emotion?
 - Hypothalamus
 - Hippocampus
 - Prefrontal cortex
 - Optic-chiasm

- 4 Raine's own brain scan suggesting that his 'profile' matched the profile of a serial murderer raises issues of:
- a the use of such information to detain individuals who are deemed to be dangerous but who have not committed crimes
 - b the use of such information for scientific and research purposes
 - c the use of such information for ethics committees
 - d the use of such information in philosophical arguments about free will vs determinism
- 5 According to the author, the so called 'neuro-moral circuit' that is dysfunctional in criminals includes:
- a the amygdala, hypothalamus and hippocampus
 - b the somatosensory cortex, hippocampus and visual cortex
 - c the amygdala, pons and visual cortex
 - d the amygdala, angular gyrus, insula and anterior cingulate

Challenge questions

Use the information in the article to help you answer these questions.

Write your answers on a separate piece of paper.

- 1 In his article, Adrian Raine recalls a series of chance events that took him eventually into a career in criminology, psychology and psychiatry. What specific evidence does he provide for his belief that, at least in part, there is a biological basis to murderers' behaviour? How might you then counter-argue this controversial viewpoint?
- 2 The author goes on to suggest that the violent offender is like a jigsaw puzzle, made up of lots of different pieces: social, cultural, psychological and biological. Which piece or pieces do you consider more important in making up the picture ('profile') of the offender? Are there any pieces missing from this jigsaw picture, and why might we also need to consider the relationships between these parts? Give suggested reasons for your answer.
- 3 Raine further elaborates on his well-documented 1997 study of violent offenders, stating that we now understand more about the possible role of brain structure and not just brain function in criminality. From reading this article, and also from your own studies of the human brain, what specific areas may be involved in violent offending that anatomical MRI scans may detect?
- 4 Raine describes his surprise at the discovery that a PET scan of his own brain resulted him in being grouped into a 'typology' similar to that of a serial killer rather than a 'normal' or 'murderer'. What are the clear concerns stated by Raine about using this kind of evidence to detain people deemed to be a risk to others or to wider society? Are there additional wider concerns not stated by Raine in his article?
- 5 Summarise the early findings of Raine's Mauritius-based randomised control trial (RCT) study into the effects of enhanced omega-3 fish supplements for the children of violent offenders. How might these findings support the interactionist explanations of criminality? What are some of the possible limitations of these early findings?