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YOUTH JUSTICE AND NEUROSCIENCE

A Dual-Use Dilemma

Charlotte Walsh*

Neuroscience is rapidly increasing comprehension of the human brain. This paper considers its prospective relevance to youth justice policy. In the United States, neuroscientific findings have been co-opted as a liberalizing tool. The parallel lure of these studies in the United Kingdom is foreseeable, given how they plausibly mesh with arguments in support of raising the age of criminal responsibility, along with bolstering policies of de-carceration and diversion. However, caution should be exercised: neuroscience can be used in ways that both contribute to human flourishing, along with potentially diminishing it. In science, this is a well recognized quandary, referred to as the dual-use dilemma. More problematically, neuroscience could be utilized to 'prove' poor parenting, to 'predict' future criminality.

Keywords: neuroscience, youth justice, criminal responsibility, risk

Youth Justice and Neuroscience

The nascent field of neuroscience is rapidly accelerating understanding of that most intricate of organs—the anthropoid brain: as such, it has the potential to fundamentally shift human self-conception. Neuroscientific research has been facilitated by the development of Magnetic Resonance Imaging (MRI), a means by which the structure of the brain can be depicted, and by functional Magnetic Resonance Imaging (fMRI), which reveals how this configuration is used, 'the dynamic electrical flux through which the living brain conducts its millisecond by millisecond business' (Rose in Rees and Rose 2004: 4). These non-invasive tools have enabled neuroscientists to study the brain in an unprecedented fashion.

Neuroscientists posit a direct correlation between brain structure, brain activity and behaviour; thus, it is apparent why their findings are of interest to the legal system and to criminal justice policy makers. To date, such curiosity has been most discernible in the United States, though, as will be demonstrated, neuroscience is creeping into both policy and media discourse in England and Wales. Given the history of political transfer between these two nations—particularly when it comes to issues of social control (cf. Garland 2001)—pre-empting the emergence of such ideas in this country appears prudent. Neuroscience is 'sitting at the courtroom door' and law and policy makers of the (near) future will need to assimilate its findings (Garland and Frankel in Farahany 2009: 158).

This paper considers the prospective relevance of the new brain sciences to youth justice policy. Drawing upon comparative research from the United States, it illustrates how neuroscientific findings have there been co-opted as a liberalizing tool, used to help

* School of Law, University of Leicester, University Road, Leicester, LE1 7RH, UK; ckw2@le.ac.uk.

soften a system that had become increasingly adult-erated. The lure of a parallel reliance on these studies in England and Wales is foreseeable, given how neatly these discoveries can be made to mesh with arguments in support of raising the age of criminal responsibility, reinstating the principle of doli incapax (or something akin to it) and the advocation of de-carceration, alongside seemingly vindicating the philosophy of diversion.

However, caution should be exercised before embracing these lines of argument too enthusiastically: as with all tools, neuroscience can be used in ways that both contribute to human flourishing, along with potentially diminishing it. In science, this is a well recognized quandary, referred to as the dual-use dilemma, arising 'when the same scientific work can be used to do good or be misused and it is unclear how to prevent misuse without foregoing beneficial applications' (Parliamentary Office of Science and Technology 2009: 1). One likely utilization is as a predictor of risk of future criminality, hypothetically adding another dimension to the barrage of actuarial devices to which the children of the most marginalized social groups are already subjected. Further, advanced understanding of how brains work—or belief in having acquired such—historically prefigures the generation of techniques to manipulate these machinations. Accordingly, the advance of neuroscience will almost inevitably be closely followed by the rise of neurotreatments; indeed, such developments are underway. These come accompanied by a plethora of ethical issues in any arena, but perhaps particularly acutely in the sphere of youth justice.

A Neuroscientific Perspective on the Young Brain

Developmental neuroscience focuses on the structural and functional changes that occur within the brain as it matures. Scanning adolescent brains has (perhaps unsurprisingly) shown them to be under-developed when contrasted with adults. Whilst the overall volume of the brain remains constant from the toddler stage, significant adjustments and refinements are made in relation to its connectivity. There are two primary ways in which this occurs: myelination and synaptic pruning. Myelination refers to the insulation of the 'wires' of the brain—a process that increases the speed via which messages can travel from one region to another. Synaptic pruning is the honing down of connectivity in the brain: only those connections that are used are retained, culminating in an escalation of efficiency in the cortex over time. These two processes lead to an increase in white matter and a decrease in grey matter—most notably in the prefrontal cortex—as the young brain matures: 'The prefrontal cortex is of paramount interest in adolescent development largely because of its well-understood function with regard to cognitive, social and emotional processes in adulthood' (Baird and Fuselgang 2004: 1801).

Many of the 'discoveries' of neuroscience have long seemed apparent from a behavioural perspective, with research often serving to augment theories that have already been advanced, either through 'common sense', in psychology, or sociology, for instance: '. . . the slow maturation process that plays out in the social context is mirrored by a slow maturation process at the neural level' (Aronson 2009: 917). Importantly, much of what is 'known' from neuroscience is speculative; there is still a paucity of research directly linking brain development with changes in behaviour: however, when MRI scans are twinned with behavioural observation, the assumptive leaps are not so vast as to be unconvincing.

Growing appreciation that the human brain is not fully formed until people are in their twenties contributes to a better understanding of the aspects of adolescent behaviour that most often bring them to the attention of the youth justice system; crucially, it suggests that young people may have limited or impaired capacity to behave otherwise. Kambam and Thompson offer an up-to-date review of the neuroscientific research into decision-making capacities in young people, as well as relating such findings to the youth justice system. Whilst their work is United States-centred, its messages transfer. One of the key distinctions they draw is between cognition (generally present in adolescents) and judgment (often considered to be lacking), with the latter taken to include the ability to 'imagine alternative courses of action, think of potential consequences of these hypothetical actions, estimate probabilities of their occurrence, weigh desirability in accordance with one's preferences, and engage in comparative deliberations about alternatives and consequences' (Kambam and Thompson 2009: 174).

Structural and functional variations in adolescent brains are attributed with underpinning these judgment-based deficiencies. To a far greater extent than adults, young people process information through the amygdala, part of the ancient mammalian system layered within the brain, associated with the emotions. Conversely, adults are much more likely to filter corresponding data through the prefrontal cortex, the most recently evolved part of the brain, associated with rational thought and impulse control: 'To the extent that the prefrontal lobe operates like the brakes on a car, most adolescents would be driving cars with very thin brake shoes. It is not that the entire mechanism is missing, but that it is not operating at full strength' (Rutherford 2002: 727). Absence of the 'gut instinct' that adults have—that instantaneous inner synthesis of previous escapades and their outcomes—also feeds into this process: 'Teens' emotional lives, and their patterns of criminal behavior, cannot be reduced to the relative strength of amygdala response; they are shaped by a rich set of factors including social goals and expectations, as well as relative lack of life experience' (Maroney 2009: 164).

The most notable use of developmental neuroscience in the field of youth justice to date was in the US case of Roper v. Simmons (125 S. Ct. 1183 2005)—a judgment that ended the practice whereby young people could be executed for capital crimes they had committed as juveniles upon attaining adulthood. Neuroscientific arguments predominated in the oral and written arguments of defence counsel (O'Mahony 2009: 106–7), along with being central to a now famous Amicus Curiae brief submitted to the court by an amalgamation of medical and psychiatric organizations, stating '[t]o a degree never before understood, scientists can now demonstrate that adolescents are immature not only to the observer's naked eye, but in the very fibers of their brains' (American Medical Association 2004: 10). Whilst finding in favour of the defence and ruling the death penalty in such circumstances to be unconstitutional, it is worth noting that the court did not refer specifically to the new brain research in passing judgment.

Developmental Neuroscience: A Liberalizing Tool?

The US system of youth justice is (in general) substantially more punitive than that operating in England and Wales—a fact that probably (at least partially) accounts for the vigour with which defence attorneys there have embraced this emergent science. However, whilst less pronounced, the youth justice system in England and Wales has also been permeated by a creeping adult-eration, the 'neo-liberal responsibilizing mentality

in which the protection historically afforded to children is rapidly dissolving', resulting in a 'resurgent authoritarianism' (Muncie 2008: 108). Developmental neuroscience is potentially supportive of calls for a return to the style of youth justice that dominated in the 1980s, still popular amongst many academics and practitioners (cf. Field 2007).

Neuroscience could feasibly be conscripted in defence of a diversionary model of youth justice, one in which all but the most serious of young offenders are routed out of the system due to a belief that their offending is likely to be adolescence-limited. Explicit rejection of this diversionary template underpinned the former Labour Government's youth justice philosophy: 'For too long we have assumed that young offenders will grow out of their offending if left to themselves' (Home Office 1997: 1). This repudiation informed their 'nip it in the bud' model, a zero tolerance approach to anti-social behaviour, re-conceptualized as a likely precursor to more serious offending. However, neuroscientific research is far more congruent with the former approach, reconfiguring the bulk of youth crime as developmental in nature and thus—by definition—transient:

> Changes in the socio-emotional system, as a result of pubertal changes, lead to increased reward-seeking (i.e., increased risk-taking) behaviors. Concomitantly, more gradual changes in the cognitive-control system improve adolescents' self-regulation, leading to decreased risk-taking behaviors … The 'time gap' caused by the abrupt increase in reward-seeking behaviors and the more gradual increase in the capacity for self-regulation leaves middle adolescence 'exposed'. (Kambam and Thompson 2009: 176)

None of this denies the very real problem of youth crime, with young people overly represented in the criminal statistics: in 2008, 88,400 young people were found guilty of an offence (Ministry of Justice 2010*a*: 57), 58,800 for one that was indictable (46). Seventeen is the peak age of offending for both sexes, with males of that age offending at a rate of 3,675 per 100,000 of the population and females at 485 (66). The latest re-offending rate for young people stands at 37 per cent (Ministry of Justice 2010*b*). Further, self-report studies reveal that many more young people engage in criminalized activities for which they are not processed (though these are often trivial in nature) (Roe and Ashe 2008: 6). In spite of these high figures, if most crime is likely to be adolescence-limited, even from a utilitarian perspective, it arguably makes sense to divert young people, given the potential for contact with the youth justice system—however well intentioned—to 'freeze' youths in the criminal role (cf. Becker 1963).

Crime statistics thus reveal that many young people are perfectly capable of carrying out the actus reus of an offence. A related and recurring question—one to which neuroscience can perhaps help contribute an answer—is whether or not they have the requisite mens rea, the capacity to formulate intent. Although the youth justice system was established upon the premise that young people have a lower level of responsibility, rendering them less culpable for their actions, this presupposition has been losing power in recent years. This shift is evident in political discourse: 'An excuse culture has developed within the youth justice system. It … too often excuses the young offenders before it, implying that they cannot help their behaviour' (Home Office 1997: 1). Commenting upon the US system, but with clear parallels, Rutherford observes:

> Age no longer seems to be a measure of how guileless or immature a child is. Instead, age is seen as a subterfuge for malicious behaviour. As the boundary between adults and children is pushed to ever

younger ages, we are virtually eradicating the concept of adolescence. Ironically, this shift is occurring just as new neuroscience research is demonstrating remarkable differences between adolescent and adult brains. (Rutherford 2002: 715)

Neuroscientific findings help reaffirm the theoretical assumptions upon which the youth justice system was built. This issue segues into an ongoing perennial dispute—the issue of what the age of criminal responsibility should be. This threshold has far-reaching consequences, functioning as the dividing line between those who are criminalized and those who are responded to as welfare cases. Pitched at ten years, the English age of criminal responsibility is considerably lower than the Western European norm of 14—a fact that has attracted repeated criticism from the United Nations Committee on the Rights of the Child (UNCRC 2008: 19). The legal attribution of criminal responsibility should be based on capacity, which the former government were convinced ten-year-olds possess: 'Children above the age of responsibility are generally mature enough to be accountable for their actions and the law should recognize this' (Home Office 1997: 2).

This bold assertion looks increasingly questionable in light of neuroscientific research. With its pictorial evidence that the human brain is not fully formed until the third decade of life—the young adolescent brain being particularly compromised—developmental neuroscience lends compelling support to the argument that the age of criminal responsibility in England and Wales should be raised, and by some considerable margin. Indeed, it is peculiar that it should appear necessary to appropriate tools such as neuroscience to make the point that ten-year-olds are not fully responsible: this seems apparent, acknowledged in the fact that they are not allowed to vote, buy cigarettes or alcohol, get married without parental consent, or serve on a jury until they are 18; drive a car on the road until they attain 17; get married with parental consent, leave school or have sexual intercourse before they are 16; or get a part-time job until they are 13.

Neuroscience could further be used in support of an argument for the reinstatement of doli incapax—or something akin to it—an ancient common law rebuttable presumption that latterly meant that children aged between ten and 13 years of age were presumed not to be capable of knowing the difference between right and wrong and thus not criminally responsible, unless there was evidence to the contrary. The former Labour Government dispensed with this presumption on the grounds that it was 'contrary to common sense' (Home Office 1997: 12). However, neuroscience confirms that development takes place on a spectrum, unreflective of the stark binary approach incorporated into any system establishing a categorical cut-off point.

Perhaps in the future, a system similar to that of doli incapax could be reintroduced, with psychological tests bolstered with fMRI scanning of young people for the appropriate level of understanding on a case-by-case basis? Whilst the high cost of testing almost certainly rules out such an approach at this juncture, the price of technologies typically falls dramatically as they become more established. Is this potential for highly individualized justice something to strive towards or is it problematic to delve too deeply into the fiction that all (except for the most compromised) brains are equal in the eyes of the law? The complexity of assessing capacity should not be under-estimated. Baird and Fuselgang emphasize that cognitive development is nonlinear: 'An adolescent may demonstrate an adult-like ability to reason abstractly, and act in accordance with this

advanced cognition on Monday, but behave impulsively and irrationally on Thursday' (Baird and Fuselgang 2004: 1803).

Further, it is worth remembering that it is not simply a case of looking inside a young person's cranium to 'see' whether or not their capacity is impaired sufficient to negate mens rea. As Maroney emphasizes in his (sceptical) paper on this subject, there is 'a disconnect between scientific findings and the questions asked by legal doctrine' (Maroney 2009: 93). This is particularly so in relation to the concept of mens rea: '. . . contemporary analysis of mens rea asks only whether a defendant desired or knew that a result would obtain, while neuroscientific arguments invite a focus on substantive irrationality notwithstanding specific intent' (Maroney 2009: 94). Importantly, there are questions that neuroscience cannot answer, merely inform:

> Relative deficiencies do not necessarily take juveniles below a legal threshold but may instead show that they exceed it by a lower margin. Where to set that threshold, relative to juvenile deficits is, at its core, a moral and legal determination, not a scientific one. (Maroney 2009: 151)

Given that the notion of legal responsibility is itself a construct, it is unsurprising that issues of whom is seen to be criminally accountable—and how society chooses to deal with them—cannot be wholly decided on the basis of hard science (cf. Gazanigga 2005). Accordingly, it is perhaps unlikely that any liberalizing changes to the age of criminal responsibility will be instigated in the current social and political context: the appropriate age of criminal responsibility remains a highly contentious issue in England and Wales, with discussion of it seemingly inextricably yoked to the most serious and rarest of crimes, child on child murders, most notably the 1993 murder of toddler James Bulger by ten-year-olds Robert Thompson and Jon Venables. When Children's Commissioner Maggie Atkinson proposed the threshold be raised, the resulting outcry—heightened by the recent recall of Jon Venables to prison on licence—led to her feeling compelled to apologize to Denise Fergus, James Bulger's mother (Weaver 2010). The issue has been headline news again with the conviction of two ten-year-old boys for attempted rape of an eight-year-old girl (cf. Macdonald 2010). It will be interesting to see how the new coalition government deal with this, given that the Conservatives have rejected calls for the age of criminal responsibility to be raised, whilst the Liberals have supported them (Hirsch 2010).

Even if the argument that developmental neuroscience supports raising the age of criminal responsibility is not accepted, it could still potentially be used as part of an assessment of whether or not—on a case-by-case basis—young people are fit to plead: currently, such examinations only take place where young people are very obviously impaired, disturbed or severely learning-disabled; '[h]owever the wider possibility that most child defendants may not be fit to plead to charges by dint of their . . . developmental immaturity and impaired judgement is seldom considered' (Royal College of Psychiatrists 2006: 45).

Further, where young people are deemed fit to plead, neuroscientific findings could be used to mitigate, indicating a lesser level of culpability:

> Under standard criminal law doctrine, actors whose decision-making capacities are impaired—by mental illness or retardation, for example—are deemed less blameworthy than typical offenders .... Considerable evidence supports the conclusion that children and adolescents are less capable decision-makers than adults in ways that are relevant to their criminal choices. (Scott and Steinberg 2008*a*: 20)

Whilst youth can act as a mitigating factor in that the penalties imposed by the youth court are (generally) less punitive than those in the adult court, this ideal could be implemented to a greater degree. The fact that young people appear to have impaired capacity and thus (arguably) reduced criminal accountability is heightened by the reality that many of the children who appear before the youth court have histories of abuse and/or neglect, also confirmed by neuroscience as adversely affecting brain development. As was acknowledged in the Amicus Curiae brief submitted in Roper, 'Adolescents cannot be expected to transcend their own psychological or biological capacities. However, an adolescent who has suffered brain trauma, a dysfunctional family life, violence, or abuse cannot be presumed to operate even at standard levels for adolescents' (American Medical Association 2004: 20).

In the most serious cases—namely those involving murder—neuroscience may support reducing that charge to one of manslaughter through the mechanism of diminished responsibility. The question is whether young people in such circumstances have anything approaching a full comprehension of what it means to kill, of the implications of permanently ending a life. In 2006, the Law Commission reviewed diminished responsibility and one of the conclusions they came to was that this concept should be expanded to incorporate the notion of 'developmental immaturity':

> [E]xperts may find it impossible to distinguish between the impact on a defendant's mental functioning of developmental immaturity, and the impact on that functioning of a mental abnormality. To force experts—as the law currently does—to assess the impact of the latter, whilst disregarding the effect of the former, is wholly unrealistic and unfair. (Law Commission 2006: 106)

The Law Commission did not contend that no children or young people could justifiably be found guilty of the full charge of murder, but rather that the possibility that their youth prevented this from being fair should be fully considered by the court under the banner of diminished responsibility. They illustrated this argument with reference to the possibility of poor frontal lobe development, demonstrating how neuroscientific research is edging into such documentation. The Commission acknowledged that their proposal would in actuality affect very few young people, given that this group—particularly those in the younger age bracket—rarely commit murder: 'However, for the few cases that do meet the criteria we believe our recommendation meets requirements of justice recognized as fundamental in civilized legal systems across the world' (Law Commission 2006: 108). Commenting in favour of this recommendation, the Standing Committee on Youth Justice remarked:

> An adult of 40 years with the emotional maturity of a 10 year old . . . can claim diminished responsibility if they are diagnosed as having a 'recognized medical condition', yet a 10 year old without such a recognized condition cannot succeed with the plea as their development has not been arrested, it is simply ongoing. The fact that children develop consequential reasoning as they grow older is disregarded and in this way, more is expected of children than adults. (SCYJ 2009: 2)

However, the Law Commission's proposal was not incorporated into the reformulation of the test for diminished responsibility, which still demands that the abnormality of mental functioning necessary to trigger this partial defence arises from a recognized medical condition (Coroners and Justice Act 2009, s. 52). Aside from this requirement, it is striking how closely the description of what constitutes diminished responsibility correlates with the findings of neuroscience in relation to young people's capacity, with

the impairment having to affect the defendant's ability 'to understand the nature of the . . . conduct; to form a rational judgment; and, to exercise self-control'. Were the Labour Government justified in their rejection of this comparison of the state of adolescence with the conditions that give rise to diminished responsibility? Aronson cautions against such an approach:

> [I]f adolescence were truly a significant ongoing condition of development (in the sense of a serious, well-defined, diagnosable medical problem like bipolar disorder) that seriously impaired decision-making in all individuals all over the world, we would be in serious trouble. Marauding youths would be killing each other, their teachers, their elders, and their parents—and civilization as we know it would probably come to an end. The fact that it has not, and that when adolescents do commit heinous crimes it is almost always considered newsworthy, suggests that factors other than myelination and pruning are equally, if not more important than biology in determining why some subset of adolescents commit violent crimes. (Aronson 2009: 930)

This view seems to be substantiated: self-report surveys reveal the majority of young people to be law-abiding, illustrating that it takes more than brain immaturity alone to result in criminalized behaviour (Roe and Ashe 2008: 6). Yet, the question remains: how to deal justly with those who commit serious offences whilst still developmentally immature, set against a background of abuse, trauma and neglect?

Relatedly, neuroscience could influence penological responses to youth offending, potentially boosting arguments in favour of large-scale de-carceration. Proportionate punishment—crucial to the legitimacy of a penological system—must reflect not only the level of harm caused, but also the culpability of the individual (cf. Ashworth 2005): fMRI scans suggest that blameworthiness is lower in young people, as their capacity to make the 'right' decision is impaired. Compounding the possibility of injustice—and adding further support to abolitionist arguments—brain research highlights how crucial adolescence is as a developmental period, meaning that imprisonment is likely to be detrimental, in many ways, not least neurologically: 'Severe disruption of this process may impede, or completely sidetrack, the transition to productive adulthood' (Scott and Steinberg 2008*b*: 15).

Under the previous Labour administration, it has become possible to imprison children at a much younger age—dropping from 15 years of age to 12 with the introduction of the Detention and Training Order (now contained within the Powers of Criminal Courts (Sentencing) Act 2000, s. 100)—for offences that fall far short of the most heinous. In 2007, 513 children below the age of 14 were imprisoned, a significant number of whom were neither violent nor dangerous (Barnados 2009: 3). Neuroscientific research affords an extra layer of evidence in support of more progressive options, such as intensive fostering (cf. Hollingsworth 2008).

Further, by exposing limitations in their abstract thinking, the neuroscientific research sheds some light on why it can be difficult to deter adolescent offending using traditional methods: a more sophisticated understanding of what is going on inside young minds could help in devising more creative responses to offending. An as yet unexplored but potentially fertile ground for future research is the contribution developmental neuroscience could make in relation to initiatives rooted in restorative justice. Restorative justice looks set to become an increasingly important aspect of youth justice policy, with further development of such initiatives flagged up in the Liberal Democrat Manifesto (Liberal Democrats 2010: 75). The potential application of neuroscientific

discoveries to building restorative justice-based strategies emphasizes the point that responses to crime crafted with an awareness of their neurological implications need not be medicalized in nature: brains can be moulded (and re-moulded) by social experience.

Alongside issues of culpability and penology, whether or not the system is procedurally fair is also potentially impacted by young people's diminished capacity. This issue permeates the youth justice process, from youths' understanding of charges and their potential consequences, their competency to confess or to agree to plea bargains, through to understanding and participating in the trial process. The issues become starker in cases in which either the alleged offence is very serious or in which there is an adult co-defendant, resulting in diversion from the youth to the adult court, where it becomes a public and media event. This is a practice for which England has already been criticized by the European Court of Human Rights in the case of *T and V* v. *UK* ((1999) 30 EHRR 121), in which it was found to be a breach of the 11-year-old defendants' right to a fair trial, as protected under Art. 6 of the European Convention on Human Rights (ECHR). Whilst a Practice Direction issued by the Lord Chief Justice in the wake of this decision sought to soften the intimidatory effect of the adult criminal court on child defendants—by, for instance, simplifying the language used and incorporating regular breaks—the controversial practice of rerouting to the adult court has been retained (Lord Chief Justice 2000).

It has recently been under scrutiny once again in the context of the trial of two ten-year-olds for rape, held at the Old Bailey, with former Director of Public Prosecutions Ken Macdonald commenting 'Put bluntly, we've been been witnessing a spectacle that has no place in an intelligent society: very young children do not belong in adult criminal courts. They rarely belong in criminal courts at all' (Macdonald 2010). Neuroscientific research on youth capacity could support arguments for curtailing redirection. The Royal College of Psychiatrists endorse this:

> [T]he trial of children and young people within a full adult context is inappropriate in relation to their developmental immaturity and cognitive limitations and . . . a more appropriate youth court context should be sought in all cases to ensure that the child's human rights are not contravened and that the child is able to participate effectively in the trial process. (Royal College of Psychiatrists 2006: 8)

The Prison Reform Trust recently carried out an investigation into this practice and were also firmly of the view that it should be abolished, replaced instead with a new form of youth court involving trial by jury. Whilst not part of the Trust's proposal, a pertinent question is whether this jury ought to be made up of young people to fulfil the expectation that defendants be tried by a jury of their peers. If youths are deemed old enough to be criminally responsible, then it seems at least arguable that they are responsible enough to serve on a jury. Where relevant, should the standard they then apply be that of the 'reasonable adolescent' as distinct from the (adult) 'reasonable person', more fairly reflective of the 'developmental chaos of a teenager's brain' (Aronson 2009: 920)? Neuroscientific research potentially fortifies such a proposition. More radically still, it could support the view that young people should not be dealt with via the adversarial system at all, but rather through the family courts, adopting a purely welfare-based approach. Coming full circle, this could be achieved through the simple mechanism of raising the age of criminal responsibility.

In what other ways might neuroscience influence youth justice policy? The second part of this paper examines its potential contribution in relation to parenting and to risk prediction. As will be elucidated, the possibility of such research being used to detrimental effect rises steeply in these spheres.

The Neuroscience of Parenting

A belief that 'poor parenting' is criminogenic was central to the former Labour administration's theorizing on youth justice. Translating their ideology into policy, they introduced the Parenting Order, a combination of parenting classes and requirements to control one's child, backed up by threat of criminal sanctions for failure to comply (Crime and Disorder Act 1998, ss. 8–10). These orders were initially restricted to those parents whose children had offended but have since been considerably broadened to include the parents of those children deemed to have behaved anti-socially (not necessarily criminally) (Anti-Social Behaviour Act 2003, s. 26). Thus, embedded in the law is an inclination to use the justice system to intervene in the parenting sphere, along with an established focus on pre-crime. It is salient to consider how neuroscience could be slotted into this context, potentially generating another layer of control in a system that has already been described as 'an extension of punitiveness underpinned by stigmatizing and pathologizing constructions of working class families' (Goldson and Jamieson 2002: 82).

As is so often the case with the relevant neuroscientific research, it does not introduce an entirely new argument, but rather can be incorporated to shore up positions in an age-old debate. Goldson and Jamieson trace the history of positing parents as a significant causal factor in youth crime from the Victorian Age up to the present day. For instance, they discuss the mid-twentieth-century work of Bowlby, who found 'that "maternal deprivation" led to the development of "affectionless characters" with a propensity to commit criminal offences in later years' (Goldson and Jamieson 2002: 84). Emerging neuroscientific research tells a similar story, using a different discourse, illustrating the tale with brightly coloured pictures of young people's brains. Crucially, this neuroscientific research is increasingly pointing towards the conclusion that by the time current interventions like the Parenting Order are initiated, much of the damage has already been done:

> During the first 2 years of postnatal life the right side of the brain is in a critical growth period. Its normal development depends on healthy attachment. The infant's relationship with its primary caregiver has a direct effect on the wiring of neural circuits in the developing brain. (Heide and Solomon 2006: 223)

These concerns are emerging in policy-shaping discourse. A recent review conducted by the Youth Justice Board, focusing on the backgrounds of abuse and neglect in the lives of young people held in custody, included a section on 'Neurological Impacts', noting that 'A number of researchers have concluded that there are lasting biological effects and neurobiological impacts of child maltreatment that can be linked to offending behaviour' (Youth Justice Board 2008: 32). Foreshadowing where this shift in attention may lead, this report contains a section on 'Psycho-Biological Treatments' (Youth Justice Board 2008: 43).

As a second illustration, Breakthrough Britain: The Next Generation—a 2008 report from Conservative think tank, The Centre for Social Justice—features numerous references to neuroscience. Again, emphasized here is the fact that the time by which interventions are triggered is typically too late: 'Policy is currently focused on dealing with the consequences of early adversity .... The most effective intervention strategy . . . requires helping parents to get it right at the antenatal, postnatal and infant stages' (Centre for Social Justice 2008: 13). The relationship between carer and child is seen as being of paramount importance:

> [I]n the early years, the brain is still forming. Due to this period of rapid brain development, adult-infant interaction can affect the architecture and long-term chemical balance in a child's brain, for better or worse. Key stress response systems, and foundational systems for emotional regulation, kindness, empathy and concern are very immature at birth. How they will unfold is dramatically affected by the infant's relational experiences. (Centre for Social Justice 2008: 14–15).

The paper discusses how being raised in the context of a stressful or impoverished relationship—one that involves continuous criticism and verbal abuse, for instance—can actually damage brain tissue, due to the 'toxic levels of stress hormones "cascading" over the brain' (Centre for Social Justice 2008: 43). The Centre explores the crucial concept of epigenetics, the increasing understanding that how genes are expressed is highly dependent upon environmental—including relational—factors (Centre for Social Justice 2008: 44). The claim is made herein that 'Parental beliefs about what constitutes good parenting . . . may be significantly at odds with . . . brain science research' (Centre for Social Justice 2008: 36). There are some very interesting and controversial ideas packed within this seemingly simple statement. In a departure from postmodern relativism, the potential for brain pictures to be used to (allegedly) definitively illustrate which parenting has 'good' effects and which 'bad' ones on the infant brain carries with it the notion that science can be used to answer what have traditionally been seen as moral questions, exempt from the empirical realm (cf. Harris 2010). The Centre for Social Justice pitches the concept of the 'Neuron Footprint' as an idea for a media campaign:

> In the same way that policy and society now support the notion that an individual must take responsibility for his or her contribution to global environmental problems, the campaign we envisage needs to encourage, help and qualify every contribution to neuronal pathway construction and therefore brain development in our young children. Thus we suggest appropriating the concept of a carbon footprint to offer a simple way to understand the complexity of the neuroscientific message. (Centre for Social Justice 2008: 151)

Indeed, a version of the neuroscientific research into the damage that can be caused to the infant brain by being brought up in an abusive or neglectful environment is already emerging in British media discourse. Writing in The Telegraph on the Edlington brothers jailed for torturing two young boys, Garner comments 'These are not normal children behaving badly, but children whose brains have formed in response to cruel and unusual treatment. They may be incapable of empathy and highly reactive to violence' (Garner 2009). Revisiting the *Bulger* case in the New Statesman in 2010, Hinsliff discusses the fact that neuroscientific developments since this crime took place in the early 1990s have profoundly shifted understanding of what creates damaged children:

> [T]he infant mind is not born but made, building itself like a muscle over the first two years of life as parental attention triggers responses in the brain. Put simply, love builds a child's ability to relate to others. Love withheld creates a dangerous vacuum. A propensity to violence, or at least to uncontrollable emotions, may be hard-wired into abused children. (Hinsliff 2010)

Or consider Palmer's comments, again in *The Telegraph:*

> The physical composition of our brains is fundamentally affected by what happens in the first three years of life .... The idea that if things have gone sufficiently wrong with your earliest upbringing, you will be constitutionally unable to choose to do the right things later on is profoundly unsettling—partly because it undermines our belief in free will. But it is increasingly well-supported by the scientific evidence. (Palmer 2010)

Where might all this lead? Prominent children's charities are starting to take an interest in this sphere. Kid's Company are currently collaborating with King's College London to investigate the brain changes in children who have suffered significant trauma; looking to the future, this research also seeks to establish whether surrogate parenting and loving care can reverse ill-effects. In an interesting attempt to bring the neuroscientific message to a wider audience, their fundraising campaign invites the public to donate five pounds to buy a virtual neuron in a one-million-neuron virtual brain (Cassidy 2010). Further, Martin Narey—Chief Executive of Barnados—has controversially expressed the view that more babies should be removed from their mothers at birth before such irreparable harm is inflicted (cf. McVeigh 2009). There is an argument to be made—given the increasing evidence of foetal alcohol spectrum disorder—that even intervening at this early stage is, to a certain extent, too late (cf. Anonymous 2009).

The Neuroscience of Risk

This growing belief in the need for early intervention presages the point at which neuroscience and youth justice seem most likely to intersect: risk prediction. Most notably, this science has the potential to be used in the diagnosis of conduct disorders, associated with criminal risk: 'Conduct disorder in children is best described as a pattern of repetitive behaviour . . . where the rights of others or the social norms are violated' (Baird in Farahany 2009: 115). Immediately from this definition, the ethical difficulties inherent in pathologizing deviation from social standards begin to emerge. Personalities are seen as becoming 'disordered' 'through a multifaceted matrix of interactions between somatic and societal factors—genes and environment—which act together and upon each other in complex ways that shape the brain and result in personality disorder' (Pickersgill 2009: 51). As indicated above, abusive parenting is one of the factors identified in the development of certain conduct disorders, such as where callous and unemotional traits are displayed. These characteristics can be crudely conceptualized as a sort of 'switching off' of empathy, both for oneself and for others: 'Failing to experience extant physiological arousal in the face of danger or stress or emotions has a certain appeal in a world that seems stressed and afraid all the time' (Shirtcliff *et al.* 2009: 163).

Whilst, as noted, much youth offending is adolescence-limited, some is not: where offending 'sticks', many see it as being related to the presence of such conduct disorders. Frick and Marsee in Patrick (2006), for instance, point to callous and unemotional traits as being particularly salient when predicting which young people will persist with

offending into adulthood. Such assertions—which amount to a claim that those who continue to offend are of a different 'type'—are controversial (cf. Skardhamar 2010). However, this science feeds into the longitudinal research—such as that carried out by Farrington and West (1993)—that has been so influential in recent youth justice policy, the idea that there is a hardcore (approximately 5 per cent) of males who are physically aggressive in childhood and remain so into later life: this small group are seen to be disproportionately responsible for offending, including serious transgressions (cf. Hales *et al.* 2009). Tackling those who will not simply grow out of crime—persistent offenders—can be seen as the Holy Grail of youth justice policy. Labour's Youth Crime Action Plan 2008, for instance, identified the 110,000 families whose children were thought to be a risk (HM Government 2008: 7).

Given that neuroimaging is purported to reveal biomarkers for conduct disorders (Moffitt 2002: 10), a future in which neuroscience plays a role both in isolating this alleged subgroup and identifying how to prevent their predicted criminality is not inconceivable, particularly as a focus on risk is currently the dominant discourse in youth justice policy (O'Mahony 2009). Thus, neuroscientific research could potentially add another dimension to risk prediction, enabling social control to permeate to an even deeper level. One issue with current predictive tools is that whilst they exhibit a theoretic appreciation of the multi-causal nature of criminalized behaviour, practically they frequently culminate in individualized responses: neuroscience risks taking this propensity to focus on the individual to new depths, delving into their craniums. The potential threat to human rights of incorporating a neuroscientific element into actuarial instruments (already utilitarian at heart) are apparent, most notably to Art. 8 of the ECHR, the right to privacy, and to Art. 9, the right to freedom of thought. Further, this style of pre-emptive intervention fits ill with the diversionary ideals of the United Nations Convention on the Rights of the Child 1989. An expanded concept of 'cognitive liberty', defining the limits of state power in relation to the individual, has been advanced as necessary in the face of neuroscientific developments that have the potential both to view—and ultimately to alter—neural pathways (cf. Boire 2000).

One particular conduct disorder, psychopathy—as (controversially) defined by Hare's Checklist (Hare 1991)—is considered highly relevant in the context of the adult criminal justice system:

> Psychopathy is a serious personality disorder characterized by emotional and behavioural abnormalities. The disorder is present in approximately 15% to 20% of criminal offenders and is one of the strongest predictors of violent recidivism in prisoners. Psychopaths tend to lack feelings of empathy, guilt, and remorse; they often lack fear of punishment, are impulsive, have difficulty regulating their emotions, and display antisocial and violent behaviour. (Glenn and Raine 2008: 163)

Although psychopathy is, by its constructed definition, an adult disorder, Hare has devised a youth version of his checklist to help with predicting where conduct disorders in young people may develop into this condition (Forth *et al.* 2003). Neuroscience is increasingly being co-opted to facilitate prognoses due to a growing belief that there are a number of distinguishable structural and functional differences in the brain that can be linked with psychopathy. For instance, in their review of the literature on the subject, Glenn and Raine (2008) discuss a neurogenetic propensity to the disorder, along with differences in both the make-up of the pre-frontal cortex and with the functioning of the amygdala.

The complexity of mapping the neural architecture of psychopathy (even assuming it exists) should not be under-estimated: 'It is becomingly increasingly clear that understanding the neurobiology of psychopathy goes far beyond identifying brain regions that may be involved. Genetics, neurotransmitters, and hormones all impact the functioning of brain structures and the connectivity between them' (Glenn and Raine 2008: 471). As daunting as this project is, the potential pay-offs are considered to be huge: 'While psychopathy has thus far been found to be intransigent to treatment attempts, an understanding of the neural substrates of psychopathy will likely be a major contributor to future treatment and prevention' (Glenn and Raine 2008: 463). Pickersgill's research wherein he interviewed the top working neuroscientists describes many of them as advocating intervention with 'fledgling psychopaths' (Pickersgill 2009: 53). Vizard serves as an example of this thinking:

> [T]he plasticity of brain development over the first decades of life may . . . mean that personality (and by extrapolation personality disorder) has the ability to change and that it is not set in stone by late adolescence. If this is the case, there may be grounds for optimism in terms of early identification of high-risk/high-harm children and therapeutic intervention to remove them from adverse developmental trajectories. (Vizard 2008: 393)

Undeniably, all prediction involving systems as complex (and fundamentally unpredictable) as human beings carries with it the unavoidable problem of identifying false positives, along with the concomitant danger of the adverse effects of labelling: labels do not come with much higher potential for detriment than 'psychopath'. This inability to infallibly identify those—and only those—who will go on to seriously offend will remain, regardless of advances in knowledge. If (potentially false) identification of an individual as a risk results in their receiving a neurotreatment, the ethical issues are magnified.

Writing about this situation in the United States, Jane Rutherford describes juvenile justice as being 'caught between "The Exorcist" and "A Clockwork Orange", with children who offend being portrayed as either demonic or as potential subjects for reprogamming' (Rutherford 2002). Therapeutic interventions that seek to 're-wire' the brain are not necessarily drug-based: as demonstrated in the literature on the development of conduct disorders, environmental factors are equally capable of shaping brain development. However, the tendency to pathologize and then to respond to behaviour pharmacologically is already evident in the enthusiastic prescription of Ritalin to children constructed as having ADHD (cf. Cooper in Rees and Rose 2004: 249–62). Further, the incorporation of treatment into sentencing is well established in, for instance, the area of drug policy. US trials that attempt to predict which 'conduct disordered' young people will develop into problematic adults—and how to treat them—are already underway (Sevecke *et al.* 2009: 594). Again, this constitutes a classic dual-use dilemma. There may be enormous gains to be had here, both for the individual concerned and for society, but there is also the potential to cause unimaginable harm:

> The new biologism could be linked, in a post-Foucauldian nightmare vision, to the disciplinary expansion of 'bio-power' within a public health regime that combines the identification of violence-prone individuals with their treatment and control. Under this regime, adults, children and even the unborn could be screened for risk of a violent predisposition. Those identified as being at risk of or having committed acts of violence could be 'helped', medically or therapeutically treated or re-educated out of violent behaviour. This could have a political appeal to welfare minimalists wanting to make savings

for the public purse because resources could be targeted towards those sectors of the population identified as being most 'at risk'. (Radford in Rees and Rose 2004: 143)

Explaining criminalized behaviour through science has a murky history and there is well justified reticence towards what can cynically be conceptualized as modern phrenology. As with any nascent science, many initial findings may turn out to be wrong. A further complicating issue is the potential corruption of the literature that can take place when it is translated for the purposes of policy integration; any future appropriation of neuroscientific research presents a particularly high risk of over-simplification and exaggeration, with the nuances and caveats of the original work potentially lost in translation. As Pickersgill comments:

Simplistic cerebral reductionism and determinism . . . are . . . not always evident within this research, though they may be taken to be implicit in scientists' claims as they travel into discursive arenas beyond those through which they were assembled, and are stripped of the assertions of contingency attached by their creators. (Pickersgill 2009: 49)

Science with a capital 'S' can sometimes be accredited with an explanatory power that it does not possess. It is all too 'tempting to draw great truth from brightly colored pictures of brain activity' (Baird in Farahany 2009: 121). 'Crime', 'conduct disorders'—even neuroimages and their interpretation—are all human constructions, so this is far more complicated, far more ethically messy, than an 'objective' exercise in prediction. It is dangerously easy to injure when trying to help: brain development is non-linear, a complex web of recursive loops, and it may be difficult to foresee the ultimate outcome of any 'therapeutic' intervention. Yet, there are also dangers in too easily dismissing new discoveries on the basis of past mistakes: science has benefited human progress far more than it has hobbled it. The cluster of behaviours that are referred to as psychopathy, or one of the other serious conduct disorders, can have horrendous consequences, for both sufferers and their victims.

Concluding Remarks

Neuroscientific evidence reveals how the human brain has a tendency to 'cherry pick':

[P]eople typically do not evaluate evidence in an atheoretical manner; rather they use their beliefs and expectations to guide their assessment of the evidence given to them. This interplay between one's beliefs and evidence has a distinct neural signature in that evidence that is consistent with one's beliefs is more likely to recruit neural tissue involved in learning and memory, whereas evidence that is inconsistent with one's beliefs is more likely to invoke neural tissue associated with error detection and conflict monitoring. (Fugelsang and Dunbar 2004: 1752)

Thus, how developmental neuroscience is used in youth justice will constitute a complex interplay between the evidence itself and its interpretation through various prisms of former beliefs: for some, it may be seen as a liberalizing tool, for others as confirmation of the need for ever earlier intervention, a tougher stance. Taking a highly individualized approach when assessing, for instance, the capacity to form criminal intent, offers the promise of a higher form of justice; however, there are dangers inherent in undermining the carefully constituted myth of real-world equality, particularly in this era of risk aversion. It is perhaps safer—and more in line with the probabilistic,

group-based nature of neuroscience itself—to use this research simply as another layer of information when devising broad youth justice policies: 'To go further is unwarranted and threatens to draw attention away from critical legal and environmental factors—good schools, strong families, economic opportunities, humane sentencing regimes, and rehabilitative services—that are both more important and subject to greater direct control' (Maroney 2009: 90).

If used wisely and cautiously, neuroscientific knowledge could beneficially inform youth justice policy and practice. Employing neuroscientific findings does not mean relying exclusively on that domain of knowledge. The concept of consilience, the unity of knowledge (cf. Wilson 1998), emphasizes the need for an interdisciplinary approach: '[T]he real world actually is complicated, and particularly that the people in it are so. Because they are complex, we need to ask many kinds of questions about them, not just one' (Midgley in Rees and Rose 2004: 25). As human knowledge advances, it is anticipated that the different models of understanding will converge, deepening human understanding in relation to 'the complex interaction between genes, proteins, nerve cells, biochemical and neurochemical pathways, and the environment, which combine to give rise to human behavior' (Farahany 2009: xvii) ideally resulting in a more compassionate youth justice policy.

References

American Medical Association (2004), *Amici Curiae in Support of Respondent at 10.* Roper, 543 U.S. 551(No. 03–633), 2004 WL 1633549.

Anonymous (2009), 'We Didn't Know Our Babies Had Been Damaged by Alcohol', *The Observer,* 13 September, available online at www.guardian.co.uk/society/2009/sep/13/foetal-alcohol-spectrum-disorder.

Aronson, J. (2009), 'Neuroscience and Juvenile Justice', *Akron Law Review,* 42: 917–30.

Ashworth, A. (2005), *Sentencing and Criminal Justice.* 4th edn. Cambridge: Cambridge University Press.

Baird, A. and Fuselgang, J. (2004), 'The Emergence of Consequential Thought: Findings from Neuroscience', *Philosophical Transactions of the Royal Society B,* 359: 1797–804.

Barnados (2009), *Locking Up or Giving Up.* Essex: Barnados.

Becker, H. (1963), *Outsiders.* New York: Free Press.

Boire, R. (2000), 'On Cognitive Liberty (Part 1)', *Journal of Cognitive Liberties,* 1: 7–13.

Cassidy, S. (2010), 'How a Deprived Childhood Leaves Its Mark on the Brain', *The Independent,* 1 June, available online at www.independent.co.uk/news/science/how-a-deprived-childhood-leaves-its-mark-on-the-brain-1988007.html.

Centre for Social Justice (2008), *Breakthrough Britain: The Next Generation.* London: Centre for Social Justice.

Farahany, N. ed. (2009), *The Impact of Behavioral Sciences on Criminal Law.* Oxford: Oxford University Press.

Farrington, D. and West, D. (1993), 'Criminal, Penal and Life Histories of Chronic Offenders: Risk and Protective Factors and Early Identification', *Criminal Behaviour and Mental Health,* 3: 492–523.

Field, S. (2007), 'Practice Cultures and the "New" Youth Justice in (England and) Wales', *British Journal of Criminology,* 47: 311–30.

Forth, A., Kosson, D. and Hare, R. (2003), *Hare Psychopathy Checklist: Youth Version*. Canada: MHS.

Fugelsang, J. and Dunbar, K. (2004), 'A Cognitive Neuroscience Framework for Understanding Causal Reasoning and the Law', *Philosophical Transactions of the Royal Society B,* 359: 1749–54.

Garland, D. (2001), *The Culture of Control*. Oxford: Oxford University Press.

Garner, L. (2009), 'We Should Separate At-Risk Children from their Parents at Birth', *The Telegraph,* 8 September, available online at www.telegraph.co.uk/health/children_shealth/6151954/We-should-separate-at-risk-children-from-their-parents-at-birth.html.

Gazanigga, M. (2005), *The Ethical Brain*. Chicago: Chicago University Press.

Glenn, A. and Raine, A. (2008), 'The Neurobiology of Psychopathy', *Psychiatric Clinics of North America,* 31: 463–75.

Goldson, B. and Jamieson, J. (2002), 'Youth Crime, the "Parenting Deficit" and State Intervention: A Contextual Critique', *Youth Justice,* 2: 82–99.

Hales, J., Nevill, C., Pudney, S. and Tipping, S. (2009), *Longitudinal Analysis of the Offending, Crime and Justice Survey 2003–06*. London: Home Office.

Hare, R. (1991), *The Hare Psychopathy Checklist—Revised*. Toronto, Ontario: Multi-Health Systems.

Harris, S. (2010), *Science Can Answer Moral Questions* (video), available online at www.ted.com/talks/lang/eng/sam_harris_science_can_show_what_s_right.html.

Heide, K. and Solomon, E. (2006), 'Biology, Childhood Trauma, and Murder: Rethinking Justice', *International Journal of Law and Psychiatry,* 29: 220–33.

Hinsliff, G. (2010), 'Bulger Killers Were Damaged, Not Evil', *New Statesman,* 11 March, available online at www.newstatesman.com/law-and-reform/2010/03/venables-thompson-children.

Hirsch, A. (2010), 'Too Young to Understand?', *The Guardian,* 24 May, available online at www.guardian.co.uk/society/2010/may/24/boys-attempted-rape-criminal-responsibility.

HM Government (2008), *Youth Crime Action Plan 2008*. London: HM Government.

Hollingsworth, K. (2008), 'Protecting Rights at the Margins of Youth Justice in England and Wales: Intensive Fostering, Custody and Leaving Custody', *Youth Justice,* 8: 229–44.

Home Office (1997), *No More Excuses: A New Approach to Tackling Youth Crime in England and Wales*. London: Home Office.

Kambam, P. and Thompson, C. (2009), 'The Development of Decision-Making Capacities in Children and Adolescents: Psychological and Neurological Perspectives and their Implications for Juvenile Defendants', *Behavioral Sciences and the Law,* 27: 173–90.

Law Commission (2006), *Murder, Manslaughter and Infanticide*. London: The Stationery Office.

Liberal Democrats (2010), *Liberal Democrat Manifesto 2010*. London: Liberal Democrats.

Lord Chief Justice (2000), *Practice Direction Crown Court: Trial of Children and Young Persons*. London: Her Majesty's Court Service.

Macdonald, K. (2010), 'This Spectacle Has No Place in a Civilized Land', *Times Online,* 25 May, available online at www.timesonline.co.uk/tol/comment/columnists/guest_contributors/article7135435.ece.

Maroney, T. (2009), 'The False Promise of Adolescent Brain Science in Juvenile Justice', *Notre Dame Law Review,* 85: 89–176.

McVeigh, T. (2009), 'Take More Babies Away from Bad Parents, Says Barnado's Chief', *The Guardian,* 6 September, available online at www.guardian.co.uk/society/2009/sep/06/children-babies-parents-care-barnardos.

Ministry of Justice (2010*a*), *Criminal Statistics: England and Wales 2008*. London: Ministry of Justice.

——— (2010*b*), *Reoffending of Juveniles: Results from the 2008 Cohort*. London: Ministry of Justice.

Moffitt, T. E., Caspi, A., Harrington, H. and Milne, B. (2002) 'Males on the Life-Course Persistent Behavioral Pathways: Follow-up at Age 26', *Development & Psychology,* 14: 179–206.

Muncie, J. (2008), 'The "Punitive Turn" in Juvenile Justice: Cultures of Control and Rights Compliance in Western Europe and the USA', *Youth Justice,* 8: 107–21.

O'Mahony, P. (2009), 'The Risk Factors Prevention Paradigm and the Causes of Youth Crime: A Deceptively Useful Analysis?', *Youth Justice,* 9: 99–114.

Palmer, A. (2010), 'The Only Way to Stop Youth Crime Is to Help the Parents', *The Telegraph,* 27 March, available online at www.telegraph.co.uk/comment/7530902/The-only-way-to-stop-youth-crime-is-to-help-the-parents.html.

Parliamentary Office of Science and Technology (2009), *The Dual-Use Dilemma*. London: Parliamentary Office of Science and Technology.

Patrick, C. J. ed. (2006), *Handbook of Psychopathy*. New York: Guilford.

Pickersgill, M. (2009), 'Between Soma and Society: Neuroscience and the Ontology of Psychopathy', *Biosocieties,* 4: 45–60.

Rees, D. and Rose, S., eds. (2004), The New Brain Sciences: Perils and Prospects. Cambridge: Cambridge University Press.

Roe, S. and Ashe, J. (2008), *Young People and Crime: Findings from the 2006 Offending, Crime and Justice Survey*. London: Home Office.

Royal College of Psychiatrists (2006), *Child Defendants*. London: Royal College of Psychiatrists.

Rutherford, J. (2002), 'Juvenile Justice Caught between *The Exorcist* and *A Clockwork Orange*', *DePaul Law Review,* 51: 715–42.

Scott, E. and Steinberg, L. (2008*a*), 'Adolescent Development and the Regulation of Youth Crime', *The Future of Children,* 18: 15–33.

——— (2008*b*), *Rethinking Juvenile Justice*. Cambridge, MA: Harvard University Press.

Sevecke, K., Kosson, D. and Krischer, M. (2009), 'The Relationship between Attention Deficit Hyperactivity Disorder, Conduct Disorder, and Psychopathy in Adolescent Male and Female Detainees', *Behavioral Sciences and the Law,* 27: 577–98.

Shirtcliff, E., Vitacco, M., Graf, A., Gostisha, A., Merz, J. and Zahn-Waxler, C. (2009), 'Neurobiology of Empathy and Callousness: Implications for the Development of Antisocial Behavior', *Behavioral Sciences and the Law,* 27: 137–71.

Skardhamar, T. (2010), 'Reconsidering the Theory on Adolescent-Limited and Life-Course Persistent Anti-Social Behaviour', *British Journal of Criminology,* 49: 863–78.

Standing Committee on Youth Justice (SCYJ) (2009), *Briefing on Coroners and Justice Bill,* available online at www.scyj.org.uk/files/CJ_Bill_SCYJ_Commons_Ctte__Diminished_Responsibility_.pdf.

United Nations Committee on the Rights of the Child (UNCRC) (2008), *Concluding Observations: United Kingdom of Great Britain and Northern Ireland*. Geneva: UNCRC.

Vizard, E. (2008), 'Emerging Severe Personality Disorder in Childhood', *Psychiatry,* 7: 389–94.

WEAVER, M. (2010), 'James Bulger's Mother Gets Apology from Maggie Atkinson', *The Guardian,* 17 March, available online at www.guardian.co.uk/uk/2010/mar/17/james-bulger-maggie-atkinson-apology.

WILSON, E. O. (1998), *Consilience*. London: Abacus.

Youth Justice Board (2008), *A Literature Review into Children Abused and/or Neglected Prior Custody*. London: YJB.