

“It could just be an additional test couldn’t it?”¹ Genetic testing for susceptibility to aggression and violence

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Much of the current genetic research into aggressive and violent behavior focuses on young people and might appear to offer the hope of targeted prediction and intervention. In the UK data are collected on children from various agencies and collated to produce “at risk of offending” identities used to justify intervention. Information from behavioral genetic tests could conceivably be included. Regulatory frameworks for collecting, storing and using information from DNA samples differ between the health service and the police particularly in the need for consent and the treatment of children. This paper draws on discussions with professionals involved with “problem” young people to consider their views on the utility of genetic research for tackling violent/aggressive behavior and the impact an identification of genetic susceptibility might have on their clients.

Keywords: behavioral genetics; crime; young people

Introduction

Aspects of individual identity from political preferences and opinions to religious belief and personality traits have been declared to be “genetic” at various times. To take two recent examples “Genes ‘play key happiness role’”, reporting on research at Edinburgh University (BBC News 24 2008), and “Born that way: your political leanings are implanted in your genes” (Giles 2008). Most such reports attract only fleeting interest and media comment and have minimal impact on individuals or society. Genetic information about human behavior that *is* controversial is that which has the potential to stigmatize people and affect their life chances; information on increased susceptibility to stigmatized behavior that may have been sought not by the individual concerned, but by parents or other relatives, or could even be required by external bodies such as employers or insurance companies. This paper focuses on the research into genetic influences on antisocial and violent behavior and how information about risk in this area might impact on individuals and families. Such information could potentially affect life

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chances, lead to measures to protect society from the individual rather than to benefit him/her, and could be sought by parents or even become compulsory for some categories of people on the grounds of risk to the public.

Genetic research into aggressive and antisocial behavior

In behavioral genetics the focus has been on separating out the effects of nature and nurture in order to quantify their relative influences. The classic way to achieve this has been to compare behavioral traits in the natural genetic models of monozygotic (identical) and dizygotic (fraternal) twins. Where twins and siblings have been brought up in different environments from birth (e.g. due to adoption) they can be compared with the twin/sibling in a different environment and with their biological parents. These studies depend on the assumption of equal environments for twins raised together and different environments for those raised apart (Parens *et al.* 2006, p. xxi). Estimates of heritability of behavior made from these studies vary greatly, since studies are based on a specific population at a specific time and employ varying measures of “criminal”, “aggressive” and “antisocial” behavior (Nuffield Council on Bioethics 2002, pp. 91ff).

Twin studies do not look at *which* genes might be involved in a phenotype or behavior: for that molecular analysis is required (Schaffner 2006, pp.10ff). Research that has been widely reported has centered on monoamine oxidase A (MAOA) function. MAOA is a mitochondrial enzyme responsible for the breakdown of several neurotransmitters, including dopamine and serotonin, which affect brain function. In a study of a Dutch family, Brunner *et al.* found that four generations included 14 males with low-normal IQ and learning difficulties who displayed abnormal behavior, including impulsive aggression, arson and rape (Brunner *et al.* 1993). Five of the affected men were tested and found to have no MAOA function. Women in the family were not affected. However, absence of MAOA function is thought to be rare. More promising is the line taken by the Caspi *et al.* study, based on longitudinal data collected in New Zealand. This study took a known environmental factor in later antisocial behavior, maltreatment in childhood, and a genetic factor, MAOA expression, and found evidence for gene-environment interaction (Caspi *et al.* 2002). Men with low-activity MAOA genotype who had experienced maltreatment in childhood were 12% of the cohort but responsible for 44% of the convictions for violence. Women were not included because there were insufficient numbers who had experienced maltreatment and had low levels of MAOA expression. Looking at antisocial behavior, 85% of those with the genetic and environmental indicator developed some form of antisocial behavior. With the recognition that it is too simple to separate genes and environment, since each constantly influences the other, it is likely that more studies will make claims in terms of GxE interactions influencing behavior, but that such claims will be narrow and specific (Schaffner 2006, p. 66).

Although it might seem premature to consider the possible effects of predictions of individual susceptibility to behaviors that may be defined as criminal there have already been attempts to use genetic test results in US criminal courts to establish the susceptibility of a specific offender to certain aggressive behaviors.² Furthermore, genetic testing of children as part of research projects looking at antisocial traits is already going on. For example the childhood study led by Terri Moffitt, which is part of the Social Contexts of Pathways in Crime (SCoPiC) undertaken by the ESRC Cambridge Network, will “test if SCoPiC neighbourhood constructs interact with specific genes” (see <http://www.scopic.ac.uk/studies.html>). The Twins Early Development Studies (TEDS) being undertaken by the Social Genetic and Developmental Psychiatry Centre, King’s College, London include molecular genetic research to identify specific genes involved in the development of antisocial behavior (see <http://www.iop.kcl.ac.uk/departments/?locator=336>).

Genetic testing of young people: alternative models

Given the patterns of police cautions and convictions, the possibility of interventions targeted at children would be particularly relevant. Around half of all recorded crime in the UK is committed by those under the age of 21 and the highest peak for offending is in the teenage years (McVie 2004). A report by the Institute for Public Policy Review (IPPR) presented a benign model for genetic testing in this area based on (parental) choice in which those “at risk” could be identified and be given information about services that would benefit them (Dixon 2005).

Behavioural genetic tests should be seen as just another way of gaining information that can aid tailored, effective service provision. It is here that the real potential of (behavioural) genetics to transform public service provision lies: in giving people the ability to make better, more informed decisions about their lives. (Dixon 2005, p. 17)

In this view, testing would be by parental choice which has the practical advantage of increasing the likelihood of parental cooperation with any treatment (Dixon 2005, p. 17).

The key concerns are that individuals remain free to choose whether or not they provide this information and suffer no discrimination or disadvantage from withholding their genetic information, and that any use of genetic information is equal and equitable. (Dixon 2005, p. 15)

However a less benign reading of parental choice in relation to testing is equally plausible. Given that families may be obliged to provide all sorts of other personal information in exchange for accessing the (social, benefit and other public) services that they need, the level to which they might be said to be engaging voluntarily in this type of genetic assessment is at best questionable.

Moreover, there is already a range of databases containing information on children which may be shared between different governmental organizations and used

to collate “risk factors” that might justify various interventions, as Anderson *et al.* have shown (2006). Their report discusses the problem of “e-discrimination”:

A system that attempts to predict which children will become delinquent, by totting up negative indicators from health, school and other records, runs the serious risk of recreating the same problems especially as the information, analysis and professional opinions it contains will be made available to many of the public-sector workers who come into contact with the child. (Anderson *et al.* 2006, p. 2)

Since antisocial and violent behavior among the young is high on the political agenda in UK, a susceptibility to aggressiveness and violence could be seen as a public health issue rather than a matter for individual family choices. Measures to deal with antisocial behavior have included ASBOs (antisocial behavioral orders), which can, for example, exclude someone (age 10-plus) from a particular area and/or prohibit specific behavior. The breaching of an ASBO constitutes a criminal offence and can lead to a custodial sentence. Young people may also be subject to a local child curfew and their parents to parental orders, ensuring they attend meetings at school for example. Children are being given custodial sentences in increasing numbers despite a decline in the number cautioned or convicted of an offence (UK Children’s Commissioners 2008, Prison Reform Trust 2008).

While it is still unclear whether individual predictions will ever be possible, in the current political and social climate, the assumption that an individual would benefit from genetic testing seems naïve when the test in question would be providing information about a susceptibility to violent and antisocial behavior in a young person. The model for genetic testing in healthcare and medical research is one of informed consent, with particular care taken over vulnerable groups including children. Newborn screening requires consent from parents in the UK. In practice, newborn screening has very high uptake rates when it is provided routinely in hospital soon after birth. Generally parents are not permitted to have their children tested for disorders that do not have any effective treatment (most notably Huntington’s disease) or that will not affect them until they are making decisions on reproduction. World Health Organization (WHO) guidelines recommend “mandatory newborn screening for disorders where early diagnosis and treatment benefit the newborn” (WHO 2003, p. 13). Any test for a susceptibility to violence would, of course, be assessing risk for a complex multifactorial (and socially defined) set of behaviors. A parallel can be drawn with newborn testing for type 1 diabetes, which is a complex multifactorial condition. Kerruish and Robertson conclude that there are potential harms in newborn testing for type 1 diabetes “centred around the probabilistic nature of the information, potentially maladaptive parental reactions to this level of uncertainty, and perceived breaches of the autonomy of the child being tested” (Kerruish and Robertson 2005).

A focus group study in the Chicago area conducted by Campbell and Ross (2004) found mixed responses from the public to the idea of genetic testing for their own children for violent behavioral traits. Parents were interested in a test

that might help them understand their child and make child-rearing more effective. In contrast, only two of the healthcare professionals, both genetic professionals, would test their own children. In their study, the professionals medicalized violent behavior and looked towards medical solutions, clinical therapies and drugs, whereas the public tended to focus on environment and expected, for example, changes in child-rearing to result from a positive test. In the study only members of the public raised issues of equality of race, class and gender, as in this quotation from a black woman and mother:

Do I support the research, if you can find a gene? It comes to, for me, who gets tested for that gene. Who has say so over who gets tested? Realistically, I feel the first people to be tested are going to be young, black males. They're going to test them. Those four white ladies living in the suburbs, chances are they'll never be tested. (Campbell and Ross 2003, p. 583)

Young black males are also over-represented in the UK National DNA database. DNA collection is compulsory for all those arrested on suspicion of committing any offence and profiles are loaded on the NDNAD (Levitt 2007). In England and Wales the DNA profile and sample is retained for life regardless of whether the individual is ever actually charged with a crime. In Scotland profiles are destroyed if the person is not convicted.³ The only exception currently is for adults charged with a serious violent or sexual offence whose profiles may be retained for up to five years. While it is true that around half of all crime in England and Wales is committed by those age under 21 and the peak for offending is in the teenage years, most offenders do not go on to be adult criminals. As Robins (1978) puts it "Adult antisocial behaviour virtually requires childhood antisocial behaviour, yet most antisocial children do not become antisocial adults" (quoted in Ezell and Cohen 2005, p. 6). Thus it is particularly important to avoid premature stigmatization for life of those who seem at the moment to "grow out" of crime. The high percentage of young people who do commit a crime, particularly where self-report studies are used, indicates that those never committing an offence are unusual. In the Edinburgh Study of Youth Transitions and Crime, only 10% did not report committing any offence⁴ from age 12 to 16 (McVie 2004).

The views of practitioners

The rest of the paper draws on empirical research gathered in the "Criminal Genes and Public Policy Project" which explored the policy and practice implications of behavioral genetics research into aggressiveness and violence within the UK context through the eyes of practitioners involved in the management of those who might be deemed at risk of displaying violent and aggressive behaviors (Pieri and Levitt 2007, 2008). Those who work with young people and families whose circumstances or behavior bring them to the attention of the social services and criminal justice system include social workers, the legal profession and probation officers. They deal day-to-day with ASBOs, child care proceedings, criminal

proceedings and their aftermath. Their perspectives are therefore relevant when considering the possible impact of genetic testing in this area. These were gathered through semi-structured scoping interviews and then seven focus groups to record discussions in peer groups. Scoping interviews were also undertaken with geneticists, clinical psychiatrists and criminologists. The topics covered included their understandings of definitions and causes of criminal and of anti-social behavior, their response to the idea of a genetic susceptibility to aggressive behavior and the implications (if any) this might have for their own work, for policing and the justice system and for planning interventions and policy priorities. This led to examining the possibility of pharmacological or environmental solutions for anti-social behavior and of “pre-crime” interventions. Interviews and focus groups were usually conducted in the participants’ place of work (Pieri and Levitt 2007, pp. 9–11, 59–62). The data gathered are qualitative and no claims are made about generalizability.

This discussion focuses on topics most relevant to the impact of risk status as seen by professionals who might be in contact with such individuals.

Aggressive and violent behavior: social and political factors

Social and environmental factors were most often cited as leading to violent and aggressive behaviors, with the family having a central role. However, upbringing and family values were impacted upon by the norms and expectations of neighborhoods and communities which are themselves located in wider socio-economic structures. The social workers group referred to “the levels of violence and aggression that you would see and see as normal on a big council estate”:

It’s like part of the community have different rules. (Social workers’ group 14 February 2007)

Several comments were made about the role of socio-economic status and gender in inhibiting certain behaviors. Emotions – and even the ability and will to control emotions – were related by some participants to social factors. Feelings of lack of power and control, or of having fewer chances than others were all seen as emotions contributing to aggressive behavior. Participants suggested young people with “disrupted lives”, those in poverty and those unable to articulate their feelings were more likely to behave aggressively especially if they had taken alcohol or drugs which acted as disinhibiting agents.

For those who deal with criminal and antisocial behavior there is no quick fix and such behavior can only be understood in social context (hence the limitations of genetic susceptibility testing):

I think it’s very complex and I think the problem is that people want to make it simple. Because if they make it simple they think they can come up with a solution or the solution in terms of public policy and practice. And in my experience that’s not possible. (Social worker interview 19 February 2007)

When introduced to the idea of genetic susceptibility to violent and antisocial behavior, participants raised criticisms of any assumption that aggressiveness, criminality, violence and antisocial behavior could be “natural categories” simply to be observed and measured, without making value judgments. Participants raised a series of methodology problems in conducting genetics behavioral research, including the small samples of people involved (for instance in twin studies), the low repeatability of the results, the fact that results obtained on one sample would be taken to apply to a different population and the basic problem of correlation not causation. The latter point was a comment not only on how many other different environmental/family factors could have been tested, but also that maltreatment might itself cause changes in MAOA expression. They did not reject any genetic component, nor genetic research in the field, but emphasized social and environmental factors and some were suspicious of the motivation for the interest in genetics. In particular they argued that the “the science” fits in with the current (political) drive for increased data gathering and surveillance.

B: What’s driving the agenda, is it the science driving it or is it what’s happening? My view is we’re matching the science to fit what’s going on and to get answers that way rather than independently and observing what’s going on, seeing what’s going on, seeing what you actually get from that . . .

D: Because science needs money and it tends to be political leaders who provide money for the science. (Probation officers’ group 1 February 2007)

It was generally felt that even if there was strong evidence for a genetic predisposition this simply raised more problems in deciding what to do next.

Genetic testing and its aftermath

Even if a genetic test was available, participants disliked the idea of testing a child before s/he had shown signs of delinquent behavior because they were worried about labeling people and self-fulfilling prophecies. It was recognized that it would be easy to add testing to existing prenatal or newborn screening programs but that this would raise issues of civil liberties. There was concern that children would be tested routinely and that the genetic test could be used (strategically) to obtain or challenge custody of a minor by one parent.⁵

Pharmacological solutions were considered and problematized. The probation officers group raised the issue that drug treatments would provide another lucrative market for pharmaceutical companies, could cost so much it could lead to a suggestion of prenatal diagnosis and termination, and might be used in place of teaching people to manage their aggression and channel it properly. On the other hand, if no treatment was available the only result of testing might be to cause parents and teachers unnecessary worry.

Like the woman in Campbell and Ross’s study, the participants assumed that testing, and so any detrimental impacts of testing, would fall on their usual

clientele. There was a recognition that in practice “who you are” in terms of where you live, social class, gender and age does affect the way you are treated in the criminal justice system. To begin with corporate and white collar crime is not given attention proportionate to its costs to society. The notion that there would be targeting of certain groups was frequently raised:

Clearly how we respond to different groups is different and I think that would proportionately affect people of the low socio-economic status. (Probation officers group 2 February 2007)

Just as a genetic test could be slotted into the existing healthcare system, so a genetic test result could be added to the systems already used to identify children with “problem” behavior. A test result might not have great explanatory power on its own but would be combined with other pieces of information on an existing database. Participants feared it would be used to further target individuals who had already come to the police’s attention – or the attention of other networks and databases that the police can access. For example, a participant discussed the possibility that after a violent crime is committed in a council estate, the police may check and suspect those who appear from their records to have a genetic susceptibility to aggressiveness, and live on that estate. Data on the RYOGENS system, aimed at reducing youth offending and piloted by several local authorities in England, records “concerns” that include both objective and subjective measures; for example, frequently moving house, lack of family support, social isolation, poor school attendance, being bullied, learning difficulties, living in a high crime area and being easily led (Action on Rights for Children n.d., RYOGENS n.d.). The local authority can decide how many “concerns” will trigger an alert, leading to an assessment and referral of the child to the relevant services.

As Rose discusses, techniques to identify and manage risky individuals will be used to “justify interventions in to the lives of ‘the usual suspects’” (Rose 2007, p. 75). Those who deal with “problem” young people argued that society was less tolerant of normal behavior than in the past. The barristers’ group discussed clients who had been given ASBOs for petty nuisance behavior and the solicitors and probation officers made similar comments:

F2: . . . isn’t there also a tendency at the moment to criminalize behavior that in the past would have been laughed off as you know . . .

F1: Naughty boys. (Solicitors’ group 8 March 2007)

MJ: . . . in terms of the ASBO, the creation of something that is criminally enforceable through the courts, which really is just a response to behavior that 20–30 years ago was like relatively accepted and normal. (Probation officers group 2 February 2007)

Participants discussed how professionals might use a positive test result and agreed that defense teams would try to use the information to help their client, for example, in a plea for mitigation. However, some felt that a genetic predisposition to violence might rather lead to additional blame if the person came to court for

an offence. Both judges who were interviewed concluded that, if or when genetic information concerning a predisposition to aggressiveness and violence was to be taken into consideration at all, its weight in court would and should be very limited. They also envisaged it having an impact on contact arrangements and care proceedings. A woman might bring it up as a reason not to give her partner unsupervised contact with their children or it might be a reason to issue care proceedings because parents were seen as unable to meet the child's special needs.

There were several comparisons with screening for disability where parents are told the result and can choose what to do with the information. However, it was recognized that a genetic predisposition to aggressiveness and violence can be argued to have a negative impact on society, so that the individual preferences of those deemed at risk (or of their parents) relating to testing and possibly interventions may not be prioritized. After this discussion one social worker pointed out that it is already possible to detain someone under the Mental Health Act with a view that this is done for the protection of other people, and the implication with genetic testing may then be that "it only takes an act to come in" to potentially detain individuals deemed to be (genetically) risky for others⁶ (Social workers' group 14 February 2007).

Three models for gene testing

If a genetic test could be developed to screen for increased susceptibility to aggressive and violent behaviors, and if the test was to be used for some sort of intervention then it would be likely to be used in childhood, before a pattern of undesirable behavior is established. The question is whether the test would proceed on the childhood (genetic) healthcare model, whether it would follow the model of the use of genetics by the police or something different again? In the existing models of genetic testing the person who is tested and found to be "at risk" is assigned to a category of risk and, depending on the condition, will be subject to some degree of surveillance (to monitor the condition) and of intervention if deemed necessary. Belonging to any "at risk" category may bring increased responsibility and costs for the individual and their family, especially their genetic relatives. Being "at risk" may also affect individual identity, for example, as someone who is currently healthy acquires a new health status (Novas and Rose 2000, Pieri 2008).

Figure 1 looks in more detail at the parallels and differences between three models of genetic testing that may apply and the respective impact: an individual found to be at risk of a genetic disorder, someone who is on the National DNA database (the police database in the UK) and, more tentatively, a person found to be at increased risk for antisocial and violent behavior based on the preceding discussion. All gene-testing leads to increased surveillance and interventions for those who test positively. Given the moral panic about violence and unruly behavior, child victims and perpetrators, and the social and political costs it is suggested that measures following a test for increased susceptibility to aggressiveness and

	1. At (genetic) risk for disorder	2. On National DNA database	3. At (genetic) risk for violent/aggressive behavior
Genetic testing	Voluntary (but may become routinized).	DNA sample taken. Compulsory on arrest (age 10+)	Currently voluntary in research projects. In the future?
At risk or risky?	At risk. "Risky" in reproduction but decisions left to individual choice.	Risky (even if never charged or charged but acquitted).	Risky.
Surveillance	Some degree of monitoring of health, data may be on genetic database for research (with consent).	Retained for life and subject to continuous speculative searching for matches with crime scenes.	Purpose to prevent criminal acts – so likely to be intense in childhood and teenage years.
Interventions	Investigations and treatments intended to benefit the individual. Require informed consent.	To protect society. Samples may be used for research without consent.	To protect society. Might include parental guidance, educational interventions, pharmaceutical treatments.
Responsibilities and costs	Increased responsibilities (e.g. over reproductive decisions); and possible costs (e.g. increased insurance).	Not able to control use of DNA or to earn the right to be taken off the database. Might have to prove innocence if DNA match found.	May be treated differently from other children. Inescapable "risky" label regardless of behavior. Danger of self-fulfilling prophecy.
Effects on family	More information, treatment, reassurance provided by monitoring. And/or increased anxiety, feelings of stigmatization; unwanted genetic information.	Come under surveillance through use of family matching.	Possible effect on relationship with child, increased involvement with social services, subject to assessments of environmental risk.
Individual identity	Depends on the condition but no right not to know if tested by parents.	Permanent suspect.	Stigmatized. Affects interaction with all who know status e.g. family, teachers.

Figure 1. Three models for genetic testing and its consequences.

antisocial behavior would be more concerned with public safety than individual rights. There was agreement among the practitioners that those most likely to be tested and affected by an "at risk" status for antisocial and violent behavior will be those already socially and environmentally disadvantaged and thus less able to resist additional stigmatization. If a genetic test of this type was developed, and its low predictive value meant it "could just be an additional test" integrated

into existing systems of data collection on children, its possible impacts could still be deleterious and require further scrutiny.

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Notes

1. Quotation from a solicitors’ focus group held on 8 March 2007.
2. Stephen Mobley’s defense team attempted to use Brunner *et al.*’s research to argue for a life sentence rather than the death penalty for murder, using Mobley’s family background as mitigating evidence. The request for Mobley to be tested for the MAOA deficiency found in the Dutch study was rejected on the grounds that it did not meet the standard for scientific evidence. Mobley was executed on 1 March 2005.
3. The age of criminal responsibility is 10 in England and Wales, and 8 in Scotland. However, in Scotland cases involving children aged 8 and above may be dealt with by the Children’s Hearings system rather than through the criminal courts. Only children whose cases are dealt with by the criminal courts will have their profiles retained if convicted. See Scottish Government’s response to the Fraser Report on retention of DNA and fingerprint data Government’s response (<http://www.scotland.gov.uk/Resource/Doc/239066/0065846.pdf>).
4. Twelve types of offence were included here: “fire-setting; driving stolen vehicles; theft from vehicles; physical violence; theft using violence; shoplifting; carrying a weapon; breach of the peace; non-fare payment; housebreaking; vandalism and graffiti” (McVie 2004, p. 7). Data were collected in five successive sweeps (*ibid.*, p. 11). Self-report studies of crime, whether of young people or adults, show higher levels of offending and reduced gender and class differences compared with the official statistics.
5. Some professionals even expressed the fear that children might be removed from their parents on the basis of a test result. The implications that would ensue and practicalities of increased numbers of children going into care were not discussed.
6. Again this point was raised while discussing the tensions between individual benefits and risks of testing *vis-à-vis* risks and benefits to society at large. No further consideration was given by the participants at the time to the proportion of people who might be affected by this hypothetical measure and whether it would in fact be practical.

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