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## THE XYY OFFENDER: A MODERN MYTH?

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The issue of the English medical journal *Lancet* published on August 26th, 1961, contained the first report of an XYY human male.[1] The case was discovered in the United States in the course of an investigation into the genetic background of this particular man's two mongoloid daughters. This first reported XYY male was of average intelligence, physically unremarkable, and was not drawn from a prison or mental hospital population. Criminologists had no special reason to be interested in this new discovery.

Some two weeks before this report was published, a 37 year old man by the name of Robert Peter Tait broke into a house in a suburb of Melbourne, Australia. While seeking money inside the house Tait was disturbed by the occupant's 77 year old mother. His response was to batter her to death. Tait, who was on parole after serving almost two years of a three year sentence for assaulting a 70 year old woman in 1959, and whose sexual satisfactions came from wearing or handling woman's underclothes, from making compulsive sexual assaults on young women, and from inflicting pain upon himself while masturbating, then removed his latest victim's clothes, dressed himself in her undergarments, and subjected her body to certain bizarre sexual indignities.

At his trial for murder, his plea of insanity under the McNaughten rules failed and he was sentenced to death by hanging—a mandatory sentence for those convicted of murder in the State of Victoria. After the ordinary avenues of appeal had been exhausted, the government of the day announced that it did not intend to commute the sentence of death to one of life imprisonment although it had invariably taken that step in relation to death sentences over the previous ten years. This announcement provoked the abolitionists into a frenzy of legal and extra-legal steps to preserve Tait's life. Apart from general arguments addressed to the morality of the death penalty as a sanction, the particular point was taken that Tait, though not insane at the time of the offence or unfit to stand trial, was nevertheless not liable to be executed because of insanity subsequent to trial. Reference was made to an old common law rule that a person should not be hanged if he were found to be insane in the period immediately preceding his proposed execution. The only difficulty was that, apart from the ordinary reactive depression and anxiety state which reasonably accompanied the prospect of his hanging, Tait exhibited no sign of severe mental illness. The date of the hanging had been set and revised on four occasions by the Cabinet before the High Court of Australia eventually ordered an indefinite stay of execution pending a further appeal. At that point the Cabinet's stubborn resistance crumbled and the sentence of death was commuted. However, the Government insisted to the very end that there was nothing in the circumstances surrounding the offence or in the accused's mental state to warrant commutation.[2]

Five years later, during a 1967 chromosome survey conducted at Pentridge Prison, Melbourne, Tait was identified as a prisoner having an abnormal chromosome constitution, namely an XYY chromosome complement.[3] For reasons which will

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[1] Sandberg, Koepf, Ishihara & Hauschka, *An XYY Human Male*, 2 LANCET 488 (1961).

[2] The entire story is set out at length in 6 BURNS, THE TAIT CASE (1962). The appeals and other applications are variously reported in: R. v. Tait [1963] V. R. 520; *Re* Tait [1963] V.R. 532; Tait v. R. [1963] V.R. 547 and Tait v. R. 108 C.L.R. 620 (1963). See also Feltham, *The Common Law and the Execution of Insane Criminals*, 4 MELB.U.L.R. 434 (1963) and Howard, *Time and the Judicial Process*, 37 AUST.L.J. 39 (1963).

[3] The anomaly was first reported as an XYY/XYYY mosaic: Wiener, Sutherland, Bartholomew & Hudson, *XYY Males in a Melbourne Prison*, 1 LANCET 150 (1968). Further study, however, revealed that his karyotype was 47,XYY with a further genetic defect: Wiener, Sutherland & Bartholomew, *A Murderer with 47 XYY and an Additional Autosomal Abnormality*, 2 AUST. & N. Z. J. CRIM. 20 (1969).

be considered later, it is doubtful whether recognition of this abnormality would have aided his plea of insanity under the McNaughten rules. However, in the view of the psychiatrist who attended Tait in prison during the legal struggle for his life and who advised the Government as to his mental state, if Tait's chromosomal abnormality had previously been known, he would most probably have had his death sentence quickly commuted on the ground that the abnormality constituted sufficient justification for the exercise of executive clemency.[4]

The XYY abnormality was first proffered as the basis of a defense in 1968, at the Paris trial of Daniel Hugon.[5] Hugon was charged with murder after strangling an elderly prostitute. His lawyers initially raised the issue of XYY chromosome abnormality in relation to his fitness to stand trial. The court appointed a panel of experts to determine his competency and, when it was found that Hugon was fit to stand trial, his lawyers took the position that this genetic anomaly was the cause of his violent behaviour. Hugon was convicted of murder, but sentenced to only seven years imprisonment because of extenuating circumstances.[6] Whether these related to the circumstances of the offense itself, or the presence of the additional Y chromosome in Hugon, is not clear. The experts appointed by the court denied that the extra Y chromosome made men "born killers" but considered that it brought on "troubles of comportment and humour".[7]

Two years earlier in Chicago, Richard Franklin Speck killed eight nurses in a rampage of rape, stabbing and strangulation. The fact that Speck was over six feet tall, semi-literate (with an IQ of about 85), deeply pitted with acne, and had a history of violent acts against women attracted the attention of a number of geneticists who, in 1967 (after his trial and conviction), conducted a chromosome analysis on a sample of his blood. They reported that he had an XYY chromosome complement;[8] but the fact of this chromosome abnormality had not formed part of the defense at the trial, nor was it raised at subsequent appeals. In November 1968, the Illinois Supreme Court upheld Speck's conviction for murder as well as the sentence of death.[9]

The closing months of 1968 saw further newspaper attention devoted to the XYY defect in the reports of the trials of Lawrence Edward Hannell in Melbourne, Australia and Ernst Dieter Beck in Bielefeld, West Germany. Twenty-one year old Hannell was tried for the apparently motiveless murder by stabbing of his elderly landlady. Although evidence was adduced by the same psychiatrist who attended Tait to prove the existence of an XYY chromosome defect in Hannell's body cells, this fact did not significantly affect the jury's determination that he was not guilty on the ground of insanity since, on any interpretation of his conduct, Hannell was clearly legally insane within the McNaughten rules.[10] Beck, a 20 year old farm worker, was sentenced to life imprisonment for the murder of three women.[11] Scientists informed the court that Beck had an extra Y chromosome and that this made him unable to control his impulses to commit crimes ranging from house-breaking to murder. The court, nevertheless, accepted the prosecution's argument that Beck was fully aware that he was committing the murders even though he might not have been able to control his impulse to kill. There is no capital punishment in West Germany and Beck was sentenced to life imprisonment. The fact that this was the maximum sentence possible casts doubt upon the view that the court was favourably impressed by the XYY defense.

In April, 1969, in New York, Sean Farley a 6 ft. 8 in., 26 year old man pleaded not guilty on the ground of insanity to a charge of raping and murdering a woman in an alley near her home. Farley also exhibited the XYY chromosome abnormality in his body cells but the jury rejected his defense of

[4] *Id.* at 27.

[5] New York Times, April 21, 1968 at 1, col. 3; TIME, May 3, 1968 at 41.

[6] New York Times, Oct. 15, 1968 at 5, col. 2; TIME, Oct. 25, 1968 at 75; Graven, *Existe-t-il un "Chromosome du Crime?"* 22 REV. INT. CRIM. & POL. TECHNIQUE 277, 277–78 (1968).

[7] Toronto Globe and Mail, Oct. 15, 1968.

[8] New York Times, April 22, 1968 at 43, col. 2; Telfer, *Are Some Criminals Born That Way?* 34 THINK 24, 26 (1968); New York Times, May 6, 1969 at 93, col. 5.

[9] However, after the State Supreme Court rejected Speck's appeal, Associated Press reported his attorney as announcing that Speck's chromosome structure was normal. Speck's execution has been stayed pending an appeal to the U.S. Supreme Court.

[10] Bartholomew & Sutherland, *A Defence of Insanity and the Extra Y Chromosome: R. v. Hannell*, 2 AUST. & N.Z. J. CRIM. 29 (1968).

[11] Melbourne Herald, Nov. 12, 1968 at 3, col.—. The first British murder trial of a known XYY male took place at Lewes Assizes on 20 December 1968. The accused eventually was convicted of manslaughter. His plea of diminished responsibility by reason of mental abnormality was supported by medical reports without the necessity of raising his genetic abnormality which, as a consequence, was not specifically mentioned in the court proceedings. See 1 BRIT. MED. J. 201 (1969).

insanity and found him guilty of first degree murder.[12]

The extensive publicity that has attended the finding of genetic anomalies in the body cells of certain offenders has generated a great deal of premature speculation and, consequently, much confusion. Before considering the present state of knowledge, there are one or two definitional points to be cleared up. In general terms, chromosomes are threads of complex molecules (DNA) containing the genetic material which transmits hereditary messages from generation to generation of both plant and animal life. These messages direct the development of the offspring after fertilisation. The number of chromosomes to be found in each plant or animal cell varies according to species. There are, for instance, two chromosomes in each cell of a simple worm, fourteen in the garden pea, and forty-six in man. There is an exception to the general rule that each normal human cell has 46 chromosomes. The female ovum and male sperm cells respectively contain only 23 chromosomes but, on uniting at conception, they pool their chromosomes so that the fertilized ovum contains 46 chromosomes. These are arranged in 23 pairs. As the fertilized ovum grows by division into a new individual, each of the 46 chromosomes also divides so that eventually each normal cell (other than sperm and ovum) contains the same number of chromosomes. Of the 23 pairs of chromosomes in each cell one pair contain genes which determine, among other features, the primary sexual characteristics of the individual. In women this single pair of chromosomes are of similar size and are called X chromosomes or, in the biologists' shorthand, XX. In the male this pair of chromosomes are unequal in size; one of the pair is an X chromosome and is larger than the other which is called the Y chromosome. In the biologists' shorthand, the male's sex chromosomes are described as XY. The primary biological characteristics of masculinity are determined by the Y chromosome. From this it becomes obvious that the sperm of the father, not the ovum of the mother, determines the sex of the new individual. The character of the male sperm cell, X or Y, that fertilizes the ovum determines the sex of the child. If the sperm contains a Y chromosome the child will be male; if the sperm contains an X chromosome the child is normally female. If this process fails to operate effectively individuals may be born with either too few or too many chromosomes. Numerous chromosomal abnormalities are recognized. The XXY or Klinefelter Syndrome is one in which the person is usually found to be outwardly male but sterile, somewhat mentally retarded and suffering from some breast enlargement. This anomaly (which occurs in approximately one out of every 400–500 male births) has been linked with anti-social behaviour, especially alcoholism and homosexuality, but as yet few findings of importance have been published.[13] XXYY males have also been discovered. These persons generally exhibit the same physical features as XXY males but the view has been expressed that the additional Y chromosome may have a deleterious effect on the development of their personality and, as a consequence, on their behavior.[14]

It is, however, the XYY male who presently is of special interest to criminologists.[15] Although it

[12] New York Times, April 16, 1969 at 54, col. 6; April 24, 1969 at 53, col. 1; April 30, 1969 at 93, col. 4.

[13] Mosier, Scott & Dingham, *Sexually Deviant Behavior in Klinefelter's Syndrome*, 57 J. PEDIATRICS 479 (1960); Court Brown, *Sex Chromosomes and the Law*, 2 LANCET 508 (1962); Forssman & Hambert, *Incidence of Klinefelter's Syndrome Among Mental Patients*, 1 LANCET 1327 (1963); Wigmann & Smith, *Incidence of Klinefelter's Syndrome Among Juvenile Delinquents and Felons*, 1 LANCET 274 (1963); Nielson, *Klinefelter's Syndrome and Behaviour*, 2 LANCET 587 (1964); Kvale & Fishman, *The Psychological Aspects of Klinefelter's Syndrome*, 193 J.A.M.A. 567 (1965); Casey, Segal, Street & Blank, *Sex Chromosome Abnormalities in Two State Hospitals for Patients Requiring Special Security*, 209 NATURE 641 (1966); Telfer, Clark, Baker, Richardson & Schmauder, *Diagnosis of Gross Chromosomal Errors in Institutional Populations*, 7 PENN. PSYCHIAT. Q. 3 (1968); Swanson & Stipes, *Psychiatric Aspects of Klinefelter's Syndrome*, 126 AM. J. PSYCHIAT. 814 (1969); Clark, Telfer, Baker & Rosen, *Sex Chromosomes, Crime and Psychosis*, 126 AM. J. PSYCHIAT. 1659 (1970).

[14] Court Brown, *Sex Chromosome Aneuploidy in Man and its Frequency, with Special Reference to Mental Subnormality and Criminal Behaviour*, 7 INT. REV. EXP. PATH. 31 (1969).

[15] The literature on XYY males is considerable, exceeding 200 articles in a wide range of professional journals, but mainly in the sphere of medical science. The leading articles in journals of a specifically criminological or legal nature are: Mergen, *Der Geborene Verbrecher (Ein Bericht über Chromosomenforchung und Kriminologie)*, KRIMINALISTIK VERLAG (1968); Nielsen, *The XYY Syndrome in a Mental Hospital*, 8 BRIT. J. CRIM. 186 (1968); Bartholomew & Sutherland, *supra* note 10; Wiener, Sutherland & Bartholomew, *supra* note 3; Fox, *XYY Chromosomes and Crime*, 2 AUST. & N.Z. J. CRIM. 5 (1969); Graven, *Le Problèm de l' "Anomalie Chromosomique XYY" en Criminologie*, 23 REV. INT. CRIM. ET POL. TECHNIQUE 21 (1969); Note, *The XYY Chromosome Defense*, 57 GEO. L. J. 892 (1969); Sergovich, *Chromosome Aberrations and Criminal Behaviour*, 11 CRIM. L. Q. 303 (1969). Amir

will be shown that the research findings are less significant than first reports suggested and that there are strong psychological reasons for interest in the topic, the flurry of recent attention has at least provoked criminologists into re-examining the hitherto largely neglected field of criminal biology. The new biological research is not simply a revamping of Lombroso or Hooton, but is rather a continuation and extension of the work of Kretschmer, Sheldon and the Gluecks on the relationships between body type, temperament and criminality. And, in the final analysis, its importance lies less in the weight of current findings than in the fact that the attempt to identify the behavioral correlates of particular genetic defects represents one of the important first steps towards the ultimate elimination of undersirable traits in human beings by genetic manipulation. The attainment of this goal, however frightening it may appear to be, is no fanciful dream; its realization has been seriously predicted for the first decade of the new century[16] and, with the recently reported isolation of a single gene by Harvard scientists, this prediction may already require updating.[17]

Dr. Mary Telfer of the Elwyn Institute of Pennsylvania has described the characteristics of a person possessing an extra Y chromosome as "extremely tall stature, long limbs with strikingly long arm span, facial acne, mild mental retardation, severe mental illness (including psychosis) and aggressive, anti-social behaviour involving a long history of arrests, frequently beginning at an early age".[18] Other writers have, however, warned that there may be up to four distinct clinical manifestations of this syndrome only one of which includes overgrowth, mental deficiency and criminal history.[19] Despite this warning, both popular and professional writings on this subject have presented their hypotheses in terms of XYY being linked with tall, aggressive, anti-social individuals who are found in unusual numbers in prisons and security mental hospitals.

Between the first report of an adult XYY male in 1961, and the end of 1965, some 12 examples of XYY males had been described as such in the literature. They did not come from any particular institutional or other setting, but were apparently found fortuitously during the examination of males suffering from some physical abnormality, often in conjunction with a degree of mental retardation.[20] The questions which are now being raised in relation to XYY abnormality and crime found first expression in 1962 in a perceptive and prescient letter written by the late Dr. William Court Brown of Edinburgh to the journal *Lancet*. Dr. Court Brown, noting a predisposition in chromosomally abnormal males to "larceny, fire-raising, and indecent exposure" asked "whether such individuals could be held in law to suffer from a diminished responsibility by virtue of their abnormal constitution?" [21] Court Brown's colleague, Dr. Patricia Jacobs, pursued the matter further and initiated a new phase of research with her publication of preliminary findings from a chromosome survey of male patients in the maximum security State Hospital at Carstairs in Lanarkshire, Scotland.[22]

The hospital, which is not a part of the prison service, provides care for persons detained under the Scottish *Mental Health Act 1960* and who require treatment in conditions of special security on

& Berman, *Chromosomal Deviation and Crime*, 34 FED. PROB. 55 (1970); Baker, *XYY Chromosome Syndrome and the Law*, 7 CRIMINOLOGICA 2 (1970); Russell & Bender, *Legal Implications of the XYY Syndrome*, 2 SEMINARS IN PSYCHIATRY 40 (1970). Some extraordinary research is being undertaken at the State University of New York in breeding fish with an extra Y chromosome and comparing their behaviour with normal XY male fish, see, Hamilton, Walter, Daniel & Mesler, *Competition for Mating Between Ordinary and Supermale Japanese Medaka Fish*, 17 ANIMAL BEHAVIOUR 168 (1969); Walter & Hamilton, *"Supermales" (YY Sex Chromosomes) and Androgen-Treated XY Males: Competition for Mating with Female Killifish*, 18 ANIMAL BEHAVIOUR 128 (1970).

[16] KAHN & WEINER, THE YEAR 2000, 108–113 (1967); Fleming, *On Living in a Biological Revolution*, ATLANTIC MONTHLY, March 1969; *Further Thoughts on the Biological Revolution*, ATLANTIC MONTHLY April, 1969; Bender, Strack, Ebright & Haunalter, *Delphic Study Examines Developments in Medicine*, 1 FUTURES 289 (1969).

[17] New York Times, Nov. 23, 1969 at 1, col. 2.

[18] Telfer, *Are Some Criminals Born That Way?* 34 THINK 24 (1968). Similarly, Dr. John Money of Johns Hopkins University has set out a composite image of the XYY prisoner based on at least eleven variables *viz.*: "broken family; difficult child; school history of behaviour problems and under achievement; I.Q. average; E.E.G. probably abnormal; excessive daydreaming; socially alone; occupationally a drifter; unrealistic future expectations; impulsive aggression and/or violence, but not an aggressive personality; bisexual or homosexual and impulsive in sexual expression, with no depth or continuance of affection". *See* Money, Gaskin & Hull, *Impulse, Aggression and Sexuality in the XYY Syndrome*, 44 ST. JOHN'S L. R. 220, 231 (1969).

[19] Carakushansky, Neu & Gardner, *XYY with Abnormal Genitalia*, 2 LANCET 1144 (1968); Heinz, *YY Syndrome Forms*, 1 LANCET 155 (1969).

[20] Court Brown, *Males With an XYY Sex Chromosome Complement*, 5 J. MED. GENET. 341 (1968).

[21] *Sex Chromosomes and the Law*, 2 LANCET 508 (1962).

[22] Jacobs, Brunton, Melville, Brittain & McClemont, *Aggressive Behaviour, Mental Subnormality and the XYY Male*, 208 NATURE 1351 (1965).

account of their dangerous, violent or criminal propensities. It was divided into one wing for those classified as mentally subnormal and another for those suffering from mental illness. At the time of Jacob's survey, there were 342 male patients in the hospital; 203 in the subnormal's wing and 139 in the wing for the mentally ill. Patients were admitted in one or other of the following ways: (a) on committal by the courts, (b) from penal institutions where mental illness or mental subnormality was diagnosed during the course of a prison sentence, and (c) from other mental hospitals and hospitals for the mentally subnormal whether or not they had been admitted there on a court order.

Although it was possible that patients who had not been convicted of criminal offenses could be sent to this hospital, at the time of the chromosome survey 249 of the 342 patients were admitted from the courts. All but ten of the total number of patients had criminal records. By ascertaining whether or not there was an increased frequency of XYY males among mentally abnormal persons who were detained because of their dangerous, violent or criminal propensities, the research workers hoped to test their hypothesis that an extra Y chromosome predisposed its carrier to unusually aggressive behavior. Jacobs and her colleagues were only able to examine 315 of the 342 men and, of these, 196 came from the subnormal's wing. The preliminary report showed that twelve of the 196 men had an abnormal chromosome complement (6.1%) and that this included 7 men with an XYY sex chromosome constitution (3.6%). When the survey was completed,[23] another two XYY males had been found in 119 men from the wing for the mentally ill (1.7%). Altogether nine XYY males were discovered in this initial survey of an institutional population—a frequency of almost 3%.

This figure alone has no significance until compared with figures on the frequency of the same abnormality in the general community. At the time of the Carstairs hospital study this figure was not known, though on theoretical grounds it had been estimated to be in the vicinity of 1.3 per 1,000 live births (0.13%).[24] Actual chromosome counts of almost 10,000 new-born male infants in Scotland, Canada and the U.S.A. have since indicated an overall figure in the vicinity of 1.5 per 1,000 (0.15%).[25] The Carstairs findings therefore represented a twentyfold increase over the newborn incidence. However, the study was not able to reveal whether the increased frequency of XYY males found in the State hospital was related to their aggressive behaviour, their mental retardation or to a combination of both these factors.

A particular point of interest was that the males with XYY chromosomes were significantly taller than the XY males in the institution and that, in the group studied, a man 6 ft. or more in height had approximately a 50% chance of having an XYY constitution. The mean height of the men with a single Y chromosome was 5 ft. 7 in., while the mean height of the males with an extra Y chromosome was 6 ft. 1 in.

In the following year another team of researchers examined the tall men (6 ft. or over) at the English maximum security hospitals at Rampton, Moss Side, and Broadmoor and confirmed the findings of Jacobs that stature was a useful marker for the identification of the XYY male.[26] Of the 50 males found to be 6 ft. or more in height at the special hospitals at Moss Side and Rampton, 12 had an XYY complement and 4 of 50 from Broadmoor had the same chromosome defect. Though the survey findings from Moss Side and Rampton, in which there was no screening on the basis of height, have yet to be reported, the indications are that the overall frequency of XYY males will be comparable with the Carstairs hospital study with approximately 3% of the institution's population having an extra Y chromosome.[27]

Apart from their unusual height, the XYY males

[23] Jacobs, Price, Court Brown, Brittain & Whatmore, *Chromosome Studies on Man in a Maximum Security Hospital*, 31 ANN. HUM. GENET. 339 (1968).

[24] Court Brown, *supra* note 14 at 86.

[25] Sergovich, Valentine, Chen, Kinch & Smout, *Chromosome Aberrations in 2159 New-Born Babies*, 280 NEW. ENG. J. MED. 851 (1969); Ratcliffe, Stewart, Melville, Jacobs & Keay, *Chromosome Studies on 3500 New-Born Male Infants*, 1 LANCET 121 (1970); Lubs & Ruddle, personal communication 1969, cited in Ratcliffe *et al. ibid.* p. 122; Walzer, Breau & Gerald, *A Chromosome Survey of 2,400 Normal Newborn Infants*, 74 J. PEDIATRICS 438 (1969); Turner & Wald, *Chromosome Patterns in a General Neonatal Population*, Proceedings of the Pfizer International Symposium, Edinburgh, Scotland, 14–16 May 1969 (in press) cited in Roebuck & Atlas, *Chromosomes and the Criminal* 15 CORRECTIVE PSYCHIAT. 103 (1969). Each of the above studies surveyed consecutive liveborn male infants. Walzer however specifically excluded from his study physically abnormal or unhealthy infants. If his study is omitted from calculation, the incidence of XYY abnormality in newborn male infants will be shown as 19. per 1000.

[26] Casey, Blank, Street, Segall, McDougall, McGrath & Skinner, *YY Chromosomes and Antisocial Behaviour*, 2 LANCET 859 (1966).

[27] Court Brown, *supra* note 20 at 349.

TABLE 1

FAMILY HISTORY OF CRIMINAL CONVICTIONS

| | 9 XYY | 18 Controls |
|---|---|---|
| No. of parents convicted of crime. | 0 | 1 |
| No. of convictions..... | 0 | 1 |
| No. of siblings..... | 31 | 63 |
| No. of siblings convicted..... | 1 | 12 |
| No. of convictions..... | 1 | 139 |
| No. of families with criminal records*..... | 1 | 7 |

* Excluding the records of the 27 patients.

in the Carstair's study have been shown to be physically unremarkable and not different in any significant bodily respect from a group of other patients in the hospital when matched for age, intelligence and stature.[28] All appeared to be normally sexually developed. Similarly, in terms of psychological test results, no significant differences between the chromosomally abnormal group and matched controls have been detected.[29] The behavioral characteristics of the nine XYY males at Carstairs were subject to a detailed assessment and were compared with a control group of eighteen XY males randomly selected from the hospital population.[30] All nine XYY male patients suffered from a mental disorder which was classified as "severe personality disorder of undetermined cause" which, in most instances, was associated with intellectual impairment. In this respect the control group was almost identical to the XYY's.

There were, however, four ways in which the XYY male differed importantly from the controls. First, even though the patients in the two groups had criminal records of comparable length, the XYY patients displayed, in their criminal behaviour, *less* violence against persons than did control patients. Thus, of the 210 occasions on which the eighteen control males had been convicted, forty-six of these (21.9%) had been for crimes against the person while 132 (62.9%) had been for crimes against property. On the other hand, the nine XYY males had been convicted on a total of ninety-two occasions, but only eight (8.7%) of these convictions had been for crimes against the person whereas eighty-one (88%) had been for crimes against property. Only four of the nine XYY males had been convicted of offenses against the person compared with seventeen out of the eighteen controls. This finding substantially demolished Jacob's original hypothesis that an extra Y chromosome predisposed its carrier to unusually aggressive behaviour and, to this extent, the title of Dr. Jacobs 1965 preliminary report on XYY males now appears somewhat inappropriate.

The second main finding in relation to the Carstairs group of XYY patients was that, although their records included considerably fewer crimes of violence against persons, they began their criminal activities at a very young age (on an average, five years earlier than the control patients). Three of the nine XYY males had been convicted before the age of 10 years and the mean age at first conviction for all was 13.1 years. None of the eighteen controls had been convicted before reaching 10 years of age and the mean age at first conviction was, in this group, 18 years. Moreover, there was evidence in the case of more than half the XYY males that they had been in trouble with school authorities and police on account of minor offences even before their first convictions. Third, the research indicated that, among the XYY patients, there was no significant family history of crime or mental illness (see table 1).

The final observation made suggested that the XYY patients were more resistant than others to conventional corrective training and treatment.

From these studies by Jacobs, Casey, Price, Court Brown and their various research teams, the picture emerged of psychopathic individuals, often standing out as the black sheep in otherwise reasonably well adjusted families. Aggression against persons was not, however, an important feature of these men, although later reports of individual XYY cases have shown that XYY males can be extremely aggressive.[31] Even though some "nor-

[28] Price, Strong, Whatmore & McClemont, *Criminal Patients with XYY Sex Chromosome Complement*, 1 LANCET 565 (1966).

[29] Hope, Philip & Loughran, *Psychological Characteristics Associated with XYY Sex Chromosome Complement in a State Mental Hospital*, 113 BRIT. J. PSYCHIAT. 495 (1967).

[30] Price & Whatmore, *Criminal Behaviour and the XYY Male*, 213 NATURE 815 (1967); Price & Whatmore, *Behaviour Disorders and Pattern of Crime Among XYY Males Identified at a Maximum Security Hospital*, 1 BRIT. MED. J. 533 (1967).

[31] *See, e.g.*, Telfer *et al.*, *supra* note 13 at 7; Wiener, *et al.*, *supra* note 3; Persson, *An XYY Man and His Relatives*, 11 J. MENT. DEFIC. RES. 239 (1967); Matthews & Brooks, *Aggression and the YY Syndrome*, 2 LANCET 355 (1968); Cowie & Kahn, *XYY Constitution in Prepubertal Child*, 1 BRIT. MED. J. 748 (1968). Reference must also be made to the cases of Tait, Hugon, Speck, Beck, Hannell and Farley referred to earlier.

mal" XYY individuals have been reported,[32] it is upon the Scottish findings of an increased incidence in institutional populations, and upon their description of the behavioral characteristics of XYY men, that most later research has been based. The Carstairs study is not presented as a model piece of scientific investigation. The samples are too small to exclude the risk of gross statistical error; and the bulk of information on the criminality of XYY males is based on information derived from surveying groups of men, the majority of whom are known to have criminal records. Nevertheless, Jacob's work remains important as the bench-mark from which all subsequent research has taken its direction.

The stage of research has now been reached in which information is being gathered on the frequency and characteristics of extra Y men in diverse samplings of male populations. The surveys have included groups of men in prisons and mental hospitals, juvenile delinquents, and samples of non-institutionalized "normal" males. The classification, for comparative purposes, of available surveys findings is an exercise of extremely doubtful validity and, therefore, care must be taken not to over-interpret the few facts that are already in hand. A number of important limiting factors should be kept in mind. The tabulation of the populations surveyed into Adult Prisoners, Criminally Insane Offenders, Mental Patients, Juvenile Offenders and Non-Institutionalized Populations, is, of necessity, somewhat arbitrary owing to the brief fashion in which the institutions under study are usually described in the presentations of research findings. There has been negligible standardization of research in terms of the type, purpose and location of the institution or agency whose population is sampled, the general physical, mental or social characteristics of the entire group from which the research sample has been selected, the period of time over which the survey has been conducted, and even the particular laboratory procedures used for the identification of chromosomal abnormalities. Similarily, the variations in sample size are considerable. It will be seen from table 2 that in chromosome surveys of populations not defined by height, the sample size has ranged from 50 to 607 persons. But, with regard to the expected frequency in the normal population of only 1 or 2 XYY cases per thousand, the sample size is clearly inadequate.[33]

A number of different screening devices have been utilized by researchers in an attempt to expedite the discovery of persons with an extra Y chromosome complement. Height (6 ft. and over) is the primary screening device used and, as can be seen from table 3, it does increase the probability of identifying XYY males. However, it is important to note that the height limitation set by different researchers varies from 5 ft. 9 in. to 6 ft. 2 in. and that it is sometimes used in conjunction with further screening on the basis of low intelligence and/or aggression. Moreover, it is clear that not all of the screening criteria used by the various researchers have been made explicit in their published reports and there is reason to believe that, on this ground, a number of the findings should be viewed as unrepresentative.[46]

Not only is comparison of results complicated by the differing criteria used in the choice of research subjects, but also, in most cases, little attention is given to the identification and analysis of the particular selection factors and admission criteria which determine the type of man found in the institution. Because certain facilities bear similar titles and appear to serve the same purposes, it does not necessarily follow that they contain homogeneous populations. The existence of different population profiles is a likely explanation of why outwardly comparable institutions contain significantly different distributions of XYY males.

Tables 2 and 3 reveal that, to date, surveys of non-institutionalized adult populations (whether height screened or not) have failed to find any cases of XYY abnormality. Because of the heavy weighting of married males provided by the groups attending subfertility clinics and the fact that over half of the 207 men in the Edinburgh general practices sample were 65 years or older, these findings cannot be taken to be representative of the normal non-institutional population at

[32] *See* Wiener & Sutherland, *A Normal XYY Man*, 2 LANCET 1352 (1968); Stenchever & MacIntyre, *A Normal XYY Man*, 1 LANCET 680 (1969). In 1968 Court Brown, Price & Jacobs published information on a further 15 XYY males emphasising their apparently normal sexual development and the fact that they were to be found in various sectors of the community and not merely in prisons or maximum security hospitals. There was however considerable evidence of behavioural disturbances in this group: Court Brown, Price & Jacobs, *Further Information on the Identity of 47 XYY Males*. 2 BRIT. MED. J. 325 (1968).

[33] The Centre of Criminology, University of Toronto in conjunction with the Department of Pathological Chemistry and Banting Institute is planning an XYY chromosome survey in different male populations using 1000 as the minimum sample size in each group. The Johns Hopkins University in Maryland is planning a project involving two samples of 7,500 each.

TABLE 2

PREVALENCE OF XYY MALES IN POPULATIONS UNSCREENED ON BASIS OF HEIGHT*

| Population Surveyed | No. Examined | No. XYY | % XYY |
|---|---|---|---|
| Adult Prisoners | | | |
| Grendon Prison for recidivists, England[34] | 204 | 2 | 0.98 |
| Allocation centre, Saughton Prison, Edinburgh, Scotland (males sentenced to one year or more)[35] | 302 | 0 | — |
| | 506 | 2 | 0.39 |
| Criminally Insane Offenders | | | |
| Hospital for the Criminally Insane, Ontario, Canada[36] | 230 | 4† | 1.73 |
| Juvenile Offenders | | | |
| New entrants, Scottish Borstals for one year[37] | 607 | 1 | 0.16 |
| Detention home and court psychiatric referrals, New York State[38] | 57 | 1 | 1.75 |
| | 664 | 2 | 0.30 |
| Mental Patients | | | |
| Maximum Security Hospital, Carstairs, Scotland[39] | 315 | 9 | 2.85 |
| Mental Subnormality Hospital, England[40] | 605 | 0 | — |
| | 920 | 9 | 0.97 |
| Non-Institutionalized Population | | | |
| Randomly selected adult males, Edinburgh (general medical practices)[41] | 207 | 0 | — |
| Males attending a subfertility clinic, Uppsala, Sweden[42] | 135 | 0 | — |
| Males attending a subfertility clinic, Edinburgh, Scotland[43] | 50 | 0 | — |
| Males attending a subfertility clinic, Edinburgh, Scotland[44] | 143 | 0 | — |
| | 535 | 0 | — |
| Other | | | |
| Epileptic Colony, Edinburgh[45] | 72 | 1 | 1.38 |
| Totals | 2927 | 18 | 0.61 |

* Newborn infant surveys have been excluded from this table—see *supra*, note 25 and accompanying text.
† Includes one XYYY.

[34] Bartlett, Hurley, Brand, & Poole, *Chromosome of Male Patients in a Security Prison*, 219 NATURE 351 (1968).
[35] Unpublished Edinburgh data, see Court Brown, *supra* note 20 at 354.
[36] Sergovich, *supra* note 15 at 307.
[37] Note 35 *supra*.
[38] Marinello, Berkson, Edwards & Bannerman, *A Study of the XYY Syndrome in Tall Men and Juvenile Delinquents*, 208 J.A.M.A. 321 (1969).
[39] Jacobs, *et al.*, *supra*, notes 22 and 23.
[40] Note 35 *supra*.
[41] Court Brown, Buckton, Jacobs, Tough, Kuenssberg & Knox, *Chromosome Studies on Adults*, 42 EUGENICS LABORATORY MONOGRAPH (1966).
[42] Kjessler, *Karyotype, Meiosis and Spermatogenesis in a Sample of Men Attending an Infertility Clinic*, 2 MONOGRAPHS IN HUMAN GENETICS (1966).
[43] McIlree, Price, Court Brown, Tullock, Newsam & Maclean, *Chromosome Studies on Testicular Cells from 50 Subfertile Men*, 2 LANCET 69 (1966).
[44] Note 35 *supra*.
[45] *Id.*
[46] Especially Goodman *et al.*, *infra* note 49 and Wiener, *et al.*, *supra* note 3. See the comments by Court Brown, *supra* note 20 at 356.

TABLE 3

PREVALENCE OF XYY MALES IN POPULATIONS SCREENED ON BASIS OF HEIGHT

| Population Surveyed | Screening Criteria | No. Examined | No. XYY | % XYY |
|---|---|---|---|---|
| Adult Prisoners | | | | |
| Nottingham Prison, England[47] | ht. ≥6 ft. | 24 | 2 | 8.33 |
| Institution for defective offenders, Patuxent, Maryland[48] | ht. 6 ft.; W.A.I.S. <75 | 10 | 0 | — |
| | ht. ≥6 ft.; aggressive | 10 | 0 | — |
| | ht. ≥6 ft. 2 in. | 22 | 1 | 4.54 |
| State Penitentiary, Ohio[49] | ht. ≥6 ft. 1 in. | 100 | 2 | 2.00 |
| H. M. Prison, Wandsworth, London, England[50] | ht. ≥6 ft. | 34 | 2 | 5.88 |
| H. M. Prison, Pentridge, Melbourne, Australia[51] | ht. ≥5 ft. 9 in. | 34 | 4 | 11.76 |
| Penal Institution for unselected delinquent adults, Pennsylvania[52] | ht. ≥5 ft. 11 in. | 35 | 2 | 5.71 |
| Penal institution for mentally defective adults, Pennsylvania[53] | ht. ≥5 ft. 11 in. | 30 | 0 | — |
| All prisons, Scotland[54] | ht. ≥6 ft. | 106 | 1 | 0.94 |
| State Prison, Attica, New York State[55] | ht. ≥6 ft. | 86 | 2 | 2.32 |
| Prison, New York State[56] | ht. ≥6 ft.; aggressive | 5 | 0 | — |
| | | 496 | 16 | 3.22 |
| Criminally Insane Offenders | | | | |
| Hospital for the criminally insane, Pennsylvania[57] | ht. ≥5 ft. 11 in. | 50 | 2 | 4.00 |
| Institution for criminal psychopaths, Herstedvester, Denmark[58] | ht. ≥5 ft. 11 in. | 37 | 2 | 5.40 |
| Criminal psychiatric patients, New York State[59] | ht. ≥6 ft.; aggressive | 18 | 1 | 5.55 |
| | | 105 | 5 | 4.76 |
| Juvenile Offenders | | | | |
| Detention Centre for juvenile delinquents, Pennsylvania[60] | ht. ≥5 ft. 11 in. | 14 | 1 | 7.14 |
| Delinquent boys (12–19 years) in approved schools, England[61] | ht. ≥90th percentile for age | 29 | 3 | 10.34 |
| Institution for young offenders, Scotland[62] | ht. ≥6 ft. | 16 | 1 | 6.25 |
| Detention Centre, Scotland[63] | ht. ≥6 ft. | 4 | 0 | — |
| | | 63 | 5 | 7.93 |
| Mental Patients | | | | |
| Maximum security hospital, Scotland[64] | ht. ≥6 ft. | 21 | 5 | 23.80 |
| Maximum security hospitals, England:[65] mentally subnormal | ht. ≥6 ft. | 50 | 12 | 24.00 |
| mentally ill | ht. ≥6 ft. | 50 | 4 | 8.00 |
| Institution for mentally ill, England[66] | ht. ≥6 ft. | 30 | 0 | — |
| State hospital, Atascadero, California[67] | ht. ≥6 ft. | 120 | 4 | 3.33 |
| State mental hospital, Denmark[68] | ht. ≥5 ft. 11 in. | 23 | 3 | 13.04 |
| Hospital for mentally subnormal and psychiatric cases England[69] | ht. ≥6 ft. | 19 | 2 | 10.52 |
| Mental hospitals, Sweden[70] | ht. ≥6 ft. | 96 | 3 | 3.12 |
| State mental hospital, Arhus, Denmark[71] | ht. ≥5 ft. 11 in. | 41 | 0 | — |
| Mental subnormality hospitals, Scotland[72] | ht. ≥6 ft. | 39 | 3 | 7.69 |
| Mental subnormality hospital, England[73] | ht. ≥6 ft. | 21 | 5 | 23.80 |
| Mental disease hospitals, Scotland[74] | ht. ≥6 ft. | 112 | 1 | 0.89 |

TABLE 3—*Continued*

| Population Surveyed | Screening Criteria | No. Examined | No. XYY | % XYY |
|---|---|---|---|---|
| Mental Patients | | | | |
| Mental hospitals, Wisconsin[75]: maximum security | ht. ≥6 ft. | 210 | 10 | 4.76 |
| mentally retarded | ht. ≥6 ft. | 32 | 1 | 3.12 |
| State mental hospital, New York State[76] | ht. ≥6 ft. | 76 | 1 | 1.31 |
| Psychiatric patients (4 institutions), New York State[77] | ht. ≥6 ft.; aggressive | 26 | 0 | — |
| | | 966 | 54 | 5.59 |
| Non-institutionalized Populations | | | | |
| "Normal" male population, England[78] | ht. ≥6 ft. | 30 | 0 | — |
| College basketball players, Ohio[79] | ht. ≥5 ft. 11 in. | 36 | 0 | — |
| Industrial population, Scotland[80] | ht. ≥6 ft. | 371 | 0 | — |
| White "normal" male volunteers, New York State[81] | ht. ≥6 ft. | 30 | 0 | — |
| | | 467 | 0 | — |
| Totals | | 2097 | 80 | 3.81 |

large. However, they do point to the existence of a gap between the numbers found in prisons, hospitals for the criminally insane, mental hospitals and centres for juvenile delinquents and those in the wider community. Why tall juvenile offenders and mental patients, as discrete groups, should provide the highest percentages of XYY cases is not clear. Since juvenile offenders and mental patients are ordinarily seen as needing treatment rather than as deserving punishment they are, paradoxically, likely to be confined in an institution for a wider range of behavior than would normally be seen as justifying strict imprisonment. It is thus open to the speculation that, if in fact the extra Y chromosome is linked with impulsive forms of anti-social conduct, populations of institutionalized juvenile offenders and mental patients will represent more variant forms of such behaviour and, consequently, will disclose more XYY cases.

In addition to the 98 XYY cases discovered in the above surveys, at least a further dozen have been individually identified because of their severe

[47] Casey *et al.*, *supra* note 26.
[48] Welch, Borgaonkar & Herr, *Psychopathy, Mental Deficiency, Aggressiveness and the XYY Syndrome*, 214 NATURE 500 (1967).
[49] Goodman, Smith & Migeon, *Sex Chromosome Abnormalities*, 216 NATURE 942 (1967).
[50] Griffiths & Zaremba, *Crime and Sex Chromosome Anomalies*, 4 BRIT. MED. J. 622 (1967).
[51] Wiener, *et al.*, *supra* note 3.
[52] Telfer, Baker, Clark & Richardson, *Incidence of Gross Chromosomal Errors Among Tall Criminal American Males*, 159 SCIENCE 1249 (1968).
[53] *Id.*
[54] Unpublished Edinburgh data, see Court Brown, *supra* note 20 at 355.
[55] Marinello, *et al.*, *supra* note 38, p. 321.
[56] Abdullah, Jarvik, Kato, Johnston & Lanzkron, *Extra Y Chromosome and its Psychiatric Implication*, 21 ARCH. GEN. PSYCHIAT. 497 (1969).
[57] Note 52 *supra*.
[58] Nielsen, Tsubol, Sturup, & Romano, *XYY Chromosomal Constitution in Criminal Psychopaths*, 2 LANCET 576 (1968).
[59] Note 56 *supra*.
[60] Note 52 *supra*.
[61] Hunter, *Chromatin-positive and XYY Boys in Approved Schools*, 1 LANCET 816 (1968).
[62] Note 54 *supra*.
[63] Note *Id.*
[64] Jacobs, *et al.*, *supra*, notes 22 and 23.
[65] Note 47 *supra*.
[66] *Id.*
[67] Thompson (1967), personal communication cited in Court Brown, *supra* note 20 at 355.
[68] Nielsen, *The XYY Syndrome in a Mental Hospital*, 8 BRIT. J. CRIM. 186 (1968).
[69] Close, Goonetilleke, Jacobs & Price, *The Incidence of Sex Chromosome Abnormalities in Mental Subnormal Males*, 7 CYTOGENETICS 277 (1968).
[70] Akesson, Forssman & Wallin, *Chromosomes of Tall Men in Mental Hospitals*, 2 LANCET 1040 (1968).
[71] Nielsen, *Y Chromosomes in Male Psychiatric Patients above 180 cm. Tall*, 114 BRIT. J. PSYCHIAT. 1589 (1968).
[72] Note 54 *supra*.
[73] *Id.*
[74] *Id.*
[75] Daly, *Neurological Abnormalities in XYY Males*, 221 NATURE 472 (1969).
[76] Note 55 *supra*.
[77] Note 56 *supra*.
[78] Note 47 *supra*.
[79] Goodman, Miller & North, *Chromosomes of Tall Men*, 1 LANCET 1318 (1968).
[80] Note 54 *supra*.
[81] Note 55 *supra*.

behavioral problems and unusual height. Thus, in the five years following Jacobs' first report of institutionalized XYY males, more than 100 cases have been described in the literature. Since the bulk of this subsequent research has involved surveying populations of males held in institutions for the psychiatric or behaviorally deviant, it is hardly surprising to find that the majority of extra Y males detected have had a history of anti-social behavior. Nevertheless, this has been widely interpreted as indicating that XYY individuals are predisposed to anti-social and criminal behavior and has led to the hypothesis that XYY individuals can be shown to differ significantly from chromosomally normal males with respect to behavioral and other characteristics. It cannot be denied that there is evidence that gross chromosomal abnormalities are found in small but unexpected numbers of males who become institutionalized for criminal or abnormal psychiatric behavior; but the stage at which it is meaningful to talk of an XYY syndrome in Dr. Telfer's terms has certainly not been yet reached. The Scottish researchers have consistently been unwilling to state any case stronger than, that by comparison with an XY male, an XYY individual incurs some increased risk of developing a psychopathic personality through the quantitative evaluation of this enhanced risk is not yet possible. Certainly, in their opinion, there is no evidence that an XYY male is inexorably bound to develop anti-social or criminal traits.[82]

Not only is additional systematic investigation of the incidence of XYY abnormality in selected populations required, but almost every aspect of the morphology of the XYY male demands a great deal of further study. For example, a comparison of tables 2 and 3 indicates that when the population examined is defined according to height, the probability of identifying XYY males is largely increased. However, unless the study systematically samples the full range of height in the population surveyed, no comparison of height/XYY frequency correlates can be made between different groups which may vary in height. Moreover, there is evidence that significant numbers of XYY individuals are not abnormally tall. When a listing is made of the heights of all adult XYY males identified in the literature in circumstances in which height was neither a screening device nor a factor influencing the undertaking of chromosome studies, it is found that the height range commences at 5 ft. 7 in. and extends to 6 ft. 5 in. with a mean of 6 ft.[83] This data, when tabulated, suggests that approximately 50% of adult XYY's will be under 6 ft. in height. This means that chromosome surveys limited to men of this height or greater, risk failing to detect 50% of the XYY cases likely to be present. And, even if the height limitation is set at 5 ft. 10 in., approximately 25% may still be missed. The contention that overgrowth is the outstanding morphological characteristic of extra Y males may also be assailed on a number of other grounds.

On the one hand there is the problem of taking into account factors which exert a restraining influence on bodily growth. For example, malnutrition in childhood, especially in those born before the postwar improvements in nutritional standards, and mental subnormality, commonly reported in XYY men, is, itself, known to affect stature. On the other hand, and probably of greater importance, is the likelihood that some males with an XYY constitution come from families with an established tendency towards tallness. In several cases it has been found that the chromosomally normal siblings (both male and female) of a tall institutionalized XYY male were of similar height to their abnormal brother.[84] In the family history of the tallest XYY man so far reported, a Jamaican measuring 7 ft. 5½ in., it was stated that his father was of similar height and that all his living siblings were also tall.[85] Again, the first report of a Mexican with an extra Y complement came about as the result of an investigation into the genetic background of this man's two unusually tall daughters.[86]

If the extra Y chromosome is simply linked with overgrowth it is plausible to argue that individuals who are in fact taller and heavier in stature may be particularly susceptible to the risk of imprisonment because their great build and height presents such a frightening picture that courts and psychiatrists may be biased in directing them towards mental hospitals or prisons for community safety.[87] Such an hypothesis has the advantage of

[82] Court Brown, Price & Jacobs, *The XYY Male*, 4 BRIT. MED. J. 513 (1968).

[83] Court Brown, *supra* note 20 at 350.

[84] Wiener *et al. supra*, note 3; Jacobs, *et al.*, *supra* note 23.

[85] Thorburn, Chutkan, Richards & Bell, *XYY Chromosomes in a Jamaican with Orthopaedic Abnormalities*, 5 J. MED. GENETICS 215 (1969).

[86] Lisker, Zenzes & Fonesca, *XYY Syndrome in a Mexican*, 2 LANCET 635 (1968).

[87] Hunter, *YY Chromosomes and Klinefelter's Syndrome*, 1 LANCET 948 (1966).

being more parsimonious than one which postulates that the XYY genotype, in some hitherto unknown manner, finds phenotypic expression in particular types of anti-social behavior.

A variety of other physical, neurological and physiological abnormalities have been described as being associated with the finding of an additional Y chromosome. These include anomalies of the genital tract, varicose ulceration of the legs, acne, abnormal EEG and ECG findings, and elevated levels of the hormone testosterone (largely responsible for the full development of male secondary sex characteristics). These and other findings have been critically reviewed at length elsewhere[88] and it is sufficient for present purposes to observe that they are, to say the least, equivocal. Even the widely affirmed connection between mental subnormality and XYY has been challenged with the recent finding of males with normal and above normal I.Q.'s.[89]

An editorial annotation in the *Australian and New Zealand Journal of Psychiatry* has suggested that XYY research "might well lead to the delineation of a clear cut constitutional psychopath from the present amorphous mass of psychopathic personalities".[90] This is an interesting speculation since the English psychologist Hans Eysenck has, for some time, been arguing controversially for acceptance of a modern version of the Lombrosian notion of the "born criminal" on the basis of the existence of "some kind of gene, chromosome, or other structure which could be the physiological or neurological basis for differences between the criminal and non-criminal kind of person". Eysenck's theory is probably far too broad, but it would be of considerable interest to ascertain whether "XYY psychopaths" bear any of the modern Eysenckian "stigma of criminality" —high scores on measures of extraversion and low ones on measures of conditionability.[91]

It might be thought premature to speculate on the significance in the criminal law of such an ill defined theory and one whose viability, in any form, is so uncertain. Yet, as has already been noted, reference to the accused's abnormal genetic make-up has been made in a number of criminal trials—inevitably in support of a plea of insanity. But in no case known to the writer has the presence of an extra Y chromosome proved to be an adequate basis for a successful defense. The demonstration of this genetic defect in the body cells of a defendant has not yet impressed the courts in their consideration of his criminal responsibility, nor is it likely to have any effect on them in the immediate future. Until scientists are able to enunciate, in fairly precise terms, the behavioural impact on a person of this abnormality, the courts are wise to retain their skepticism.

Whether the defense of insanity rests on the view that insanity is a cognitive or behavioural disorder, or a combination of both, the overriding problem of establishing some causal connection between the accused's chromosomal anomaly and his mental functioning remains.[92] Under formulations based on the McNaughten rules the onus is upon the accused to prove that at the time of the act he was incapable of either appreciating the nature and quality of his conduct or knowing that it was wrong. If one puts aside those XYY individuals who are found to be also suffering from severe mental illness or retardation which is productive of cognitive incapacity, it would appear, in the present state of knowledge, that possession of the extra Y chromosome does not itself affect a person's ability to appreciate either the nature and quality of his aggressive or criminal acts or that they are wrong. Thus proof of this particular chromosomal abnormality would not, alone, sustain a plea of insanity under this test.

In those jurisdictions in which insanity is recognized as a behavioural disorder, the defense of insanity is founded on the incapacity of the accused to control his actions. This often takes the form of the defence of "irresistible (or uncontrollable) impulse" or the limited defense of "diminished responsibility". However, until the alleged nexus between the chromosomal abnormality pleaded by the accused and his poorly controlled aggression can be more clearly demonstrated, these defenses too are doomed to failure. In any event, the result of a successful plea of insanity usually is indeterminate detention in

[88] Kessler & Moos, *The XYY Karyotype and Criminality: A Review*, 7 J. PSYCHIAT. RES. 153 (1970).

[89] In one case an XYY male with an I.Q. of 125 was reported. *See* Borgaonkar, Murdock, McKusick, Borkowf, Money & Robinson, *The YY Syndrome*, 2 LANCET 461 (1968).

[90] Bartholomew, *The Extra Y Chromosome and Criminal Behavior*, 2 AUST. & N.Z. J. PSYCHIAT. 6 (1968).

[91] H. EYSENCK, CRIME AND PERSONALITY (1964).

[92] For an extended discussion of the relevance of the XYY syndrome to the *M'Naghten, Irresistible Impulse, Durham* and *Model Penal Code* tests of insanity, see, Note, *The XYY Chromosome Defense*, 57 GEO. L. J. 892 (1969). The Australian situation is described in Fox, XYY *Chromosomes and Crime*, 2 AUST & N.Z. J. CRIM. 5 (1969).

either a prison or security hospital. The strategic advantage of this defense is found in escape from the death penalty or, in those jurisdictions in which capital punishment has been abandoned, in the hope that the period of indeterminate detention will turn out to be shorter than the sentence of life imprisonment or fixed sentence in commutation of the death penalty. However, in the latter case, since the implication is that the chromosomal defect relied upon in establishing the defense of insanity is a chronic and unchangeable condition, the accused may find that his defense, in terms of expediting release, is no defense at all.

It is interesting to consider why XYY chromosome abnormality so quickly caught both the public and professional imagination. A search of the literature discloses that there have been more than 200 articles in professional journals in the fields of medicine, science, psychology, law and criminology since 1965.[93] Buttressing this interest has been considerable newspaper publicity. Part of the attention is, undoubtedly, the result of the murders which have been associated with a finding in the defendant of an XYY constitution. Again, some of the attention has derived from interest in XYY abnormality as a possible defense to a criminal charge; but, since XYY has been notably unsuccessful in this regard, it is hardly a case of lawyers delighting in finding new grounds of exculpation for their clients. The answer may lie at a deeper level.

In the pre-Freudian era of simplistic explanations of human behaviour, the view was largely held that behaviorally abnormal individuals, whether psychologically or criminally deviant, were qualitatively different from the wider normal population. The bizarre conduct of the abnormal person was due to possession by demons or, in Lombrosian terms, an atavistic throwback to earlier animal stages of existence, and bore no real relationship to normal conduct. It was important, therefore, that these people be isolated for they appeared to be dangerously different not merely in degree, but in terms of significant qualities.

[93] In June 1969 a conference on the XYY Syndrome was held in the U.S. under the auspices of the N.I.M.H. Centre for Studies in Crime and Delinquency and, in December, a similar conference was held in England under the sponsorship of the Institute of Criminology, Cambridge, CRIMINOLOGICAL IMPLICATIONS OF CHROMOSOME ABNORMALITIES (West ed. 1969). *See also* PROCEEDINGS OF THE SYMPOSIUM ON CHROMOSOME ABNORMALITY AND CRIMINAL RESPONSIBILITY, HEBREW UNIVERSITY OF JERUSALEM INSTITUTE OF CRIMINOLOGY (1969).

The behavioral scientists of the 20th century have propagated a different message. Possibly Freud's greatest contribution to the understanding of human behavior was that mentally-ill persons were not qualitatively different from the normal population and that mental illness was only a matter of degree. The garbled utterances of a schizophrenic patient were not meaningless sounds, but could be interpreted and, on interpretation, would realize meanings bearing remarkable resemblance to the thought processes of normal persons. Criminals too were not qualitatively different from non-criminals. Members of both groups had within themselves propensities for murder, rape, incest, theft and criminality in general. The differences between the groups lay more in the internalized controls and external constraints which modified the expression of their criminal potential than in any inherent difference between them. To be reminded of this essential similarity is not comforting, especially for those who believe themselves to fit clearly into the non-offender classification. And yet, since the time of Freud, social scientists in a variety of ways have been emphasizing and re-emphasizing the blurred distinction between, "normal" and "abnormal", criminal" and "non-criminal". Particularly in the last few years, this process has been carried forward so as to challenge the very concepts of crime and mental disorder themselves.

In this setting the proposition is suddenly advanced that some individuals, judicially labelled as serious offenders, can be shown to be biologically different from others not so labelled. The difference lies in the assertion that "serious offenders" bear in their body cells a genetic abnormality which is said to be linked with aggressive anti-social behavior. Again, as in Lombrosian days, the contention offers the comfort and reassurance of a clear cut, qualitative distinction between normal and abnormal individuals (or at least the worst of them). It is interesting that the cases which have received most attention as typifying the XYY syndrome, involve the most bizarre, disturbed and unacceptable behavior. In the process of denying one's own criminal propensities, it is extremely useful to accept the contention that serious offenders may have genetic abnormalities which predispose them to their crimes. This not only goes a long way towards fulfilling naive hopes for a single, all inclusive determinant of criminality, but it also provides a convenient moral advantage for both the community at

large and those personally responsible for the offender's welfare, for all are relieved from blame for the behavioural consequences of what is a purely biological accident.

Whatever may be the explanation for the publicity XYY abnormality has drawn to itself, the great interest in the theory has led to other significant consequences. The most important of these relates to the development of an XYY mythology. It would be wrong to think that by demonstrating that XYY abnormality constitutes an inadequate foundation for an insanity defense, and by showing that there are strong psychological reasons for interest in the topic, the subject no longer deserves the attention of criminologists. The substantive and procedural rules applicable to the trial process do not exhaust the subject matter of the criminal law. Decisions made before and after the trial are of equal concern to the criminal lawyer and criminologist. And the grounds upon which these decisions are made are not always to be found in statutes, regulations, or common law. Personal beliefs, institutional policies and community attitudes are some of the factors operating at these other stages in the criminal justice system. Over a period of time beliefs develop as to the characteristics of certain offender types and these beliefs have an important impact on the various decisions affecting those offenders, especially sentencing and discharge decisions. These beliefs, when they diverge significantly from reality, are more properly described as myths. There have been, and still are, a good number of these myths operating in our criminal justice system. A good example is the mythology surrounding sex offenders —that they are dangerously over-sexed, that they graduate from less serious to more serious sex offences, that there is a high risk of recividism, and that the victims are invariably innocent and unsuspecting strangers. Research findings do not support these views but, too often, sentences are imposed in accordance with the folk-belief rather than current knowledge.[94] Because XYY offenders constitute a brand new classification of offender type, one might have thought that here was an opportunity for medical and social scientists to come together to examine the phenomenon free of the mythology which tends to attach to classifications which have been in vogue for much longer periods. It might also be thought that sound decisions could be made in relation to the disposition of XYY individuals on the basis of those research findings. Unhappily, it is obvious that in the five years following the first major research publications a mythology has built up around the XYY male which extends to the definition of the syndrome, the nature of the offences committed, and the offender's rehabilitative potential. Very little of this is warranted by the information in hand. Yet this mythology is not only beginning to shape the limits of further research, it is also seriously presented as the basis of recommendations for far reaching legislative and administrative action within the criminal justice system. For instance, Professor McWhirter of the Department of Genetics in the University of Alberta, in a recent letter to *Science*, advocated the following:

> All boys and men who are under lawful restraint should be classified into XY and XYY categories so that the best treatment can be ascertained and carried out.... Where actions in tort lie against the state or its agents or both, each chromosomal type of delinquent, if not segregated, might sue—the XY for the gross negligence, and perhaps assault, of the state which is confining him in an environment known to be prejudicial to his chances of reform—and the XYY, because he is being negligently and cruelly deprived of the treatment and research which his condition requires. Subsequent victims of an XYY whom the state had negligently failed to diagnose despite confinement after a criminal act should also have an action in some jurisdictions. The probability factor makes the criminal XYY a predictably dangerous person and the standards of the duty to take care should accordingly be raised.[95]

In the near future the question whether legislative policies are to be framed, and administrative decisions made, in accordance with XYY mythology or XYY reality may have to be faced. McWhirter's letter calls for action on the basis of the mythology, namely that XYY males are psychopaths of uncontrollably aggressive temperament. The reality is that XYY males in an institutional setting are *less* violent or aggressive when compared to matched chromosomally normal fellow inmates; and their criminal histories involve crimes against property rather than persons. XYY individuals who do not exhibit forms of psychiatric deviance or criminal behavior have already been reported and social, familial and other non-

[94] *See* GIGEROFF, SEXUAL DEVIATIONS IN THE CRIMINAL LAW (1968).

[95] 164 SCIENCE 1117 (1969).

genetic environmental factors have not yet been ruled out as the primary determinants of the characteristics attributed to the extra Y chromosome. Even the generally accepted link with a tendency towards height requires further investigation. There are so many unknown factors that all of the research findings available to date must be considered with considerable circumspection.

If the mythology wins out, one can expect that the major role played by the discovery of an XYY constitution in an offender will be in relation to his sentencing, institutionalization and, at a later stage, his parole eligibility and discharge. The XYY offender will risk longer sentences of imprisonment, not for purposes of deterrence, vengeance or rehabilitation, but simply out of a desire on the part of the judge to isolate him in order to protect the community from danger. Similarly, the parole board may deny parole to an otherwise eligible prisoner on the ground that he has an XYY constitution which, in their opinion, substantially increases the risk of him recidivating. The cost to the individual XYY offender in terms of his personal suffering through longer sentences and decreased parole eligibility will be considerable. We are cruel enough to our prisoners under the guise of rehabilitating them without having to add additional false justification for that cruelty. Research must proceed in the exposition of this phenomenon but, in the present state of knowledge, no one should be subjected to any additional sanction or suffer any other disability on account of the finding in that person of an XYY chromosome abnormality.