INDIVIDUALS WITH SEX CHROMOSOMAL ANEUPLOIDIES: Does the Phenotype Reflect the Genotype?

Susan B. Jimenez
McMaster University

ABSTRACT

Abnormalities in sex chromosomes result in individuals with karyotypes that differ from the normal 46,XX human female or the 46,XY human male. While these unusual karyotypes have been described in terms of physical manifestations, most studies have attempted to discern whether or not there are any behavioural or psychological traits associated with individuals exhibiting sex chromosomal aneuploidies. In this paper I will discuss whether these aneuploidic individuals are atypical behaviourally compared with males and females with a normal chromosomal karyotype. Many studies of aneuploidic individuals have concentrated primarily on behavioural aspects. Frequently, inferences have been made concerning personality and behaviour, based on extremely small sample sizes. Some possible reasons for the research emphasis on psychosocial characteristics will be suggested.

RÉSUMÉ

Des abnormalités dans les chromosomes de sexe produisent des individus avec des karyotypes qui diffèrent du normal 46, XX (femelle) ou du 46, XY (mâle). Malgre que ces karyotypes ont été décrit en termes de manifestations physiques, la majorité des études ont essayer de discerner la présence ou l'absence de traits psychologiques associés aux individus ayant des nombres anormaux de chromosomes sexuels. L'auteur évalue le comportement de ces individus et les compare aux mâles et femelles ayant un karyotype normal. Plusieurs études se sont limitées essentiellement au comportement physique. Ces études ont établies des conclusions se rapportant à la personalité et au comportement, malgré qu'elles soint basées sur des petits échantillons. L'auteur suggère plusieures facteurs soulignant l'importance de la recherche sur les implications psychosociales de ce phénomène.

NORMAL vs. ANEUPLOID SEX CHROMOSOMAL KARYOTYPES

The normal human female has the karyotype 46,XX and the normal human male, 46,XY. Variations in these karyotypes result from errors that occur during meiosis and mitosis (Levine 1971:99). In nondisjunction, one or more chromosomes may fail to migrate properly. As a result, one daughter cell ends up with both chromosomes of a pair, while the other ends up with none (Levine 1971:99; Sutton 1980:74). Another event causing chromosomal variation is chromosome lag. In this case, a chromosome may move too slowly, and is not incorporated into the nucleus of the daughter cell (Sutton 1980:59). Errors occurring at the first mitotic division of the fertilized zygote may cause mosaicism; the two daughter cells receive a different set of chromosomes and the individual is composed of two cell lines with different karyotypes (Levine 1971:39). Three different cell types occur in mosaic individuals: euploid cells contain the normal diploid number of chromosomes; monosomic cells lack a chromosome, and trisomic cells have an extra chromosome (Sutton 1980:59). In late nondisjunction, fewer monosomic and trisomic cells are produced, and the effects of aneuploidies on the individual may be minimal. This is especially important when evaluating the physical and behavioural characteristics attributed to those individuals with an aneuploid sex chromosomal complement. The effects may be negligible, resulting in little phenotypical difference between the 'normal' male or female and those with aneuploidies.

Because of the phenomenon of mosaicism, many different sex chromosomal aneuploidies can occur in humans. Multiple sex chromosomal conditions include trisomy, tetrasomy and pentasomy representing the presence of three, four or five sex chromosomes respectively. In autosomal abnormalities, the severity of the disorder reflects both the size and the number of excess chromosomes. For example, Trisomy 13 causes severe mental retardation and congenital defects in children, and affected individuals rarely survive beyond one year of age (Thomas 1985:1778). Trisomy 21 (Down's syndrome), also causes a variety of congenital malformations and moderate to severe mental retardation. It is suggested, however, that because chromosome 21 is smaller than chromosome 13 and carries less genetic material, the aneuploidy is somewhat less severe (Hutt 1972:21). If this same phenomenon is true of the sex chromosomes, then we might expect to find that 47,XXX females would be more severely affected than 47,XXY or 47,XYY individuals, since the female X chromosome carries more genetic material than the male Y chromosome. However, as many studies have

demonstrated, this is not necessarily the case. In most cases the extra X chromosome is inactive (Hutt 1972:21).

Most of the research in sex chromosomal aneuploidies has focused on individuals with Klinefelter's syndrome (47,XXY), Turner's syndrome (45,XO), XXY Male (Double Y Male) and Triple X Female (47,XXX). The next section will describe some of the physical and behavioural traits that have been attributed to individuals with these aneuploidies.

KLINEFELTER'S SYNDROME (47,XXY MALE)

In 1942, the physician, H.F. Klinefelter described several male patients that exhibited gynaecomastia (breast development), small testes, and sterility (Klinefelter 1984:1). Research in 1949 by Barr and Bertram revealed that males with these particular symptoms had an XXY karyotype (Klinefelter 1984:3).

The Y chromosome plays a role in the development of the male gonads. Hutt contends that " ... the presence of a Y chromosome cannot be masked by X-chromosomes, however numerous" (1972:22), but this does not explain the under-developed external male genitalia in Klinefelter's individuals.

Rossiwell (1984:83) studied the dentition of thirty-five XXY males and noted that 40% of them had taurodont molars (vertical enlargement of the pulp chamber), a feature that Rossiwell points out is also seen in Neanderthal males. Rossiwell failed to point out, however, that taurodont molars are also present in some modern populations (Bass 1987:285). The suggested association with an early hominid dentition leaves the reader with the impression that XXY males may exhibit vestiges of the erroneous, but traditional picture of the Neanderthal as brute!

Federman (1967:30) reports that Klinefelter's individuals are usually tall and overweight, and often suffer from chronic pulmonary diseases. Although he also points out that their IQ is lower than the normal population, he does not indicate whether or not this is statistically significant. There is an apparent decrease in intelligence with an increase in the number of extra sex chromosomes according to Zang (1984). This observation suggests that an increase in the number of sex chromosomes results in differences in terms of the severity of effects on the individual. Whether the extra chromosome is an X (carries more genetic material) or a Y may be irrelevant.

According to Federman (1967:30), individuals with Klinefelter's syndrome present " ... general evidence of social maladaptation". His conclusions are based on a study of 24 Klinefelter's cases drawn from a hospital study in the United States. These individuals were slotted into

categories: those that were unemployed, alcoholics, divorced, had not completed high school (or less than one year of college), or had previously been in mental or penal institutions. Based on this study Federman concluded that the Klinefelter male:

> ... is a man of limited intelligence and ambition, with poor "sticking qualities" ... a tendency to stray from challenge or circumstance, be it school, job, primary family ties or marriage. An outstanding behavioural trait is talkativeness, he rambles incessantly but says very little of substance (1967:31).

Other researchers have also been pre-occupied with the behavioural aspects of Klinefelter's individuals. Money (1968:17) pointed out that 47,XXY individuals exhibited inadequate personalities. Nielsen, Sorensen et al. (1969:28) studied 34 XXY males and compared them to 16 normal XY males. The results of their study are questionable. They found that 14 of the 34 Klinefelter's males were nail-biters (41%), compared with 3 of 16 XY males (19%). While this may be statistically significant, the habit of nail-biting alone is not a particularly scientific observation to employ in order to substantiate claims of inadequate personalities. In addition, Nielsen, Sorensen et al. (1969:30) observed that XXY males not only had less energy than their normal male counterparts, but also chose less exacting tasks and were often unskilled labourers.

These observations are subjective and rather ambiguous criteria for judging personality. How is less energy measured? Does the performance of a less exacting task by an individual indicate inadequacies or does it simply reflect personal choice? These researchers also revealed that Klinefelter's males pursued peaceful hobbies. We can only speculate about what constitutes a "peaceful" hobby, and how such observations can be scientifically quantified. What meaningful data do they provide about the individuals with sex chromosome aneuploidies?

Nielsen et al. (1969:36) also noted that 13 of the 34 XXY males exhibited or had been involved in some aspect of "criminality", compared with 1 of 16 normal XY males. This is particularly interesting when compared with the typical personality attributed to XYY (Double Y Males). Early researchers suggested that XYY individuals were more aggressive and exhibited criminal tendencies because of the extra Y chromosome. If we follow this line of thinking to its logical conclusion, it appears that both Klinefelter's males (XXY) and Double Y males (XYY) are likely to demonstrate some form of criminal behaviour when compared with normal XY males. Can we then further assume that the normal XX

female is inherently at risk for criminal tendencies because of two X chromosomes? This confusion is the result of studies that have attempted to make inferences about behaviour based on limited studies of individuals with abnormal sex chromosomal complements.

While some physical and behavioural traits are displayed in individuals with these aneuploidies, the sex chromosomal complement of the individual does not necessarily constitute a form of biological determinism. Hutt (1972:26) suggests that external factors may be responsible for the social and psychological disturbances seen in some individuals with Klinefelter's syndrome.

This is the picture of the 'typical' Klinefelter's male based on studies carried out in the 1960s and 1970s. Less attention is paid to the physical stigma associated with the syndrome than to the behavioural and psychological traits thought to accompany the 47,XXY male. This is also the case with other sex chromosomal aneuploidies.

TURNER'S SYNDROME (45,X0 FEMALE)

The Turner's female lacks an X chromosome (45,X0). Hansmann (1983:133) suggests that of 20-30% of clinically recognized abortions, 10% may be 45,X0 females. Sutton (1980:94) indicates that the incidence of 45,X0 females is 1 in 2000 live-born females.

The physical manifestations of this aneuploidy include webbing of the neck, low set ears and insignificant breast development. In addition, the genitalia are often infantile in appearance. Ovaries are usually described as "streak ovaries" or rudimentary gonads (Mittwoch 1967:118; Levine 1971:103). Red-green colour blindness occurs more often in Turner's females as a result of the lost paternal X chromosome. Skeletal malformations are also present in many XO females and these include spina bifida and scoliosis (Levine 1971:104). Other skeletal anomalies such as a high, arched palate and shortened metacarpals are also characteristic of the condition (Levine 1971:103).

As with Klinefelter's males, research on Turner's females has tended to focus on the behavioural and psychological aspects of the syndrome, although Levine's list contains more than 80 possible somatic malformations observed in Turner's females. Money (1968:20) pointed out 45,X0 girls exhibited an unusual ability to deal with stress and adversity. It is unclear if Money is suggesting that this ability reflects a 'typical' Turner's personality, or simply indicates that Turner's females deal exceptionally well with their anomaly. The number of Turner's females examined in his study is not indicated. Hutt (1972: 25) cites Kaplan's (1967) remark that there is an association between the absence of the X

chromosome in 45,X0 females and juvenile delinquency. No sample numbers are indicated.

Sotos (1970:761) notes that although Turner's females may be at higher risk for mental deficiencies, up to 75% may be of normal intelligence. This reinforces the need to avoid generalizations about individuals with sex chromosomal aneuploidies, since the effects on the individual are variable and may be minimal.

TRIPLE X FEMALE (47,XXX)

Approximately one Triple X female is born per 1600 live female births (Sutton 1980:96) and 47,XXX females are infrequently spontaneously aborted (Hansmann 1983:143). Little has been written about 47,XXX females and this may reflect the lack of significant effects on the individual. Olanders' (1975:41) study of 39 47,XXX females showed that clinical symptoms were difficult to assess because few physical characteristics accompany the syndrome, other than lower than normal ridge counts on the fingers. Polani (1981:523) points out that 47,XXX females may have minor physical anomalies, but suggests that some studies indicate that the more serious defects, such as congenital heart disease, are more prevalent in 47,XXX females. Triple X females are normally fertile.

There is some controversy about the mental effects in Triple X females. Olanders (1975:19) states that some degree of mental retardation was associated with the aneuploidy. Hutt (1972:25), citing Kaplan (1967), and without supporting data, points out that 47,XXX females occur more frequently than expected in institutionalized schizophrenics. However, Hansmann (1983:143) maintains that the extra X chromosome does not cause either malformations or severe retardation.

The notion that an extra X chromosome may confer more 'femaleness' on an individual is one that pervades early research, and this is reflected in the literature. An investigation by Jacobs et al. (1961:68) of 47,XXX females focused on the existence of the " ... human super-female". However, the study (sample size unknown) reported that 47,XXX females have infantile external genitalia and suffer from amenorrhea. Beyond this observation, little else was concluded. These reports, together with the relative lack of information about 47,XXX females, suggest that the 'super' female does not manifest extreme physical or behavioural traits.

XYY MALES (DOUBLE Y MALES)

Of all the sex chromosomal aneuploidies, the XYY male has been the focus of the most controversial research. The physical characteristics attributed to the XYY male are not extensively referred to in the literature, other than the potential association of stature with an extra Y chromosome. Hutt (1972:24) remarks that an extra Y chromosome allows more genetic information to be expressed and that this may be linked to taller stature in 47,XYY males. As a result, studies have concentrated on males taller than 183 cm. in an effort to locate individuals with a 47,XYY karyotype (Forssman et al. 1975:18).

The incidence of XYY males in the population is very low. Of 83,517 live-born males karyotyped in a study carried out from 1959 to 1974 in three major cities, Edinburgh, Denver, and Toronto, only 9 were XYY individuals, representing .01% (Jacobs et al. 1979:3). Although the sample size is large, spontaneously aborted fetuses and stillborn males were not karyotyped. A study in 1977 by Carr and Gedeon found that as many as 50% of all spontaneously aborted fetuses displayed some type of chromosomal abnormality; in stillborn infants, approximately 5% exhibit chromosomal abnormalities. Thus, the incidence of XYY males may be higher than Jacobs et al.'s (1979) estimate. Polani (1981:522) maintains that XYY males are not selected against in the early stages of pregnancy, but may be at higher risk of dying during birth or soon after.

The idea that there is an association between criminality and the XYY genotype dates to the 1960s. Court Brown (1968:341) reviewed some of the original research carried out by Jacobs et al. in 1965 of XYY males in a maximum security Scottish State hospital. Of 342 men in the institution, 196 were classified in this study as having below normal levels of intelligence; 7 of these were XYY males (Jacobs et al:1965). The researchers felt that seven XYY males in a sample of 196 was significantly higher than normal. What is striking about the study, however, is that no information about the incidence of XYY in live-born males was available at the time. The researchers apparently decided it was " ... safe to assume ... " that seven XYY males in this institutionalized sample represented more than would be found by chance (Court Brown 1968:347). Court Brown's summary showed uncritical acceptance of this unsubstantiated conclusion, perpetuating the idea that criminality and XYY are linked:

> This picture strongly favours the idea that the additional Y chromosome genetically predisposes the 47,XYY male to the development of a psychopathic personality and to consequent aberrant behaviour and antisocial conduct (1968:348).

Other problems with XYY research involve research design flaws. For instance, according to Forssman et al. (1975:18), XYY individuals are usually over 183 cm. in height; thus, their study included only institutionalized individuals over 183 cm; any XYY males under this height were not included. These same researchers noted in their study of 24 XYY males that four individuals demonstrated sexual underdevelopment; the only other notable somatic anomalies consisted of a greater incidence of varicose veins (9 of 24 individuals)! It should be pointed out, moreover, that there were no controls (46,XY males) and that the sample was biased, consisting of individuals from clinical settings (including mental and special hospitals), from penally exempt institutions and institutions for alcoholics. It also included epileptics and those considered to be clinically "suspicious" (Forssman et al. 1975:18).

47,XYY males, in particular, have been the focus with respect to their presumed behavioural and psychological anomalies. Forssman et al. (1975) carried out a psychiatric assessment of their small, biassed sample of XYY males (n=24). Their conclusions lent support to the earlier studies by Jacobs et al. (1965), arguing that XYY males were over-represented within institutionalized settings and that they exhibited:

> ... a variety of neurotic symptoms: phobias, compulsions, impulsiveness, obsession, aggressiveness, tendency to temper tantrums, homosexual behaviour, insomnia, depression ... (Forssman et al. 1975:18).

They also evaluated the social backgrounds of XYY males, finding that of 21 XYY males, 12 grew up in homes with "unfavourable conditions" (1975:19). Their criteria for "unfavourable" environments included being born illegitimately, coping with the death of a parent prior to the age of fifteen, or being institutionalized. However, since 13 of 21 XY male controls were also found to have come from "unfavourable" backgrounds, no significance could be attributed to the finding. Thus, no significant conclusions could be drawn that were related to social background.

Other studies, based on single cases, have been seen to reinforce the XYY/criminality link. Franks et al. described an XYY male pseudohermaphrodite within the context of the " ... phenotypic males with XYY sex chromosomes who have mental retardation and aggressive behaviour ... " (1967:1625). A study by Hunter and Quaife (1973:82), of one 48,XYYY male in an institution for the mentally handicapped, resulted in the conclusion that the XYYY male exhibited " ... feckless behaviour, early frustration ... " and was " ... bullying in manner and

voice". According to these studies, presumably the more Y chromosomes the individual has, the more socially maladjusted he is, and prone to criminal behaviour. Harsanyi and Hutton (1981:183) report that there is a least one instance of lawyers pleading insanity on behalf of their XYY client. This instance, discussed by Gould (1977:228), involves the case of Richard Speck, who murdered eight nurses in Chicago in 1966. Although the lawyers argued that Speck killed because of the effects of an extra Y chromosome, he was later found to have a normal male XY chromosomal complement. The "criminal chromosome" became food for journalism (Gould 1977:228).

Gorlin, describing what he calls "classical" chromosomal disorders, presents the picture of the typical XYY male:

> In general, explosive behaviour and a propensity to destroy property rather than to display violence to individuals have been noted. Deviant behaviour was exhibited quite early, in most cases soon after puberty (1977:92).

Deviance and aggression are the focus of other studies. Ginsburg (1979:58) discusses the role of animal research in studies of human aggression. He suggests that studies linking a single Y chromosome to aggression in animals gives credibility to the notion that 47,XYY human males may be predisposed to aggression as a result of a double dose of Y chromosomes. However, research from animal studies should be applied with caution to humans.

The XYY male fared poorly in studies such as those conducted by Jacobs et al. in the 1960s. By 1979, however, some researchers were willing to admit that, although the XYY individual may exhibit antisocial behaviours, this was not always the case, and that some XYY individuals developed normally (Nielsen et al. 1979:49). Money (1980:61) rejected the suggestion that XYY males tended to be homosexuals, and indicated that there was no evidence that the sex chromosomal complement reflected sexual preference. Although Forssman et al. claimed that XYY males had a tendency to homosexuality, an institutionalized sample is biased to begin with. Homosexual encounters frequently occur in these settings, particularly in prison environments. Since there were no normal XY male controls, any link between sex chromosomes and homosexuality is spurious.

Not all the research on aneuploidies is questionable. Witkin et al. (1977) carried out what appears to be a relatively un-biased study. They argued that many of the reports of behaviours attributed to individuals with sex chromosomal abnormalities, particularly 47,XXY and 47,XYY

individuals, were based on extremely small, biased samples. To address this issue, they karyotyped all males in the top 15% of the height distribution born in Denmark between 1944 and 1947. With a final sample of 4,139 males, they attempted to look for intervening variables that might account for the suggested link between aggression and extra Y chromosomes. Of the twelve 47,XYY males found in the study (voluntary participation), four had committed criminal offenses to property and one had committed a criminal offense against another person. Sixteen 47,XXY males were found in the sample of 4,139 and three of these had criminal records. However, the researchers demonstrated that males with double Y chromosomes were no more likely to commit crimes against individuals than were 46,XY controls (Witkin et al. 1977:184). Further, their study contained a large control sample of normal 46,XY males with which to compare the incidence of criminal behaviour to that of individuals with sex chromosomal aneuploidies. They suggested that because some of the individuals with abnormal sex chromosomal complements exhibited lower than average intelligence, they were more likely to be apprehended in the process of committing a crime than 46,XY males of normal intelligence. Another study by Valentine (1979), which tracked six XYY males from birth to approximately six to ten years of age, showed that in most cases, the boys developed 'normally', with few problems. However, the sample size was small (n=6), and there were no 46,XY controls.

THE FOCUS ON BEHAVIOURAL AND PSYCHOLOGICAL ASPECTS OF INDIVIDUALS WITH SEX CHROMOSOMAL ANEUPLOIDIES

What is intriguing about the research on sex chromosomal aneuploidies is the wealth of literature focusing on behavioural and psychological characteristics. Yet we rarely read of sex chromosome studies of normal XY males and normal XX females in terms of these characteristics. Many studies attempt to define the differences between normal males and normal females, but seldom approach these differences from the perspective of the sex chromosomes. Wylie et al. (1989) point out that the role of gender in science is a complex issue. Assumptions about gender are continually made as Wylie notes, " ... however invisible or inaccessible it may be" (1990:5).

This discussion has centred around the sex chromosomal aneuploidies forming the core of traditional research. Physical anomalies have been described in association with each of the four more common aneuploidies: Klinefelter's Syndrome (47,XXY), Turner's Syndrome (45,X0), Triple X Female (47,XXX) and Double Y Males (47,XYY). While some serious

physical and physiological defects may be manifested in the individual, such as the cardio-vascular defects often found in Turner's females, many are superficial traits that carry no risks, such as the shortened metacarpals of Turner's females or tallness in XYY males. However, the behavioural and psychological aspects of these syndromes have been drawn with little scientific basis. Frequently, studies in sex chromosomal aneuploidic individuals suffer from extremely small sample sizes. Generalizations and value-laden judgements have often been extended to any individual that exhibits a particular sex chromosomal complement based on these small samples. In addition, the often biased nature of the sample has tended to skew the information resulting from such studies. Much of the research was conducted on individuals in institutional or clinical settings, thus only those presenting themselves as a result of a particular symptom or problem are generally studied. Since many individuals with sex chromosomal aneuploidies may be phenotypically normal and develop according to normal standards, numerous aneuploidic individuals within the population may remain unidentified and unstudied.

At best, the behaviours often attributed to these syndromes are vague and innocuous, such as nail-biting (Nielsen, Sorensen et al. 1969:28), or "feckless behaviour" (Hunter and Quaife 1973:82). They appear to be an attempt by researchers to label the individual with a sex chromosome aneuploidy as a particular psychological or personality type, with little concern given to individual differences. This pre-occupation with the behavioural and psychological aspects of individuals with sex chromosomal aneuploidies may be the result of several factors. Bond and Chandley (1983:21) report that the XYY male is often phenotypically normal, although he may be slightly below average in intelligence. Salzman (1979:75) suggests that the normal XY male is no more aggressive than the normal XX female. If this is the case, then the possession of a Y chromosome does not confer any degree of aggression to the individual. Having more than one Y chromosome therefore, is redundant, but probably not deleterious in terms of becoming a criminal personality. Bond and Chandley conclude that the " ... consequences of an XYY sex chromosome complement remain in doubt" (1983:21).

Salzman (1979:81) feels that these gender generalizations are used to promote theories that support the notion of biologically-based sex differences. This is especially apparent in the theories of aggression promoted in sociobiology; the passive female (XX) is subordinate to the more aggressive male (XY) (Barash 1979:90). These theories of the aggressive male/passive female are fundamental to sociobiology. David Barash, for example, attempts to explain warfare and competition by blaming the innate aggressive tendencies of males:

> We can legitimately ask whether our society provides satisfying and constructive opportunities for our youth to heed the whisperings within them. The consequences of not doing so are clearly painful (1979:193).

As Fausto-Sterling (1985:125) notes, Barash's argument is centred upon the premise that male hormones are linked to aggression in its various forms: warfare, genocide, lynchings and reckless driving, to name a few. Gould (1977:228) suggests how biological determinism implicit in sociobiology has resulted in the persistence of a link between Y chromosomes and aggression. Because males are often more aggressive than females, this may be genetically determined, and since males have a Y chromosome and females don't, this genetic predisposition for aggression must be linked to the Y chromosome. The natural conclusion, therefore, is that if one Y chromosome produces aggressive males, two Y chromosomes will produce males who are twice as aggressive. As Gould succinctly points out:

> Once again, biological determinism makes a splash, creates a wave of discussion and cocktail party chatter, and then dissipates for want of evidence (1977:228).

It is not difficult to see why aggression in XYY males has been the focus of most research in sex chromosomal aneuploidy studies. Sociobiologists appear to have been provided with material from studies done in the 1960s about individuals with sex chromosomal aneuploidies. Jacobs et al.'s (1965) study of XYY males from maximum security Scottish state hospitals, for one, provides *post facto* information with which sociobiologists can promote their convictions.

The sociobiological view of males and females is constrained by this biological determinism. Sociobiology attempts to justify and explain biological and behavioural characteristics of humans through the argument of genetic inheritance. Almost every human strategy, biological feature, or behaviour can be attributed to an evolutionary path that led to maximum fitness. This 'fitness' is purported to be evident in diverse elements of the human condition. In a series of articles published in 1982 in a popular science magazine, sociobiologists presented reasons for the adaptiveness of rape, polygamy, sibling rivalry, kin-selecting altruism, multiple sex partners for males, depression, deceit and self-deception and sexual standards (Science Digest 1982). Can the anthropologist be

comfortable with the doctrines of a field of study in which authors such as Barash promote these explanations for multiple sex partners for males?

> ... genes inducing selectivity will increase at the expense of those that are less discriminating. For males, a very different strategy applies. The maximum advantage goes to individuals with fewer inhibitions. A genetically influenced tendency to "play fast and loose" -- "love'em and leave'em" -- may well reflect more biological reality than most of us care to admit (1979:48).

Gould remarks that sociobiology " ... promises only absurdity by its refusal to consider immediate nongenetic factors" (1977:258). This point is especially applicable to research of individuals with sex chromosomal abnormalities, since much of the focus has been on attempting to link the presence or absence of chromosomes with behaviour almost to the exclusion of other possible factors.

In general, sociobiology has tended to extrapolate data obtained from animal studies and apply the results to humans, particularly to male/female differences. There is a danger in this, especially in terms of behavioural characteristics. A further danger, as Gould (1977:257) notes, is the failure of sociobiology to give equal time to those human behaviours that may also be biological, following the biological deterministic train of thought: kindness and peacefulness may not be as obvious as anger and aggression because we have not created satisfactory social structures that allow them to flourish.

SUMMARY AND CONCLUSIONS

Most of the research in sex chromosomal aneuploidies was carried out in the 1960s and 1970s. Studies often concentrated on individuals from clinical or institutionalized settings. The research focused less on physical characteristics associated with sex chromosomal aneuploidies than on perceived psychological and behavioural aspects. Frequently, individuals with sex chromosomal aneuploidies were stigmatized.

Even prior to the rise of sociobiology in the 1970s, the research tended to peg individuals with sex chromosomal abnormalities as distinct personality types, and this was especially true of the XYY male. E.O. Wilson's *Sociobiology*, published in 1975, was a landmark for biological determinism. Studies of sex chromosomal aneuploidies in the 1970s appear to reflect these theories and early research on sex chromosomal aneuploidies is supported through the tenets of sociobiology.

Little research in sex chromosomal aneuploidies appears to have been done in the 1980s. Perhaps the appeal of sociobiology as a means to explain every aspect of human biology and behaviour has maintained the *status quo* in this area of research. Alternately, it may simply reflect the relatively mild effects on the individual exhibiting these abnormal karyotypes, in which case further research may be a low priority. The effects of autosomal aberrations such as Trisomy 21 (Down's Syndrome), or Trisomy 18 appear to be much more profound, and may merit more in the way of research funding, even though the incidences of these chromosomal aberrations may occur at similar frequencies as some of the sex chromosomal aneuploidies.

Although physical abnormalities can occur in individuals with sex chromosomal aneuploidies, they are seldom life-threatening. The exaggerated focus on the perceived psychological and behavioural traits of individuals with these abnormalities may reflect the sociobiological trends of the past decade. Biological determinism does a disservice to those individuals exhibiting sex chromosomal abnormalities. The genotype of the individual with a sex chromosomal aneuploidy does not necessarily result in a predetermined phenotype. Further research is warranted to determine the etiologic factors responsible for the anomalies. An emphasis on psychosocial aspects only hinders this process, and can result in a distortion of the facts.

THE SOCIOBIOLOGY OF RAPE: A Critique

Hugh Clark
McMaster University

ABSTRACT

In the last chapter of his book, *Sociobiology: The New Synthesis* (1975), E.O. Wilson suggested that adaptive behaviours found in animals could be applied to humans. Wilson's work provided the impetus for a great deal of behavioural research which was to be carried out on a number of topics, including rape. The purpose of this paper is to look