

Self-report delinquency and violence in adult twins

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INTRODUCTION

I examined retrospective self-reports about antisocial behaviour including the destruction of property, fighting, carrying and using a weapon, and struggling with a police officer from 274 adult twin pairs raised together (126 monozygotic female, 79 dizygotic female, 42 monozygotic male, 27 dizygotic male). Correlational and model fitting analyses were carried out. For men, about 74% of the variance in general misbehaviour and 55% in violent behaviour was due to the genes, 0% was due to the common rearing environment, and the remainder was due to unique environmental effects. For women, most of the variance seemed to be due to environmental factors. These results should be viewed as tentative because few women endorsed the violent acts and only a small number of male twins were tested.

LITERATURE REVIEW

Raine (1993) reviewed 10 twin studies producing 13 analyses of adult crime based on official convictions and found the concordance rates were 52% for 202 MZ twins and 21% for 345 DZ twins. Converging with the twin work were the results from several American, Danish, and Swedish adoption studies. Children who were adopted in infancy were at greater risk for criminal convictions if their biological parents had been convicted of a crime than if their adoptive parents had been. For example, in a Danish study of some 14 000 adoptees, if boys had neither adoptive nor biological criminal parents, their rate of criminal conviction was 14%. If the adoptive but not biological parents were criminals, boys still had a conviction rate of only 15%. But if the biological but not adoptive parents were criminal, the rate increased to 20%. And, if both biological and adoptive parents were criminal, the rate increased to 25%. Moreover, while siblings raised apart showed 20% concordance,

half-siblings showed only 13% concordance and pairs of unrelated children reared together only 9% concordance (Mednick *et al.*, 1984).

Replicating the concordance rates based on official statistics are numerous studies based on self-reports. For example, Rowe (1986) sampled the eighth to twelfth grades in almost all the school districts of Ohio and found that MZ twins were roughly twice as much alike in their self-report delinquent behaviour as were DZ twins, the heritability being about 50%. Questionnaire studies of related traits such as altruism, aggression, and empathy in adults have also shown a 50% heritability (Rushton *et al.*, 1986). Despite work on several types of aggression and crime, there was previously little or no behaviour genetic evidence on violence, *per se*.

METHODS

Following a self-report study of altruism and aggression in 573 twin pairs (Rushton *et al.*, 1986), I again used the Twin Register of the University of London Institute of Psychiatry to compare MZ and DZ twins raised together. A battery of questionnaires was mailed out in 1983, with a follow-up in 1984. This battery included a 20 item Self-Report Misbehaviour Scale with items such as 'I have taken an illegal drug' and 'I have stolen something from a big shop or supermarket' for which evidence of reliability and validity has been provided (Rushton and Chrisjohn, 1981). All items were responded to using a 5-point scale ranging from 0 = never to 4 = very often. Item responses were aggregated. For the analysis of violence the five items shown in Table I (for which additional validity data were unavailable) were selected from this scale.

The respondents' ages ranged from 19 to 64 years, with a mean age of 50 years. Subjects were instructed to complete the questionnaires under conditions of anonymity in their homes. A total of 311 pairs (622

TABLE I. Percentage endorsing items one or more times

Item	Men	Women
1. I have taken a weapon (like a knife) out with me in case I needed it in a fight.	15.6	2.4
2. I have fought with someone in a public place—like in the street or at a dance.	37.8	7.8
3. I have used a weapon in a fight—like a knife or a razor or a broken bottle.	1.7	0.4
4. I have struggled or fought to get away from a policeman.	3.3	0.6
5. I have broken or smashed things in public places like in the street, cinemas, dance halls, trains or buses.	16.7	2.0

individuals) responded. There were 126 MZ females, 79 DZ females, 42 MZ males, 27 DZ males, and 37 opposite-sex (OS) pairs (the 37 OS pairs were dropped from further analysis leaving the total number of twin pairs analysed at 274). The return rate and excess of women over men and MZs over DZs is comparable to that from previous studies with this register (Rushton *et al.*, 1986) as well as other volunteer twin samples.

RESULTS

Analyses were conducted on the full 20 item misbehaviour scale and on the five violence items contained therein. The alpha coefficient, collapsed across sex, was for the 20 misbehaviour items, 0.81 and for the five violence items, 0.60. Thus individuals who endorsed one of these items tended to endorse others. At the aggregate level, men had higher scores than women for both the 20 misbehaviour items [$F(1,622) = 78.36, p < 0.001$] and for the five violence items [$F(1,633) = 107.36, p < 0.001$]. This result is

in agreement with previous reports of sex differences in self-report misbehaviour. Also, as with previous self-report measures, a positive skewness was noted in both the male and the female score distributions. Age effects were found for both the 20 item misbehaviour scale (men $r = 0.23, p < 0.01$; women $r = 0.32, p < 0.01$) and the five violence items (men $r = 0.17, p < 0.05$; women $r = 0.13, p < 0.05$). Also, DZ twins tended to be younger than MZ twins. Thus scores are corrected for age in all analyses.

The twin correlations on the 20 misbehaviour items were significantly higher for MZ than for DZ males (0.77 vs 0.48; $z = 6.85, p < 0.05$), and for MZ than for DZ females (0.73 vs 0.47; $z = 12.00, p < 0.05$). The twin correlations for the five violence items were also significantly higher for MZ than for DZ males (0.53 vs 0.06; $z = 6.86, p < 0.05$) and also for MZ/DZ females (0.27 vs 0.05; $z = 10.45, p < 0.05$). These results suggest heritability in the responses of both men and women.

Structural equation model fittings are typically more powerful than correlations because all data are weighted appropriately (see Neale and Cardon, 1992). Models were fit to the age-corrected variance-covariance matrices separately for males and females, using the computer program LISREL VII (Jöreskog and Sörbom, 1989). The results for both the 20 item misbehaviour scale and the five violence items are shown in Table II. For men, genetic effects contributed 74% of the variance for the 20 misbehaviour items and 55% for the five violence items but for women, no genetic effects were found for either scale. Common environmental effects contributed not at all to male delinquency but significantly to that of females. Unique, non-shared, environmental effects accounted for a reliable amount of variance in men and a greater proportion still in women; in fact, 100% of the variance for the violence items. This latter is a residual term that is composed of many

TABLE II. Model fitting for estimates of genetic and environmental influence on self-report delinquency scales

Sample	N pairs	Parameter estimates ^a				Fit in χ^2 units					
		A	D	C	E	ACE ^{ab}	ADE	AE	DE	CE	E
PART 1. 20 item delinquency scale											
Males	69	0.74	0.00	0.00	0.26	4.91	5.64	5.64 ^c	7.78	7.89	45.56
Females	205	0.00	0.00	0.64	0.36	22.56	27.64	27.64	34.49	24.35 ^c	129.62
PART 2. Five item violence scale											
Males	69	0.00	0.55	0.00	0.45	4.98	3.55	4.98	3.55 ^c	9.61	17.16
Females	205	0.00	0.00	0.00	1.00	106.67	106.22	106.67	106.22	108.18	112.32 ^c

^aA = additive genetic factors; D = dominance genetic factors; C = common environmental effects; E = unique environmental factors specific to the individual.

^bdf = 4.

^cBest fitting.

sources including measurement error and various kinds of genetic and environmental interactions.

DISCUSSION

The results reported here are in line with classic genetic theory of individual variation and with the results from other twin studies of antisocial behaviour. Thus, this study extends the heritability literature to the domain of violence. Men were found to be the more violent sex with male violence estimated to be largely genetic in origin and female violence largely due to environmental factors. Genetic hypotheses help to focus research attention on underlying physiology. One possibility is the sex hormone testosterone. We have recently shown that salivary testosterone is positively related to self-report aggression and negatively related to self-report empathy in both men and women (Harris *et al.*, in press). Moreover, testosterone has been shown to differentiate known group differences in violence including among men and women, teenagers and older persons, and the well educated and the less well educated.

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