

Childhood predictors of adult criminality: are all risk factors reflected in childhood aggressiveness?

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ABSTRACT

Background *Early aggressive behaviour is one of the best predictors of adult criminality.*

Aim *To assess the degree to which family background variables, parental beliefs and behaviour and child intelligence predict child aggression and adult criminality.*

Method *Data were used from the Colombia County Longitudinal Study, a longitudinal study of 856 children in third grade in New York, in 1959–60. Adult measures of criminal behaviour, child measures taken at age eight, child peer-nominated aggression, child's peer-nominated popularity, child's IQ and parental measures at eight years were used.*

Results *Aggressive children were less intelligent, less popular, rejected more by their parents, had parents who believed in punishment, were less identified with their parents' self-image and were less likely to express guilt. As adults, more aggressive children with parents who were less well educated, experienced more marital disharmony and who seldom attended church were most at risk for arrest. However, after the effect of early aggression was controlled, most effects disappeared and only parents having a strong belief in punishment added significantly to risk of arrest by age 30; the only fact that then reduced the risk of arrest was having parents who attended church often. Both parental authoritarianism and child IQ reduced the risk of conviction for arrested children.*

Discussion *Level of aggression at age eight is the best predictor of criminal events over the next 22 years. A clear implication is that the risk for criminality is affected by much that happens to a boy before he is eight years old. Preventive interventions need to target risk factors that appear to influence the development of early aggression.*

Introduction

Over the past four decades, the number of longitudinal studies investigating the precursors of adolescent and adult antisocial and aggressive behaviour has increased substantially. Many of these studies have continued long enough to

relate individuals' behaviours as adults to their childhood behaviour, environment and early physiological status. One of the clearest findings has been that early aggressive behaviour predicts later aggressive, antisocial and criminal behaviour. In these studies, aggression has usually been defined as behaviours intended to harm another person. Over 20 years ago, Olweus (1979) reviewed 16 longitudinal studies of aggression with lags ranging from six months to 21 years and reported prediction correlations ranging from 0.98 for 1 year with 13-year-olds to 0.36 for 13 years from ages five to 18. Unfortunately, only a few studies at that time reported lags from childhood to adulthood. That deficiency was remedied in the 1980s and 1990s with the publication of results from a number of well-designed studies.

The Columbia County Longitudinal Study of 856 children growing up in New York State (Huesmann et al., 1984) found a disattenuated correlation of 0.50 for males and 0.35 for females for predicting age 30 aggression from age eight aggression. The predictability to age 19 aggression was even higher. Huesmann and Moise (1998) showed that this continuity is not simply a function of a few very aggressive children staying aggressive, but is due to every segment of the population remaining approximately in their relative position on aggression. The results of this 22-year study also revealed that the likelihood of being convicted of a crime by age 30 and the seriousness of the crime were significantly predicted by peer-nominated age-eight aggression. McCord (1983, 1994) in the USA, Farrington (1991, 1994) in England, Magnusson (Magnusson et al., 1975; Magnusson et al., 1994) in Sweden, Pulkkinen (1992) in Finland, and Moffitt and Silva (Moffitt, 1990, 1991; Silva, 1996) in New Zealand have reported similar continuities from childhood aggression to young adult aggression, antisocial behaviour, conduct problems and/or criminality. A number of ongoing studies (e.g. Huizinga and Jakob-Chien, 1998; Loeber et al., 1999; Farrington, 2000; Tremblay et al., in press), while not yet reporting extensive data on adult behaviour, confirm continuities from childhood aggression to late adolescent delinquency. Of course, as researchers have pointed out (Moffitt, 1993; Huesmann and Moise, 1998; Loeber and Stouthamer-Loeber, 1998), most high-aggressive children do not end up as adult criminals. Nevertheless, early aggression predicts a greater risk for becoming an adult criminal.

One might ask what other early childhood factors add to the prediction of risk for criminal behaviour. Longitudinal research has emerged in recent decades suggesting the involvement of a number of risk factors, almost all of which are also correlated with childhood aggressiveness. For example, childhood neurophysiological factors (e.g. low baseline arousal, low serotonin, high testosterone) are related to later violence or criminality (Raine et al., 1997) as well as to childhood or adolescent aggression. Most of these predisposing factors seem to *interact* with the child's social environment rather than to have direct effects. Low childhood intellectual functioning also is correlated

with both childhood aggression and later criminality (Huesmann et al., 1984; Moffitt, 1990; Farrington, 1991), though the causal direction of this relation is unclear (see Huesmann et al., 1987). Among potential early child-rearing factors, parental rejection, harsh punishment of children and inconsistent or overly permissive discipline are related both to childhood aggression and to adult aggression, antisocial behaviour and criminality (e.g. Eron et al., 1991; Dishion et al., 1994; Farrington, 1994; McCord, 1994). Later in childhood, association with deviant peers becomes a good predictor of delinquency or criminality (Elliot et al., 1985; Dishion et al., 1994). Huesmann and Eron (Eron et al., 1972; Huesmann, 1986; Huesmann et al., 2003) provided evidence that early exposure to media violence adds to risk of criminality, and a plethora of studies has implicated a variety of demographic factors.

Because so many potential risk variables co-occur in children's lives, and each child behaviour can change the child's environment, it is difficult to disentangle their effects on later criminality. It is particularly difficult to know to what extent early aggressive behaviour becomes the driving factor that creates longitudinal correlations. Harsh punishment might be correlated with criminality because it stimulates antisocial behaviour or because aggressive children stimulate harsh punishment and aggressive children tend to become antisocial. Longitudinal studies that relate a combination of potential childhood risk factors, including early aggression, to adult criminality are thus particularly valuable in elucidating the contribution of early childhood factors. In this paper we report on the results of a new analysis of data from the Columbia County Longitudinal Study. Specifically, our research questions are: (1) To what degree do family background variables, parents' aggression-related beliefs and behaviours, and child intelligence predict child aggression? (2) To what degree do these early childhood variables predict aspects of adult criminality (i.e. arrests, violence of crimes, convictions)? Related to the second question, we expect that early aggression would mediate the relation between childhood variables and adult criminality, i.e. once the effect of early aggression is statistically controlled, the effects of the childhood variables on adult criminality should diminish.

Method

The data reported here come from the Columbia County Longitudinal Study, initiated in 1960 by Eron et al. (1971) as a longitudinal study of 856 children who were in the third grade in Columbia County, New York during the 1959–60 school year. This project has generated a large amount of data concerning how aggression develops in children and young adults (see Eron et al., 1971; Eron et al., 1972; Lefkowitz et al., 1977; Huesmann et al., 1984; Eron et al., 1991); however, little has been published thus far about predicting criminality within this sample.

Participants

The participants constituted the entire third-grade population – both public and parochial schools – of Columbia County, New York in 1959–60. These 856 children – 436 boys and 420 girls – were interviewed and tested in class at that time, and most of their mothers and fathers were interviewed. The children's modal age was eight. Ten years later in 1970, shortly after these children had graduated from high school, we located and reinterviewed about 50% of them; their modal age was 19. Then, 22 years after the initial interviews, in 1981 when the participants' modal age was 30, we relocated and reinterviewed 409 of the original sample (198 males and 211 females). Further, at that time we were also able to obtain access to the records of the New York State Criminal Justice System, and we were able to check criminal records of all 856 original participants. We were able to determine the criminal records of 332 of the original 436 males (76%) following procedures described below. We found that 68 of these 332 (20%) had arrest records. However, probably because of problems with name changes, we were able to determine the criminal records of only 206 of the original 420 females (49%), and found that only 12 (5.8%) of them had been arrested. Judging this sample to be too small for statistical reliability, we focus in this paper on the sub-sample of 332 males on whom we obtained criminal justice data. For 284 of these 332, we had also obtained parent interviews at age eight, though on some parent measures the number of valid (non-missing) scores obtained was fewer.

Measures

Adult measures of criminal behaviour

To obtain criminal justice records, we submitted the names of all 436 original male participants, along with all the identifying information we had (birth date, last known address, etc.), to the New York State Criminal Justice Archive and requested copies of their criminal records. A record should exist for any participant who had been arrested in New York. For every arrest, the record included the type of offence, the disposition (e.g. acquitted, plea bargain to or conviction of a lesser crime), and how many days were served in prison. We coded each arrest for seriousness according to the procedure of Rossi et al. (1974). From these data we computed (1) *number of arrests*, (2) *number of convictions*, (3) *total number of days served in prison*, (4) *whether the person was ever arrested*, (5) *whether the person was ever convicted*, (6) *whether the person was ever arrested for a violent crime*, and the *total seriousness score for the person's arrests for violent crimes* (0 if never arrested for a violent crime). A violent crime was defined as one involving physical force.

The New York State Criminal Justice Archive contains records only for persons who had been arrested at least once in New York State. Of the 436 males for whom we requested information, we received records for 68. For any of the 368 other males, however, there might be no record because they had never been officially arrested or because they had not lived in New York State as an adult. To determine which was more likely, we submitted the names of every child in the original sample to the New York Department of Motor Vehicles and requested their driver's licence records. We received driving records for 264 of the 368 males for whom we had not found an arrest record. Because they had lived in New York State as adults, we felt justified in assigning these latter participants arrest and conviction scores of 0. The remaining 104 males were treated as having missing data. This gave us a sample of 332 males on whom we had arrest information.

Child measures obtained when the child was eight years old

The 332 boys had been tested and interviewed in school in 1959–60 when they were in the third grade. In addition, we attempted to interview both parents of each child in personal interviews, usually conducted in a field office in Columbia County. We succeeded in interviewing at least one parent of 284 of the 332 boys. If both parents were interviewed, their scores were averaged. A more complete description of the measures and interviewing methodology is given in Eron et al. (1971). Here, we summarize the information. The primary measures of interest obtained directly from the children at that time are two peer-nominated measures of behaviour and an IQ test.

Child's peer-nominated aggression

Eron et al. (1971) defined aggression as 'an act whose goal response is injury to another object' (p. 30). Their 10 aggression items covered physical (e.g. 'Who pushes and shoves other children?'), verbal (e.g. 'Who says mean things?'), acquisitive (e.g. 'Who takes other children's things without asking?'), and indirect (e.g. 'Who makes up stories and lies to get other children into trouble?') aggressive acts. The score represents the proportion of times the child was nominated by his or her classmates on any of 10 aggression items. This measure is described in detail elsewhere (Eron et al., 1971; Huesmann et al., 1984), has been widely used, and has an internal consistency above 0.90 in cross-national samples (Huesmann and Eron, 1986).

Child's peer-nominated popularity

This score represents the proportion of times the participant was nominated by his or her classmates on two popularity items, e.g. 'Who would you like to have as a best friend?'. The internal consistency is 0.87 (Eron et al., 1971).

Child's IQ

The child's IQ was assessed with the California Short-Form Test of Mental Maturity (Sullivan et al., 1957). Kuder-Richardson reliability coefficients for total scores range from 0.87–0.89 across grades; the total score correlates approximately 0.75 with other IQ measures.

Parent measures obtained when the child was eight years old

The measures obtained from the parents were selected from those reported in Eron et al. (1971); measures were included in the present analyses only if their reliabilities were above 0.50. The measures fall into four categories:

1. Family background variables: (a) *the number of children in the family* when the child was eight years old; (b) *parent's education* (7 = grad/prof, 6 = college grad, 5 = some college, 4 = high school grad, 3 = 10 to 11 years, 2 = 7 to 9 years, 1 = under 7 years; if information was obtained on both parents, the results were averaged); (c) *value of family housing* (1 = inexpensive rental, 2 = expensive rental, 3 = inexpensive owned, 4 = expensive owned); and (d) *parents' church attendance* (0 = never, 1 = few times/year, 2 = about 1/month, 3 = few times/month, 4 = once or more/week).
2. Parents' beliefs and behaviours: (a) *parents' delinquency*: The scores on this question range from 0 to 2. To score 2, both parents must have said that they were 'occasionally in trouble with the police when a youth'. (b) *Parents' authoritarianism*: Authoritarianism was measured with a five-item short form of the original F-scale (Adorno et al., 1950). Each item measures endorsement of a statement on a five-point scale, so scale scores can range from 5 to 25. To obtain a high score, both parents must have strongly endorsed items like 'What young people need most of all is strict discipline' and 'Sex criminals deserve more than prison; they should be whipped in public or worse.' Coefficient alpha was 0.57.
3. Family interaction variables: (a) *parental rejection*: This is the sum of scores on 10 items about how 'unsatisfied' the parent is with the child. For example, 'Do you think your child wastes too much time? Are you satisfied with your child's manners? Does your child read as well as he/she should?'. The scale score can range from 5 to 20. Parents' scores were combined. Coefficient alpha was 0.75. (b) *Parental disharmony*: This scale measures the amount and seriousness of disputes between the parents. It is the sum of 10 items of the form, 'Do you or your spouse ever leave the house during an argument?' and 'Do arguments between you and your spouse ever settle anything?'. The total score ranges from 10, indicating almost no disagreements, to 24 for a lot of disagreements with poor resolution. Parents' scores were combined. Coefficient alpha was 0.77. (c) *Parents' endorsement*

of punishment for child: This is the sum of scores on 24 items of the form, 'If you saw [your son] grab things from another child, would you ... [e.g. spank] your child until he/she cries?' (0 = no, 1 = yes). Some punishments were harsh physical punishments, but more were non-physical, e.g. 'make him apologise', or 'not let him play with friends for two days', or 'tell him in a nice way how to act differently', or 'tell him you don't love him for grabbing things'. However, one could only get a high score by approving the use of many punishments in many situations. Parents' scores were combined. Coefficient alpha was 0.81. (d) *Discrepancy in parent-child self images*: This scale measures the discrepancy between how the child rates himself and how the parents rate themselves on body image and five expressive behaviours (walking, talking, standing, eating, and writing). For each behaviour (e.g. 'I walk') the respondents rated themselves on several five-point adjective dimensions (e.g. slow vs. fast, soft vs. loud, not often vs. often). On body image (i.e. 'My body is') the respondents rated themselves on five five-point adjective dimensions (light vs. dark, tall vs. short, thick vs. thin, hard vs. soft, and strong vs. weak). The discrepancy score is the square root of the sum of the squared differences on all the resulting 18 adjective ratings and can range from 0 to almost 17. Theoretically, children whose self-perception is different from their parent(s)'s self-perception should identify less with their parents. Thus, this measure has been used as a means of identification with parents (e.g. Eron et al., 1991). (e) *Child's expression of guilt*: This scale assesses from parent reports the extent to which the child feels guilty about his bad behaviours. It consists of seven 'yes-no' items with scores ranging from 7 to 14 with higher scores indicating more guilt. A boy low on guilt would be one who 'feels that his punishments are not justified, doesn't worry about lies, and does not feel sorry when he disobeys'. Parents' ratings were combined. Coefficient alpha was 0.65. (f) *Child's confessing*: This scale assesses from parent reports the extent to which the child is willing to admit transgressions. It consists of two items with five-point response scales, so scores can range from 2 to 10. A boy low on confessing would be one who, according to his parents, 'always denies doing "naughty" acts', and who 'never tells them about naughty acts without them having to ask'. Parents' ratings were combined. Coefficient alpha was 0.56. (g) *Birth certificate data*: Two variables were created from birth certificate records. We coded the *child's birth weight* and the *age of the mother* when the child was born.

Results

Sample characteristics

The sample of 332 boys was predominantly middle class according to their

parents' education (49% of their parents had graduated from high school) and housing (63% owned their homes) and of average IQ ($M = 97.92$, $SD = 14.72$); 3.5% belonged to racial minorities. We examined differences between the boys on whom we could and could not find criminal data on the family background variables, parents' beliefs and behaviours, family interaction measures, and child IQ and aggressiveness. Only two differences emerged: the boys on whom we could find criminal data were significantly less aggressive at age eight (nominated on aggression items 15% versus 19% of the time, $t(434) = 2.37$, $p < 0.02$) and had parents who were on average about six months less well educated than the boys on whom we could not find criminal data.

Of the 332 boys, 68 (20%) were arrested at least once by age 30, and 42 (13%) were convicted at least once. The number of arrests ranged from one to 15 and the number of convictions ranged from one to 11. Twenty of the males who were convicted (40%) served time in prison, and the time served in prison ranged from five days to slightly over 10 years. Twenty-five of the males were arrested at least once for violent crimes.

What childhood variables correlate with childhood aggression?

Table 1 shows the correlations of the age eight predictors with age eight aggression. Recall that age eight aggression was assessed by a peer-nomination procedure that included items covering multiple types of aggressive behaviour (i.e. physical, verbal, acquisitive and indirect aggression). These results have been presented previously for the whole sample, but it is important to keep them in mind in interpreting the longitudinal results presented below. An age eight predictor that correlates highly with age eight aggression but not as highly with later criminality might nevertheless be an important risk factor for later criminality because early aggression is in itself an important risk factor. It might simply have already had its effect on aggressive behaviour before age eight.

Table 1 shows that the child's IQ, the child's unpopularity and a number of family interaction variables were significantly correlated with childhood aggression. More aggressive children were less intelligent, less popular, rejected more by their parents, had parents who believed more firmly in punishment for transgressions, were less identified with their parents' self-images, were less likely to express guilt over transgressions and were less likely to confess undetected transgressions. Although lack of guilt and lack of confessing most probably are precursors to aggression, the parenting factors might as easily be reactions to the child's aggression. It will be most interesting is to see whether they predict criminality longitudinally beyond the effect of early aggression. Table 1 also shows that boys from poorer homes were more aggressive, and boys from larger families were marginally more aggressive ($p < 0.10$).

Table 1: Correlations of age eight aggression with other potential age eight predictor variables			
Predictors	Correlation with age eight aggression		
	<i>r</i>	Signif.	<i>n</i>
Birth certificate variables:			
Mother's age	-0.03	ns	233
Child's birth weight (g)	0.12	0.07	232
Family background variables:			
Number of children in family	0.11	0.07	283
Parents' education	-0.08	ns	283
Value of family housing	-0.17	0.005**	273
Parents' church attendance	-0.03	ns	284
Parents' beliefs and behaviours:			
Parents' delinquency	0.01	ns	283
Parents' authoritarianism (<i>F</i> -scale)	0.06	ns	283
Family interaction variables:			
Parents' rejection of child	0.22	0.0002***	283
Parental disharmony	0.05	ns	273
Parents' endorsement of child punishment	0.22	0.0002***	272
Discrepancy in parent-child self-images	0.24	0.0001****	252
Child's expression of guilt	-0.13	0.03*	283
Child's confessing	-0.17	0.004**	283
Age eight child variables:			
Child's IQ	-0.28	0.0001****	332
Child's peer-nominated popularity	-0.27	0.0001****	332

Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, **** $p < 0.0001$.

Longitudinal predictors of adult criminality

Predictors of arrests

In Table 2, the mean scores on the early childhood predictor variables are compared for the 68 boys who were arrested at least once by age 30 with the 264 who were never arrested. As reported in earlier papers, age eight peer-nominated aggression was a significant predictor of being arrested by age 30. The effect size is 0.38 standard deviations. What is more interesting is that a number of other age eight factors that were not particularly strongly related to age eight aggression predict being arrested, while some that were related to age eight aggression do not predict being arrested. Children with more siblings who come from families who were less well educated and lived in poorer housing were more at risk for being arrested, but those whose parents attended

church more often were less at risk. Whereas the parents' own delinquency was not related to the boy's aggressiveness at age eight, it was marginally predictive ($p < 0.10$) of risk for the boy being arrested. Although many family interaction variables were related significantly to aggression at age eight, they were less strongly related to criminality 22 years later. Only the child's failure to express guilt was significantly predictive of being arrested. Of the child variables, IQ remained a significant predictor of arrest risk but unpopularity at age eight did not.

These predictor variables are correlated with each other and do not represent independent effects. To understand their independent effects, we computed a stepwise logistic regression equation to see what was the best combination of variables for predicting being arrested by age 30. To avoid reducing the sample size for the stepwise regression, we considered for entry only those birth variables with bivariate significance ≤ 0.10 , and only other parenting variables with bivariate significance ≤ 0.20 . The results shown in the rightmost columns of Table 2 indicate that four factors can explain most of the effect of the age eight predictors on being arrested: the child's aggressiveness at age eight, the parents' church attendance, the parents' disharmony, and the parents' level of education. More aggressive children with parents who were less well educated, experienced more marital disharmony and who seldom attended church were the most at risk for arrest. A one standard deviation increase in childhood aggression increases the odds of being arrested by 45%, and a one standard deviation increase in parents' disharmony increases the odds of the child being arrested by 33%. On the other hand, a one standard deviation increase in parents' church attendance *decreased* the odds of a child being arrested by 30%; and a one standard deviation increase in parents' education *decreased* the odds of a child being arrested by 27%. The bivariate effects revealed for the other predictors (i.e. IQ, housing, feeling guilt, number of children in the family) are very probably encompassed in the effects of these four factors.

Among the 68 males who were arrested at least once, the number of arrests for each individual varied from one to 15. If being arrested more times is indicative of more serious criminality, then our next analysis might detect what is most important in predicting more serious criminal behaviour. In Table 3 we present correlations and a multiple regression that relate the same childhood predictor variables to the number of arrests a participant accumulated by age 30. One can see that the pattern of predictors is similar to that for being arrested at least once. In both cases, childhood aggression was the best predictor and all the family background variables predict significantly. However, there are some differences. Comparing the correlations in Table 3 with the *t*-tests in Table 2, one sees that the parents' strong belief in punishing a child was a much better predictor of a child being arrested multiple times than of a child being arrested at least once. Whereas parent report that a child felt guilty was a good indicator that the child would never be arrested, it was

Table 2: Comparison of means on childhood predictor variables for males arrested by age 30 and those never arrested

Predictors	Means		Effect Size	N1,	N2	T-value	Signif.	Logistic regression	
	Arrested (N1 = 68)	Never Arrested (N2 = 264)						Standardized Odds slope	Signif.
Birth certificate variables:									
Mother's age	25.09	26.52	-0.27	46,	187	-1.65	0.11	-	-
Child's birth weight (g)	3270	3258	-0.02	46,	186	-0.12	ns	-	-
Family background variables:									
Number of children in family	4.18	3.59	0.33	60,	223	2.24	0.03*	0.73	ns
Parents' education	3.28	3.76	-0.41	60,	223	-2.79	0.006**		.09
Value of family housing	2.28	2.73	-0.42	58,	215	-2.83	0.005**		ns
Parents' church attendance	1.73	2.36	-0.46	61,	223	-3.18	0.002**	0.70	.05*
Parents' beliefs and behaviours:									
Parents' delinquency	0.10	0.04	0.28	60,	223	1.90	0.06		ns
Parents' authoritarianism (F-scale)	15.98	15.17	0.22	60,	223	1.50	0.14		ns
Family interaction variables:									
Parents' rejection of child	10.04	9.75	0.10	60,	223	0.68	ns	-	-
Parental disharmony	16.04	15.50	0.24	59,	214	1.65	0.10	1.33	.09
Parents' endorsement of child punishment	10.85	10.00	0.27	58,	214	1.84	0.07		ns
Discrepancy in parent-child self-images	7.10	6.63	0.29	53,	199	1.86	0.07		ns
Child's expression of guilt	10.13	10.59	-0.35	60,	223	-2.43	0.02*		ns
Child's confessing to parents	5.44	5.86	-0.27	60,	223	-1.87	0.06		ns
Age eight child variables:									
Child's IQ	98.82	103.08	-0.32	68,	264	-2.35	0.02*		ns
Child's peer-nominated aggression	0.194	0.139	0.38	68,	264	2.76	0.006**	1.45	.008**
Child's peer-nominated popularity	0.195	0.229	-0.22	68,	264	-1.60	0.11		ns
Logistic chi-square (4) = 21.3, n = 228 p < 0.0003									

Notes: The logistic regression was computed by forward stepwise entry with $p < 0.10$ required for entry. To avoid reducing the sample size more, only those birth variables were considered for entry with bivariate $p < 0.10$ and only those parent variables were considered for entry with bivariate $p < 0.20$. The excluded variables are denoted by dashes. The effect size is the difference in means in standard deviation units. * $p < 0.05$, ** $p < 0.01$.

Table 3: Relations between number of arrests by age 30 and childhood predictor variables

Predictors	Correlation with number of arrests		OLS regression (n = 235)	
	r	Signif	Beta	Signif.
Birth certificate variables:				
Mother's age	-0.07	ns	-	-
Child's birth weight (g)	0.03	ns	-	-
Family background variables:				
Number of children in family	0.15	0.01**	0.12	0.06
Parents' education	-0.16	0.009**	-	ns
Value of family housing	-0.17	.004**	-	ns
Parents' church attendance	-0.19	0.001***	-0.18	0.003**
Parents' beliefs and behaviours:				
Parents' delinquency	0.04	ns	-	-
Parents' authoritarianism (F-scale)	0.07	ns	-	ns
Family interaction variables:				
Parents' rejection of child	0.08	0.17	-	-
Parental disharmony	0.05	ns	-	-
Parents' endorsement of child punishment	0.19	0.001***	0.12	0.05*
Discrepancy in parent-child self-images	0.12	0.06	-	ns
Child's expression of guilt	-0.10	0.10	-	ns
Child's confessing	-0.12	0.05*	-	ns
Age eight child variables:				
Child's IQ	-0.14	0.01**	-	ns
Child's peer-nominated aggression	0.26	.001***	0.24	0.0001****
Child's peer-nominated popularity	-0.07	ns	-	-
Regression R2 = 0.16, F(4, 230) = 11.14, p < 0.0001				

Notes: The regression was computed by forward stepwise entry with $p < = 0.10$ required for entry. To avoid reducing the sample size more, only those birth variables were considered for entry with bivariate $p < = 0.10$ and only those parent variables were considered for entry with bivariate $p < 0.20$. The excluded variables are denoted by dashes. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, **** $p < 0.0001$.

not particularly good at predicting multiple arrests. When we compare the regression equation in Table 3 with the logistic regression in Table 2, we also see that lower aggression in childhood and greater parent church attendance were good predictors of lower criminality in both cases. However, whereas parental disharmony added independently to the prediction of being arrested at least once, it did not add to the prediction of number of arrests. Instead, both having more children in the family and having parents who believed more in punishment added to the prediction of multiple arrests.

Predictors of violent crimes

Another indicator of adult criminality is the type of crimes committed. Twenty-five of our participants had been arrested at least once for a violent crime. As noted earlier, we computed a seriousness score for each violent crime and a total seriousness of violent crimes score for each participant. In Table 4 the mean scores on the childhood predictor variables are compared for those who were arrested for a violent crime by age 30 and those who were not. The pattern is not very different from the pattern of means in Table 2 for predicting who would be arrested for any crime. Low age eight IQ and high age eight aggressiveness were significant predictors of risk for arrest for a violent crime with effect sizes of 0.63 and 0.47 standard deviations. Parents' church attendance again was a significant protective factor, whereas having more siblings and having less educated parents were again risk factors. It is of interest that parental history of delinquency and strong parental endorsement of punishment were also predictors of arrest for a violent crime. When these were combined in a logistic regression predicting arrest for a violent crime, early aggression was accompanied by lower value of family housing and lower parental church attendance as the predictor variables. For example, a one standard deviation increase in early aggressiveness increased the odds of arrest for a violent crime by 41%, and a standard deviation increase in parents' church attendance decreased the odds by 34%.

In Table 5 the early childhood predictors are correlated with each participant's total score for seriousness of all violent crimes committed. Again, lower IQ, lower parental church attendance, lower value of family housing and lower parental education joined child aggression in being correlated with violent adult criminality. However, when combined in a regression prediction, childhood aggression was the only significant predictor.

Predictors of convictions

Of the 68 boys who were arrested at least once, 42 were convicted at least once, while 26 were never convicted of a crime. Do the same childhood factors that predict being arrested also predict who will be convicted? In Table 6 the mean scores of the 42 convicted boys are compared with those of the 'never

Table 4: Comparison of means on childhood predictor variables for males arrested for violent crime by age 30 and those never arrested for violent crime

Predictors	Means		Effect Size	N1,	N2	T-value	Signif.	Logistic regression (N1 = 15, N2 = 219)	
	Arrested for violent crime (N1 = 25)	Never Arrested (N2 = 306)						Standardized Odds slope	Signif
Birth certificate variables:									
Mother's age	24.94	26.37	-0.27	16,	216	-1.03	ns	-	-
Child's birth weight (g)	3327	3252	0.12	16,	215	0.48	ns	-	-
Family background variables:									
Number of children in family	4.53	3.66	0.48	19,	263	2.00	0.05*		ns
Parents' education	3.08	3.71	-0.52	19,	263	-2.19	0.03*		ns
Value of family housing	2.22	2.67	-0.42	18,	254	-1.72	0.09	0.75	0.08
Parents' church attendance	1.39	2.28	-0.64	19,	264	-2.71	0.007**	0.66	0.02*
Parents' beliefs and behaviours:									
Parents' delinquency	0.16	0.04	0.50	19,	263	2.11	0.04*		ns
Parents' authoritarianism (F-scale)	16.66	15.22	0.40	19,	263	1.62	0.11	-	-
Family interaction variables:									
Parents' rejection of child	9.58	9.82	-0.08	19,	263	-0.35	ns	-	-
Parental disharmony	15.98	15.59	0.18	19,	253	0.74	ns	-	-
Parents' endorsement of child punishment	11.61	10.06	0.50	19,	252	2.11	0.04*		ns
Discrepancy in parent-child self-images	7.31	6.69	0.37	16,	235	1.45	0.15		ns
Child's expression of guilt	10.3	10.51	-0.16	19,	263	-0.68	ns	-	-
Child's confessing to parents	5.39	5.81	-0.27	19,	263	-1.15	ns	-	-
Age eight child variables:									
Child's IQ	94.48	102.80	-0.63	25,	306	-3.03	0.003**		ns
Child's peer-nominated aggression	0.214	0.145	0.47	25,	306	2.26	0.03*	1.41	0.02*
Child's peer-nominated popularity	0.205	0.224	-0.12	25,	306	-0.56	ns	-	-
Logistic chi-square (3) = 17.1, n = 235, p < 0.0007									

Notes: The logistic regression was computed by forward stepwise entry with $p < = 0.10$ required for entry. To avoid reducing the sample size more, only those birth variables were considered for entry with bivariate $p < = 0.10$ and only those parent variables were considered for entry with bivariate $p < 0.20$. The excluded variables are denoted by dashes. Effect size is the difference in means in SD units. * $p < 0.05$, ** $p < 0.01$.

Table 5: Relations between total violence score for all arrests by age 30 and childhood predictor variables

Predictors	Correlation with violence of crimes		OLS regression (n = 234)	
	r	Signif.	Beta	Signif.
Birth certificate variables:				
Mother's age	-0.04	ns	-	-
Child's birth weight (g)	0.04	ns	-	-
Family background variables:				
Number of children in family	0.10	0.080	0.12	0.06
Parents' education	-0.12	0.050*		ns
Value of family housing	-0.12	0.050*		ns
Parents' church attendance	-0.16	0.007**		ns
Parents' beliefs and behaviours:				
Parents' delinquency	0.06	ns	-	-
Parents' authoritarianism (F-scale)	0.07	ns	-	-
Family interaction variables:				
Parents' rejection of child	0.06	ns	-	-
Parental disharmony	0.08	ns	-	-
Parents' endorsement of child punishment	0.10	0.090	0.12	0.07
Discrepancy in parent-child self-images	0.12	0.060		ns
Child's expression of guilt	-0.07	ns	-	-
Child's confessing to parents	-0.08	0.190		ns
Age eight child variables:				
Child's IQ	-0.18	0.001***		ns
Child's peer-nominated aggression	0.13	0.020*	0.16	0.02*
Child's peer-nominated popularity	-0.05	ns	-	-
Regression $R^2 = 0.07$, $F(3,224) = 5.73$, $p < 0.001$				

Notes: The regression was computed by forward stepwise entry with $p < 0.10$ required for entry. To avoid reducing the sample size more, only those birth variables were considered for entry with bivariate $p < 0.10$ and only those parent variables were considered for entry with bivariate $p < 0.20$. The excluded variables are denoted by dashes. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

convicted'. The pattern of means is quite different from the pattern that discriminated the 'arrested' from 'never arrested'. First, early aggression *did not predict* who will be convicted at least once. The more important childhood variables were IQ and popularity. Among the 68 boys who were arrested, those who were more popular and smarter were less likely to be convicted. This pattern fits with a model that the outcome of a first arrest depends more on the social skills and intelligence of the boy than it does on his actual aggressiveness. When these variables were combined in a logistic regression predicting conviction, IQ explains most of the variance: a one standard deviation increase in IQ predicted an 84% decrease in the odds of being convicted. Childhood popularity did not add significantly to the prediction because it was correlated with IQ ($r = 0.39, p < 0.001$). The only childhood factor that added significantly to the prediction of being convicted was parental authoritarian beliefs; interestingly, more authoritarian beliefs by parents predicted a decrease in the likelihood of the child being convicted following an arrest.

The picture changes when we look at number of convictions or number of days served in prison for the 68 males who were arrested at least once. Although IQ was the key factor in predicting who would be convicted at least once, childhood aggression again became the most significant predictor of how many times a person will be convicted and how long he will serve in prison. This is not surprising given that early aggression is also the best predictor of how many times a boy will be arrested and how serious will be the crimes for which he is arrested. Parents' church attendance and their endorsement of punishment were the only other significant risk factors for number of convictions and time in prison. However, as the regressions in Table 7 show, once age eight aggression is controlled, only lack of parental church attendance added significantly to aggression in predicting the risk for multiple convictions and more time in prison.

Discussion

These results suggest that how aggressively children behave by age eight is the best predictor of how likely they are over the next 22 years to be arrested, how many times they will be arrested, how serious will be their crimes, how many times they will be convicted and how long they will serve in prison. The reader should be reminded that the age eight aggression measure was not limited to an assessment of physical, violent aggression but rather included items assessing verbal, acquisitive and indirect aggression as well. It is this composite measure of early aggression that predicts arrests and convictions 22 years later. These results are consistent with studies cited earlier that document continuities from childhood aggression to late adolescent delinquency to young adult aggression and antisocial behaviour (e.g. Pulkkinen, 1992; Farrington, 1994; Magnuson et al., 1994; McCord, 1994; Silva, 1996). Yet, the current study extends those

Table 6: Comparison of means on childhood predictor variables for arrested males who have been convicted at least once and arrested males who have never been convicted

Predictors	Means		Effect size	N1,	N2	T-value	Signif.	Logistic regression	
	Arrested and convicted (N1 = 42)	Arrested but never convicted (N2 = 26)						Standardized odds slope	Signif.
Birth certificate variables:									
Mother's age	24.66	25.82	-0.19	29,	17	-0.62	ns	-	-
Child's birth weight (g)	3217	3356	-0.22	29,	17	-0.73	ns	-	-
Family background variables:									
Number of children in family	3.89	4.68	-0.41	38,	22	-1.54	0.13	0.54	0.08
Parents' education	3.28	3.26	0.02	37,	23	0.09	ns	-	-
Value of family housing	2.20	2.43	-0.19	37,	21	-0.69	ns	-	-
Parents' church attendance	1.59	1.96	-0.27	38,	23	-1.02	ns	-	-
Parents' beliefs and behaviours:									
Parents' delinquency	0.08	0.13	-0.14	37,	23	-0.52	ns	-	-
Parents' authoritarianism (F-scale)	15.29	17.08	-0.32	37,	23	-1.91	0.06	0.40	0.02*
Family interaction variables:									
Parents' rejection of child	10.14	9.86	0.09	37,	23	0.35	ns	-	-
Parental disharmony	15.87	16.33	-0.20	36,	23	-0.76	ns	-	-
Parents' endorsement of child punishment	11.33	10.07	0.43	36,	22	1.58	0.12	-	ns
Discrepancy in parent-child self-images	7.31	6.79	0.28	32,	21	0.98	ns	-	-
Child's expression of guilt	10.18	10.04	0.11	37,	23	0.41	ns	-	-
Child's confessing to parents	5.59	5.20	0.24	37,	23	0.90	ns	-	-
Age eight child variables:									
Child's IQ	95.43	104.31	-0.72	42,	26	-2.89	0.005**	0.16	0.001***
Child's peer-nominated aggression	0.216	0.159	0.32	42,	26	1.29	ns	-	ns
Child's peer-nominated popularity	0.168	0.24	-0.49	42,	26	-1.98	0.05*	-	ns
Logistic chi-square (3) = 22.2, n = 58, p < 0.0001									

Notes: The logistic regression was computed by forward stepwise entry with $p < 0.10$ required for entry. To avoid reducing the sample size more, only those birth variables were considered for entry with bivariate $p < 0.10$ and only those parent variables were considered for entry with bivariate $p < 0.20$. The excluded variables are denoted by dashes. Effect size is the difference in means in SD units. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 7: Correlations of childhood predictor variables with number of convictions and prison terms for subjects who were arrested at least once

Predictors	Correlation with Number of convictions		OLS regression (n = 55)		Correlation with total days served		OLS regression (n = 52)	
	r	Signif.	Beta	Signif.	r	Signif.	Beta	Signif.
Birth certificate variables:								
Mother's age	-0.05	ns	-	-	0.00	ns	-	-
Child's birth weight (g)	-0.02	ns	-	-	-0.01	ns	-	-
Family background variables:								
Number of children in family	0.1	ns	-	-	0.31	0.02	60	ns
Parents' education	-0.14	ns	-	-	-0.25	0.06	ns	-
Value of family housing	-0.19	0.15	-	ns	-0.04	ns	-	-
Parents' church attendance	-0.17	0.18	-0.25	0.05*	-0.28	0.03*	-0.27	0.03*
Parents' beliefs and behaviours:								
Parents' delinquency	0	ns	-	-	-0.07	ns	-	-
Parents' authoritarianism (F-scale)	-0.03	ns	-	-	0.13	ns	-	-
Family interaction variables:								
Parents' rejection of child	0.13	ns	-	-	0.10	ns	-	-
Parental disharmony	-0.1	ns	-	-	-0.02	ns	-	-
Parents' endorsement of child punishment	0.33	0.01	-	ns	0.30	0.02*	-	ns
Discrepancy in parent-child self-images	0.11	ns	-	-	0.19	0.18	-	ns
Child's expression of guilt	0.04	ns	-	-	0.08	ns	-	-
Child's confessing	-0.06	ns	-	-	-0.08	ns	-	-
Age eight child variables:								
Child's IQ	-0.19	0.13	-	ns	-0.11	ns	-	-
Child's peer-nominated aggression	0.33	.007**	0.33	0.01**	0.39	0.001***	0.38	0.003**
Child's peer-nominated popularity	-0.09	ns	-	-	-0.06	ns	-	-
					R2 = 0.25, F(2, 49) = 8.23, p < 0.001			

R2 = 0.19, F(2, 52) = 5.96, p < 0.005

Notes: The regression was computed by forward stepwise entry with $p < = 0.10$ required for entry. To avoid reducing the sample size more, only those birth variables were considered for entry with bivariate $p < = 0.10$ and only those parent variables were considered for entry with bivariate $p < 0.20$. The excluded variables are denoted by dashes. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

findings by shedding light on the role of early childhood contextual factors. That is, contextual factors such as family background variables (e.g. value of family housing) and family interaction variables (e.g. parental punishment toward and rejection of the child) appear to exert their influence on adult aggression indirectly through their effects on early aggression. Thus, early aggression mediates the effects of early childhood influences on adult criminality.

These findings are especially noteworthy because, unlike several other longitudinal studies cited earlier, the current study's participants were not a high-risk sample but rather a middle-class, predominantly Caucasian community sample. In addition, because of the relative loss of high-aggressive participants over the course of 22 years, the magnitude of our findings should be viewed as underestimates of the actual strength of the stability of aggression over time as well as the effects of the early contextual influences. Nevertheless, in terms of arrest rates, the current sample appears to be similar to a national sample of adults surveyed in 1980 (Flanagan and McLeod, 1983); 20% of males in that survey indicated they had been arrested at least once, the same rate as in the current sample. Despite differences between the current sample and those of other researchers, our findings regarding the stability of aggression are consistent with those of other researchers.

As noted, childhood aggression was by far the strongest predictor of adult criminality. Only a few other risk factors added to the accuracy of the prediction of these adult criminal behaviours. Of particular interest is the finding that parents who believed strongly in punishing transgressions (harshly or not harshly) had boys who were more at risk for criminality (number of arrests and seriousness of violent arrests) compared with equally aggressive boys without such parents. Why? Perhaps such parents and their sons become more alienated from each other in adolescence because of the parents' punishing attitudes. One consequence would be that the boy might turn more to other alienated and antisocial peers (Dishion et al., 1994) thus breeding antisocial behaviour. Another consequence would be a reduction in the parents' influence over the boy's developing social scripts and world schemas. Another possibility is that the punitive parent models physically aggressive behaviour that the son learns as an effective way of interacting with others (Bandura et al., 1961; Eron, 1987).

A second finding of particular interest is the protective role that parental church attendance seems to play in preventing criminality. Boys whose parents attended church more frequently when the boys were eight years old were less at risk for criminality as adults than equally aggressive eight-year-old boys whose parents attended church less frequently. Other survey studies have shown similar negative correlations between parental church attendance and risk for aggression, delinquency or criminality of their children within one denomination (Petterson, 1991; Ellis and Petterson, 1996). One explanation has been that parents who care enough about spiritual issues to attend church

regularly also devote more effort to dealing with their children's problems. Another explanation has been that the religious establishment provides support to help parents with problem children successfully deal with the problems. Others have argued that the correlations are due to 'structural relations' between church attendance and other factors that influence criminality (Cochran et al., 1994; Benda and Corwyn, 1997). However, the fact that the correlation persists after early aggression and the other early predictors are partialled out makes the latter explanation seem less likely.

Many other variables were related to adult criminality by themselves, but did not add to predicting criminality once early aggression was considered, e.g. low IQ, poor housing, lower parent education, child not feeling guilty, discrepancy in parent and child self-images. That does not mean that these variables are unimportant. It simply means that they might exert their effect very early in life on how aggressively the child behaves, and it is the early aggression that is mediating the effect of these factors on adult criminality. For example, low IQ might be an important frustrator that instigates early aggression or might be a sign of CNS (central nervous system) abnormalities that presage aggression. A child's failure to feel guilty or confess transgressions at an early age might allow antisocial scripts and beliefs to be established that reveal themselves first in early aggressive behaviour and later in criminal behaviour. Poor housing and lower SES (socioeconomic status) might place the child in settings where he is more likely to be exposed to violence and antisocial behaviours and associate more with deviant peers. These in turn might stimulate both childhood aggression and adult antisocial and criminal behaviour. It is also important to note that other childhood variables that were not assessed in our study might add to predicting risk for adult criminality, e.g. personal factors such as temperament and attention deficit disorder (e.g. Moffitt, 1990, 1993) and contextual factors such as parent criminality, stress and poverty (e.g. Guerra et al., 1994; Farrington, 1995).

Another notable finding from our analyses was that whether an arrested boy is convicted the first time seems to depend on quite different factors than those that predict whether he will be arrested or convicted multiple times. In particular, boys who were more intelligent and socially skilled were less likely to be convicted for their first arrest. Furthermore, although parental authoritarianism was generally a risk factor for child criminality, it served as a protective factor for more intelligent children ever being arrested or convicted. (We note that when all childhood predictors are taken together, only child intelligence and parental authoritarianism were the significant predictors of later convicted status; that is, these predictors seem to explain the variance that early social skills explained by itself.) These results provide empirical confirmation of a process that many criminologists have speculated occurs. The criminal justice establishment seems to respond differently to a socially skilled, intelligent boy who gets in trouble the first time than it does to a less intelligent, less socially skilled boy. Having parents who seem to have strong

feelings about discipline is also probably viewed positively by judges. Nevertheless, after multiple arrests these same factors do not help the boy much. The outcome of multiple arrests (e.g. time served in prison) was predicted by much the same factors that predicted being arrested, i.e. the individual's own aggression and having parents who strongly endorsed punishment and did not attend church much.

A clear implication of this study is that the risk for adult criminality is affected by much that happens to a boy before he is eight years old. Aggressiveness at age eight predicted adult criminality better than most other childhood factors, but that is probably because the other factors have already exerted their influence on a boy's behaviour before he is eight years old. These findings have important theoretical and applied implications. Longitudinal studies of the development of aggression and interventions to prevent aggressive and antisocial behaviour must begin in the very early years of the child's life. Preventive interventions need to target ecological risk factors that appear to influence the development of early aggression. These findings support the design of multi-level intervention programmes (e.g. Hawkins et al., 1992; Conduct Problems Prevention Research Group, 1999; Reid et al., 1999; Metropolitan Area Child Study Research Group, 2002) that include components aimed at modifying early contextual influences (e.g. parenting skills, family interaction variables) through parent-focused interventions, as well as early childhood behaviour problems through child-focused, classroom-based interventions.

Acknowledgement

This research was supported in part by grants from NIMH and NICHD. This manuscript was written while the senior author was on sabbatical from the University of Michigan as a Visiting Fellow at the Institute of Criminology of Cambridge University. The authors wish to acknowledge the contributions of Monroe Lefkowitz and Leopold Walder to the Columbia County Longitudinal Study.

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