An investigation of the role of personality, familial, and peer-related characteristics in homicidal offending using retrospective data

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Abstract

Purpose – *The current study seeks to assess the predictive utility of personality, family violence, associations with criminal friends, peer rejection, parental attachment, and parental supervision as predictors of homicidal behaviour among a sample of 144 male recidivistic offenders.*

Design/methodology/approach – *This research project utilized a quasi-experimental design with propensity score matching in order to minimize the effect of selection bias. Post-matching binary logistic regression analysis was subsequently conducted in order to determine what factors predict homicidal behaviour.*

Findings – *Post-matching regression results indicated that experience of family violence, psychoticism, and parental attachments were significant predictors of being a homicidal murderer.*

Originality/value – *The findings provide strong empirical support for the important role of early childhood experiences in the prediction of homicidal acts, along with the crucial role of personality (psychoticism). These findings provide additional support for Eysenck's theoretical indications regarding the role of psychoticism in the prediction of violent criminal behaviours.*

Keywords *Homicide, Psychoticism, Family violence, Parental attachment, Propensity score analysis, Personality, Violent crime*

Paper type *Research paper*

Introduction

Despite the large amount of research on the predictors of violent behavior, there has been relatively little attention given to the prediction of homicidal behavior (Farrington *et al.*, 2012). This is likely due to the comparatively low prevalence of homicidal offending compared with more general violent offending. However behavioral consistency theories of development would suggest that many of the same factors that predict violent behavior in general may also predict the risk for homicide (Loeber and LeBlanc, 1990). On the other hand, it has been suggested that there are important psychiatric problems that can distinguish those who kill versus those who do not (Lewis *et al.*, 1988). Nonetheless, a number of dispositional, familial and peer related factors have been found to be predictive of both general violence and more specifically homicidal behavior.

It has been suggested that theories of personality may be more appropriate than ICD/DSM concepts of personality disorders for offender samples (Ireland and Ireland, 2011). Eysenck's theory of personality is perhaps the most well-known personality theory in terms of criminal behavior. According to the theory, individuals have biological dispositions to behave in certain ways. The original concept of the theory suggested that individuals high in extraversion and high in neuroticism are more likely to engage in criminal behavior (Eysenck and Eysenck, 1976). Psychoticism was later added to the model and suggested to predict cold and intrusive social behaviors (Eysenck and Eysenck, 1976). Individuals who display high levels of psychoticism are impulsive, egocentric, cold, aggressive, unempathic, and tough-minded. Eysenck (1998) suggests that the biological roots of psychoticism lie in the

level of cortical arousal, and subsequently is linked to conditionability and conscience development. Impulsivity is hypothesized to be the crucial characteristic in the link between conditionability and personality. Consequently individuals with high levels of psychoticism are believed to experience low levels of cortical arousal, and are less easy to condition and more prone to developing criminal behavior (Eysenck, 1998; Gudjonsson, 1997). The link between psychoticism and psychopathy (a potent predictor of homicidal behavior) has received a significant amount of empirical investigation. Hare (1982) initially investigated the relationship between psychoticism and psychopathy among 173 male prison inmates. His results indicated a high degree of correlation between the two traits in particular psychoticism was most highly associated with the impulsive, early antisocial behavioral manifestations, and unstable life style components of psychopathy. Hare suggested that the personality trait psychoticism reflected the criminal and antisocial aspects of psychopathy. More recently Corr (2010) has developed a neuropsychological model that describes a continuum from psychoticism to psychopathy in which the central deficits observed in both psychoticism and psychopathy can be traced to abnormalities in the behavioral inhibition system. These abnormalities are hypothesized to lead cognitive defects, dysfunctions in the flight-fright-freeze systems, along with corresponding abnormalities in the behavioral approach systems, all of which contribute to the emergence of maladaptive levels of impulsivity. Although the connection between psychopathy and homicidal behavior has received significant empirical attention, the same cannot be said for the role of psychoticism in homicidal behavior. This oversight is curious given the degree of overlap that appears to exist between psychoticism and psychopathy.

Support for Eysenck's personality theory of criminality remains equivocal, however, and while some research has supported the model (Eysenck and Gudjonsson, 1989; Carrascoa et al., 2006; Savina, 2009), others have failed to find support for the model (Fonseca and Yule, 1995). With regard to homicidal offending, Ram (1987) reported that recidivistic non-murders scored higher on extraversion and neuroticism while convicted murderers scored higher on psychoticism.

Dahlberg (1998) suggested that the familial factors associated for the risk of violence can be put into three categories:

1. those that pertain to caregiver attachment;

2. those that pertain to overall family functioning (e.g. family violence); and

3. those that pertain to parenting behaviors (e.g. parental supervision).

Bowlby (1973) considered insecure attachment as both a consequence and a source of trauma. Insecure attachment has consistently been cited as a risk factor for aggressive and anti-social behavior (Bousha and Twentyman, 1984; Farrington, 1978). Insecure attachment has specifically been implicated as a significant risk factor for intimate partner violence (Dutton et al., 1994; Babcock et al., 2000). Ressler et al. (1988) investigated the personal histories of 36 serial killers and concluded that the men did not form adequate attachments with their primary caregivers.

Violence in the family has also been found to be a significant risk factor for later engagement in violent behavior (Lisak et al., 1996). Family violence has also been shown to be a differentiating factor between homicidal and non-violent groups (Zagar et al., 2009). However, it has been suggested that the vast majority of individuals with such conditions are so resilient such that violent offending does not occur (Zagar et al., 2009), suggesting that there may be additional risk or protective factors that may increase or decrease the risk of violent behavior respectively. One possible risk factor is poor parental supervision. Poor parental supervision has been found to be a predictor of violence and delinquency (Hawkins et al., 1998; Lipsey and Derzon, 1998; Farrington and Loeber, 2000). Roe-Sepowitz (2009) found that 30.8 percent of the males charged with homicide or attempted homicide reported no parental supervision. However, a recent prospective study on young homicide offenders, found that none of their child-rearing factors predicted homicide, suggesting that positive parenting may act as a protective factor rather than negative parenting being a risk factor

(Farrington *et al.*, 2012). Furthermore this study indicated that the important risk factors for homicide in young men were socioeconomic and environmental rather than individual factors (Farrington *et al.*, 2012)

Peer rejection has also been associated with later delinquent behavior (Kupersmidt *et al.*, 1990) and has been identified as a risk factor for multiple victim homicide (Verlinden *et al.*, 2000; Leary *et al.*, 2003). Additionally, peer rejection in childhood has been associated with anti-social peers in adolescence (Coie *et al.*, 1995). Association with criminal peers has been suggested to strengthen the relationship between criminal attitudes and offending behavior (Mills *et al.*, 2002).

Very few studies with sound methodological designs exist which have investigated the role of personality (as defined by Eysenck and Eysenck, 1976), family violence, associations with criminal friends, peer rejection, parental attachment, and parental supervision as possible predictors of homicidal behavior. Thus, the primary objective of this paper is to investigate the personality traits, familial, and peer-related characteristics in a group of homicidal offenders incarcerated in a high security prison. To control for selection effects, it was necessary to match prisoners based on whether or not they had committed a murder. This was accomplished through a propensity score matching procedure. Propensity score matching mimics experimentation by isolating the effect of the treatment and thus stronger assertions about prediction can be made in contrast to regression analysis conducted without propensity score matching which only holds constant the influence of potential confounding variables. Furthermore, post matching analysis (regression in this particular case) can be used with a much larger number of covariates than would be appropriate for regression analysis without propensity score matching (Guo and Fraser, 2010).

Method

Participants

The sample consisted of 55 murderers and 89 non-murderers incarcerated in Nowogard High Security Prison for recidivists. The respondents ranged in age from 20 to 66. The average age for participants was 33.85 (M = 33.85, SD = 9.38). Most offenders (88.1 percent) come from urban areas. 52.2 percent of offenders reported possessing a primary school education, 45.5 percent possess a secondary school education, and 2.2 percent indicated some college or university educational experience. 68.3 percent of prisoners indicated their marital status as single, 11.9 percent as married, 18.6 percent as divorced or separated, and 1.3 percent as widowed. The frequency of imprisonment reported by offenders ranged from 1 to 19 times (M = 3.57; SD = 2.48) and number of reported police arrests from 1 to 20 (M = 4.85; SD = 4.09).

Procedure

The sample was recruited from Nowogard High Security Prison for recidivists. The ethical approval for this project was granted by the Polish Prison Service. Appropriate prison staff members were instructed by the principal researcher about procedures involved in conducting this study. The questionnaires were delivered to prison by the principal researcher. A total of 158 offenders volunteered their participation however only 144 were considered for the final analysis (due to substantial missing data). Participants completed anonymous, self-administered, paper-and-pencil questionnaires which were compiled into a booklet along with an instruction sheet and a consent form attached to the front of the booklet. Each participant was provided with a brief description of the study, how to complete the questionnaire, and the general expected completion time. Participants were assured about the confidentiality of their participation and informed that they could withdraw from the study at any time. Participants completed the questionnaires within the prison in their living units. After completing the questionnaire, prisoners were asked to return it to the prison educational coordinator in a sealed envelope.

Materials

The Measure of Criminal Attitudes and Associates (MCAA) (Mills and Kroner, 1999) is a two-part self-report measure of criminal thinking style and associations with criminal friends. For the purpose of the current study only first part was used. Part A of the measure intends to quantify associations with criminal friends. Participants were asked to recall four individuals with whom they spent most of their time before incarceration and then answered four questions regarding the degree of criminal involvement of their associates:

1. ''Has this person ever committed a crime?''

2. ''Does this person have a criminal record?''

3. ''Has this person ever been to jail?''

4. ''Has this person tried to involve you in a crime?''.

Responses were used to analyze two measures of criminal associations. The first, ''number of criminal friends'' which was calculated by adding up the number of friends to which the participant answered ''yes'' to any of question on criminal association. The second measure was the ''criminal friend index'' calculated by assigning 1 through 4 to the percent of time options (0-25 percent; 25-50 percent; 50-75 percent; 75-100 percent) available for each friend. That number was then multiplied by the number of ''yes'' responses to the four questions of criminal association. All answers were summed as the criminal friend index. The potential scores for the criminal friend index (CFI) ranged from 0 to 64, with higher scores indicating stronger association with criminal friends.

The Eysenck Personality Questionnaire Revised-Abbreviated (EPQR-A) (Francis *et al.*, 1992) is a 24-item inventory of four sub-scales with six items each: extraversion (E; Cronbach's Alpha = 0.73), neuroticism (N; Cronbach's Alpha = 0.71), Psychoticism (P; Cronbach's Alpha = 0.61) and a Lie scale (L). It was scored on yes (1) and no (0) format and possible scores ranged between 0 and 6, with higher scores indicating higher levels of the personality trait. Sample questions included; ''do you often feel lonely?'' (N), ''do other people think of you as being very lively?'' (E), ''is it better to follow society's rules than go your own way?'' (P), and ''do you always practice what you preach?'' (L).

Peer rejection (Mikami *et al.*, 2005) is seven-item inventory with a five-point Likert scale response format ranging from a positive answer (5) to a negative (1) with one reverse-scored question. Thus, the possible total score can range from a minimum of 7 to a maximum of 35, with higher scores reflecting more positive peer relations and lack of rejection. Participants are asked to indicate the amount of peers they liked versus disliked in the class they attended before incarceration (sample question: ''how many students in your class did you get along with?''). In addition, they had to estimate the amount of peers who respected them versus those who tend to picked on them (sample question: ''how many students in your class teased you, put you down, or picked on you?''). Current research has suggested acceptable level of reliability for this measure (Cronbach's $\alpha = 0.75$).

Parental supervision (Ingram *et al.*, 2007) is a six-item retrospective instrument including questions regarding parental knowledge about range of aspects of offenders' lives when they were at the school age. These aspects included parental knowledge of participants' close friends, friends' parents and school teacher; what they were doing with friends; who they were with when they were not at home; and what they were doing at school. Answers were based on a four-point Likert type scale ranging from 1 (knows nothing) to 4 (knows everything). Thus, the possible total score can range from a minimum of 6 to a maximum of 24, with higher scores indicating greater indirect parental supervision. Based on the current sample the reliability for the entire measure (Cronbach's $\alpha = 0.83$) was acceptable.

Parental attachment (Ingram *et al.*, 2007) is an 11-item retrospective measure of the nature of the positive and negative relationship between offenders and their parents. Prisoners were asked how often they felt each statement was true (e.g. positive relationship ''you felt you could really trust your mother/father''; negative relationship ''you felt angry toward your mother/father''). Answers were based on a 4-point Likert type scale ranging from 1 (never) to

4 (always) with higher values indicating stronger parental attachment. The current research analysis reported sufficient reliability for entire measure (Cronbach's α = 0.86).

Analysis

This research project utilized a quasi-experimental design with propensity score matching in order to minimize the effect of selection bias (Rosenbaum and Rubin, 1985; Rudner and Peyton, 2006). It was assumed that the ''treatment group'' (murderers) would differ from the ''control group'' (non-murderers) on a number of psychological variables, and that these variables may also predict the outcome variable (committing murder). These potential confounding variables (covariates) were used to estimate a propensity score (ranging from 0 to 1) that represents each participant's probability of being assigned to the treatment group. The propensity score is then used to create a matched sample of treatment and control participants. Thus, the propensity score is a balancing score of covariates, meaning the distribution of the covariates are the same for the treatment and control group. In order to estimate the propensity score, all covariates included in the study are combined into a single propensity score using logistic regression predicting treatment group membership. Eight covariates were included in the model. The covariates were experience of family violence as a child (binary coded yes/no), associations with criminal friends, personality traits (psychoticism, extraversion, and neuroticism), peer rejection, attachment with parents, and parental control (supervision).

After obtaining the propensity scores for each offender, a matching algorithm is utilized to match treatment and control group. The propensity score matching procedure utilized in this study was greedy matching (nearest neighbor matching without replacement; Guo and Fraser, 2010). The ''MatchIt'' package in R version 2.14.1 was used to perform ''greedy matching'' which minimizes the total distance between treatment and control groups on their propensity scores. This allows for propensity scores to be used as a way of matching the murderers and non-murderers at a 1:1 ratio. The algorithm attempts to retain the matches for the experimental group with the least possible number of matches first. With this new matched sample regression analysis was performed to investigate what variables can be included in the regression model to predict homicidal behavior.

Results

Propensity score results

The original sample size is 144, of which 89 were non-murderers and 55 were murderers. The first step is to assess the differences between groups on all covariates. Previous research strongly suggests that t-test scores can be misleading, due to statistical significance being partially influenced by the sample size (Rosenbaum and Rubin, 1985; Austin, 2008; Loughran *et al.*, 2010). Therefore, the first step in determining covariate imbalance is to calculate the average difference in means, as a percentage of the average standard deviation. The standardized absolute percentage difference is based on the means, and not influenced by the unit of measurement or the sample size (Rosenbaum and Rubin, 1985, Loughran *et al.*, 2010). The following formula is used to calculate the standardized absolute differences in percentages:

$$100(M_t - M_c)/\left[(s_t^2 + s_c^2)/2 \right]^{1/2}$$

where M_t and M_c are the means for the treatment and control groups, respectively, and s_t^2 and s_c^2 are the variances. Rosenbaum and Rubin (1985) suggested that a standardized absolute difference equal to or greater than 20 percent is an indication of imbalance. Table I indicates that six of the covariates (family violence, psychoticism, extraversion, neuroticism, attachment, and parental supervision) are imbalanced in the original full sample (before matching). This indicates the necessity of using propensity score matching.

Nearest neighbor matching

P_i and P_j are the propensity scores for treated and control participants, respectively, I_1 is the set of treated participants, and I_0 is the set of control participants. A neighborhood $C(P_i)$

Table I	Absolute standardized difference between murderers and non-murderers before and after matching

	Before matching	After matching
Family violence	93.71	60.35
Criminal friends	− 8.46	4.69
Neuroticism	− 39.89	− 17.20
Extraversion	26.82	16.25
Psychoticism	54.64	41.16
Peer rejection	9.85	9.51
Attachment	− 80.52	− 64.80
Supervision	25.20	11.85

contains a control participant j (i.e. $j\varepsilon I_0$) as a match for a treated participants i (i.e. $i\varepsilon I_1$), if the absolute difference of propensity scores is the smallest among all possible pairs of propensity scores between i and j, as:

$$C(P_i) = \min {}_j \|P_i - P_j\|, j\varepsilon I_0$$

Once a j is found to match i, j is removed from I_0 without replacement. If for each i there is only a single j found to fall into $C(P_i)$, then the matching is nearest neighbor pair matching or 1-to-1 matching (Guo and Fraser, 2010).

After running propensity score matching (greedy matching) 55 successful paired matches were obtained ($n = 110$). More precisely, 34 cases from the control group were eliminated from the study. Finally, in order to determine the percentage difference in bias reduction for initially imbalanced covariates, the following formula was used (Rosenbaum and Rubin, 1985; D'Agostino, 1998):

$$100(1 - b_m/b_i)$$

where b_i and b_m are the mean differences after matching and before matching, respectively. The results in Table II indicate that all variables improved their balance after matching.

Post-matching regression model

Regression analysis was employed to help determine which of the set of predictor variables (experience of family violence, associations with criminal friends, personality traits, peer rejection, attachment with parents, and parental supervision) could be used to predict engagement in homicidal behavior. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. A test of the full model containing all predictor variables against a constant-only model was statistically significant, $X^2 (8, 102) = 27.35$, $p < 0.001$, indicating that the model was able to

Table II	Characteristics of unmatched ($N = 144$) and matched ($N = 110$) sample and balance improvement after matching

Covariates	Means before matching		Mean difference	Means after matching		Mean difference	Balance improvement (%)
	M	NM		M	NM		
Distance (propensity score)	0.64	0.22	0.42	0.64	0.32	0.32	23.75
Family violence	0.67	0.25	0.42	0.67	0.38	0.29	31.64
Criminal friends	14.33	15.36	− 1.03	14.33	13.76	0.56	45.40
Neuroticism	2.87	3.66	− 0.79	2.87	3.22	− 0.35	56.28
Extraversion	4.47	4.04	0.43	4.47	4.22	0.25	40.50
Psychoticism	2.67	1.85	0.82	2.67	2.02	0.65	20.06
Peer rejection	20.95	20.46	0.48	20.95	20.47	0.47	2.49
Attachment	28.27	33.98	− 5.70	28.27	33.00	− 4.73	17.14
Supervision	13.44	12.57	0.86	13.44	13.02	0.42	51.56
Sample size	55	89		55	55		

Notes: M = murderers; NM = Non-murderers; 34 cases unmatched

distinguish between prisoners who had committed a murder and those who had not. As shown in Table III only three of the independent variables made a unique statistically significant contribution to the model (family violence, psychoticism, and attachment). The strongest predictor of murder was experience of family violence recording an odds ratio of 5.62 (OR = 5.62, $p < 0.001$). This indicated that individuals who experienced family violence as children were 5.62 times more likely to commit a murder than those who did not report family violence, controlling for all other factors in the model. The second strongest predictor was psychoticism (OR = 1.55, $p < 0.01$). This finding suggests that those prisoners who score higher on the psychoticism scale were over 1 time more likely to commit murder. The odds ratio of 0.87 (OR = 0.87, $p < 0.001$) for attachment was less than 1, indicating that for increased scores on the parental attachment scale prisoners were 0.87 times less likely to report committing murder, controlling for other factors in the model.

Discussion

The current study was conducted in order to fill a significant gap in the existing literature with regards to the prediction of homicidal behavior among a sample of violent recidivistic offenders. Previous research findings and theoretical models have suggested a number of psychological and environmental factors that may be crucial in the prediction of homicidal behavior. Moreover a number of these factors have been suggested as variables that could serve to differentiate those violent offenders who commit murders from violent offenders who do not. Unfortunately there does not appear to be any methodologically rigorous studies conducted which have examined the effects of personality, family violence, associations with criminal friends, peer rejection, parental attachment, and parental supervision within a single model with the aim of predicting engagement in homicidal behavior. The current study examined the predictive utility of these variables for belonging to a homicidal violent offending group using a new and highly sophisticated analytical approach.

The use of propensity score analysis with post-matching multivariate analysis allows for reliable interpretations to be made regarding the predictive effect of the observed variables selected for the current analysis, given that selection biases with regards to the treatment condition (having committed a murder) were controlled for prior to conducting the logistic regression analysis. The results presented in Tables I and II demonstrate that use of propensity score analysis substantially improved the balance between the treatment (homicidal offenders) and control (offenders who have not engaged in homicidal behavior) groups on the majority of the covariates. This produces a much higher level of precision and accuracy in prediction than would have been achieved without the use of propensity score analysis.

The results from the post-matching regression analysis are largely consistent with previous findings in the literature and thus provide greater clarity and understanding with regards to the factors that can differentiate those offenders who commit acts of homicide from those who do not. The strongest predictor of belonging to the homicidal group was experiencing violence within the family as a child, with those offenders who reported having experienced

Table III	Post-matching regression analysis predicting homicidal offending			
	B	SE	z-value	OR
Family violence	1.73	0.49	3.54	5.62**
Criminal friends	−0.03	0.02	−1.10	0.97
Neuroticism	−0.19	0.12	−1.52	0.83
Extraversion	0.13	0.16	0.83	1.14
Psychoticism	0.43	0.17	2.58	1.55*
Peer rejection	0.00	0.05	0.01	1.00
Attachment	−0.14	0.04	−3.27	0.87**
Supervision	0.15	0.08	1.81	1.16

Notes: *$p < 0.01$; **$p < 0.001$

violence in the home being more than five times more likely to have committed a homicidal act than those offenders who had not witnessed violence in the familial home. This finding is consistent with those of Lisak *et al.* (1996) and Zagar *et al.* (2009) which suggest that experience of family violence can predict later violent behavior and distinguish homicidal violent offenders from non-violent groups. These results build on such previous discoveries by also demonstrating that experiencing family violence early in development can serve to differentiate those violent offenders who engage in homicide from those violent offenders who do not.

The second strongest predictor of belonging to the homicidal group was the higher reported scores on the psychoticism scale, with offenders who reported higher psychoticism scores being one-and-a-half times more likely to belong to the homicidal group. This finding is generally supportive of the predictions of Eysenck's model (Eysenck and Eysenck, 1976) which hypothesizes that high levels of psychoticism can serve to predict extreme interpersonal criminal acts such as homicide. Furthermore, current findings are congruent with those reported by Ram (1987) that higher levels of psychoticism discriminate murderers from non-homicidal offenders. These combined results suggest that psychoticism is a very important factor in the prediction of homicidal behavior among offenders.

The only other significant predictor identified in the current study was parental attachment. The reported odds ratio of 0.87 indicates that those offenders who reported having developed more positive parental attachments were significantly less likely to belong to the homicidal offender group. This suggests that a positive parental attachment yields a small, but significant, protective factor against engagement in homicidal violence, a finding that is somewhat consistent with the findings of Farrington *et al.* (2012) who suggested that parental factors are unimportant in the prediction of homicidal acts but that positive parental factors may yield a protective effect against later engagement in homicidal behavior.

The findings from the current study are especially interesting when considered in light of recent neuroscientific and genetic discoveries relating to the emergence of psychopathy and related violent antisocial/criminal behaviors. Three factors have been identified as being crucial in the emergence of violent antisocial behaviors. Neuroanatomical factors appear critical with specific structural and functional abnormalities identified in the orbital cortex, along with related abnormalities in the ventral prefrontal areas of the brain, including the ventromedial prefrontal cortex, ventral anterior cingulate, amygdala, and associated basal ganglia and cortico-subcortical loop circuits, all which have been directly linked to psychopathy and antisocial violent behaviors (Fallon, 2006). Genetic factors are also integral to the emergence of violent behavior and a wealth of evidence has now emerged indicating that violent behaviors are due to heritable factors (Rhee and Waldman, 2002). Recent research findings regarding the genetic underpinnings of violent behavior have focused primarily on allelic variations of the monoamine oxidase A (MAOA) gene, which is involved in the regulation of the neurotransmitter serotonin (Viding and Frith, 2006). The low-activity alleles of a functional polymorphism in the promoter region of the MAOA gene has been shown to significantly increase the likelihood of engaging in violent behaviors (Caspi *et al.*, 2002; Kim-Cohen *et al.*, 2006), including gang membership and use of lethal weapons (Beaver *et al.*, 2010). The other necessary element for the emergence of violent psychopathic behaviors relates to environmental factors which have an integral role to play in the phenotypic expression of the allele MAOA gene. The relationship between maltreatment, specifically violent abuse during childhood, and the MAOA gene has been well supported in the empirical literature (Beaver *et al.*, 2010; Caspi *et al.*, 2002; Kim-Cohen *et al.*, 2006). These recent discoveries in neuroscience suggest a clear pathway towards violence in which certain individuals are born with a strong genetic and biological vulnerability towards violence. These factors alone however are insufficient to produce the kinds of violent behaviors that characterize the homicidal criminal. Early childhood maltreatment may be necessary for these genetic and biological vulnerabilities to manifest, while positive early environmental experiences appear to provide a robust protective factor against the emergence of such characteristics or behaviors.

The findings of the current study then are consistent not only with the criminal psychology literature but also with the neuroscientific literature. Similar factors predicted by these discoveries in neuroscience and behavioral genetics have emerged in our own case, with psychoticism, experience of childhood violence, and negative parental attachments the only factors identified as significant predictors of being a homicidal offender. The findings of the current study suggest that not only psychopathy but psychoticism should be considered as an important factor in the prediction of homicidal offending. Furthermore, given the degree of association between psychopathy and psychoticism the findings of the current study can therefore serve as the empirical foundations for a new avenue of research to explore the possible paths between psychoticism and homicidal violence. Future research can explore, for example, whether parental attachments or experience of family violence, or some hitherto untested variable, moderates or mediates the impact of psychoticism on homicidal violence. Such research is crucial to elucidate the various environmental and psychological factors essential for the emanation of such behavior.

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