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PAPER

PSYCHIATRY & BEHAVIORAL SCIENCE

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Domestic Homicide: Neuropsychological Profiles of Murderers Who Kill Family Members and Intimate Partners

ABSTRACT: Domestic homicide is the most extreme form of domestic violence and one of the most common types of homicide. The objective was to examine differences between spontaneous domestic homicide and nondomestic homicide offenders regarding demographics, psychiatric history, crime characteristics, and neuropsychological status, utilizing neuropsychological test data from forensic examinations of 153 murderers. Using standard crime classification criteria, 33% committed spontaneous domestic homicides (SDH) and 61% committed nondomestic homicides (NDH). SDH offenders were more likely to manifest psychotic disorders, but less likely to be diagnosed with antisocial personality disorder or to have prior felony convictions. SDH offenders manifested significantly worse neuropsychological impairments than NDH offenders. The mean number of victims was lower for the SDH than the NDH group and only 14% of SDH offenders used a firearm, whereas 59% of NDH offenders used a firearm. These findings corroborate the notion that spontaneous domestic homicide may represent a discernible criminological phenotype.

KEYWORDS: forensic science, domestic homicide, violence, neuropsychological testing, murder, psychosis, intimate partner

Domestic homicide and domestic violence, in general, represent major public health challenges in the United States and around the world. The U.S. Department of Justice defines domestic violence as "a pattern of abusive behavior in any relationship that is used by one partner to gain or maintain power and control over another intimate partner" and may include physical, sexual, emotional, economic, or psychological actions or threats of actions toward another person (1). According to the Center for Disease Control (CDC), intimate partner violence, defined as physical, sexual, or psychological harm by a current or former partner or spouse, is a serious preventable public health problem that affects millions of Americans (2). The National Institute of Justice estimates the lifetime prevalence of physical intimate partner violence at 22.1% for women and 7.4% for men in the United States (3). Eighty percent of the victims of intimate partner violence are female (4).

Domestic homicide and intimate partner homicide are the most extreme forms of domestic violence. According to the Federal Bureau of Investigation (FBI) Uniform Crime Report (5), approximately 14,827 people were murdered in the United States in 2012, a rate of 4.7 murders per 100,000 people. Nearly 90% of offenders were male. With respect to the relationship of the victim to the offender, 30.2% of victims were murdered by someone they knew (i.e., friend, acquaintance, neighbor, boyfriend,) and 12.5% were murdered by a family member. Of female murder victims, 35% were murdered by their husbands or boyfriends (6). Similarly, the 2011 global study on homicide by the United Nations Office on Drugs and Crime revealed that in Europe in 2008, half of all female murder victims were killed by family members (i.e., 35% by spouses or ex-spouses; 17% by other relatives) (7). In Denmark, over a 25-year period from 1983 to 2007, 45% of all women murdered were killed by an intimate partner (8).

According to summary statistics compiled by the National Domestic Violence Fatality Review Initiative (9), while perpetrators of domestic homicide are predominantly men (80%), nearly 38% of victims are also male. In relation to the homicide perpetrator, 65% of victims are current or ex-intimate partners, the remainder of the victims being children, parents, or in-laws.

Familicide, the most extreme form of domestic homicide, is the most common type of mass murder (10), occurring approximately 23 times per year in the United States (11). Acts of familicide are typically premeditated and committed by adult males motivated by uncontrolled anger, resentment, and revenge (12,13). A recent analysis of 238 cases of familicide revealed offenders may be classified into four subtypes: despondent husbands, spousal revenge, extended parricide, and diffuse conflict (14).

With regard to the neuropsychological status of perpetrators of domestic homicide and nonhomicidal domestic violence, the empirical literature is extremely limited. When compared to a control group of nonviolent men, men who had committed

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physical domestic violence (i.e., batterers) revealed significant neurocognitive deficits, primarily involving executive functions and attention (15). In a follow-up study, male batterers showed greater impulsivity on several neuropsychological measures and decreased verbal intellectual functions, relative to a nonviolent male control group, suggesting that poor impulse control combined with a relatively deficient capacity for verbal expression may predispose men to domestic violence (16). Similarly, a sample of men convicted of violent domestic crimes in New Zealand revealed significantly worse executive dysfunction and decreased intellectual status, relative to a nonviolent control group matched for age, premorbid intelligence, and alcohol abuse (17).

A study of the neuropsychological differences between a sample of schizophrenic men who had committed domestic homicide, primarily parricide, and a sample of nonviolent schizophrenic men, matched for age, education, race, and substance abuse histories revealed that the murderers manifested significantly worse executive dysfunction and memory dysfunction, relative to the nonviolent schizophrenic men (18). However, executive dysfunction has been shown to characterize many types of murderers (19) and may be a fundamental neurocognitive abnormality that contributes to the execution of impulsive homicidal acts, in general.

The current study was designed to examine the neuropsychological differences between individuals who committed domestic homicide and individuals who committed nondomestic homicide. Domestic homicide was operationally defined as the murder of a family member or a member of the household by another member of the family/household and/or intimate partner murders, including the murder of a wife, ex-wife, husband, ex-husband, boyfriend, ex-boyfriend, girlfriend, or ex-girlfriend by his or her current or former intimate partner. In light of previous findings regarding the neuropsychological differences between murderers who kill impulsively versus murderers who kill their victims in a strategically planned and premeditated fashion (20), we hypothesized that offenders who commit spontaneous domestic homicide, involving an unstaged and unplanned homicidal act that is typically precipitated by a recent stressful event (21), manifest more extensive neurocognitive dysfunction, particularly executive dysfunction, relative to other types of murderers.

Methods

Participants were 153 men and women charged with and/or convicted of first-degree murder in Illinois, Missouri, Indiana, Colorado, or Arizona, who were referred for forensic neuropsychological evaluations in relation to the assessment of fitness to stand trial, criminal responsibility, or sentencing. Over 70% (i.e., 110) of the participants were criminal defendants detained in the Cook County Department of Corrections, Chicago, Illinois. Nearly 30% (i.e., 43) of the participants were detained in other county jails or prisons. Evaluations included a detailed clinical interview, comprehensive neuropsychological assessment, and review of pertinent records, including police reports, crime scene photographs, autopsy reports, criminal history reports, correctional records, medical records, psychiatric records, school records, court documents, and interviews of collaterals and attorneys. After a complete description of the purpose of the evaluations to the participants, written informed consent was obtained. The study was completed in accordance with the ethical standards of the institutional review board of Northwestern University Feinberg School of Medicine.

Study groups were created using the homicide classification criteria outlined in the Crime Classification Manual (21). Classification was conducted by the first author; in addition, an independent expert classified 50% of the cases with excellent inter-rater agreement (Cohen's Kappa = 0.99, $p < 0.01$). Fifty-one cases (33.3%) were classified as spontaneous domestic homicides. Nine cases (5.9%) were classified as staged domestic homicides; these cases were excluded from group analyses. The remaining 93 cases (60.8%) were classified as nondomestic homicides. Specifically, twenty-nine cases (19%) were classified as felony murders in which one or more homicides were committed during the commission of another felony, such as robbery, burglary, or home invasion. Fifty-five cases (35.9%) were classified according to other apparent motives, including murders resulting from argument/conflicts (9.8%), gang-motivated murders (6.5%), drug-related murders (6.5%), murders motivated by revenge (3.9%), authority murders, such as murders of law enforcement agents (3.3%), contract murders (2.6%), kidnap murders (2.0%), religion-inspired murders (0.7%), and insurance-related murder motivated by inheritance (0.7%). Seven cases (4.6%) were classified as disorganized sexual homicides, and two cases (1.3%) were organized sexual homicides.

Neurocognitive performance was assessed using standardized neuropsychological tests (see Appendix 1). Inclusion required passing scores on at least three objective symptom validity tests [i.e., Test of Memory Malingering (22), Word Memory Test (23), Rey 15-Item Memory Test (24), and Victoria Symptom Validity Test (25)], consistently demonstrating sufficient test-taking effort. As a result, neuropsychological test data were deemed valid and considered to accurately represent the neuropsychological status of participants at the time of the evaluations.

Analyses were carried out using SPSS statistical software package version 20 (IBM Corp, Armonk, NY). Neurocognitive performance of participants was examined using demographically adjusted standard scores as outlined in the manuals for each test. Group differences between the spontaneous domestic homicide (SDH) and nondomestic homicide (NDH) groups were examined using independent samples *t*-tests (2-tailed) for normally distributed continuous variables, nonparametric Mann–Whitney *U*-tests (2-tailed *Z* statistic) for significantly skewed continuous variables, and chi-squared tests (2-sided) for cross-tabulated categorical variables. For categorical data, nested column proportions were compared using *Z*-tests with Bonferroni adjustment. All *p*-values were set at 0.05.

Results

Overall Sample Characteristics

Demographics—Demographic and clinical characteristics of the current sample are outlined in Table 1. Offenders were predominantly male (88.2%) and African American (64.7%), and widely ranging in age (*Mean* = 33.06, *Range* = 15–67) and level of education (*Mean* = 10.54, *Range* = 4–19).

Homicide Characteristics—Consistent with previous reports, firearms were the most commonly used weapon (40.5%), followed by knives (29.4%), and strangulation or suffocation (15.7%). Other weapons included baseball bats, hammers, clubs, rocks, and fists, and other methods included drowning and fire (22.2%).

The total number of victims was 263. The majority of the murders (62.1%) involved one victim. Of the remaining cases,

TABLE 1—*Demographics, neuropsychiatric history, and antisocial behavior: overall sample characteristics and differences between spontaneous domestic homicide (SDH) and nondomestic homicide (NDH) offenders.*

Demographics	Overall Sample (N = 153) Mean (SD)	SDH (N = 51) Mean (SD)	NDH (N = 93) Mean (SD)	Effect Size Cohen's d
Age	33.06 (11.27)	34.53 (11.48)	32.15 (10.96)	0.21
Years education	10.54 (2.33)	10.65 (2.63)	10.33 (2.19)	0.13
	N (%)	*N* (%)	*N* (%)	*Phi*
Male gender	135 (88.2)	44 (86.3)	82 (88.2)	0.03
Ethnic group				0.15
African American	99 (64.7)	30 (58.8)	67 (72.0)	*ns*
Caucasian	35 (22.9)	14 (27.5)	15 (16.1)	*ns*
Hispanic	17 (11.1)	6 (11.8)	10 (10.8)	*ns*
Other	2 (1.3)	1 (2.0)	1 (1.1)	*ns*
Some employment	97 (63.4)	29 (56.9)	60 (64.5)	0.08
Neurologic history				
History of head trauma	128 (83.7)	40 (78.4)	81 (87.1)	0.11
Head trauma severity				0.15
Symptomatic	45 (29.4)	14 (27.5)	28 (30.1)	*ns*
Mild	64 (41.8)	22 (43.1)	39 (41.9)	*ns*
Moderate–Severe	19 (12.4)	4 (7.8)	14 (15.1)	*ns*
History of seizures	17 (11.1)	7 (13.7)	10 (10.8)	0.04
On antiepileptic drugs	13 (8.5)	6 (11.8)	7 (7.5)	0.07
Neurodevelopmental history				
History of special education	81 (52.9)	30 (58.8)	51 (54.8)	0.04
History of ADHD diagnosis	17 (11.1)	3 (5.9)	13 (14.0)	0.12
Met criteria for learning disorder	69 (45.1)	24 (47.1)	45 (48.4)	0.01
Met criteria for intellectual disability	22 (14.4)	7 (13.7)	15 (16.1)	0.03
Psychiatric history				
Psychotic disorder	44 (28.8)	23 (45.1)	18 (19.4)	0.27**
Mood disorder	34 (22.2)	12 (23.5)	22 (23.7)	0.001
Anxiety disorder	4 (2.6)	1 (2.0)	3 (3.2)	0.04
Antisocial personality disorder	45 (29.4)	9 (17.6)	33 (35.5)	0.19*
Other personality disorder	16 (10.5)	6 (11.8)	9 (9.7)	0.03
Antipsychotic medication	43 (28.1)	21 (41.2)	20 (21.5)	0.21*
Antidepressant medication	58 (37.9)	25 (49.0)	28 (30.1)	0.19*
Mood stabilizer medication	23 (15.0)	11 (21.6)	12 (12.9)	0.11
History of abuse	64 (41.8)	25 (49.0)	38 (40.9)	0.08
Physical	35 (22.9)	13 (25.5)	21 (22.6)	*ns*
Sexual	14 (9.2)	5 (9.8)	9 (9.7)	*ns*
Both	15 (9.8)	8 (8.6)	7 (13.7)	*ns*
Substance use				
Lifetime history of drug use	119 (77.8)	41 (80.4)	72 (77.4)	0.04
Cannabis	107 (69.9)	37 (72.5)	65 (69.9)	0.03
Cocaine	55 (35.9)	22 (43.1)	29 (31.2)	0.12
Hallucinogens	44 (28.8)	14 (27.5)	28 (30.1)	0.03
Heroin	22 (14.4)	8 (15.7)	13 (14.0)	0.02
Amphetamines	14 (9.2)	3 (5.9)	9 (9.7)	0.07
Inhalants	11 (7.2)	4 (7.8)	7 (7.5)	0.01
Barbiturates	3 (2.0)	0	2 (2.2)	0.09
Used drugs during offense	48 (31.4)	15 (29.4)	31 (33.3)	0.04
Used alcohol during offense	41 (26.8)	17 (33.3)	22 (23.7)	0.10
Antisocial behavior				
Prior felony convictions as adult	89 (58.2)	25 (49.0)	61 (65.6)	0.16^{T}
Prior violent charges as adult	73 (47.7)	24 (47.1)	48 (51.6)	0.04
History of arrest as juvenile	53 (34.6)	14 (27.5)	37 (39.8)	0.12
History of conduct/behavior disorder	55 (35.9)	19 (37.3)	34 (36.6)	0.01

SD, standard deviation; Cohen's d = effect size for Student's t-test; *Phi* = effect size for chi-squared test. Column proportions were compared using z-tests with Bonferroni adjusted p-values set at 0.05. ^{T}group difference significant at trend level $p < 0.1$; *group difference significant at $p < 0.05$ level; **group difference significant at $p < 0.01$ level; ***group difference significant at $p < 0.001$ level.

19.6% involved two victims, 11.1% three victims, 3.3% four victims, 2% five victims, 1.3% seven victims, and one case involved eight victims. For male perpetrators, roughly half (48.4%) of the victims were female, whereas female perpetrators killed nearly twice as many men (65.0%) as women.

In relation to the perpetrator, 29.4% of the victims were friends or acquaintances, 25.5% were strangers, 24.9% were family members (11.8% parents, 8.5% children, 1.3% siblings, 3.3% other relatives), 15.7% were current or past intimate partners, and 4.6% were members of a rival gang.

Neurologic History—A striking proportion (83.7%) of the sample reported prior history of at least one incident of head trauma. Using the Mayo Classification System for Traumatic Brain Injury Severity (26), 29.4% of the sample was classified as symptomatic/possible, 41.8% as mild/probable, and 12.4% as moderate–severe/definite. In addition, 11.1% had a documented history of seizure(s), with 8.5% having been prescribed an antiepileptic medication.

History of Neurodevelopmental Disorder—Lifetime prevalence of attention deficit—hyperactivity disorder (ADHD) diagnosis in the current sample was 11.1%—substantially higher than the reported prevalence of 2.5% in the general adult population (27). Over half (52.9%) of the sample had a history of special education, and 45.1% met criteria for the diagnosis of developmental learning disorder. Moreover, 14.4% of the sample met diagnostic criteria for intellectual disability.

Psychiatric History—Nearly half of the sample (45.8%) carried a psychiatric diagnosis. Psychotic spectrum disorders (schizophrenia, schizoaffective, delusional disorder, and psychotic disorder NOS) were most common, followed by mood disorders (major depression, bipolar); four participants carried a diagnosis of anxiety disorder. In addition, 39.6% of the sample carried a diagnosis of personality disorder. Antisocial personality disorder was, by far, most common (29.4% of the sample). Other personality diagnoses included borderline (3.9%), paranoid (1.3), narcissistic (0.7%), obsessive compulsive (0.7%), schizoid (0.7%), and personality disorder NOS (3.3%). Over half (51.4%) of the sample had a lifetime history of psychotropic medication prescription including antidepressants, antipsychotics, or mood stabilizers. Finally, 41.8% of the sample reported a lifetime history of physical and/or sexual abuse.

Substance Use History—Consistent with prior reports, lifetime prevalence of illicit substance use was high (78%). Marijuana was the most common drug of choice, followed by cocaine, hallucinogens, heroin, amphetamines, inhalants, and barbiturates. Additionally, 31.4% of the sample used drugs and 26.8% used alcohol during the commission of homicide.

Prior History of Antisocial Behavior—Based on criminal histories provided by law enforcement agencies, nearly one-half of the sample had at least one prior felony conviction or arrest for a prior violent charge. In addition, over a third of the sample had a history of one or more arrests as a juvenile or carried a diagnosis of conduct disorder or behavior disorder.

Neurocognitive Performance—As evident from Table 3 and Fig. 1, the overall pattern of neurocognitive test performance in the present sample suggested decreased cognitive status compared to the test norms. The largest deficits were observed for

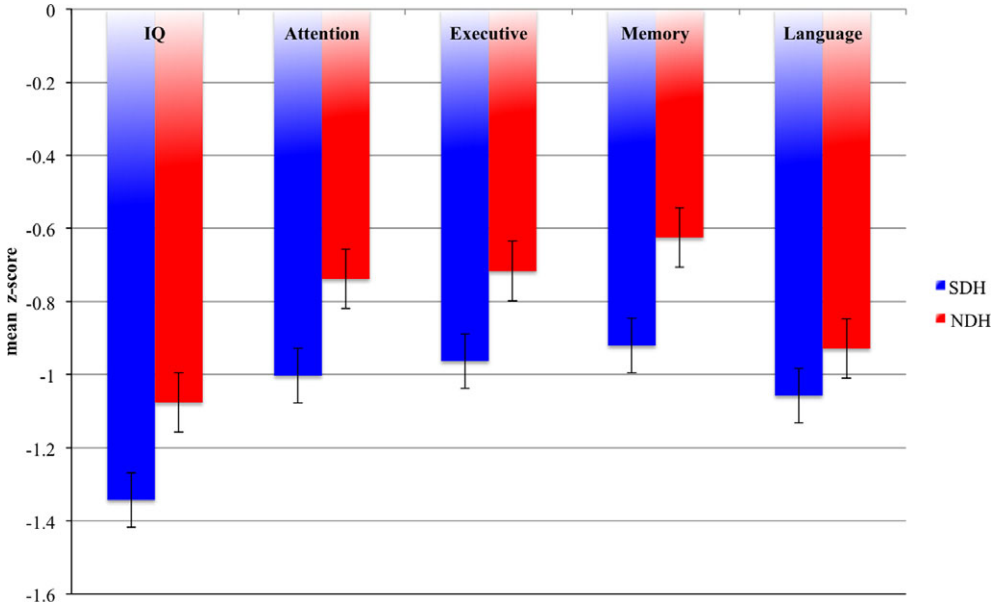

FIG. 1—*Test scores averaged by cognitive domain in spontaneous domestic homicide (SDH) and nondomestic homicide (NDH) offenders. All test scores have been converted to z-scores to allow for visual comparison. Bars depict deviation of test scores from the normative mean (z-score = 0), such that negative values indicate normatively reduced performance. Error bars represent standard error.*

IQ scores, followed by language, attentional functions, executive functions, and memory, in this order. When averaged across cognitive domains, the sample scored 0.86 standard deviations below the normative mean on tests of cognition.

Group Analyses

Background Variables—As presented in Table 1, no statistically significant group differences were observed with regard to demographics (age, education, ethnicity, employment), neurologic history, neurodevelopmental history, history of physical and/or sexual abuse, or lifetime prevalence of drug use. In contrast, offenders who committed spontaneous domestic homicide (SDH) were more likely to carry a diagnosis of psychotic disorder χ^2 (1, N = 144) = 10.72, $p < 0.01$, but less likely to carry a diagnosis of antisocial personality disorder χ^2 (1, N = 144) = 5.07, p = 0.02. They were also more likely to have been prescribed an antipsychotic χ^2 (1, N = 144) = 6.26, p = 0.01 or antidepressant χ^2 (1, N = 144) = 5.07, p = 0.02 medication. The SDH group was marginally less likely to have a history of prior felony convictions χ^2 (1, N = 144) = 3.76, p = 0.05.

Homicide Characteristics—As presented in Table 2, the mean number of victims was lower for the SDH than the nondomestic homicide (NDH) group, t(142) = 2.05, p = 0.04. With regard to method of homicide, only 14% of SDH offenders used a firearm in their crimes, compared to 59% of NDH offenders χ^2 (1, N = 144) = 27.71, $p < 0.01$. Alternatively, SDH offenders were more likely to use knives χ^2 (1, N = 144) = 10.33, $p < 0.01$ or other weapons such as baseball bats, clubs, and fists.

Neurocognitive Performance—Visual inspection of average test scores and standard error intervals in Fig. 1 suggests that the SDH group had lower overall IQ scores and exhibited poorer performance on measures of attention, executive functions, and memory, but not measures of language. Group differences on individual tests within each cognitive domain are presented in Table 3 and summarized in the following paragraphs.

Intelligence—Spontaneous domestic homicide offenders evidenced marginally lower overall IQ scores than NDH offenders, $Z = -1.80$, p = 0.07, and this difference was associated with a moderate effect size. Specifically, the SDH group exhibited lower nonverbal $Z = -2.47$, p = 0.01 but not verbal intelligence.

Attention, Working Memory, and Processing Speed—Examination of effect sizes in Table 3 suggests relatively decreased performance on attentional measures in SDH offenders compared to NDH offenders. The greatest deficits were observed on measures of speeded visuomotor tracking (TMT A, t(135) = 3.85, $p < 0.01$) and speeded color naming (Stroop Color, t (115) = 2.45, p = 0.02). Group differences on measures of

TABLE 2—*Homicide characteristics: overall sample statistics and differences between spontaneous domestic homicide (SDH) and nondomestic homicide (NDH) offenders.*

	Overall Sample (N = 153) Mean (SD)	SDH (N = 51) Mean (SD)	NDH (N = 93) Mean (SD)	Effect Size Cohen's d
Number of victims	1.74 (1.34)	1.45 (0.78)	1.85 (1.55)	0.33*
	N (%)	*N* (%)	*N* (%)	*Phi*
Firearm	62 (40.5)	7 (13.7)	55 (59.1)	0.44***
Knife	45 (29.4)	23 (45.1)	18 (19.4)	0.27**
Strangulation/ Suffocation	24 (15.7)	8 (15.7)	12 (12.9)	0.04
Other	34 (22.2)	19 (37.3)	13 (14.0)	0.27**

SD, standard deviation; Cohen's d = effect size for difference between group means; *Phi* = effect size for chi-squared test. ^{T}group difference significant at trend level $p < 0.1$; *group difference significant at $p < 0.05$ level; **group difference significant at $p < 0.01$ level; ***group difference significant at $p < 0.001$ level.

TABLE 3—*Neurocognitive test performance: overall sample statistics and differences between spontaneous domestic homicide (SDH) and nondomestic homicide (NDH) offenders.*

	Overall Sample			SDH		NDH		Effect Size
	N	Mean (SD)	Median	*N*	Mean (SD)	*N*	Mean (SD)	Cohen's *d*
Intellectual functions (WAIS)								
Full scale IQ	151	83.44 (13.79)	82.00	51	79.86 (11.39)	92	83.86 (13.69)	0.31[T]
Verbal comprehension	147	86.56 (14.29)	85.00	49	84.12 (13.34)	90	86.14 (14.01)	0.15
Perceptual reasoning	150	86.95 (14.09)	84.00	50	82.24 (10.15)	91	88.22 (14.20)	0.47*
Working memory	147	88.42 (12.97)	88.00	49	86.69 (10.97)	90	88.22 (13.05)	0.12
Processing speed	149	81.64 (12.84)	81.00	49	78.94 (11.16)	91	82.64 (13.10)	0.30
Attention, working memory, and processing speed								
Digit span forward (WAIS)[sc]	140	−0.60 (0.73)	−0.60	45	−0.62 (0.71)	87	−0.64 (0.69)	−0.03
Digit span backward (WAIS)[sc]	140	−0.36 (0.70)	−0.60	45	−0.51 (0.59)	87	−0.30 (0.70)	0.32
Mental arithmetic (WAIS)[sc]	147	7.80 (2.75)	8.00	49	7.65 (2.51)	90	7.67 (2.81)	0.01
Visuomotor coding (WAIS)[sc]	149	6.28 (2.53)	6.00	49	5.71 (2.06)	91	6.47 (2.61)	0.31
Visuomotor search (WAIS)[sc]	148	6.89 (2.72)	7.00	49	6.47 (2.56)	90	7.04 (2.78)	0.21
Visuomotor tracking (TMT A)[TS]	146	43.15 (10.09)	43.50	48	38.88 (10.05)	89	45.44 (9.22)	0.69***
Omission errors (CPT)[z]	105	−0.68 (1.24)	−0.39	30	−1.05 (1.34)	71	−0.56 (1.17)	0.40
Speeded word reading (Stroop)[TS]	125	40.94 (7.96)	41.00	41	39.39 (8.47)	76	41.68 (7.23)	0.30
Speeded color naming (Stroop)[TS]	125	39.65 (8.37)	40.00	41	37.17 (8.33)	76	40.87 (7.49)	0.48*
Reasoning and executive functions								
Similarities (WAIS)[sc]	148	7.53 (2.61)	7.00	49	6.88 (2.22)	91	7.55 (2.61)	0.27
Matrix reasoning (WAIS)[sc]	149	7.83 (2.70)	8.00	50	6.94 (2.23)	90	8.12 (2.76)	0.46*
Block design (WAIS)[sc]	150	7.91 (2.66)	7.00	50	7.06 (1.99)	91	8.11 (2.66)	0.43*
Problem solving errors (WCST)[z]	143	−1.00 (1.25)	−1.18	49	−1.23 (1.13)	85	−0.99 (1.28)	0.20
Perseverative responses (WCST)[z]	143	−0.64 (1.47)	−0.81	49	−1.07 (1.21)	85	−0.55 (1.52)	0.37[T]
Alternation (TMT B)[TS]	148	41.58 (11.06)	43.00	49	39.08 (9.26)	90	42.57 (11.09)	0.34*
Commission errors (CPT)[z]	105	−0.11 (1.03)	0.06	30	−0.15 (1.08)	71	−0.10 (1.04)	0.05
Response inhibition (Stroop)[TS]	125	38.06 (8.27)	37.00	41	38.78 (9.21)	76	37.24 (6.86)	−0.20
Anterograde memory functions								
Word lists (CVLT)								
Encoding[TS]	124	40.65 (11.94)	40.00	40	37.95 (11.85)	76	41.29 (11.17)	0.30[T]
Delayed recall[z]	124	−1.18 (1.11)	−1.50	40	−1.46 (1.09)	76	−1.10 (1.01)	0.35[T]
Stories (WMS)								
Immediate recall[sc]	142	7.99 (2.60)	8.00	46	7.61 (2.44)	88	7.98 (2.53)	0.15
Delayed recall[sc]	142	7.92 (2.63)	8.00	46	7.50 (2.57)	88	7.85 (2.46)	0.14
Faces (WMS)								
Immediate recognition[sc]	93	8.72 (2.48)	9.00	26	8.00 (2.62)	64	8.95 (2.30)	0.40[T]
Delayed recognition[sc]	93	9.47 (2.60)	10.00	26	8.31 (2.72)	64	9.89 (2.46)	0.63*

	Language Functions							
	Overall Sample		SDH	NDH				Effect Size
	N	Mean (*SD*)	Median	*N*	Mean (*SD*)	*N*	Mean (*SD*)	Cohen's *d*
Expressive vocabulary (WAIS)[sc]	147	7.33 (2.75)	7.00	49	6.86 (2.53)	90	7.29 (2.75)	0.16
Word reading (WRAT)[SS]	142	85.83 (14.50)	87.00	46	84.30 (14.93)	88	85.73 (14.36)	0.10
Sentence comprehension (WRAT)[SS]	105	80.90 (16.66)	82.00	40	79.50 (16.82)	60	81.12 (15.45)	0.10
Verbal fluency (FAS)[TS]	142	31.86 (24.65)	27.00	46	28.26 (24.15)	88	32.90 (24.53)	0.19

SD, standard deviation; Cohen's *d* = effect size for difference between group means; WAIS, Wechsler Adult Intelligence Scale; WMS, Wechsler Memory Scale; CVLT, California Auditory Verbal Learning Test; WRAT, Wide Range Achievement Test; CPT, Conners Continuous Performance Test; TMT, Trail Making Test; WCST, Wisconsin Card Sorting Test. [SS]Standard Score (Mean = 100, SD = 15); [TS]T score (Mean = 50, SD = 10); [sc]scaled score (Mean = 10, SD = 3); [z]z-score (Mean = 0, SD = 1). [T]group difference significant at trend level $p < 0.1$; *group difference significant at $p < 0.05$ level; **group difference significant at $p < 0.01$ level; ***group difference significant at $p < 0.001$ level. Positive effect size indicates worse cognitive performance in the SDH group relative to the NDH group.

auditory working memory (Digit Span Backward), sustained attention (CPT Omission Errors), and other measures of psychomotor processing speed (WAIS Coding, Stroop Word Reading) did not approach statistical significance despite moderate effect sizes.

Reasoning and Executive Functions—Compared to NDH offenders, the SDH group evidenced decreased inductive perceptual reasoning (WAIS Matrix, $Z = -2.44$, $p = 0.02$) and visuoconstructional reasoning (WAIS Block Design, $Z = -2.08$, $p = 0.04$), but not abstract verbal reasoning (WAIS Similarities). The total number of errors on a measure of deductive perceptual reasoning (WCST) did not differ between the groups; however, SDH offenders demonstrated marginally reduced cognitive flexibility (WCST Perseverative Responses, $Z = -1.72$, $p = 0.09$). There was further evidence of reduced cognitive flexibility in SDH offenders, as they scored lower on a measure of conceptual alternation requiring rapid switching between two types of responses (TMT B, $Z = -2.05$, $p = 0.04$).

Anterograde Memory—Compared to NDH offenders, the SDH group exhibited marginally reduced immediate recognition $Z = -1.73$, $p = 0.08$ and substantially reduced delayed (25 min) recognition $Z = -2.40$, $p = 0.02$ of faces from the WMS. Encoding of noncontextual verbal information (CVLT words) over five consecutive learning trials $Z = -1.77$, $p = 0.08$ and

spontaneous retrieval of the same words after a 20-min delay $Z = -1.76$, $p = 0.08$ were marginally lower in the SDH group, with these differences being associated with moderate effect sizes. No group differences were observed with regard to encoding or retrieval of narrative verbal information (WMS stories).

Language Functions—Study groups did not differ with regard to expressive vocabulary ability, single-word reading ability, sentence comprehension ability, or phonemic verbal fluency.

Discussion

The present study utilized the largest known sample of offenders who committed spontaneous domestic homicide (SDH) and nondomestic homicide (NDH) to explore demographics, psychiatric history, crime characteristics, and performance on clinically validated neuropsychological measures, in these two offender groups. As a whole, this sample of offenders was characterized by high incidence of illicit drug use and head trauma, and high prevalence of psychotic disorders. Offenders who committed SDH were more psychiatrically and cognitively impaired, but less violent by history. These findings corroborate the notion that spontaneous domestic homicide may represent a discernible criminological phenotype.

Comparisons Between SDH and NDH Offenders

Several features differentiated the SDH and NDH offenders. The SDH offenders had twice the incidence of psychotic disorders and treatment with antipsychotic medication—with almost half having such histories. This suggests that severe mental illness may play a role in a greater proportion of spontaneous domestic homicides. The SDH offenders had half the incidence of antisocial personality disorder, with only one in six having this diagnosis. Further, the weapon choice of the SDH offenders (86% nonfirearm) points to a more affectively driven and less organized action.

That said the SDH and NDH offenders also shared many features. Similarities were evident across most demographic, historical, and neuropsychological characteristics. Demographically and historically, the modal offender in both groups was an African American male in his thirties; with a history of head trauma, 10 years of education and special education services, substance abuse, and a prior felony conviction. The offender groups did not differ in age, sex, employment history, neurologic history, developmental history, mood/anxiety disorders, childhood maltreatment history, drugs of abuse, substance abuse during offense, or criminal history. The neurocognitive test performance of both groups reflected deficits in intelligence, attention, executive functioning, memory, and language. These similarities pointed to shared vulnerabilities in the etiology of both types of homicide.

A primary goal of the present study was to illuminate differences in the neuropsychological status of SDH and NDH offenders. Although both groups exhibited impairments, the SDH offenders exhibited modestly greater impairment in intelligence, attention, executive functioning, and memory domains, but not language. This finding is roughly consistent with the limited research on the neuropsychological deficits of batterers, reflecting decreased intellectual status and worse executive functioning. The current study extends the violence risk assessment implications of these features from domestic violence in general to spontaneous domestic homicide. Although the SDH offenders demonstrated somewhat greater impairment in intelligence, attention, and executive functioning, the prevalence of these deficits among both SDH and NDH offenders suggests that the aggression-potentiating implications of these neurocognitive deficits are not restricted to SDH. Rather, these features may have a role in homicides broadly.

Implications of Features of Homicide Offenders

Features common to both SDH and NDH groups expand the literature regarding homicide offenders and the etiology of these offenses. Consistent with prior research with homicide offenders (28), many homicide offenders in the current study demonstrated problematic neurologic histories. Over 80% had a history of head trauma, and 12.4% had suffered a moderate–severe traumatic brain injury.

Neurodevelopmental disorders were also overrepresented among these homicide offenders. Comparing them to community prevalence data, 52.9% of the homicide offenders had a history of special education, whereas the national prevalence rate for learning disorders is 7.66% (29). Their learning disorders may not differentiate these homicide offenders from other offenders, though, as a history of poor academic achievement is not uncommon among prison inmates.

Disproportionate rates of psychotic disorders were observed in both groups of homicide offenders (SDH = 45.1%; NDH = 19.4%). This compares to a lifetime prevalence of psychosis in the community of approximately 3% (30). However, 15.1% of prison inmates reported psychotic symptoms during the preceding 12 months in a national survey of prison inmates (31). Histories of mood disorder were equivalent in both homicide offender groups, but not discrepant from the self-reports of state prison inmates (31).

The majority of homicide offenders in both groups had a history of substance abuse. This pattern is consistent with prison inmates in general (32) and incarcerated homicide offenders (33). Also similar to prior research (33), a substantial minority of the homicide offenders in the current study used drugs (31.4%) or alcohol (26.8%) during the homicide. Given the neurocognitive impairments demonstrated by both SDH and NDH offenders, it is hypothesized that inhibitory controls may have been further weakened by drugs or alcohol proximate to the homicides.

The principal methodological weakness of this study is that it utilized a convenience sample. All of the participants were referred for neuropsychological evaluations by criminal justice attorneys. Although neuropsychological evaluations are increasingly routine in homicide cases, historical or presentation factors may have contributed to the referral in some instances. Additionally, a large portion of the sample (i.e., 70%) was drawn from a single urban area (i.e., Cook County/greater Chicago). Despite the convenience sample, the demographics of the sample were broadly consistent with national data on the sex and age of homicide offenders (33).

It is hypothesized that any biasing from the convenience sample would equally impact on both the SDH and the NDH offenders. Thus, comparisons between these groups may be more generalizable than prevalence rates for the sample as a whole. With these caveats, the current findings point to a number of comparative characteristics of spontaneous domestic homicide offenders (SDH).

Future research efforts are encouraged to utilize random and more representative samples in examining the comparative neuropsychological characteristics of spontaneous domestic homicide and nondomestic homicide offenders. It would be intriguing to examine whether offenders who committed staged domestic

homicides differ from SDH and NDH offenders with regard to neurocognitive test performance; however, low sample size in the staged domestic homicide group ($n = 9$) did not permit meaningful statistical comparison in the current study. It would further expand this literature to include comparisons of SDH offenders with nonlethal batterers and nonviolent persons. These additional comparisons would also make possible the development of actuarial models to facilitate violence risk assessments of batterers. In the development of such models, it is hypothesized that the presence of neurocognitive deficits involving IQ, executive functioning, and verbal abilities; mood disorder and more particularly psychotic disorder; substance abuse history, and a conflicted relationship with a female intimate or former intimate partner have an additive if not synergist effect on the risk of domestic homicide.

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Appendix 1

Neuropsychological testing procedures.

Measure	Abilities Measured	Source
Wechsler Adult Intelligence Scale (WAIS) 3rd edition or 4th edition	Overall intellectual functions, verbal comprehension, spatial reasoning, working memory, speeded visuomotor integration	Pearson Clinical Assessments, San Antonio, TX
Wechsler Memory Scale (WMS) 3rd edition or 4th edition: Logical Memory and Faces	Anterograde memory for narrative verbal and visual material	Pearson Clinical Assessments, San Antonio, TX
California Verbal Learning Test (CVLT) 2nd edition	Anterograde memory for noncontextual verbal material	Pearson Clinical Assessments, San Antonio, TX
Trail Making Tests (TMT A & B)	Speeded visuomotor tracking (TMT A), speeded conceptual alternation, and cognitive flexibility (TMT B)	Reitan RM. *Percept Mot Skills.* 1958; 8:271–276
Stroop Test	Briefly sustained attention, processing speed, response inhibition	PAR, Inc., Lutz, FL
Conners' Continuous Performance Test (CPT)	Sustained attention, vigilance, response inhibition	Multi Health Systems, North Tonawanda, NY
Wisconsin Card Sorting Test (WCST)	Deductive perceptual reasoning	PAR, Inc., Lutz, FL
Wide Range Achievement Test (WRAT) 4th edition	Single word reading ability and sentence comprehension	PAR, Inc., Lutz, FL
Verbal Fluency (FAS)	Phonemic generative fluency	Strauss, Sherman, & Spreen (2006) Oxford University Press: New York, NY