Hundozi et al., *Cogent Psychology* (2016), 3: 1233650
http://dx.doi.org/10.1080/23311908.2016.1233650

cogent psychology

CLINICAL PSYCHOLOGY & NEUROPSYCHOLOGY | RESEARCH ARTICLE

Cognitive functions and recidivism of aggressive behavior in schizophrenic inpatients at Forensic Unit Clinic of Psychiatry in Kosovo

Zylfije Hundozi[1]*, Nazmie F. Ibishi[2] and Nebi R. Musliu[3]

Received: 04 May 2016
Accepted: 04 September 2016
Published: 23 September 2016

*Corresponding author: Zylfije Hundozi, Clinic of Neurology, University Clinical Center of Kosovo, Prishtina, Kosovo
E-mail: zylhundozi@hotmail.com

Reviewing editor:
Peter Walla, University of Newcastle, Australia

Additional information is available at the end of the article

Abstract: *Background*: Schizophrenia is associated with elevated risk of aggressive behavior and poor cognitive performance. *Methods*: 65 male offenders, age ≥ 18, with schizophrenia, hospitalized between January 2014 and December 2015, were evaluated using Weschler Adult Intelligence Scale (WAIS), Trail Making Test (TMT A), Trail Making Test (TMT B), and Mini Mental State Examination (MMSE) tools for cognitive function, Positive and Negative Syndrome Scale (PANSS) and Psychopathic checklist- revised (PCL-R) were used to evaluate psychopathological symptomatology manifestations of schizophrenia disorder. Historical, Clinical and Risk management-20 (HCR-20) test was used to assess the risk factors of aggressive behavior. Overt Aggression Scale (OAS) was used to asses aggressive behavior recidivism. *Results*: 56.9% of inpatients with schizophrenia were recidivate in aggressive behavior (≥1 incident), while 43.1% were not recidivate during the same period time. The group with recidivism of aggressive behavior showed significant poor results in WAIS ($p < 0.029$, F-4.441), MMSE test ($p < 0.025$, F-2.755), TMT A (F-4.023, $p < 0.044$), and TMT B (F-4.110, $p < 0.047$). Cognitive variables TMT A, TMT B, and MMSE were in significant correlation with risk factors for aggressive behavior. Poor executive function

ABOUT THE AUTHORS

Zylfije Hundozi is a professor in the Department of Neuropsychiatry at the University of Prishtina-Medical Faculty, licensed Neuropsychiatrist, head of Medical Chamber of Kosovo, co-author of book chapter in Schizophrenia treatment, and author of publications in Psychiatry and Neurology. Her main research interest is Neurocognitive impairment in Mental disorders.

Nazmie Ibishi is licensed Psychiatrist, lecturer at the University of Prishtina-Medical Faculty, head of Department—Psychotic disorders in Clinic of Psychiatry, long-time working, and research in Forensic Psychiatry field. Her main interest is Mental disorders in Forensic System.

Nebi Musliu has completed a Doctoral degree of Science in Medicine at the University of Mostar. His main research interests are Mental disorders and Cardiovascular disease.

PUBLIC INTEREST STATEMENT

This paper sought to explore the relationship between poor cognitive performance in Schizophrenia inpatients and aggressive behavior recidivism as outcome. Aggressive behavior is huge Public health concern, particularly in mental health disorder offenders. Clinical psychopathology plays crucial role in recidivism including cognitive executive functions, and our aim was to show that risk factors for aggressive behavior recidivism in schizophrenia are complex and multidimensional. We were concerned that some inpatients were under pressure of security measure and may react as a result of the isolation and lack of communication. However, the Forensic settings are specific conditions for schizophrenia patients, and we considered that the role of such Institutions should be reassessed. We concluded that recommendation for mandatory treatment is combination between psychopharmacologic and cognitive remediation therapy as best solution for recovery and decreasing risk for recidivism in the future, and reintegration in the community.

was a relevant factor and it significantly predicted the recidivism of aggressive behavior. *Conclusion*: Poor cognitive performance seems to be associated and presents a predictor factor for aggressive behavior recidivism. Cognitive remediation methods of rehabilitation present priority in treatment of inpatients with schizophrenia under mandatory treatment measure.

Subjects: Behavioral Sciences; Bioscience; Medicine, Dentistry, Nursing & Allied Health

Keywords: cognitive function; schizophrenia; aggressive behavior

1. Introduction

Studies have shown that schizophrenia, a psychotic disorder, is associated with an elevated risk of violent behavior (Link, Stueve, & Phelan, 1998; Swanson, Holzer, Ganju, & Jono, 1990), and patients with schizophrenia who engage in violent behavior constitute a very heterogeneous population. Some have a history of antisocial behavior from a very early age, others begin engaging in antisocial behavior at approximately the time of schizophrenia onset, others commit only one violent attack in their lives, and others behave aggressively only when acutely psychotic (Hodgins, 2004).

The population of individuals with psychotic disorders is associated with an increased risk of violent crime when compared with the extremely low risk in the non-sentenced general population (Fazel & Grann, 2006) even after correcting for socio-demographic confounders and co-morbid substance abuse (Brennan, Mednick, & Hodgins, 2000; Tiihonen, Isohanni, Räsänen, Koiranen, & Moring, 1997).

Results of the epidemiological investigations are consistent in showing that the proportions of persons with schizophrenia who commit crimes vary from one study to another, while the elevations in risk among those with schizophrenia when compared to the general population are similar (Hodgins, 1998).

And, the systematic review of Fazel, Gulati, Linsell, Geddes, and Grann (2009), about the risk of violence in schizophrenia and other psychoses identified 20 studies including 18,423 individuals with these disorders and the first finding was that the risk of violent outcomes was increased in individuals with schizophrenia and other psychoses. The risk estimates, reported as ORs, were all above one indicating an increased risk of violence in those with schizophrenia and other psychoses compared with the general population control.

The lack of association between aggressive behavior and positive symptoms of psychosis in patients with schizophrenia is unsurprising given evidence that psychosocial function is not typically associated with positive symptoms (Hodgins, 2008). Aggressive behavior reflects a lack of interpersonal skills or, simply, one aspect of psychosocial functioning. Interpersonal skills, community activities, and work skills are most strongly associated with performance on neuropsychological tests and not with positive symptoms (Hodgins, 2008).

Cognitive deficits have long been considered a core component of schizophrenia but have only recently been considered possible diagnostic features of the illness (Barkataki et al., 2005; Braw, Benozio, & Levkovitz, 2012; Gold, Hahn, Strauss, & Waltz, 2009; Keefe et al., 2006; MacCabe, 2008; Ranganath, Minzenberg, & Ragland, 2008). They affect up to 75% of patients, and in particular, memory function, attention, motor skills, executive function, cognitive processing speed, and intelligence are disturbed (Goldberg & Gold, 1995; Sharma & Antonova, 2003).

Barrat (1994), after reviewing many studies and relying on clinical experience concluded that there were three subfactors of impulsiveness: (1) motor impulsiveness, which involved acting

without thinking, (2) cognitive impulsiveness, which involved making quick cognitive decisions, and (3) non planning impulsiveness, which involved lack of concern for the future. Aggressive behavior has been classified into three various subgroups. A useful classification defines three subtypes: premeditated aggression, medically related aggression, and impulsive aggression. Premeditated aggression which is defined as a planned aggressive act that lacks spontaneity and behavioral agitation and is learned within social contest, medically related aggression covers wide range of aggression which may be secondary to illness, including psychopathology, and impulsive aggression is a hair-trigger aggressive response to environmental provocation, characterized by a loss of behavioral control, without thinking.

Some authors have suggested that impulsivity correlates significantly with cognitive function and can cause aggressive behavior (Giancola & Zeichner, 1995; Lau, Pihl, & Peterson, 1995).

In a prospective study of a forensic sample of patients, Barker et al. (2007) showed that poor cognitive function correlates with aggressive behavior.

In schizophrenia, cognition is relevant due to its relationship with aggressive behavior. Aggressive and violent behavior are complex phenomena, and when co-morbid with cognitive impairment or disorganized behavior due to psychotic processes, aggression may manifest as serious crimes, such as homicide, rape, or serial killings (Siever, 2008), and is associated with drug abuse (Arango, Barba, Gonzalez-Salvador, & Ordonez, 1999; Swanson, Holzer, Ganju, & Juno 1990).

Studies on the association between impaired cognitive function and aggressive behavior in hospitalized patients with schizophrenia in the forensic community are rare. Some studies (Adams, Meloy, & Moritz, 1990; Foster, Hillbrand, & Silverstein, 1993; Krakowski, Convit, Jaeger, Lin, & Volavka, 1989; Rasmussen, Levander, & Sletvold, 1995), but not all (Lafayette, Frankle, Pollock, Dyer, & Goff, 2003; Lapierre et al., 1995; Roy, Herrera, Parent, & Costa, 1987; Silver, Goodman, Knoll, Isakov, & Modai, 2005), have reported that an association exists between violence and impaired cognitive-executive function in schizophrenia spectrum disorder.

In the study of Hodgins et al. (2011), violent offenders obtained significantly lower IQ scores than no offenders, both current and pre-morbid. Violent offenders were distinguished by significantly poorer performance on the verbal learning and short-term verbal recall components of the RAVLT, Raven's CPM Set A test, a measure of visual–spatial perception and organization, and three subtests of the WAIS, Digit Symbol which assesses processing speed, and Vocabulary and Comprehension, which index verbal intelligence (Hodgins et al., 2011).

In recent studies, cognition has been considered a relevant component of schizophrenia disorder due to its relationship with aggressive behavior. Thus, the aims of this study were to determine the recidivism rate of aggressive behavior during hospitalization and to evaluate the relationships of socio-demographic data, cognitive functioning, and psychopathologic characteristics with recidivism of aggressive behavior in a forensic sample of hospitalized patients with schizophrenia. We hypothesized that forensic inpatients with schizophrenia will recidivate with aggressive behavior and this group will result with poor cognitive function performance in most of neuropsychological test used.

2. Methods

2.1. Participants

A prospective randomized study design was chosen. All subjects hospitalized at the University Clinical Center of Kosova the main tertiary health care Institution located in Prishtina in Clinic of Psychiatry-Forensic Unit during the two-year period between January 2014 and December 2015 were recruited to participate in this study. Aggressive behavior in the setting, Clinic of Psychiatry-Forensic Unit, was measured during a two-year period time and participants were in hospital for

duration of the study. Most of them were hospitalized after criminal offenses such as domestic violence, physical and verbal threatening, and murder.

Baseline data covered a broad array of psychosocial, neuropsychological, and clinical data and were collected during forensic psychiatric investigations and mandatory psychiatric treatment.

Data covering historical, demographic and social aspects including age at first conviction, type of violence offense, substance abuse problems were collected using records available for the forensic psychiatric investigations in addition to interviews.

Clinicians were trained to use the Positive and negative symptom scale of schizophrenia (PANSS), Hare psychopathy checklist-revised (PCL-R), Mini mental state examination (MMSE), and Historical, Clinical and risk factor management-20 (HCR-20) test, while neuropsychological tests were administered by clinical psychologist. Measures were administered during hospitalization of inpatients.

Aggressive and violent behavior was defined as physical abuse, threats, and violence toward others, themselves, and property. Aggressive behavior included verbal and non-verbal violence. Non-violent behavior is the type of behavior that means being harmless to self and others, under every condition.

An incident was considered violent if the inpatient was the obvious instigator or co-aggressor and if the incident involved physical aggression toward staff, other inpatients, themselves, or property. Inpatients were thus grouped into non-violent recidivism (non-violent = 0 incidents) or violent recidivism (violent ≥ 1 incident) groups.

All inpatients of both groups were treated with atypical or conventional antipsychotics, immediately after hospitalization with therapeutic doses depending of symptoms. Doses were calculated based on equivalent of chlorpromazine (mg/d). We converted all antipsychotic doses to chlorpromazine equivalents using published equivalencies for oral conventional or atypical antipsychotics. The method of Chlorpromazine equivalents is reliable and coherent for calculating antipsychotic dosing, compared to Defined Daily Doses (DDD) and percentages of British National Formulary (BNF) maximum (Sweileh et al., 2014). In the case of depot administrations of haloperidol, fluphenazine, and risperidone, we used the manufacturer's recommended equivalent for the depot oral conversion for the drug and then converted to oral equivalents of chlorpromazine.

All inpatients, who fulfilled the criteria for dual diagnosis with schizophrenia disorder including personality disorder or drug abuse disorder, were excluded from this study.

This study will provide a framework for investigating the eventual correlation between poor cognitive performance and recidivism of aggressive behavior in schizophrenia as specific disorder. While the studies in this field are scarce we decided to analyze schizophrenia spectrum disorder as main diagnosis.

The psychometric instruments and neuropsychological battery used were translated and adopted to the mother language, which was Albanian. The psychometric instruments were applied immediately after hospitalization, while the neuropsychological battery was used while schizophrenic patients were in remission phase, as mandatory treatment lasts several months and needs immediately pharmacologic treatment to reduce the psychotic symptoms and risk for aggressive behavior.

2.2. Sampling

A sample of 65 male inpatients, hospitalized in Clinic of Psychiatry-Forensic Unit from January 2014 to December 2015, who met the DSM–IVR criteria for a diagnosis of schizophrenia were recruited two inpatients group from a high-security Forensic Unit in the Clinic of Psychiatry. The inpatients included in the study were involuntary hospitalized after criminal offense.

2.2.1 Inclusion criteria
Currently clinically stable on medication, able to provide informed consent were included, while those with dual diagnosis, a history of organic brain syndrome, head injury, or mental retardation was excluded.

2.3. Materials

2.3.1. Symptom and psychopathic assessment

2.3.1.1. PANSS. Symptom severity was assessed using the PANSS. Data gathered from this assessment procedure were applied to the PANSS ratings. Each of the 30 items was accompanied by specific definition as well as detailed anchoring criteria for all seven rating points. Of the 30 items included in the test seven constituted positive scale, seven negative scale, and remaining 16 general psychopathology scale. The reliability test was expressed as alpha coefficient of the PANSS was 0.810 (N-65, 30 items).The symptoms were measured prior to aggressive behavior recidivism (Kay, Fiszbein, & Opler, 1987).

2.3.1.2. PCL-R. The PCL-R was used for assessment of psychopathic personality traits. The PCL-R was a 20-item rating scale with items rated on a three-point scale (0 = does not apply, 1 = may apply or in some respects applies, 2 = does apply) measuring the interpersonal, emotional, and behavioral aspects of the construct of psychopathy. Factor 1 of the PCL-R reflects affective/interpersonal traits and factor two reflects the behavioral/social deviance components of psychopathy. Cut-offs of ≥17 for psychopathic and ≥11 for non-psychopathic.

The PCL-R ratings are based on information in files from hospital and criminal records. The test was administered by a trained clinician.

In this study, we did not use PCL-SV as this test is a screening tool and was not designed to replace PCL-R. The PCL-R scores were used to predict risk for criminal re-offense and probability of rehabilitation. The entire PCL-R interview was conducted and based also on information in files from hospital and criminal records.

The reliability test was expressed as alpha coefficient of the PCL-R was 0.869 (N-65, 20 items) (Hare, 2003).

2.3.2. Assessment of violence risk and aggressive behavior

2.3.2.1. HCR-20. HCR-20 was rated as a measure of risk for violent criminal recidivism. The HCR-20 is a 20-item risk assessment checklist developed for the purpose of assisting the structured clinical judgment in violence risk assessments. The items are rated on a three-point scale, from “not present” to “definitely present”.

The HCR-20 is divided into three subscales. The Historical subscale has 10 items that relate to static variables present in the individual’s past. The Historical subscale includes items that relate to a past history of mental illness, psychopathy, personality disorder, and substance misuse. The Clinical subscale has five items that relate to the current status of dynamic risk markers, namely lack of insight, negative attitudes, active symptoms of major mental illness, impulsivity, and unresponsiveness to treatment. The Risk Management subscale has five items that relate to the individual’s future social and treatment circumstances and the person’s estimated reaction to these.

The reliability test expressed as alpha coefficient of the HCR-20 was 0.759 (N-65, 20 items) (Douglas, Hart, Webster, & Belfrage, 2013).

2.3.2.2. OAS. The Overt Aggression Scale (OAS) was used for evaluation of aggression during hospitalization. This is designed to assess the severity of aggressive behaviors by observation and description of the patients' aggression episodes. The scale is made up of four main areas: (1) verbal aggression, (2) aggression against objects, (3) aggression against self, and (4) physical aggression against others. There are four severity grades to classify aggressive behavior in each one of these areas. Verbal aggression includes behaviors that go from shouting with anger to making clear threats of violence toward others or toward the subject himself; aggression against objects includes actions such as hitting the door to throwing objects; the area of aggression against self includes behaviors that go from hair pulling without any physical injury to self-mutilation and deep cuts caused by the subject himself; and physical aggression against others includes making threatening gestures toward others up to direct attacks against other persons that cause severe physical harm (Kay, Wolkenfeld, & Murrill, 1988).

2.3.3. Neuropsychological assessments

2.3.3.1. MMSE. The MMSE was included to provide a general estimate of cognitive functioning. The mini–mental state examination (MMSE) is a brief 30-point questionnaire test that is used to screen for cognitive impairment. It is commonly used to screen for dementia. In about 10 min it samples functions including arithmetic, memory, orientation, comprehension, and basic motor skills.

Any score greater than or equal to 25 points (out of 30) indicates a normal cognition. Below this, scores can indicate severe (≤9 points), moderate (10–20 points), or mild (21–24 points) cognitive impairment (Folstein, Folstein, & McHugh, 1975).

2.3.3.2. WAIS-R. The Wechsler Adult Intelligence scale-revised (WAIS-R) third version consisted of seven verbal subtests and five performance subtests. The verbal tests are: Information, Comprehension, Arithmetic, Digit Span, Similarities, Vocabulary, and Letter-Number Sequencing. The Performance subtests were: Picture Completion, Block Design, Matrix reasoning, Object Assembly, and Digit Symbol. The scores derived from this test are a Verbal IQ (VIQ), a Performance IQ (PIQ), and a Full-Scale IQ (FSIQ).

The reliability test expressed as alpha coefficient of WAIS-R was 0.872 (N-65, 12 items) (Wechsler, 1958).

2.3.3.3. TMT A and TMT B. Both parts of the Trail Making Test (TMT A and TMT B) consist of 25 circles distributed over a sheet of paper. In Part A, the circles are numbered 1–25, and the patient should draw lines to connect the numbers in ascending order. In Part B, the circles include both numbers (1–13) and letters (A–L); as in Part A, the patient draws lines to connect the circles in an ascending pattern, but with the added task of alternating between the numbers and letters (i.e. 1-A-2-B-3-C, etc.). The patient should be instructed to connect the circles as quickly as possible, without lifting the pen or pencil from the paper. This test was used in part A and B, for assessing of attention, visual-motor speed, cognitive flexibility of thought and planning ability.

The reliability test expressed as alpha coefficient of the TMT A and TMT B was 0.808 (N-65, 2 items) (Tombaugh, 2004).

2.4. Ethics

Each patient was informed of the content and aims of this study prior to the evaluation, and to protect the privacy and dignity of the subjects. Written informed consent was obtained from all participants. The study was explained to patients and participants were not remunerated. A statement that participation is voluntary, that refusal to participate will involve no penalty or loss of benefits to which the subject is otherwise entitled to, and that the subject may discontinue participation at any

time without penalty or loss of benefits to which the subject is otherwise entitled. The study was approved by Institutional Review Board—Ethical Committee of University Clinical Center of Kosovo and authorized by Directory of the Clinical Center, according to the 1995 Helsinki Declaration, revised in Edinburgh in 2000.

2.5. Statistical analysis

Both groups were assessed during mandatory treatment measures according to Court Decision, and all inpatients were administered with atypical or conventional antipsychotics in doses that were equivalent to chlorpromazine (mg/d).

The relapse rate in aggressive behavior was assessed, and the experimental sample group was classified by recidivism of aggressive behavior using two categories, violent or non-violent.

The frequencies and significant differences in means on socio-demographic, criminological data, and WAIS–R subtests were assessed and compared between groups using independent Student *t*-tests for continuous or χ^2 tests for categorical variables.

We also present descriptive data on means and differences between means using ANOVAs test to compare results from neurocognitive (WAIS, MMSE, TMT A and TMT B tests), clinical symptoms (using the PCL-R and PANSS tests), and risk factors of aggressive behavior (using the HCR-20 and OAS test) between the groups (violent recidivism vs. non-violent recidivism).

The Pearson correlation coefficient (*r*) was used to analyze the relationship between the clinical and neuropsychological variables in each group.

SPSS-17 was used for statistical analyses. All tests used were two-tailed, and 0.05 was used as the standard for statistical significance.

3. Results

Inter-rater reliability estimates on diagnosis has demonstrated a kappa of 0.89 for schizophrenia spectrum disorder, age ≥ 18, mean age 39.68 (±8.74), duration of illness 15.54 (±10.42), and mean age at first violent act 26.38 (±3.53).

In Table 1, we present socio-demographic data comparisons that were made using descriptive data analyses. Frequencies (percent) and means (standard deviation) are shown. We also used independent student *t*-tests and χ^2 tests to verify significant differences between means, for continuous, respectively, categorical variables. The criterion for significance was $p < 0.05$.

Of a total of 65 inpatient offenders with schizophrenia disorder 37 or 56.9% recidivated (≥1 incident) with violent behavior, whereas 28 or 43.1% did not recidivate during the follow-up period in hospital and during the mandatory treatment period.

We noted significant differences between groups in age at first violent act ($p < 0.023$), past history of psychiatric treatment ($p < 0.05$), and social status ($p < 0.018$). Also we find significant differences between groups in neuropsychological test TMT A and TMT B.

There were no significant differences between the violent recidivism and non-recidivate group in age, years of education, marital status, previous history of treatment, type of criminal offense, duration of illness, or history of drug abuse.

With respect to the type of violent acts, the majority were threats to physical integrity (47.7% of cases), domestic violence (40.0% of cases), and homicide (12.3% of all cases). Based on documented information, the majority of criminal acts had been performed just prior to hospitalization.

Table 1. Socio-demographic, criminological and clinical data of 65 inpatients offenders with schizophrenia in both groups

	Recidivism group	Non-recidivism group	Total	*p*
	N-37 (%) m(SD)	N-28 (%) m(SD)	N-65 (%) m(SD)	
Age*	40.08 (±9.89)	39.14 (±7.07)	39.68 (±8.74)	0.672
Duration of illness*	15.86 (±12.18)	15.11 (±7.70)	15.54 (±10.42)	0.774
Age at first violent act	25.25 (±3.54)	27.24 (±3.31)	26.38 (±3.53)	0.023
*History of treatment***				0.050
Yes	25 (53.2%)	22 (46.8%)	47 (72.3%)	
No	15 (83.3%)	3 (16.7%)	18 (27.7%)	
*History of drug abuse***				0.207
Yes	9 (75%)	3 (25%)	12 (18.5%)	
No	28 (52.8%)	25 (47.2%)	53 (81.5%)	
Education				0.935
Primary	19 (63.3%)	11 (36.7%)	30 (46.2%)	
Secondary	14 (45.2%)	17 (54.8%)	31 (47.7%)	
High degree	0	4 (100%)	4 (6.2%)	
Social status				0.018
Low income	25 (78.1%)	7 (21.9%)	32 (49.2%)	
Middle income	9 (30.0%)	21 (70.0%)	30 (46.2%)	
High income	0	3 (8.1%)	3 (4.6%)	
Marital status				0.322
Unmarried	20 (58.8%)	14 (41.2%)	34 (52.3%)	
Married	9 (39.1%)	14 (60.9%)	23 (35.4%)	
Divorced	8 (100.0%)	0	8 (12.3%)	
Means of clinical and neuropsychological variables				
PANSS	96.9 (±11.4)	90.1 (±13.2)	93.4 (±8.64)	0.081
HCR-20	25.68 (±5.0)	23.4 (±5.31)	24.6 (±5.25)	0.065
PCL-R	19.0 (±10.3)	20.3 (±7.91)	19.4 (±6.15)	0.615
OAS	12.6 (±16.8)	0	12.6 (±16.8)	
TMT A	40.7 (±9.2)	36.2 (±9.31)	38.8 (±9.15)	0.009
TMT B	85.7 (±22.2)	75.3 (±19.1)	81.2 (±20.8)	0.050
MMSE	24.24 (±1.9)	25.3 (±1.59)	24.7 (±1.84)	0.065
WAIS-R	91.16 (±8.7)	94.6 (±8.42)	92.6 (±8.64)	0.118

Notes: Standard deviation (SD), Yes-No/response.

*Independent t-student test.

**χ^2 test, $p < 0.05$ is significant.

Of the total number of subjects (N-65), the majority (47.7%) had a secondary level of education 46.1% had a primary level of education, and 6.2% had a higher level of education; 72.3% showed a history of psychiatric treatment; and based on anamnesis information 18.5% had a previous history of drug abuse but had not been diagnosed.

The majority of the victims were family members (72.3% of cases), 12.3% were friends, and 15.4% of the victims were others.

We did not find any significant difference between groups regarding the treatment with antipsychotics.

cogent psychology

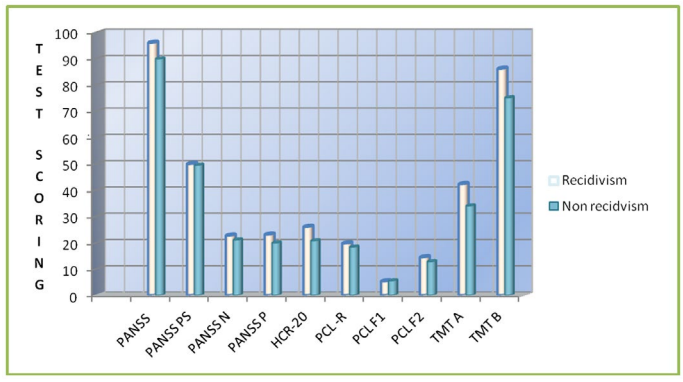

Figure 1. Mean clinical and neurocognitive data and risk factors of aggressive behavior in each group.

In Figure 1, we show the mean clinical, cognitive, and risk factors of aggressive behavior scores in each study group (N-65). Descriptive analyses of means were used for comparisons.

Cognitive measurements showed that the recidivism group of inpatients performed significantly poorer and had lower mean scores in the WAIS test ($p < 0.029$, F-4.441), MMSE test ($p < 0.025$, F-2.755), TMT A (F-4.023, $p < 0.044$), and TMT B (F-4.110, $p < 0.047$).

The mean score in the PANSS test was significantly higher in the recidivism group of inpatients (F-3.745, $p < 0.05$).

We did not find any significant difference between groups in mean risk factor scores of aggressive behavior (using the HCR-20 and Hare test of psychopathy, PCL-R).

In Table 2, we show results from Pearson correlation tests of data from the recidivism group of inpatients with aggressive behavior. Cognitive variables from the TMT A and TMT B tests showed a significant, positive correlation with risk factors of aggressive behavior, measured using the HCR-20 test, and the OAS (both $p < 0.01$), whereas results from the WAIS and MMSE tests showed a significant negative correlation with risk factors of aggressive behavior and OAS (both $p < 0.01$). In this group, we did not find a significant correlation between the WAIS-IQ test of intelligence and the PCL-R test.

Cognitive variables (tested using TMT A, TMT B and MMSE) also correlated significantly with positive and negative clinical psychopathologic symptoms (PANSS) of schizophrenia ($p < 0.01$).

Table 2. Correlation matrix of cognitive, clinical and risk factors of aggressive behavior data in a group of inpatients with violent recidivism

	WAIS	TMT A	TMT B	MMSE	PANSS	HCR-20	PCL-R
WAIS							
TMT A	−0.778**						
TMT B	−0.813**	0.971**					
MMSE	0.810**	−0.910**	−0.960**				
PANSS	−0.072	0.463**	0.423**	−0.524**			
HCR-20	−0.381*	0.550**	0.515**	−0.538**	0.522**		
PCL-R	−0.078	0.225	0.323	−0.112	0.517**	0.843**	
OAS	−0.736**	0.678**	−0.730**	−0.121	0.524**	0.736**	0.681**

*Correlation is significant on level $p < 0.05$.

**Correlation is significant on level $p < 0.01$.

Table 3. Correlation matrix of cognitive, clinical and risk factors of aggressive behavior data in a group of inpatients with non-violent recidivism

	WAIS	TMT A	TMT B	MMSE	PANSS	HCR-20
WAIS						
TMT A	−0.783**					
TMT B	−0.855**	0.847**				
MMSE	0.908**	−0.832**	−0.952**			
PANSS	−0.545**	0.638**	0.675**	−0.675**		
HCR-20	−0.248	0.200	0.127	−0.510**	0.127	
PCL-R	−0.340	0.164	0.358	−0.323**	0.358	0.671**

*Correlation is significant in level of $p < 0.05$.

**Correlation is significant in level of $p < 0.01$.

We did not find any significant correlation between cognitive variables and psychopathic behavior (PCL-R).

Risk factors of aggressive behavior (tested using the HCR-20 test) in this group of inpatients were significantly positively correlated with factors of psychopathic behavior (PCL-R; $p < 0.01$).

In Table 3, we show results of Pearson correlation tests of data from the non-violent recidivism group of inpatients. The cognitive variables tested using TMT A and TMT B did not show any significant correlation with risk factors of aggressive behavior whereas they correlated significantly with positive and negative clinical factors of general psychopathology (PANSS) of schizophrenia ($p < 0.01$).

We did not find significant correlations between the cognitive variables tested using TMT A, TMT B, or MMSE and psychopathic behavioral factors tested using PCL-R.

In Table 4, we show the means (standard deviation) and significance of differences between means of WAIS-R subtest data from the recidivism and non-violent recidivism groups, which were compared using independent Student *t*-tests. In the verbal subtest category, comprehension and digit span results showed significant differences between the groups ($p < 0.05$); however, other subtests within this category did not reveal any significant differences between groups.

Table 4. Mean WAIS–R subtest data of each group

	WAIS-R subtest	SCH-recidivism N-37	SCH-non recidivism N-28	*F*	Sig.
WAIS-R	Information	10.97 (±2.289)	11.19 (±1.596)	0.417	0.598
Verbal	Comprehension	8.51 (±2.893)	9.89 (±2.347)	2.901	0.043
	Arithmetic	8.76 (±2.994)	9.96 (±2.742)	0.457	0.501
	Digit span	9.35 (±2.552)	10.18 (±2.019)	3.884	0.05
	Similarities	9.51 (±2.950)	10.75 (±3.075)	1.025	0.315
	Vocabulary	9.32 (±2.450)	10.36 (±2.329)	0.088	0.767
	Letter-number sequencing	8.89 (±1.232)	9.12 (±1.231)	0.065	0.798
WAIS-R	Picture completion	9.12 (±1.020)	9.87 (±1.256)	0.075	0.781
Performance	Block design	8.38 (±3.022)	9.54 (±2.687)	3.874	0.05
	Matrix reasoning	8.46 (±2.243)	9.36 (±1.789)	5.761	0.01
	Object assembly	8.03 (±1.210)	8.89 (±2.149)	0.034	0.899
	Digit symbol	6.76 (±2.706)	7.61 (±2.213)	2.496	0.119

Table 5. Multiple linear regression analysis of neuropsychological variables and Overt Aggression Scale in recidivism group of inpatients

Model	Beta coefficients	Sig.	95% confidence interval	
			Lower	Upper
Verbal IQ	0.276	0.622	2.238	0.352
Information	0.756	0.395	1.980	0.785
Comprehension	2.231	0.006	2.873	1.734
Arithmetic	1.768	0.051	1.478	1.348
Digit span	0.967	0.435	0.959	1.267
Similarities	0.478	0.193	1.243	0.732
Vocabulary	2.367	0.001	2.389	1.848
Letter-number sequencing	0.364	0.765	0.211	1.321
Performance IQ	0.631	0.217	2.734	0.631
Picture completion	0.156	0.746	0.897	1.289
Block design	2.564	0.006	2.978	1.893
Matrix reasoning	1.871	0.045	1.389	1.278
Object assembly	0.678	0.241	0.235	1.143
Digit symbol	1.903	0.038	2.078	0.278
Total IQ	0.073	0.808	0.963	1.230
TMT A	1.509	0.001	3.425	1.770
TMT B	1.293	0.004	1.330	1.630
MMSE	0.174	0.221	0.204	1.550

The performance subtest category comprising block design and matrix reasoning revealed a significant difference between groups ($p < 0.05$). The other subtests within this category did not reveal any significant differences.

Multiple linear regression analysis presented in Table 5 was based on hierarchic methodology and this analysis showed that even after adjusting for confounding factors such as socio-demographic and clinical psychopathological variables show the predictive role of independent variables TMT A and TMT B in dependent variable of Overt Aggression Scale in the significant level of $p < 0.001$ vs. $p < 0.004$, while neuropsychological subtests showed significant predictive effects on aggressive behavior of comprehension ($p < 0.006$) and vocabulary ($p < 0.001$) subtest as part of verbal IQ, and block design ($p < 0.006$), matrix reasoning ($p < 0.045$), and digit symbol ($p < 0.038$) as part of performance IQ.

4. Discussion

In this cross sectional study, offenders with schizophrenia disorder who had committed criminal acts prior to hospitalization in a Forensic unit at the Clinic of Psychiatry were followed for an average period of almost two years to determine the rate of violent recidivism and to quantify associations between cognitive functions, clinical psychopathology, and risk factors of aggressive behavior.

Of a total of 65 offender inpatients with schizophrenia, 37 were recidivate with violent behavior during the 2 years follow-up period time of mandatory treatment, resulting in a total recidivism rate of 56.9%, whereas 28 or 43.1% did not recidivate with aggressive behavior. This recidivism rate is higher than reported in other long-term follow-up studies of mentally disordered offenders (Friendship, McClintock, Rutter, & Maden, 1999; Maden, Scott, Burnett, Lewis, & Skapinakis, 2004; Yoshikawa et al., 2007) discharged from hospitals and secure units, which reported rates that varied between 6 and 15% or 25% as reported by Nilsson, Wallinius, Gustavson, Anckarsa, and Kerekes (2011) in their study of the violent recidivism of schizophrenia disordered offenders.

This difference may be explained by findings that predictors of violence in institutional settings are different from predictors of violence in the community: variables including sex, age, diagnosis, and drug abuse play a minor role, whereas clinical and psychopathological variables are prominent. There are also factors including confinement and the presence of other violent or agitated patients that contribute to the emergence of violence within hospitals (Tardiff, 2003).

The majority of victims of the psychotic disordered inpatients prior to their arrest were family members (72.6% of cases), which is consistent with the findings of Adams et al. (1990) and Hakkanen and Laajasalo (2006), who reported that 68% out of 65.5%, of victims of psychotic disordered persons were family members.

We did not observe any significant difference between groups in age, level of education, marital status, duration of disease, or past history of drug abuse in this study, which is consistent with the results of Fullam and Dolan (2008) but inconsistent with those of Manschreck et al. (2000) because we observed a significant difference between groups in social status, age at first violent act, and a past history of psychiatric treatment.

Criminological risk factors in offenders with major mental illnesses, such as age at first conviction, were significantly different between groups, and the risk of aggressive behavior, as assessed using the HCR-20 instrument, and the presence of psychopathic traits, as assessed using the PCL-R test, correlated significantly with the violent recidivism rate of schizophrenia inpatients during mandatory treatment and hospitalization and are consistent with the study of Nilsson et al. (2011).

The manifestations of aggressive recidivism behavior in our study correlated with progression in cognitive impairment, as has previously been noted by Barkataki et al. (2005). The decrease in total IQ correlated significantly and negatively with an increased risk of aggressive behavior and an increased number of incidents of recidivism during hospitalization. Thus, a decreasing IQ score increases the likelihood of violent recidivism. Furthermore, poor results on executive cognitive function tests, such as cognitive flexibility, attention and planning ability, showed a significant correlation with an increased number of incidents. Future studies are required to determine the predictive role of poor cognitive functioning in aggressive-behavior recidivism.

According to the research studies regarding the correlation between cognitive functions and aggressive behavior in patients with schizophrenia disorder, both of these studies observed that poor executive cognitive function correlated with an increased risk of aggressive behavior (Krakowski et al., 1997; Lapierre et al., 1995), which is consistent with our study results where poor cognitive functioning correlated significantly with risk factors of aggressive behavior. However, our results are in contrast with the findings of other studies (Adams et al., 1990; Cohen et al., 2003; Lafayette et al., 2003; Serper, Beech, Harvey, & Dill, 2008) where no significant correlation was found.

In our study, we noted that results from verbal subtests of understanding of abstract social conventions, rules and expressions, attention and concentration in the violent recidivism group of inpatients compared with the non-violent recidivism group were significantly different, consistent with Sharma et al. (2003). Moreover, our study revealed significantly poorer results in performance subtests of spatial perception, visual, and nonverbal abstract processing and problem-solving, inductive and spatial reasoning in the violent recidivism group compared with the non-violent recidivism group, which is in contrast with the findings of Krakowski et al. (1997), where no significant differences were observed in the mean performance and verbal IQ subtest scores (measured using the WAIS-R test) between the two groups of patients.

We noted that the violent recidivism inpatients showed greater positive (hallucinations and delusions) symptom scores when using the PANSS than non-violent recidivism inpatients, which mirrors studies that reported higher levels of positive symptoms in violent compared with non-violent inpatients (Arango et al., 1999; Cheung, Schweitzer, Crowley, & Tuckwell, 1997).

Similar to other studies (Arango et al., 1999; Fresán et al., 2005; Nolan et al., 2005), we did not observe an association between violence and schizophrenia negative symptoms.

Neuropsychological factors included in the aggressive behavior were inhibition reduction, impairment of memory, attention and concentration. Our findings are consistent with Sharma et al. (2003) and Goldberg et al. (1995) where significantly poorer results in mental flexibility, attention and concentration, as assessed using the TMT A and TMT B tests, were found in the violent recidivism group when compared with the non-violent recidivism group.

Although this study found evidence of a correlation between poor cognitive functioning and recidivism of aggressive behavior, this relationship may be specific to nonsocial situations. (Hoaken, Shaughnessy, & Pihl, 2003).

Neuropsychological performance results showed that poor executive functioning such as cognitive flexibility, planning and organization of behavior, attention distractibility and poor concentration are relevant factors that independently and significantly predict the recidivism of aggressive behavior.

Impaired ability to deal with abstract social conventions, rules and expressions and ability to comprehend and verbally express vocabulary were independently predicted aggressive behavior, while impaired perceptual reasoning and working memory such are attention, concentration, and mental control had predictive role in recidivism of aggressive behavior.

It appears that cognitive deficits, in particular poor planning ability, mental inflexibility, low verbal intelligence and impaired attention, limit the individual's ability to cope with mandatory treatment measures, such as restrictions to freedom and movement within the unit, close contact with other patients, and an inability to access social support. Results from this study are consistent with Krakowski et al. (1997), who suggested that psychiatric patients with cognitive deficits and psychosis show deficits in behavioral regulation and control of impulses and an inability to benefit from reactions required to modify their behavior based on environmental demands, all of which leads to increased aggression.

Our study findings show that the relationship between poor cognitive performance, such as verbal skills, speed of information processing, mental flexibility and attention, correlates with an escalating risk of aggressive behavior. Thus, poor communication skills in inpatients with schizophrenia represent a model of behavior in which these individuals use physical aggression to communicate and achieve their goals.

5. Conclusion

Neuropsychological assessment of cognitive dysfunctions may identify psychiatric patients with schizophrenia who are at a greater risk for recidivism of aggressive behavior.

Available evidence suggests that the identification of subtypes of persistent violent offenders distinguished using their performance on neuropsychological tests is an essential step in moving the field of forward. This knowledge could contribute to the development of strategies to increase participation in learning-based rehabilitation programs and to increase the effectiveness of these programs. Neuropsychological studies that link cognitive deficits to specific traits and behavior patterns could be used to develop a two-pronged approach to rehabilitation by combining pharmacological treatment with cognitive strategies. Both interventions could target deficits in cognitive functions that are associated with violent behavior.

The use of cognitive remediation therapy as a priority during mandatory treatment may be useful in enabling communication in patients with schizophrenia disorder and in the management of aggressiveness and in the mental rehabilitation of offenders of severe criminal acts.

Funding
The authors received no direct funding for this research.

Competing Interest
The authors declare no competing interest.

Author details
Zylfije Hundozi[1]
E-mail: zylhundozi@hotmail.com
Nazmie F. Ibishi[2]
E-mail: nazmiemb3@hotmail.com
Nebi R. Musliu[3]
E-mail: benimitrovice@hotmail.com
[1] Clinic of Neurology, University Clinical Center of Kosovo, Prishtina, Kosovo.
[2] Clinic of Psychiatry-Forensic Unit, University Clinical Center of Kosovo, Prishtina, 10000 Kosovo.
[3] Department of Internal Disease, University Clinical Center of Kosovo, Prishtina, 10000 Kosovo.

Citation information
Cite this article as: Cognitive functions and recidivism of aggressive behavior in schizophrenic inpatients at Forensic Unit Clinic of Psychiatry in Kosovo, Zylfije Hundozi, Nazmie F. Ibishi & Nebi R. Musliu, *Cogent Psychology* (2016), 3: 1233650.

References

Adams, J., Meloy, J. R., & Moritz, M. S. (1990). Neuropsychological deficits and violent behavior in incarcerated schizophrenics. *The Journal of Nervous and Mental Disease, 178*, 253–256. http://dx.doi.org/10.1097/00005053-199004000-00006

Arango, C., Barba, A. C., Gonzalez-Salvador, T., & Ordonez, A. C. (1999). Violence in inpatients with schizophrenia: A prospective study. *Schizophrenia Bulletin, 25*, 493–503. http://dx.doi.org/10.1093/oxfordjournals.schbul.a033396

Barkataki, I., Kumari, V., Das, M., Hill, M., Morris, R., Das, M., ... Sharma, T. (2005). A neuropsychological investigation into violence and mental illness. *Schizophrenia Research, 74*, 1–13. http://dx.doi.org/10.1016/j.schres.2004.08.001

Barrat, E. S. (1994). *Violence and mental disorder: Developments in risk assesments*. (J. Monahan & H. J. Steadman, Eds.). Chicago, IL: University of Chicago Press.

Barker, E. D., Séguin, J. R., White, H. R., Bates, M. E., Lacourse, E., Carbonneau, R., & Tremblay, R. E. (2007). Developmental trajectories of male physical violence and theft. *Archives of General Psychiatry, 64*, 592–599. http://dx.doi.org/10.1001/archpsyc.64.5.592

Braw, Y., Benozio, A., & Levkovitz, Y. (2012). Executive functioning during full and partial remission (positive and negative symptomatic remission) of schizophrenia. *Schizophrenia Research, 142*, 122–128. http://dx.doi.org/10.1016/j.schres.2012.10.011

Brennan, P. A., Mednick, S. A., & Hodgins, S. (2000). Major mental disorders and criminal violence in a Danish birth cohort. *Archives of General Psychiatry, 57*, 494–500. http://dx.doi.org/10.1001/archpsyc.57.5.494

Cheung, P., Schweitzer, I., Crowley, K., & Tuckwell, V. (1997). Violence in schizophrenia: Role of hallucinations and delusions. *Schizophrenia Research, 26*, 181–190. http://dx.doi.org/10.1016/S0920-9964(97)00049-2

Cohen, R. A., Brumm, V., Zawacki, T. M., Paul, R., Sweet, L., & Rosenbaum, A. (2003). Impulsivity and verbal deficits associated with domestic violence. *Journal of International Neuropsychology Society, 9*, 760–770.

Douglas, K. S., Hart, S. D., Webster, C. D., & Belfrage, H. (2013). *HCR-20V3: Assessing risk of violence—User guide*. Burnaby: Mental Health, Law, and Policy Institute, Simon Fraser University.

Fazel, S., & Grann, M. (2006). The population impact of severe mental illness on violent crime. *American Journal of Psychiatry, 163*, 1397–1403. http://dx.doi.org/10.1176/ajp.2006.163.8.1397

Fazel, S., Gulati, G., Linsell, L., Geddes, J. R., & Grann, M. (2009). Schizophrenia and violence: Systematic review and meta-analysis. *PLoS Medicine, 6*, e1000120. doi:10.1371/journal.pmed.1000120

Folstein, M., Folstein, S. E., & McHugh, P. R. (1975). "Mini-mental state". *Journal of Psychiatric Research, 12*, 189–198. http://dx.doi.org/10.1016/0022-3956(75)90026-6

Foster, H. G., Hillbrand, M., & Silverstein, M. (1993). Neuropsychological deficit and aggressive behavior: A prospective study. *Progress in Neuro-Psychopharmacology and Biological Psychiatry, 17*, 939–946. http://dx.doi.org/10.1016/0278-5846(93)90021-J

Fresán, A., Apiquian, R., de la Fuente-Sandoval, C., Löyzaga, C., García-Anaya, M., Meyenberg, N., & Nicolini, H. (2005). Violent behavior in schizophrenic patients: Relationship with clinical symptoms. *Aggressive Behavior, 31*, 511–520. http://dx.doi.org/10.1002/(ISSN)1098-2337

Friendship, C., McClintock, T., Rutter, S., & Maden, A. (1999). Re-offending: Patients discharged from a regional secure unit. *Criminal Behaviour Mental Health, 9*, 226–236. http://dx.doi.org/10.1002/(ISSN)1471-2857

Fullam, R. S., & Dolan, M. C. (2008). Executive function and in-patient violence in forensic patients with schizophrenia. *The British Journal of Psychiatry, 193*, 247–253. http://dx.doi.org/10.1192/bjp.bp.107.040345

Giancola, P., & Zeichner, A. (1995). Neuropsychological performance on tests of frontal lobe functioning and aggression in human males. *Journal of Abnormal Psychology, 103*, 832–835.

Gold, J. M., Hahn, B., Strauss, G. P., & Waltz, J. A. (2009). Turning it upside down: Areas of preserved cognitive function in schizophrenia. *Neuropsychology Review, 19*, 294–311. http://dx.doi.org/10.1007/s11065-009-9098-x

Goldberg, T. E., & Gold, J. M. (1995). Neurocognitive functioning in patients with schizophrenia. *Psychopharmacology,* 1245–1257.

Hakkanen, H., & Laajasalo, T. (2006). Homicide crime scene behaviors in a Finnish sample of mentally ill offenders. *Homicide Studies, 10*, 33–54. http://dx.doi.org/10.1177/1088767905283544

Hare, R. D. (2003). *Manual for the revised psychopathy checklist* (2nd ed.). Toronto: Multi-Health Systems.

Hoaken, P. N. S., Shaughnessy, V. K., & Pihl, R. O. (2003). Executive cognitive functioning and aggression: Is it an issue of impulsivity? *Aggressive Behavior, 29*, 15–30. http://dx.doi.org/10.1002/(ISSN)1098-2337

Hodgins, S. (1998). Epidemiological investigations of the associations between major mental disorders and crime: Methodological limitations and validity of the conclusions. *Social Psychiatry and Psychiatric Epidemiology, 33*, S29–S37. http://dx.doi.org/10.1007/s001270050207

Hodgins, S. (2004). Criminal and antisocial behaviours and schizophrenia: A neglected topic. In W. F. Gattaz & H. Häfner (Eds.), *Search for the causes of schizophrenia* (Vol. 5, pp. 315–341). Darmstadt: Steinkopff Verlag.

Hodgins, S. (2008). Violent behaviour among people with schizophrenia: A framework for investigations of causes, and effective treatment, and prevention. *Philosophical*

Transactions of the Royal Society B: Biological Sciences, 363, 2505–2518. http://dx.doi.org/10.1098/rstb.2008.0034

Hodgins, S., Calem, M., Shimel, R., Williams, A., Harleston, D., Morgan, C., ... Jones, P. (2011). Criminal offending and distinguishing features of offenders among persons experiencing a first episode of psychosis. *Early Intervention in Psychiatry, 5*, 15–23. http://dx.doi.org/10.1111/eip.2011.5.issue-1

Kay, S. R., Fiszbein, A., & Opler, L. A. (1987). The positive and negative syndrome scale (PANSS) for schizophrenia. *Schizophrenia Bulletin, 13*, 261–276. http://dx.doi.org/10.1093/schbul/13.2.261

Kay, S. R., Wolkenfeld, F., & Murrill, L. M. (1988). Profiles of aggression among psychiatric patients. *The Journal of Nervous and Mental Disease, 176*, 539–546. http://dx.doi.org/10.1097/00005053-198809000-00007

Keefe, R. S. E., Bilder, R. M., Harvey, P. D., Davis, S. M., Palmer, B. W., Gold, J. M., ... Lieberman, J. A. (2006). Baseline neurocognitive deficits in the CATIE schizophrenia trial. *Neuropsychopharmacology, 31*, 2033–2046. http://dx.doi.org/10.1038/sj.npp.1301072

Krakowski, M., Convit, A., Jaeger, J., Lin, S., & Volavka, J. (1989). Neurological impairment in violent schizophrenic inpatients. *American Journal of Psychiatry, 146*, 849–853.

Krakowski, M., Czobor, P., Carpenter, M. D., Libiger, J., Kunz, M., Papezova, H., ... Abad, T. (1997). Community violence and inpatient assaults: Neurobiological deficits. *Journal of Neuropsychiatry and Clinical Neuroscience,* 549–555.

Lafayette, J. M., Frankle, W. G., Pollock, A., Dyer, K., & Goff, D. C. (2003). Clinical characteristics, cognitive functioning, and criminal histories of outpatients with schizophrenia. *Psychiatric services, 54*, 12.

Lapierre, D., Braun, C. M. J., Hodgins, S., Toupin, J., Leveillee, S., & Constantineau, C. (1995). Neuropsychological correlates of violence in schizophrenia. *Schizophrenia Bulletin, 21*, 253–262. http://dx.doi.org/10.1093/schbul/21.2.253

Lau, M. A., Pihl, R. O., & Peterson, J. B. (1995). Provocation, acute alcohol intoxication, cognitive performance and aggression. *Journal of Abnormal Psychology, 104*, 150–155. http://dx.doi.org/10.1037/0021-843X.104.1.150

Link, B. G., Stueve, A., & Phelan, J. (1998). Psychotic symptoms and violent behaviors: Probing the components of "threat/control-override" symptoms. *Social Psychiatry and Psychiatric Epidemiology, 33*, S55–S60. http://dx.doi.org/10.1007/s001270050210

MacCabe, J. H. (2008). Population-based cohort studies on premorbid cognitive function in schizophrenia. *Epidemiologic Reviews, 30*, 77–83. doi:10.1093/epirev/mxn007

Maden, A., Scott, F., Burnett, R., Lewis, G. H., & Skapinakis, P. (2004). Offending in psychiatric patients after discharge from medium secure units: Prospective national cohort study. *British Medical Journal, 328*, 1534. http://dx.doi.org/10.1136/bmj.38075.467569.EE

Manschreck, T. C., Maher, B. A., Winzig, L., Candela, S. F., Beaudette, S., & Boshes, R. (2000). Age disorientation in schizophrenia. *The Journal of Neuropsychiatry and Clinical Neurosciences, 12*, 350–358. http://dx.doi.org/10.1176/jnp.12.3.350

Nilsson, Th, Wallinius, M., Gustavson, C., Anckarsa, H., & Kerekes, N. (2011). Violent recidivism: A long-time follow-up study of mentally disordered offenders. *PLoS One, 6*(10). doi:10.1371/journal.pone.0025768

Nolan, K. A., Volavka, J., Czobor, P., Sheitman, B., Lindenmayer, J. P., Citrome, L. L., ... Lieberman, J. A. (2005). Aggression and psychopathology in treatment-resistant inpatients with schizophrenia and schizoaffective disorder. *Journal of Psychiatric Research, 39*, 109–115. http://dx.doi.org/10.1016/j.jpsychires.2004.04.010

Ranganath, C., Minzenberg, M., & Ragland, J. D. (2008). The cognitive neuroscience of memory function and dysfunction in schizophrenia. *Biological Psychiatry, 64*, 18–25. doi:10.1016/j.biopsych

Rasmussen, K., Levander, S., & Sletvold, H. (1995). Aggressive and non-aggressive schizophrenics: Symptom profile and neuropsychological differences. *Psychology, Crime and Law, 2*, 119–129. http://dx.doi.org/10.1080/10683169508409770

Roy, S., Herrera, J., Parent, M., & Costa, J. (1987). Violent and nonviolent schizophrenic patients-clinical and developmental characteristics. *Psychological Reports, 61*, 855–861. http://dx.doi.org/10.2466/pr0.1987.61.3.855

Serper, M., Beech, D. R., Harvey, P. D., & Dill, C. (2008). Neuropsychological and symptom predictors of aggression on the psychiatric inpatient service. *Journal of Clinical and Experimental Neuropsychology, 30*, 700–709. http://dx.doi.org/10.1080/13803390701684554

Sharma, T., & Antonova, L. (2003). Cognitive function in schizophrenia. *Psychiatric Clinics of North America, 26*, 25–40. http://dx.doi.org/10.1016/S0193-953X(02)00084-9

Siever, L. J. (2008). Neurobiology of aggression and violence. *American Journal of Psychiatry, 165*, 429–442. http://dx.doi.org/10.1176/appi.ajp.2008.07111774

Silver, H., Goodman, C., Knoll, G., Isakov, V., & Modai, I. (2005). Schizophrenia patients with a history of severe violence differ from nonviolent schizophrenia patients in perception of emotions but not cognitive function. *The Journal of Clinical Psychiatry, 66*, 300–308. http://dx.doi.org/10.4088/JCP.v66n0305

Swanson, J. W., Holzer, C. E., Ganju, V. K., & Jono, R. T. (1990). Violence and psychiatric disorder in the community: Evidence from the epidemiologic catchment area surveys. *Hospital and Community Psychiatry, 41*, 761–770.

Sweileh, W. M., Odeh, J. B., Shraim, N. Y., Zyoud, S. H., Sawalha, A. F., & Al-Jabi, S. W. (2014, April). Evaluation of defined daily dose, percentage of British National Formulary maximum and chlorpromazine equivalents in antipsychotic drug utilization. *Saudi Pharmaceutical Journal, 22*, 127–132. http://dx.doi.org/10.1016/j.jsps.2013.03.003

Tardiff, K. (2003). *A survey of assault by chronic patient in a state hospital system, in assaults within psychiatric facilities* (pp. 3–19). New York, NY: Grune and Stratton.

Tiihonen, J., Isohanni, M., Räsänen, P., Koiranen, M., & Moring, J. (1997). Specific major mental disorders and criminality: A 26-year prospective study of the 1966 northern Finland birth cohort. *American Journal of Psychiatry, 154*, 840–845.

Tombaugh, T. N. (2004). Trail making test A and B: Normative data stratified by age and education. *Archives of Clinical Neuropsychology, 19*, 203–214. http://dx.doi.org/10.1016/S0887-6177(03)00039-8

Wechsler, D. (1958). *The measurement and appraisal of adult intelligence.* (4th ed.). Baltimore, MD: Williams & Witkins. Retrieved June 4, 2013. http://dx.doi.org/10.1037/11167-000

Yoshikawa, K., Taylor, P. J., Yamagami, A., Okada, T., Ando, K., Taruya, T., & Matsumoto, T. (2007). Violent recidivism among mentally disordered offenders in Japan. *Criminal Behaviour and Mental Health, 17*, 137–151. http://dx.doi.org/10.1002/(ISSN)1471-2857

***Cogent Psychology* (ISSN: 2331-1908) is published by Cogent OA, part of Taylor & Francis Group.**