Impaired neuropsychological profile in homicide offenders with schizophrenia

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ABSTRACT

Background: Our ability to predict and prevent homicides committed by individuals with schizophrenia is limited. Cognitive impairments are associated with poorer functional outcome in schizophrenia, possibly also homicide. The aim of the current study was to investigate global and specific cognition among homicide offenders with schizophrenia (HOS).
Methods: Twenty-six HOS were compared to 28 individuals with schizophrenia and no history of violence (non-HOS), and a group of healthy controls (HC, n = 151). HOS and non-HOS participants were recruited from in- and outpatient units across Norway. An extensive neuropsychological test battery was administered.
Results: HOS participants performed significantly weaker than HC in all cognitive domains. Further, statistically significant differences between HOS and non-HOS participants were found for IQ ($d = 0.52$) and verbal learning ($d = 0.82$), with larger impairments in the HOS compared to the non-HOS group.
Conclusions: Our results indicate that HOS participants show clinically significant impairments in global and specific cognition.

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1. Introduction

1.1. Schizophrenia, violence and homicide

A diagnosis of schizophrenia is associated with an increased risk of committing homicide, it is estimated that individuals with this diagnosis commit 6% of all homicides [1]. The percentage is higher, probably about 20%, in jurisdictions with low homicide rates such as the Scandinavian countries [2].

A meta-analysis of 110 studies investigating risk factors of violence in psychosis concluded that hostile behaviour, non-adherence to psychotherapy, recent drug and alcohol abuse, non-adherence to medication, as well as a history of criminal behaviour were the strongest predictors [3].

Although several risk factors for violence have been detected, current risk assessment tools are limited with regards to predicting violence in general [4], and specifically in schizophrenia [5]. Adding new factors that are of importance to violence in such risk assessment tools could aid violence prediction. Increased knowledge of the characteristics of individuals with a diagnosis of schizophrenia who commit severe violence is a step in the direction of improving current violence risk assessment tools.

1.2. Is cognitive deficit a risk factor for violence in schizophrenia?

Cognitive impairment is a defining feature of [6,7] and associated with functioning [8,9] in schizophrenia. Severe interpersonal violence, such as homicide, is an example of very poor functional outcome. From this follows that impaired cognition may be a predictor of homicide in individuals with schizophrenia. A proposition of lower general intelligence (IQ) as a potential risk factor of violence was made decades ago, although this was a study of violence in criminal offenders and not specifically individuals with schizophrenia [10].

Recent research has yielded optimism when it comes to the inclusion of cognitive factors in future violence risk assessment tools

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[11,12]. A study of 25 homicide offenders with schizophrenia (HOS) [12] found impairments in a measure of general IQ. The researchers also found impairments in specific cognitive domains, including speed of processing, visuoconstructional abilities and a test of reasoning. A follow-up study of the same HOS included a control group of participants with schizophrenia who did not have a history of violence (non-HOS) [13]. The results indicated that HOS had relatively larger impairments than non-HOS in a measure general IQ, memory and executive functioning. IQ as a possible predictor of inpatient violence has also been suggested by Fullam and Dolan [14], who found lower IQ scores among violent than non-violent participants. In a recent review of the literature on violence and neuropsychological function in schizophrenia, Sedgwick, Young, Baumeister, Greer, Das and Kumari [15] concluded that there was evidence for an association between lower IQ, memory and executive function and violence in schizophrenia.

While some studies find a more pronounced generalized deficit in violent than in non-violent schizophrenia, others have focused on specific cognitive domains. A few studies [16–18], but not all [14], have found that poor executive function is associated with increased violence risk. Another study by Corbett, Karyadi, Kinney, Nitch, Bayan and Williams [19] found reduced verbal learning abilities among forensic inpatients with schizophrenia spectrum disorders, with scores about 1.5 standard deviations below the normative mean.

There are several limitations to the existing literature. First, as pointed out by Fullam and Dolan [14], definitions of violence are heterogeneous. While Stratton, Brook and Hanlon [12] focused solely on homicide, Brugman, Lobbestael, von Borries, Bulten, Cima, Schuhmann et al. [11] investigated verbal and physical violence collapsed. Second, we cannot draw inferences about violence risk in schizophrenia from studies of criminal offenders without mental illness [10,16]. Third, cognitive deficit as a risk factor for violence in schizophrenia has often been investigated with few tests [11,19], although there are exceptions [13,15,17,20]. O'Reilly, Donohoe, Coyle, O'Sullivan, Rowe, Losty et al. [20] applied the Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS) Consensus Cognitive Battery (MCCB) in a study of a forensic population with schizophrenia. They found that neurocognition and social cognition predicted inpatient violence over a 12 month follow-up period. Social cognition and neurocognition accounted for 34% of the variance in violence after controlling for age and gender. However, both those who committed violence during the follow-up period and those who did not had a history of violence prior to being admitted to the forensic hospital. Possibly, institutional violence could have other causes than non-institutional violence, suggesting that situational factors can be particularly important in institutional violence [21].

In the current study, some of the challenges presented above are addressed through an extensive investigation of cognition and homicide in schizophrenia. Specifically, we will explore cognitive characteristics among those who have a diagnosis of schizophrenia that have committed homicide. We ask if HOS participants show global cognitive impairments compared to non-HOS and healthy controls (HC). In addition, we will examine if HOS participants show specific cognitive impairments in the executive functioning and verbal learning domains.

2. Material and methods

2.1. Participants

The HOS study is a cross-sectional comparative study. It was conducted at Vestre Viken Hospital Trust in Norway, in collaboration with a number of in- and outpatient units across the whole country. Data were collected by the first author between October 2015 and June 2017.

Participants were two groups of individuals with a diagnosis of schizophrenia or schizoaffective disorder (Table 1). Twenty-six of them were sentenced to compulsory mental care for homicide or homicide attempt (HOS group), and 28 had no history of interpersonal violence (non-HOS group). Diagnostic evaluations were made by clinicians at collaborating units prior to inclusion in the current study and were based on the *International Statistical Classification of Diseases and Related Health Problems (ICD-10)* [22]. Participants were excluded if they had insufficient knowledge of Norwegian language, i.e. were unable to undergo clinical interviews and cognitive testing in Norwegian. Norwegian language skills were evaluated qualitatively before the participant signed informed consent. One HOS who was eligible for participation was excluded due to insufficient comprehension of Norwegian.

At the time of inclusion, all participants received antipsychotic medication (Table 1). Medication *Defined Daily Dose* (DDD) was calculated for each participant according to World Health Organization (WHO) guidelines [23]. Information on participants' background, including illness history and violent episodes (HOS group), was available from medical records and participants' treating clinicians.

To maximize the number of eligible participants for the HOS group, patients were recruited regardless of time since the violent offense. Both participants who had committed homicide and homicide attempt were included in the HOS group, because it is often arbitrary or circumstantial whether a severely violent act towards another person is lethal or not.

Participants were initially informed of the study by their treating clinician, and received further information by the first author upon

Table 1
Demography and clinical data.

	HOS, n = 26	Non-HOS, n = 28	HC, n = 151
Age	38.2 (7.3)	36.7 (10.1)	34.1 (8.9)
Sex, male[**]	25 (96%)	25 (89%)	76 (50%)
Education, years[**]	9.6 (2.2)	11.1 (1.6)	12.9 (2.5)
Diagnosis	23 schizophrenia	25 schizophrenia	–
	3 schizoaffective	1 schizoaffective	
Illness duration, years	15.7 (6.7)	13.7 (10.1)[a]	–
Medication, DDD[*, b]	1.84 (0.80)	1.36 (0.64)	–
Time since offense, years	6.5	–	–
Norwegian native language[*]	15 (57.7%)	24 (85.7%)	–
Inpatients[**]	16 (61.5%)	3 (10.7%)	–
PANSS positive (min–max 4–28)	7.2 (4.1)	7.5 (4.7)	–
PANSS negative (min–max 6–42)	10.2 (5.2)	8.1 (2.8)	–
PANSS disorganized (min–max 3–21)	5.7 (2.0)	4.8 (1.7)	–
PANSS excited (min–max 4–28)[**]	5.1 (1.5)	4.2 (0.5)	–
PANSS depressed (min–max 3–21)	6.3 (3.6)	7.0 (2.8)	–

[a] N = 27.
[b] DDD = defined daily dose [23].
[*] *p* < .05.
[**] *p* < .01.