

Schizophrenia and violence: realities and recommendations

Steven M. Silverstein*, Jill Del Pozzo, Matthew Roché, Douglas Boyle
and Theresa Miskimen

*The Violence Institute of New Jersey, at Rutgers, The State University of New Jersey, Piscataway,
NJ, USA*

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Published findings on the relationship between schizophrenia and violence have been mixed, due to differences in study design and quality. In this review, we address the issue with an emphasis on characterizing who is most likely to be violent and when. We conclude that: (1) individuals with schizophrenia are at an increased risk for violence due to specific psychotic symptoms; (2) this risk is increased by brain abnormalities, psychiatric comorbidities, and demographic factors that are not specific to schizophrenia; (3) the majority of violent offenses committed by people with schizophrenia are indistinguishable from offenses committed by others; and (4) despite our knowledge of factors related to increased violence risk and the existence of effective treatments to mitigate this risk, valid risk assessment instruments for this population are lacking, and treatment strategies are rarely employed at any level of psychiatric care. In short, while most people with schizophrenia are not violent and violence committed by people with this condition accounts for only a small percentage of overall violent crime, there is nevertheless a significantly increased risk for violence among subgroups in this population. This has implications for people living with people with schizophrenia, mental health professionals, administrators of psychiatric care facilities, law enforcement personnel, the court system, and policymakers.

Keywords: violence; psychosis; schizophrenia; psychopathy; antisocial personality disorder

Introduction

Reports of violence committed by people with schizophrenia commonly appear in the media, often in sensationalized form. These reports are often followed by calls for more aggressive treatment of mental illness as a way to reduce violent crime (Richard-Devantoy, Olie, & Gourevitch, 2009). The assumption behind this view is, of course, that psychotic symptoms or psychotic disorders increase the risk for violence. In this review, we examine the extant research literature to determine whether there is support for this popularly held belief. In doing so, we address and reconcile the conflicting findings from past studies so that the field can move away from a simple ‘Yes/No’ approach to the question, and toward a fuller understanding of the circumstances under which the risk for violent behavior is increased in people with schizophrenia. We address two issues in detail: (1) are there people with schizophrenia who are at increased risk for violence, and if so, what are the clinical state, trait, biological, and contextual factors related to violence in this sub-population?; and (2) which features of a violent crime, if any, can be used to raise suspicion that the perpetrator was someone with schizophrenia? This review will

*Corresponding author. Email: steven.silverstein@rutgers.edu

cover risk factors inherent to both community and treatment environments, and will also provide recommendations as to what may be effective in reducing violence in these settings. As such, this information has implications for people living with people with schizophrenia, mental health professionals, administrators of psychiatric care facilities, law enforcement personnel, the court system, and policymakers.

Review of the evidence on risk factors for violence related to psychosis

Diagnosis as a risk factor

A meta-analysis of 204 studies based on 166 independent data sets found that psychosis was associated with a 49–68% increase in the odds of violent behavior (Douglas, Guy, & Hart, 2009). However, this meta-analysis also found wide variation in violence estimates, as a function of the nature of the population studied, the study design (e.g., the nature of the control group, the time interval studied), and definitions of violence and of psychosis (e.g., having any symptoms vs. meeting full diagnostic criteria for a disorder). Representative examples of how these factors can influence data on violence and schizophrenia can be seen in the following sections.

An influential study that is often cited by consumer (patient) advocates is the MacArthur Violence Risk Assessment Study (MVRAS; Monahan et al., 2001). The MVRAS was a multisite study of violence in the community that followed a sample of 1136 patients, ranging in age from 18 to 40 years, who were recently discharged from psychiatric inpatient units with diagnoses of psychotic, mood, substance-use, or Axis II disorders. Patient interviews were conducted at three time points (during hospitalization, 10 weeks, and 20 weeks post discharge) and patient-nominated collateral informant interviews were conducted twice (at 10 and 20 weeks). In addition, official records (arrest and hospital) were reviewed to gather clinical, historical, situational, and dispositional information. Violence was defined as acts that resulted in physical injury, sexual assaults, or assaults or threats that involved a weapon (MacArthur Research Network, 2001). The following factors emerged as predictors of violence in the follow-up period: the seriousness of prior crimes and frequency of prior arrests; younger age; male gender; unemployed status; living in a disadvantaged neighborhood; having been abused as a child (with increased seriousness and frequency being linearly related to a greater likelihood of post-hospital violence); having a father who was a substance abuser or who left home before the child was 15; poor anger control; violent fantasies; history of loss of consciousness (head injury); and involuntary status in a psychiatric hospital. However, a diagnosis of schizophrenia predicted a lower likelihood of post-hospital violence, whereas personality, adjustment, and substance-abuse disorders were all associated with increased violence. Moreover, patients with schizophrenia had lower rates of post-hospital violence than those with bipolar disorder or depression. These data were widely interpreted as indicating that psychotic symptoms and disorders do not increase risk for violence.

However, after its initial publication, criticisms of the MVRAS began to appear. One was that the low rate of violence in schizophrenia was an artifact of selection bias. For example, many schizophrenia patients were rehospitalized or jailed during the follow-up period, and data from these subjects were not collected. The study also did not include patients in forensic hospitals, jails, or prisons, or who were homeless – all of whom would be expected to have a higher prevalence of violent behavior, and many of whom could be expected to have schizophrenia (Torrey, Stanley, Monahan, & Steadman, 2008). Moreover, a published report one year later indicated that the refusal-to-participate rate

for individuals with schizophrenia in the original MacArthur Foundation study paper was 43.7% (Monahan & Appelbaum, 2000), which was much higher than for other diagnoses. Also, violence in schizophrenia is related to paranoia, hostility (a trait), and anger (a state) (see below, state vs. trait factors section), and patients with these characteristics are less likely to participate in research (Torrey et al., 2008).

In contrast to the MVRAS, other large studies have found a link between schizophrenia and violence risk. For example, although the prevalence of schizophrenia is typically estimated to be approximately 1% of the population (Avila, Thaker, & Adami, 2001; McGrath, Saha, Chant, & Welham, 2008), Shaw, Hunt, Flynn, Meehan, Robinson, Bickly et al. (2006), in a study of 1594 homicide offenders, reported that 5% were diagnosed with schizophrenia. Wallace et al. (1998), in a study linking court and psychiatric records, reported similar findings, but noted that substance abuse contributed to violence in most crimes for which people with schizophrenia were convicted. Swanson and colleagues (1990), in an epidemiological study, determined that the one-year prevalence rate of violent behavior (defined as hitting a partner, hitting a child, physically fighting with others, and/or using a weapon during a fight) in schizophrenia was 8.4%, while it was only 2.1% in people without any psychiatric disorder. In a study of 205 seriously mentally ill inpatients, most of whom were diagnosed with schizophrenia, Hodgins, Alderton, Cree, Aboud, and Mak (2007a) found that, six months prior to the interview, 49% of the men and 39% of the women reported engaging in aggressive behavior (defined as throwing an object at someone; pushing, shoving, grabbing, slapping, kicking, biting, choking, or hitting someone; trying to physically force someone to have sexual relations against his or her will; threatening someone with a knife, gun, or other weapon; and any other violent act toward another person as reported), and 47% of the men and 17% of the women had been convicted of at least one violent crime (defined as violence against a person, sexual offences, and robbery). Additionally, using Sweden's public health and criminal record databases, Fazel Långström, Hjern, Grann, and Lichtenstein (2009a) cross-referenced all hospital admissions and convictions (for homicide, assault, robbery, arson, a sexual offense, illegal threats, or intimidation) from 1973 to 2006 for a sample of 8003 people with schizophrenia and 80,025 people without schizophrenia. Their results indicated that 13.2% of people with schizophrenia had at least one violent offense compared with 5.3% of general population controls. Furthermore, they found that 27.6% of the schizophrenia patients with comorbid substance abuse were convicted for a violent act versus 8.5% of patients without substance abuse, thereby highlighting how violence risk is magnified by comorbid substance abuse. Importantly, however, Brennan, Mednick, and Hodgins (2000), in a study of a Danish birth cohort born between 1944 and 1947 ($N = 358$), found that, even after controlling for substance abuse and demographic factors, people with schizophrenia have higher arrest rates for violent crimes than people in the general population [odds ratio (OR) for men = 2.0, for women = 7.5].

The latter conclusion is supported by a meta-analysis that included data from 20 studies and 18,423 people (Fazel, Gulati, Linsell, Geddes, & Grann, 2009b). This analysis confirmed that risk of violence was raised in individuals (of both genders) with psychosis and substance-abuse comorbidity (OR = 8.9] compared with general population controls. This 8.9 OR is similar to that in substance abuse without psychosis. Violence risk was lower in persons with psychosis without substance-abuse comorbidity, but still higher than people in the general population, with the risk doubled for men, and almost 20 times higher in women, with psychosis (OR = 2.1; 2.8 in men, 19.9 in women). This meta-analysis also found that risk for homicide is higher regardless of substance-abuse status

(0.3% vs. 0.02% in the general population). Importantly, across studies, risk level for violence was not associated with the choice of outcome measure, type of psychosis, study location, or dates of study.

Another large study, the Epidemiologic Catchment Area (ECA) Study (Swanson et al., 1990), examined the self-reported commission of four types of violence (hitting a child, hitting a partner, physically fighting with others, and using a weapon during a fight) in the past year in 10,059 respondents from the NIMH (USA) ECA project from 1980 to 1983. Of those who reported violent behavior, more than half met DSM-III criteria for one or more psychiatric disorders. Subjects with substance-abuse disorders were more than twice as likely as those with schizophrenia to report violent behavior (21.30% vs. 8.36%). However, when schizophrenia co-occurred with substance abuse or a mood disorder, rates of violent behavior rose to 30.33% and 21.09%, respectively. The findings regarding mood disorders are consistent with those of Hodgins and Riaz (2011), but conflict with other data, suggesting that depression reduces the risk of violence in schizophrenia (Coid et al., 2013; Dean et al., 2007). Of note, in the ECA study, the risk of violence associated with schizophrenia *decreased* by half when schizophrenia was comorbid with an anxiety disorder (4.29%). It is possible that differences in anxiety can account for the varying findings with depression noted above, as depression and anxiety are often, but not always, comorbid (Lamers et al., 2011). Mania may also more consistently contribute to violence than depression (Volavka, 2013).

However, even if schizophrenia-related violence risk is more of a clinical issue for a subgroup of individual patients than it is a public safety issue (Shaw, Buchanan, & Fahey, 2002) (relative to, for instance, concentrated poverty (Boyle & Hassett-Walker, 2008) or substance-abuse-related violence), it still has many implications for patients, their families, and communities. For example, 77.4% of caregiver relatives of people with a psychotic disorder reported being the victim of, or witnessing, significant aggression (verbal, physical, self-directed, or sexual) by the identified patient, and 52% of these victims reported incident-related symptoms of PTSD (Loughland et al., 2009). Moreover, most mental health service providers do not assess for or manage risk of violence, or provide treatments for violence reduction (Hodgins et al., 2009), leading to suboptimal treatment and persistence of unnecessarily elevated violence risk. Compounding the problem, many patients are placed in forensic psychiatric settings, jails, or prisons, where there are significant barriers to obtaining adequate mental health care (Reingle Gonzalez & Connell, 2014). In the United States, approximately 15% of state prisoners and 24% of jail inmates meet the criteria for a psychotic disorder, and there are three times as many men and women with mental illness in prisons as in mental health hospitals (James & Glaze, 2006; Torrey, Kennard, Eslinger, Lamb, and Pavle 2010). Additionally, self-reports of violent behavior are not exaggerated; they *underestimate* rates of violence compared to those of informants (Steadman et al., 1998), and patients who are not receiving treatment commit the majority of the violent acts associated with schizophrenia (Langeveld et al., 2014; Large & Nielssen, 2011). In short, despite the relatively low rate of schizophrenia in the population, and the fact that most patients are not violent, there is a group of people with this diagnosis who are at increased risk for violence, and this risk is often not addressed with appropriate assessment, prevention, and treatment. In the next sections, individual difference, state-trait, and neurobiological factors, as they relate to violence risk, will be reviewed, in an attempt to refine our understanding of those factors most related to risk.

State versus trait factors

As part of the NIMH Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE) study, a study comparing the effectiveness of second- versus first-generation antipsychotic medications, 1410 patients receiving outpatient treatment for schizophrenia were interviewed about violent behavior in the past six months (Swanson et al., 2006). Two types of violence were coded: minor violence, defined as simple assault without injury or weapon use; and serious violence, defined as assault resulting in injury or involving use of a lethal weapon, threat with a lethal weapon in hand, or sexual assault. A composite measure of any violence was also analyzed. The six-month prevalence rate for any type of violence was 19.1%, and for serious violence it was 3.6%. For minor violence, co-occurring substance abuse and interpersonal and social factors were predictors. Psychotic symptoms (e.g., hallucinations, delusions, persecutory ideation) increased the risk of both minor and serious violence, whereas negative symptoms (e.g., social withdrawal, anhedonia, low motivation, low energy) lowered the risk of serious, but not minor, violence. Among patients high in negative symptoms and low in psychotic symptoms, the violence rate over the six-month period was close to zero. However, among schizophrenia patients low in negative symptoms and with three or more psychotic symptoms, 28.4% of patients engaged in aggressive behavior. These data are consistent with those of Hodgins and Riaz (2011). It must be noted, however, that factors besides the number of psychotic symptoms are important; the content of the symptom is also relevant. For example, delusions of being spied on, persecution, conspiracy, and jealousy, as well as those involving the belief that significant others have been replaced by imposters (i.e., Capgras syndrome) are most associated with violence; and this is especially the case when these delusions co-occur with hostility, suspiciousness, agitation, or excitement (Cheung, Schweitzer, Crowley, & Tuckwell, 1997; Coid et al., 2013; Flannery, Penk, Irvin, & Gallagher, 1998; Nestor, Haycock, Doiron, Kelly, & Kelly, 1995). Delusions not associated with hostility or persecutory fears are less associated with violence. In patients who are characterized by what used to be called chronic undifferentiated schizophrenia (i.e., without systematized delusions), Addad, Benezech, Bourgeois, and Yesevage (1981) found that crimes against property were more likely than violence against people, suggesting that paranoia at the time of a violent offense may increase the likelihood of interpersonal violence.

Another noteworthy finding of the CATIE study involved the relationship between violence, and suicidal threats and attempts in both males and female community-dwelling patients with schizophrenia. Witt, Hawton, and Fazel (2014) reported that past suicidal threats and attempts increased the rate of violent behavior in male schizophrenia patients by 3.8%, compared to a 2.8% increase in the non-suicidal group. In female patients, past suicidal threats and attempts raised the OR for violence to 9.4%, compared to a 4.4-fold increase in the non-suicidal patient group. This suggests that suicidal behavior and violence are both related to the more general factor of impulsivity, and that evidence of severe impulsivity as expressed through severe aggression toward the self can serve as a risk indicator for violence toward others (Witt, Van Dorn, & Fazel, 2013).

Further evidence comes from a follow-up study by Steadman et al. (1998). They noted that in acutely ill patients, predictors of violence include psychotic symptoms, especially paranoia, as well as anger and agitation. Moreover, 62.8% of discharged patients who committed a violent act within one year after discharge did so within 20 weeks. However, in stabilizing or stable patients, predictors of violence included a history of conduct disorder or antisocial personality disorder, prior violent behavior, and substance abuse.

These data suggest that there are at least two pathways to violence in schizophrenia: one related to increased anger as well as psychotic symptoms such as delusions or hallucinations, and the other related to trait antisocial features (Volavka & Citrome, 2011). We will examine the latter in more detail in the next section. The conclusion from the material reviewed above, however, is that a number of factors increase the likelihood that a person with a psychotic disorder will commit a violent act. These include stable traits such as a history of conduct or antisocial personality disorder, impulsivity, and hostility, as well as state effects such as substance abuse, psychotic symptoms (especially certain types of delusions), and anger. Some features, such as negative symptoms and anxiety, decrease risk.

Schizophrenia and psychopathy

The association between schizophrenia and psychopathy has been discussed for 100 years, and it is known that adolescents with conduct disorder have an increased risk for developing schizophrenia. For example, in a 10-year Danish follow-up study of 780 participants ranging in age from 15 to 19 years old, Gosden, Kramp, Gabrielsen, Andersen, and Sestoft (2005) found that violent adolescent offenders are 4.59 times more likely to develop schizophrenia within 10 years than nonviolent adolescent offenders, with rates of 3.3% versus 0.7%. Furthermore, among teenagers who sought treatment for substance abuse between 1968 and 1972 (a population with high comorbidity with conduct disorder), four times more males and eight times more females had been hospitalized for schizophrenia by age 50 compared to rates in the general population (Hodgins, 1992; Wallace, Mullen, & Burgess, 2004).

Researchers have found that hostility, suspiciousness, and uncooperativeness were related to aggressive behavior in schizophrenia patients (see previous section), but only in those low in psychopathy. In contrast, patients high in psychopathy had a high probability of aggressive behavior *regardless of symptoms* (Abushua'leh & Abu-Akel, 2006). In a related finding, in the CATIE study described above, antipsychotic medication adherence was strongly related to the extent of violence reduction, but only for patients without a history of conduct problems (Swanson et al., 2008a). These data indicate that in many patients with schizophrenia, violence is driven by antisocial tendencies and not by psychosis. Therefore in such patients, antipsychotic medication should not be expected to reduce violent behavior (with the possible exception of clozaril; see treatment section below).

Based on data linking either psychotic symptoms and anger on the one hand or antisocial personality traits on the other to violence in schizophrenia, Hodgins (2008) proposed three subtypes of violent offenders with schizophrenia. The first type is defined as early-start offenders (Type I). They are characterized by a history of conduct disorder and aggressive behavior in childhood and adolescence. About 40% of violent offenders with schizophrenia fall into this category. Compared with nonviolent patients, they have better cognitive flexibility and verbal skills, but poorer attention, more impulsivity, and a tendency to misinterpret emotionally neutral faces as angry. The next subtype includes patients whose aggression starts after psychosis onset (Type II). This subtype may be related to substance abuse and they are more likely to kill (23.9%) than Type-I patients (10.4%). The last subtype (Type III) is older men, in their late 30s or older, with no history of violence or antisocial behavior, who kill, usually a caretaker. There is far less research on this subtype than on the other two types (Hodgins, 2008), and the prevalence rates of Type II and III patients remain unclear. However, the CATIE study data indicated that the prevalence of violence among

schizophrenia patients without a history of child conduct problems was 14.6% (compared with 28.2% for patients with childhood conduct problems) (Swanson et al., 2008b). Interestingly, the distinction between Type I and Type II cases can be observed as early as in the first episode of psychosis: at first episode a high level of prior delinquent behavior directly predicts violence, whereas for people with lower levels of delinquency, this factor interacts with level of positive symptoms to predict violence (Winsper et al., 2013).

First episode of psychosis: a critical risk period

Among people with a psychotic disorder, risk for violence is particularly high during the first episode of psychosis, especially prior to treatment, with approximately one-third of this population committing an act of minor violence (Nielsen, Malhi, McGorry, & Large, 2012). One factor related to this is the increased impulsivity that is present prior to treatment. In their review of 20 studies exploring the incidence of violence at different stages of psychosis, Nielsen et al. (2012) found that 49% of violent suicide attempts, 54% of the major self-mutilations, 39% of the homicides, and 38% of the nonfatal serious assaults were committed by people experiencing an untreated first episode of psychosis. In addition, a significant percentage of first-episode patients commit an act of less-serious violence prior to initial treatment. These findings support the need for early intervention to reduce the duration of untreated psychosis – which is often one to two years (McGlashan, 1999), especially given preliminary evidence that longer duration is associated with increased risk for homicide (Látalová, 2014).

Nielsen and Large (2010) reported that the greatest risk for homicide is in first-episode patients prior to their initial treatment for psychosis, with 38.5% of all psychosis-related homicides occurring during this period. Viewed differently, about 1 in 700 people with psychosis commit a homicide before treatment, compared to a rate of about 1 in 10,000 patients with established diagnoses who have already received treatment (Nielsen & Large, 2010). While homicide is a rare event, awareness of the increased risk of homicide in patients in the first episode of psychosis should inform and alert professionals about the treatment of emerging psychosis.

Victimization and violence

People with schizophrenia are more likely than people in the general population to be victims of crime, especially physical assaults (Hodgins et al., 2007a; Maniglio, 2009). Notably, victimization is among the strongest risk factors for violence in general, and as others have reported, in individuals with schizophrenia the risk of being victimized is higher than the risk of violence perpetration (Choe, Teplin, & Abram, 2008; Kooyman, Dean, Harvey, & Walsh, 2007). That said, researchers have also found that their own aggressive behavior is the strongest predictor of victimization among people with schizophrenia (Hodgins et al., 2007a; Silver, Goodman, Knoll, Isakov, & Modai, 2005; Walsh et al., 2003). Therefore, if we are able to reduce the rate of aggressive behavior, we should, in turn, reduce the rate of victimization, although this cannot be expected to eliminate all victimization of people with schizophrenia.

Subclinical psychosis and violence

It is easy to dismiss the data on schizophrenia and violence by pointing out that schizophrenia occurs in less than 1% of the population, and so, given limited funding, public health

efforts to reduce violence should focus on other risk factors. However, the link between psychosis and violence extends beyond people diagnosed with schizophrenia into the general population. Approximately 5.5% of the adult population reports occasional psychotic experiences (typically auditory hallucinations) (Stefanis et al., 2002), and when hallucinations in all sensory modalities are considered, recent estimates are as high as 15% (Hill & Linden, 2013). More important, these experiences, even in the absence of meeting criteria for a psychiatric disorder, are associated with a fivefold increase in risk for assaulting another person, and with increased rates (1.4 times to 15.2 times) of problems with the police and imprisonment (Mojtabai, 2006; Rössler et al., 2007). Furthermore, the highest 10% of scorers on the Schizotypal Personality Questionnaire (SPQ) – which measures attenuated psychotic symptoms such as magical thinking and distorted perceptions of the self or the world – report higher scores on self-reported measures of crime and violence (Raine, 1991). In addition, children with high SPQ scores also score high on measures of reactive aggression (Raine, Fung, & Lam, 2011). As noted above with adult schizophrenia patients, victimization mediates the relationship in children: children with schizotypal features are picked on presumably because they are odd, shy, or different, and then they are more likely than others to react aggressively to this provocation (Raine, 2013).

Socio-demographic risk factors for violence

A number of nonclinical risk factors for violence in people with schizophrenia have been identified, including male gender, young age, substance abuse, low socioeconomic status (living in a socially disadvantaged neighborhood; Silver, 2000), and past conviction for a violent offense (Hodgins & Riaz, 2011; Langeveld et al., 2014; Large & Nielssen, 2011; Witt et al., 2013). Since schizophrenia is overrepresented in males and low SES populations, and since there is a high rate of substance abuse in schizophrenia, it is often stated that although the rate of violence may be increased in schizophrenia, these findings are all due to these other demographic factors. Indeed, the strongest predictors of violent recidivism for mentally ill offenders are the same as those for non-mentally ill violent offenders, and the presence of a criminal history (including one that antedates the onset of psychosis) is a stronger predictor of violence than psychotic symptoms (Bonta, Law, & Hanson, 1998). However, even when these factors are taken into account, the rate of schizophrenia-associated violence is higher than in the general population (Fazel et al., 2009a, 2009b; Hodgins et al., 2007a; Steadman et al., 1998; Swanson et al., 1990; Volavka, 2013; see above). Much of this increased risk may be due to antisocial personality features and related traits (e.g., impulsivity), as discussed above. There are also data indicating that differences in race or ethnicity are related to rates of violence (Mason, Medford, & Peters, 2012), although the nature of these differences has yet to be adequately explained (Bruce, Cobb, Clisby, Ndegwa, & Hodgins, 2014). Part of the discrepancy may reflect findings of higher rates of psychotic disorders, substance abuse, and violence in marginalized groups experiencing chronic social defeat (Selten, Van Der Ven, Rutten, & Cantor-Graae, 2013; Staub, 1996), as well as racial differences in rates of commitment to psychiatric versus forensic settings (Hawthorne et al., 2012) that can affect treatment opportunities and outcomes, subsequent victimization experiences, and longitudinal course.

Other risk factors for violence in psychotic patients

In addition to the factors noted above, poor self-care skills, family functioning, and community social adjustment (Flannery et al., 1998) are related to increased risk for

violence. Some studies have also identified cognitive predictors. For example, rigid thinking, poor executive functioning (Krakowski & Czobor, 2012; Silverstein, Schenkel, Valone, & Nuernberger, 1998), and either poor facial emotion recognition or a reduced ability to discriminate intensities of facial emotions (or both) (Demirbuga et al., 2013; Silver et al., 2005) have been identified as risk factors for violence in schizophrenia (perhaps related to a lack of empathy; see Raine, 2013). However, some studies found higher intellectual functioning in violent, compared to nonviolent, individuals with psychotic disorders, likely because these patients are often characterized by paranoia (Nestor et al., 1995). Therefore, it may be that when violence is related to psychosis, it can be categorized roughly by two types, consistent with trends noted among offenders in general (Douglas, Burgess, Burgess, & Ressler, 2013): (1) a group of mostly paranoid and more intelligent patients who have the ability to plan and carry out acts based on their delusional beliefs (Nestor et al., 1995); and (2) a more reactive type that reflects lower intelligence and poor planning abilities (Raine, 2013). In addition, in patients with histories of violence that date back to childhood, where violence may be assumed to be driven by antisocial personality features rather than by psychosis, scores on tests of dorsolateral prefrontal cortex functioning are actually better, and scores on tests of orbitofrontal cortex functioning are worse, compared to patients with a later onset of violence (Naudts & Hodgins, 2006). This suggests that in Hodgins's (2008) Type I offender, there is intact planning ability but impairment in consequence-based learning, consistent with much data on adults with antisocial personality disorder (Raine, 2013).

Neurobiological risk factors

In recent years, efforts to understand causes of violence in people with psychotic disorders have included studies of brain structure and function. The brain imaging literature generally indicates that violent patients with schizophrenia are characterized by many of the same abnormalities found in violent offenders without psychosis (Cope et al., 2014; Raine, 2013; Schiltz, Witzel, Bausch-Hölterhoff, & Bogerts, 2013; Siever & Davis, 2004; Soyka, 2011; Wahlund & Kristiansson, 2009). These include abnormalities in the frontal and temporal lobes, as well as the amygdala and hippocampus. Note that while findings of reduced hippocampal volume are common in studies of schizophrenia, among psychotic patients with antisocial and violent histories dating back to childhood, hippocampal volumes are *increased* compared to nonviolent patients (Naudts & Hodgins, 2006), again supporting the hypothesis of increased planning abilities in patients where violence is driven by psychopathy as opposed to psychosis. A consistent finding in the imaging literature among violent patients with psychotic disorders is abnormal connectivity between frontal and limbic structures (Yang et al., 2010), reflecting either reduced control over aggressive impulses (when hypofrontality is present) or excessive abilities to plan and carry out violent acts (when hyperfrontality is present) (Raine, 2013).

Electroencephalographic (EEG) findings also provide evidence of specific brain abnormalities in violent offenders with schizophrenia. In a study of resting-state EEG, Schug et al. (2011) found that murderers with schizophrenia demonstrated increased left-hemispheric fast-wave EEG activity relative to nonviolent schizophrenia patients, a finding consistent with generalized overarousal. The overall conclusion from these biological studies is that: (1) studies have consistently identified brain signatures (structural and functional) of increased risk for violence in people with schizophrenia; (2) in most cases, these are similar to what is observed among violent offenders without schizophrenia (Raine, 2013); but (3) this nonspecificity should not be interpreted as indicating lack of

utility. Increased use of brain imaging and EEG methods may add significantly to violence risk prediction in psychotic patients, regardless of whether the predictor variables have diagnostic specificity.

Are there typical characteristics of violence acts committed by psychotic patients?

Studies have found only weak relationships between schizophrenia, psychotic symptoms, and specific crime characteristics. An example of this is a study by Laajasalo and Häkkänen (2006) examining factors related to excessive violence among 125 homicide offenders with schizophrenia. They observed that while 92.8% of the sample had at least one psychotic symptom (delusions or hallucinations) at the time of the homicide, motivation to kill was related to psychotic symptoms in 66% of the sample. Moreover, in the group that was motivated by their psychotic symptoms, excessive violence was most closely related to the presence of both hallucinations and delusions (especially involving paranoid themes), occurring in 37.8% of this more psychotic group, or 25% of the entire study sample. These results are similar to those reported by Taylor (1998), where in 90% of cases of 'serious violence' (but not necessarily homicide) committed by people with psychosis (the majority of whom had schizophrenia), the presence of delusions (especially involving paranoia, and especially among people in intimate relationships) was rated as driving the violent behavior. Complicating the picture, Laajasalo and Häkkänen (2006) found that excessive violence among people with schizophrenia was a feature of homicides mainly when the crime was not committed alone, and when there was a previous homicide history. In short, while excessive violence during a homicide was associated with the co-occurrence of active hallucinations and delusions, this pattern did not characterize the majority of homicide offenders with schizophrenia, and was mediated by whether the offender was the sole perpetrator, as well as prior history of homicide.

In Toch and Adams' (1989) study of 1833 prisoners with mental health treatment records, prisoners with psychotic disorders were overrepresented primarily in seven offender categories. One was termed the *acute disturbed exploder*, and was characterized by extreme and often bizarre acts of violence. Fifty-three percent of this group had a psychotic disorder diagnosis, and they were typically psychotic at the time of their arrest. Interestingly, 66% of this group had few prior arrests, and half had no history of violence. This profile fits the Type II pattern identified by Hodgins (2008) (see above). Prisoners with psychotic disorders also constituted 53% of a second type, called the *compensatory offender*. These prisoners tended to have intellectual deficits, tended to be unmarried, often committed violence in the context of robberies, had long violence histories, and were often under the influence of drugs or alcohol at the time of their violent offense. Another category, termed the *composite career offender*, consisted of mostly older offenders with long histories of both violence and mental health problems, along with a history of having been incarcerated. Thirty-seven percent of this group was diagnosed with a psychotic disorder. The largest group of mentally ill violent offenders was the *chronic disturbed exploder* type, which, as the name would suggest, had long histories of violence. Prisoners with psychotic disorders represented 28% of this group. Because onset of violent behavior in this group typically antedates the onset of psychosis, this group fits with Hodgins (2008) Type I offender, in which violence is driven by antisocial personality rather than psychosis, although psychosis may potentiate violent behavior. Prisoners with psychotic disorders were also overrepresented in a fifth category, the *disturbed sex offender*, comprising 25% of that group. A limitation of the Toch and Adams study from the point of view of this review is that specific diagnoses were not included as a

study variable and so it is not clear what percentage of the patients with psychotic symptoms had schizophrenia.

Several studies have noted that homicidal behavior committed by people with schizophrenia is most likely to be directed toward people well known to the offender, and most often takes place in the home setting. For example, among prisoners with psychotic disorders, victims were more often blood relatives than strangers, and were parents in half the cases studied in one investigation (Nestor, 1992). In a Finnish study by Joyal, Putkonen, Paavola, and Tiihonen (2004), 86% of the offenders had a personal or professional relationship with the victim, and 47% of the offenders assaulted someone from their own household, including parents and roommates, and 78% of the incidents took place in a private residence. Only 14% of the assaults were directed against a stranger. However, people with both schizophrenia and antisocial personality disorder were more likely than those with schizophrenia alone to assault nonmembers of their household and nonfamily members. Similar findings were obtained by Pera and Dailliet (2005) in a Belgian study of 99 mentally ill homicide offenders. In this sample, murders committed by a family member were more common in the group of psychotic patients (most of whom had schizophrenia) compared to any other diagnostic group. However, accidental murders were much more likely to be committed by psychotic patients (10.61% vs. 0.76% in all other groups), most often in the context of a spree murder.

Although the data cited in the above paragraph may appear to suggest that crimes committed in the home by family members – especially where there is a family member with schizophrenia – are more likely than not to be committed by the person with schizophrenia, it is important to note that this pattern is not different from characteristics of homicides in general. For example, Santtila, Häkkänen, Canter, and Elfgrén (2003) examined characteristics of 502 Finnish homicides between 1980 and 1994 and found that the typical homicide offender was male and socioeconomically disadvantaged, and killed a person he knew, in familiar surroundings.

While, as noted above, people with schizophrenia are at increased risk for committing homicide, most homicides are not committed by people without schizophrenia, even among people with a psychiatric disorder. For example, in a study of adolescent homicide offenders in Finland ($N = 57$), only 7% were diagnosed with schizophrenia, whereas over half of 17- and 18-year-old offenders had personality disorders (Hagelstam & Häkkänen, 2006). These data may be biased by the fact that very few people diagnosed with schizophrenia meet criteria for the disorder before age 17. However, in another study ($N = 19$), among adult homicide offenders who strangled their victims, 11% were diagnosed as having schizophrenia whereas 89% were diagnosed with a personality disorder (Häkkänen, 2005). Similarly, in a French study of 268 homicide offenders, 10% had schizophrenia, with most of these patients being characterized by significant paranoia [with delusions of persecution (77%) or jealousy (40%)] and disorganization (40%), with substance abuse being involved in many cases (Richard-Devantoy, Chocard, Bouyer-Richard, Duflot, Lhuiller, Gohier & Garré, 2008). With these caveats in mind, the data reviewed above, although they are limited on this topic, suggest that people with psychotic disorders are overrepresented in several offender types, and that the risk of homicide is about 10 times greater in people with schizophrenia than it is in the general population (Eronen, Tiihonen, & Hakola, 1996). However, there is no clear ‘signature’ of a murder or any other type of violent crime by a person with schizophrenia, whether psychotic or not at the time of the offense.

Violence in treatment settings

The setting in which risk for violence is the highest is the psychiatric treatment setting. The risk of injury in public psychiatric hospitals is greater than injury rates for agriculture, mining, manufacturing, transportation, and construction combined (Dinwidde & Briska, 2004). Violence is one of the most significant challenges facing mental health workers and administrators (Bjorkly, 1999) and the prevalence of violence in inpatient settings may be increasing (Daffern & Howells, 2007). Therefore, reducing violent behavior in psychiatric settings is of key importance, especially since much of this can be predicted and prevented. For example, much of the violent behavior on inpatient psychiatric units is preceded by negative staff behavior. External observers coding staff–patient interactions find that poor-quality interactions are the primary antecedent of aggressive/violent events (Bowers et al., 2011). For example, one study found that 82% of assaults on staff members were immediately preceded by an aversive stimulus (e.g., derogatory statement or overly harsh attempt at limit setting) presented to the patient by the assaulted nurse (Wykes & Whittington, 1998). In another study, limit setting, activity demands, and denial of patient requests were antecedents to over 60% of aggressive and violent incidents (Marth, 2009). Increased staff rejection of patients is associated with poorer social competence, greater irritability, and more overt psychotic and cognitive symptoms (Heresco-Levy, Ermilov, Giltsinsky, Lichtenstein, & Blander, 1999).

In contrast, research has demonstrated that positive staff behavior can significantly reduce violent behavior. For example, when patients perceived staff responses as collaborative, validating, and useful, violence and aggression toward staff decreased (Marth, 2009). Furthermore, as staff competence in demonstrating therapeutic interpersonal skills improved, seclusion, restraint, and staff injury declined (Donat, 2002). Finally, the amount of positive comments that patients receive from staff is a strong predictor of overall inpatient program success, and community tenure after hospital discharge (Coleman & Paul, 2001). Therefore, several recommendations have been made to reduce violence in treatment settings, including: (1) administration should train staff in therapeutic methods to better manage interpersonal situations with patients; and (2) staff competence should be fostered via organizational structures that reward effective performance and learning of new skills (Bowers et al., 2011). In the following section, we briefly describe a program that followed these, and other, procedures, and report on its effectiveness, in order to highlight preventive strategies that can be used in other settings.

A staff training program

Silverstein et al. (2006) described a staff training program, with the goal of reducing patient violence. The program was implemented on an inpatient behavior therapy unit for chronic, ‘treatment-refractory’ patients with psychotic disorders. It comprised: (1) eight hours of didactic instruction about schizophrenia, behavior therapy, psychiatric rehabilitation, and communication skills in specific situations; (2) a written assessment of knowledge in these areas; and (3) an *in vivo* dynamic assessment in which staff had to demonstrate specific interpersonal responses as a consequence of patient behavior on the unit. Data on program effectiveness came from two sources: (1) detailed coding of frequency and types of staff–patient interactions during three-week periods before, mid-way-through, and after the staff training program took place (Schenkel, 2006); and (2) observational data collected as part of the standard social learning milieu (Silverstein et al., 2006). Half of the unit staff were trained initially, and the other half were trained

immediately afterward. For each group of staff, training consisted of one two-hour training session per week for four consecutive weeks.

Results indicated positive changes in both staff behavior and patient aggression. Regarding the former, statistically significant increases were observed in the categories of positive verbal statements and therapeutic interactions, and significant decreases were observed in the categories of negative verbal statements and time spent in the nurses' station. It was noted that at the midway point of the training (i.e., after the first half of staff had been trained), improvements were shown only in the trained group; at the end of training of the second group, they had improved in all of the areas that the first group had improved in, and the first group had demonstrated additional improvement relative to their performance immediately after receiving the training. These changes in staff behavior were associated with dramatic changes in patient aggression. For example, following training, there was a 31% reduction in patient verbal aggression, 64% reduction in physical aggression, 30% reduction in bizarre behavior, and a 50% *increase* in patient presence in the unit environment (i.e., a 50% reduction in staying in their own rooms). The latter was presumably due to patient perception of a more therapeutic (and less adversarial) environment. In addition, overall patient functioning, indexed by a composite score including domains such as grooming, bedroom cleanliness, meal behavior, and pro-social behaviors, increased by 17%. These data, which replicate those from earlier programs using more intensive training and observational rating procedures (Beck, Menditto, Baldwin, Angelone, & Maddox, 1991; Paul & Lentz, 1977), indicate that violence among psychotic patients can be significantly reduced by changing patterns of interactions between psychiatric staff and patients. Besides being relevant to family members, and an aspect of much family psychoeducation, this is also relevant for police officers, and so should be incorporated into family treatments as well as crisis intervention training (CIT) for police (Ellis, 2014; Frese & Greek, 2007), to help reduce the number of fatal shootings of people with a serious mental illness.

The violence reduction effects noted above can be further augmented by data-driven treatment planning focusing on specific problem behaviors (e.g., verbal aggression) and targeting their underlying causes (e.g., hyper-arousal, poor social-problem-solving skills), antecedent triggers, and potentially reinforcing consequences (Hunter, Wilkniss, Gardner, & Silverstein, 2008; Wilkniss, Hunter, & Silverstein, 2004a; Wilkniss, Silverstein, & Hunter, 2004b). For example, a study by Donat (1998) demonstrated that mandatory implementation of a behavioral consultation procedure for high seclusion/restraint patients led to a 62% reduction in seclusion/restraint incidents after implementation of a behavior plan resulting from the consultation. In addition, clozapine, but not other antipsychotic medications (e.g., Beck et al., 1997), has demonstrated effectiveness in reducing aggression in psychotic patients (Volavka, 2013), and so strategies that integrate targeted medication use with evidence-based milieu, and group and individual psychological interventions will typically be most effective. Clozapine has also demonstrated effectiveness in reducing aggression in men with antisocial personality disorder, including in those scoring high in psychopathy (Brown et al., 2014). This suggests that this medication may be effective for both Type I and II patients as categorized by Hodgins (2008).

Treatment implications

An obvious, but rarely implemented, implication of the increased risk for violence in schizophrenia is that patients should undergo violence risk assessments as part of standard care. For example, Swanson et al. (2006) reported that each increase of 1 on the Positive

and Negative Syndrome Scale (Kay, Fiszbein, & Opler, 1987) Hostility item (scaled 1–7) raised the odds of serious aggression by 1.65. In light of our review of the literature, we suggest that, in addition to hostility, a violence risk screening should include the assessment of the nature and content of delusions and hallucinations, substance abuse, mood and anxiety symptoms, psychopathy traits, a history of any impulsivity (including directed against the self), and a history of abuse or victimization. Whether the addition of biological variables such as fMRI or EEG data would improve sensitivity remains an open question. However, this is worth exploring because currently available violence risk prediction instruments have not demonstrated impressive predictive validity for people with schizophrenia (Singh, Serper, Reinharth, & Fazel, 2011), and the development of new risk assessment measures is needed. When developing an assessment strategy, it is important to keep in mind that while during an acute psychotic episode, medication and behavior therapy can reduce violence, after an acute episode, medication and a focus on psychosis are insufficient to reduce violence, especially in patients with a history of conduct disorder or antisocial personality disorder. Therefore, recognition of phase of illness should guide the choice of which risk factors are assessed. For inpatients or acutely ill patients with psychotic disorders in other intensive programs (e.g., partial hospital, intensive outpatient program) who are deemed to be at high risk for violence, behavioral interventions and use of clozapine, as described above, should be provided.

After risk has been assessed, treatment should be as personalized as possible. People with schizophrenia who are violent may behave violently for very different reasons, including exploitative attitudes that are part of antisocial personality disorder, substance abuse, responses to hallucinations, paranoid delusions, untreated PTSD stemming from childhood abuse and/or adult victimization, stressful relationships, or consequences of homelessness (Swanson et al., 2002). These causes call for very different treatment approaches, as well as availability of these approaches in community and hospital settings.

For people with schizophrenia at high risk for violence who do not adhere to prescribed treatment, Assisted Outpatient Treatment (AOT) allows courts to order individuals with mental illnesses to comply with outpatient treatment. In spite of the civil liberties issues raised by AOT, recent studies conclude that it reduces suicide attempts and physical harm to self, abuse of alcohol or drugs, physical harm to others, damaged or destroyed property, threatened physical harm to others, arrests, and gun violence (Gilbert et al., 2010; Phelan, Sinkewicz, Castille, Huz, & Link, 2010; Swartz & Swanson, 2004). In contrast, treatment programs such as Assertive Community Teams (ACT) and Intensive Care Management (ICM) teams do not reduce incarceration rates (Hodgins et al., 2009). However, when care focuses simultaneously on psychosis and antisocial behavior, as is the case with Forensic Assertive Community Teams (FACT), reductions in antisocial behaviors are evident (Hodgins et al., 2009). FACT teams, which focus on reducing antisocial behavior, may be able to reduce rehospitalization, arrests, and time in jail, as well as lower rates of both symptoms and aggressive behavior (Cuddeback, Morrissey, & Cusack, 2008; Hodgins et al., 2007b), although more research on their effectiveness is needed.

Conclusions

Individuals with schizophrenia are at an increased risk for violence. This risk is due to a number of factors, some of which are due to psychosis, and some of which are related to comorbidity or associated demographic factors. The most important risk factor related to psychosis is the presence of untreated psychotic symptoms, especially persecutory

ideation and Capgras syndrome. Risk factors related to comorbidity include substance abuse, antisocial personality disorder, and mood symptoms. However, anxiety and negative symptoms both appear to reduce violence risk. Other non-diagnostic clinical risk factors include hostility, poor social skills, a prior history of violence, and a history of being physically or sexually abused. Although low IQ is related to violence in many psychotic patients, IQ by itself is not a predictor because many paranoid patients who commit violent acts have higher than average IQs (Nestor et al., 1995). However, brain imaging findings have now consistently identified structural and functional abnormalities that are associated with violence in people with schizophrenia, even if in most cases these findings are common to violent offenders in general. Greater integration of brain imaging into clinical assessment holds the potential to significantly improve violence risk assessment for schizophrenia, for which, at present, there are no instruments with strong predictive validity. The key demographic factors related to violence are being young and male, low socioeconomic status, living in a disadvantaged neighborhood, and having a father with a substance-abuse disorder or who left home before the identified patient was 15 years old.

While it is now relatively easy to identify which people with schizophrenia are at the highest risk for committing violent behavior, it is far less easy to determine from a violent offense if the offender was psychotic. Evidence from one large study (Toch & Adams, 1989) suggests that having a psychotic disorder increases the likelihood of certain offense characteristics – although most people who commit these offenses are not psychotic. Much more research is needed on this issue, however, especially regarding specificity of crime characteristics or crime scene behavior to a diagnosis of schizophrenia. It must be remembered, however, that much violence committed by people with schizophrenia is driven by antisocial behavior and can occur in the absence of psychotic symptoms. Further caveats are that most of the violence committed by people with schizophrenia is committed by a small percentage of the overall patient population, and that most violence committed by people with schizophrenia who are psychotic at the time of the offense occurs in first-episode cases prior to treatment initiation or in later episodes among people who are non-adherent to treatment recommendations.

Violence in people with psychotic disorders is not inevitable. Risk factors can be assessed, and effective treatment modalities exist across a continuum of care including inpatient and outpatient services. However, programs offering evidence-based services targeting violence are rare. Moreover, clozapine, the only antipsychotic medication that has been shown to significantly reduce violence in psychotic patients, is under-prescribed in the community due to physician concerns with its risks for potentially fatal side effects. For patients who are non-adherent with treatment, programs such as FACT, or the more aggressive AOT, can be useful to prevent the occurrence of criminal behavior and incarceration. Besides the direct benefit to the patient, reducing the instances of violence among psychotic persons may also reduce the stigma associated with severe mental illness. As noted by Torrey (2011), in terms of stigma reduction, efforts to promote a more positive view of people with psychosis are less likely to be effective than actually reducing violent behavior. However, doing so requires a comprehensive approach (Schanda, 2006) that includes understanding the varied contributions of illness-related factors (e.g., specific psychotic symptoms, antisocial personality traits), substance abuse, socioeconomic factors such as poverty, and problems in the mental health-care system including lack of violence risk assessment and inadequate treatment opportunities for many people with schizophrenia.

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No potential conflict of interest was reported by the authors.

Notes on contributors

Steven M. Silverstein, Ph.D. is Director, Division of Schizophrenia Research and Executive Director of the Violence Institute of New Jersey, at Rutgers University Behavioral Health Care (UBHC), and Professor of Psychiatry at Rutgers. Jill Del Pozzo, M.A. is a Research Assistant for the Division of Schizophrenia Research and The Violence Institute of New Jersey. Matthew W. Roché, PhD, is a postdoctoral fellow in the Division of Schizophrenia Research. Douglas Boyle, Ph.D. is Research Director for the Violence Institute of New Jersey. Theresa Miskimen, M.D. is Vice President for Medical Services at Rutgers UBHC and Professor of Psychiatry at Rutgers.

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