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Review Article

Cognition and Other Targets for the Treatment of Aggression in People with Schizophrenia

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Abstract

Schizophrenia spectrum disorders are associated with an increased risk of violent offending in comparison to non-clinical samples, which in turn puts both victims and perpetrators of schizophrenia-related violence at risk of harm. There are currently few interventions for aggression in schizophrenia with existing treatments demonstrating limited efficacy. The impact of several factors—neurocognition, social cognition, alexithymia, emotion regulation capacity, and the treatment milieu—on aggression in people with schizophrenia creates an opportunity for the development and/or evaluation of new treatments for aggression. The authors recommend studies into the possible anti-aggressive benefits of treatments that target these factors. The etiological heterogeneity of aggression in schizophrenia calls for the development of a comprehensive treatment program that targets several contributors to aggression.

INTRODUCTION

Several epidemiologic studies in North America, Europe, and Australia suggest that schizophrenia spectrum disorders are associated with an increased risk of violent offending relative to non-clinical samples [1-5]. Assaults are the most prevalent form of aggression found in people with schizophrenia, whereas the proportion of schizophrenia-related acts of homicides ranges only from 6-28% [6]. Relative to non-clinical samples however, one study demonstrated that schizophrenia is associated with a 12 fold increase in the risk of assaults [6]. The elevated risk of physical aggression is not only characteristic of people with schizophrenia who have been classified as offenders, but similar elevations have been established in non-offenders with schizophrenia [7-9]. These findings however compel some qualification--most people with schizophrenia are not violent and the risk of violence among patients receiving care is no higher than that of the rest of the population [10].

Notwithstanding the low prevalence of aggression among people with schizophrenia as a whole, schizophrenia-related acts of violence and aggression pose public health significance with regard to the harm and suffering caused by schizophrenia-related aggression on victims and perpetrators. Aggressive acts committed by violent offenders with schizophrenia contribute to their initial involvement with the criminal justice system and subsequent hospitalization. Schizophrenia patients whose aggression remains poorly managed, have an increased prospect of frequent and/or longer psychiatric hospitalizations and higher rates of recidivism that are burdensome in direct and indirect costs [11,12]. Schizophrenia-related aggression contributes to the experience of physical victimization when others retaliate in response to aggression by schizophrenia patients (patients' own aggressive behavior is one of the strongest predictors of the experience of victimization [7-10]. Moreover, aggression contributes to the experience of societal stigma and rejection by people with schizophrenia and other severe mental illnesses that poses a barrier to their experiential recovery, community integration, and quality of life.

Several factors have been demonstrated to predict or contribute to aggression in people with schizophrenia, lending credence to the assertion that schizophrenia-related aggression is heterogeneous in expression and origin. The relative contribution of these myriad of factors have been however poorly underscored in clinical studies of aggression in schizophrenia. On the one hand, clinical symptoms including positive symptoms, substance use problems, and antisociality have been frequently underscored. Other clinical predisposing factors including neurocognitive, social cognitive, and social skills deficits have received less attention. Even less attention has been paid to predisposing environmental factors such as poverty, childhood physical and sexual abuse, and prior exposure to violence; and contributing

factors such as the treatment milieu. The purpose of the review is to highlight the often ignored contributors to aggression that could be potential treatment targets for aggression.

The status of current interventions for aggression in schizophrenia

The significance of schizophrenia-related violence and aggression to public health and the clinical picture of schizophrenia compels the development of interventions with specific or non-specific (e.g., sedative) anti-aggressive properties. Only a few pharmacological and psychological treatments have however been evaluated for possible benefits for reducing aggression, resulting in little information about viable interventions. There is evidence that second generation antipsychotics, particularly clozapine and olanzapine may confer anti-aggressive properties when aggression is due to acute psychotic symptoms [13-15]. Table 1 summarizes the results of clinical trials that evaluated the anti-aggressive benefits of antipsychotics. Of the antipsychotics, clozapine appears to demonstrate the most robust efficacy for aggression [13,16]. Clozapine appears to be more efficacious than olanzapine, risperidone, and haloperidol at decreasing subjective hostility with olanzapine, risperidone, and haloperidol demonstrating equal efficacy [17,18]. Clozapine also appears to demonstrate greater efficacy than other antipsychotics at decreasing overt aggression in people with schizophrenia and schizoaffective disorder [19,20]. Across several studies, second generation antipsychotics tend to outperform haloperidol [18-23]. Aggression in many patients remains unresolved with antipsychotic treatment alone. It is quite common to administer adjunctive anticonvulsants like valproic acid, carbamazepine, and lamotrigine that combat emotional dysregulation and aggression that emanate from hyperexcitability [24]. It is also common to administer adrenergic beta-blockers (e.g., pindolol, propranolol, etc.), but the evidence in favor of this treatment approach remains limited to one methodologically sound clinical trial of pindolol and a few case reports since 2000 [25,26].

Table 1: Current Treatments for Aggression in Schizophrenia.

Medication	Notes
Clozapine	• Gold standard therapy for treatment refractory symptoms and aggression in people with schizophrenia • Superior benefits on hostility and aggression over olanzapine, risperidone, and haloperidol. • Superior benefits over olanzapine and haloperidol in reducing incidents of physical aggression • Required dosing may be at least 500 mg • Clozapine therapy requires consistent monitoring for agranulocytosis, other blood dyscrasias, and adverse effects. • May not be indicated for poor treatment engagers.
Olanzapine	• Demonstrated benefits at reducing hostility and physical aggression in people with schizophrenia • Equal efficacy to other second generation antipsychotics for chronic schizophrenia patients • Superior to haloperidol amisulpride, and quetiapine at decreasing hostility in first episode patients • Benefits may be mediated through precognitive effects • Increases risk of metabolic dysfunction
Risperidone, Aripiprazol, Quetiapine, Ziprasidone	• Equal efficacy at decreasing hostility and aggression • Comparable efficacy to haloperidol at decreasing hostility and aggression • Benign side effect profile for many patients
Anticonvulsants	• Beta Adrenergic blockers are often recommended as second line interventions for aggression in schizophrenia • Few clinical trials and thus limited empirical support for efficacy at reducing aggression • Increase risk of hypotension in schizophrenia patients
Cognitive Behavioral Therapy	• Only few clinical trials of antiaggressive benefits in schizophrenia • Evidence of decreased aggression at post-treatment • Poor maintenance benefits and high relapse and recidivism rates within the first six months post-treatment

Antipsychotic medications may be reasonable to the degree that aggression emanates from psychosis or shares its etiology. There is some evidence that the antiaggressive properties of olanzapine and risperidone may stem from their ability to improve neurocognitive functioning in schizophrenia patients as a downstream benefit of serotonin agonist activity [15,27]. Clozapine-induced reductions in aggression however have no associations with neurocognitive change; suggesting that clozapine may have non-specific effects (e.g., sedation) on aggression [27]. The mechanism of beta-blockers at decreasing aggression is speculative given evidence of their limited capacity to cross the blood-brain barrier. They may however exert an effect on the hyperadrenergic state by acting on peripheral sites [28].

The heterogeneous etiology of aggression particularly in violent offenders with schizophrenia may pose a challenge for treatment and it is therefore unsurprising that many cases are unresponsive to pharmacological treatment [29]. Factors such as deficits in neurocognition and social cognition, and childhood antisociality, and substance abuse also contribute to aggression and violent acts and may be mediators or moderators of antipsychotic response [29,30]. In addition, medication non-adherence and treatment disengagement attenuate the effectiveness of antipsychotic management. A few studies have evaluated and found cognitive behavioral therapy (CBT) to be moderately effective at reducing anger and aggression in schizophrenia patients during the treatment phase [31-33]. Gains from CBT do not appear to be sustained during follow-up periods however [32,33] and the majority of patients in one study (approximately 80%) were rearrested or rehospitalized within 6-60 months [33]. The inability of schizophrenia patients to sustain gains from such interventions is subject to speculation. One possibility is that deficits in neurocognition (e.g., verbal learning, problem-solving) decrease the ability of schizophrenia

patients to learn, maintain, recall, and implement CBT coping skills during provocative or stressful situations [34,35].

The literature suggests that there are few treatment choices for addressing aggression in schizophrenia patients. Of particular concern is that there are very few alternatives to pharmacological treatments in the form of psychological treatments and other non-pharmacological interventions that may be of interest when pharmacological interventions are ineffective, impractical due to side effects, or non-indicated such as when the etiology of aggression is not a viable target for pharmacological agents. Given the etiological heterogeneity of aggression and the possible multifactorial contributors to aggression, it is unsurprising that even clozapine, the most effective of pharmacological agents is only effective at decreasing aggression about 50% of the time [29]. A consideration of other contributors to aggression in schizophrenia including predisposing and contextual factors extends the putative targets for treating aggression in schizophrenia. Next, we consider some of these putative targets and extend some ideas for treatment and research.

Neurocognition and aggression in schizophrenia

Neurocognitive deficits have long been recognized as a seminal feature of schizophrenia spectrum disorders [36]. These deficits have been characterized as involving both generalized neurocognitive dysfunction and differential deficits in specific neurocognitive domains that include among others attention, working memory, processing speed, and executive functions [37]. Studies of the relevance of neurocognitive impairments to the clinical picture of schizophrenia have shown that these deficits 1) contribute to functional impairment and poor quality of life in people with schizophrenia; 2) may decrease the efficacy of treatments for schizophrenia by contributing to poor insight and low adherence; and 3) are associated with increased risk for relapse in first episode patients [38-40].

A growing number of studies suggest that neurocognitive deficits may also be relevant to the risk of aggression among people with schizophrenia [41-45]. Neuroimaging and neuropsychological studies of violence in schizophrenia have been however mixed. Some studies suggest that schizophrenia patients with a history of aggression or violence demonstrate greater impairments in frontal functions particularly executive dysfunction and working memory limitations. Other studies suggest that although more impulsive, violent offenders demonstrate better executive functioning and verbal skills and still others have found no differences [15,46-48]. It appears that a life-long history of antisocial behavior may moderate the association between neurocognition and violent behavior in schizophrenia given that violent offenders with antisociality prior to schizophrenia onset demonstrate better executive functioning and verbal skills (but poorer self-control) than non-offenders [44,49]. Notwithstanding the role of antisociality or psychopathic traits, frontal deficits and neurological soft signs are present among offenders and non-offenders with schizophrenia that reduce their capacity to inhibit reactive aggression during provocations and other stressful situations. One study showed that violent offenders who demonstrated poor insight were even more impaired neurocognitively [50], which suggests that neurocognitive deficits may also influence the degree to which violent schizophrenia patients participate in treatment.

There is a vast literature of studies that evaluated treatment strategies geared towards attenuating neurocognitive deficits in schizophrenia. Psychopharmacological enhancement strategies have focused on improving neurocognition by targeting and influencing neurotransmitter activity at receptor sites linked to neurocognition. These include action at dopaminergic, cholinergic, glutamatergic, GABAergic, and histaminergic receptor sites were they foster agonist or antagonist activity [51,52]. Still other pharmacological agents seek to foster neurogenesis, synaptogenesis, and neuroplasticity and still others target neuroinflammation and oxidative stress [52]. The status of this literature is disappointing at best with most clinical trials failing to demonstrate that pharmacological agents improve neurocognition in people with schizophrenia [51,52]. Neurocognitive outcomes with some anti-inflammatory drugs and antioxidants such as minocycline, aspirin, omega-3 fatty acids, B vitamins (folate, pyridoxine, cobalamine), and L-carnosine are promising.

Cognitive remediation training is a behavioral intervention geared towards improving neurocognitive abilities through repeated training [53]. Studies have shown that cognitive remediation improves neurocognition by a medium average effect size and functional outcomes by a small average effect size in people with schizophrenia while also contributing to neurobiological improvements [54-56]. None of the currently published cognitive remediation studies have however evaluated any putative benefits on hostility and/or aggression. Given the association of neurocognitive deficits with aggression, one question that remains is the degree to which such an effective intervention for mitigating neurocognitive deficits may confer an additional benefit of reducing aggressive impulses. There is reason to evaluate this possibility that is centered on a hypothesis that improving neurocognitive capacity may enhance decision-making, action selection, accurate prediction of outcomes, and response inhibition downstream [57]. Moreover, broadening of attentional scope has been shown to reduce anger as indexed by physiological measures in response to negative emotionally-evocative stimuli [58]. Similarly, working memory capacity and updating has been shown to be crucial to the ability to cope with potentially hostile situations, reduction of attentional bias for hostile information, and the reduction of the influence of impulses [59]. Thus, a decreased aggressive impulse is a reasonable downstream putative outcome of improved neurocognitive capacity.

New data on the benefits of cortical stimulation (i.e., electroconvulsive therapy (ECT), repeated transcranial stimulation (rTMS), and transcranial direct current stimulation (tDCS) for people with schizophrenia bodes well for aggression treatment. In a recent review, Demirtas-Tatlidede and colleagues [60] identified 5 RCTs, 5 open trials and two crossover studies that reported cognitive outcomes of rTMS treatment of schizophrenia. These studies provide evidence that rTMS (unlike ECT) may confer precognitive effects for people with schizophrenia. Studies have yet to evaluate the putative anti-aggressive properties of rTMS. The use of non-invasive cortical stimulation may provide a treatment platform to determine if rTMS-related improvements in neurocognition translate to improvement in aggression control.

Social cognition and aggression in schizophrenia

Neurocognitive impairments are not unique as forms of information processing deficits that contribute to aggression in people with schizophrenia. Social cognition relates to how individuals encode, store, retrieve, and process information about the self, others, social situations, and interactions [61]. Like neurocognitive deficits, social cognitive deficits are prevalent among people with schizophrenia and they include impairments in empirically-derived domains such as attribution style, emotion perception, social perception, and theory of mind [62]. Social cognitive deficits in schizophrenia have been shown to be associated with but independent from neurocognitive deficits--although correlated with the earlier, social cognition uniquely predicts functional outcomes over and above neurocognition [63]. Social cognitive deficits also appear to transmit the association between neurocognition and disability in people with schizophrenia [63].

A growing number of studies have linked deficits in the domains of social cognition with schizophrenia-related aggression [64-67]. Attributional style, a component of social cognition, has been linked to aggression in people with schizophrenia—particularly hostile and personalizing biases [64,65]. Other components of social cognition—emotion perception, social perception, and theory of mind—have received very little attention. In one study, schizophrenia patients with a history of violent acts demonstrate impairments in empathic inferencing (a component of TOM) and in another study, patients who were high in aggression demonstrated impairments in the processing of facial cues indicating fear [66,67].

Schizophrenia patients demonstrate deficits in interpreting non-verbal cues such as facial expression and deficiencies in the ability to be guided by others' facial expressions that contributes to social deficits [68]. Combined with deficits in emotion regulation, facial processing deficits may contribute to aggression and violence [69,70]. Studies suggest that violent offenders with schizophrenia demonstrate impairments in the processing of facial emotional cues. They particularly demonstrate a negative emotional bias for ambiguous facial expressions in which they are more likely to perceive anger in neutral facial expressions and overall impairments in the discrimination of emotions [71,72]. Wilkowski and Meier [73] demonstrated that the perception of angry affect often potentiates an approach (e.g., aggression) rather than avoidance response in order to overcome the perceived threat or social challenge. Thus, the misinterpretation of facial affect as threatening may often lead to an aggressive response in schizophrenia patients. Schizophrenia patients also demonstrate hostile attributional biases in which they perceive the hostile intentions of others as the cause of negative events and studies have linked this form of attributional bias to violent offending [74]. Furthermore, mentalizing abilities—that is, the attribution of mental states to oneself and others—can be viewed as an inhibitor of violent and aggressive behavior [75]. Studies have however demonstrated that violent schizophrenia patients demonstrate impairments in the attribution of emotional mental states compared to non-violent patients [76,77]. Deficits in all dimensions of empathy including emotion recognition, perspective taking, and emotional responsiveness are implicated in schizophrenia and may contribute to aggression [78].

Much like neurocognitive impairments, social cognitive deficits represent a relatively unexplored target for aggression in people with schizophrenia. There are no known pharmacological agents that have been evaluated as putative treatments for social cognitive deficits in schizophrenia. There is a growing literature that suggests that forms of social cognitive training confer benefits on the domains of social cognition and functional outcomes in people with schizophrenia [79]. These benefits include moderate to large effects on facial affect identification and discrimination, small to moderate effects on theory of mind, and minimal effects on attributional style and social perception [79]. Social cognitive training also confers moderate to large effects on psychiatric symptoms and functional outcomes. To our knowledge however, there has been no test of the beneficial effects of computerized SCT for violent offenders or any evaluation of aggression outcomes. A recent study [80] demonstrated that Training of Affect Recognition (TAR) improves the ability of violent offenders to distinguish facial affect emotions that was accompanied by improvements in neural activation. What remains unknown however is whether social cognitive training can have a downstream effect on aggression in violent offenders.

Alexithymic features may contribute to aggression

Alexithymia has received very little examination in the phenomenology of schizophrenia and its shaping of schizophrenia symptoms. Alexithymia refers to deficits in the capacity to experience, identify, and describe emotions [81]. Alexithymic features are prevalent in people with schizophrenia in the form of: 1) deficits in their ability to identify and distinguish emotions they experience; 2) deficits in observing their own emotional arousal and bodily sensations that indicate emotional arousal; 3) inability to communicate feelings and emotional arousal; 4) poverty of fantasy or imagination in their inner mental life; and 5) a stimulus-bound, externally-focused attributional style [82]. Alexithymic features are related to social cognition deficits in that they may further contribute to deficits in the ability of people with schizophrenia to understand and respond appropriately and empathically to the emotions of others [83].

To our knowledge, there have been no studies that examined the association between alexithymic features and aggression in people with schizophrenia. Some studies have however associated alexithymic features with impulsive aggression in non-clinical samples [83]. Alexithymic features have been found to predict aggression in people with antisocial personality disorder [84] and survivors of psychological trauma [85]. Alexithymic traits have also been shown to be associated with violent offending in both men and women [86,87]. In the absence of schizophrenia-specific studies, the degree to which alexithymic features contribute to aggression in schizophrenia, independently of social cognition and other contributors remains speculative. The contribution of such features to aggression in violent offenders however warrants research and clinical attention.

There is very little in the literature about treating alexithymic traits and nothing targeted towards aggression or violent offending. A recent study found that alexithymic traits demonstrated greater reductions over time in individuals who participated in a short-term, dynamically-informed supportive psychotherapy compared to individuals who participated

in interpretive psychotherapy [88]. It is however unclear if individuals with schizophrenia, who often experience severe neurocognitive impairments would be able to participate in this form of treatment. In our own laboratory, we are currently developing a skill-based model of affect remediation that is informed by paradigms from affective neuroscience and behavior training [89] to address alexithymic deficits that may contribute to aggression in violent offenders with schizophrenia. Our model uses stress inoculation as a platform for repeated training in attention and awareness of bodily sensations, describing and communicating arousal, talking through attributions regarding external stimulus, and discussing appropriate responses to stressful situations. Our model of affective remediation occurs in the context of other interventions for schizophrenia patients.

Emotion regulation and aggression in schizophrenia

There has been interest in the inner emotional experience of people with schizophrenia with studies showing that whereas positive emotions in schizophrenia are on par with those of control samples, people with schizophrenia do experience greater negative emotions [90]. The elevations in negative emotionality are observed regardless of the emotional valence of the presented stimuli as pleasant or emotionally-evocative. This suggests that people with schizophrenia demonstrate higher state and trait negative emotionality relative to controls. Like neurocognitive and social cognitive deficits, these elevations in negative emotionality have been shown to predict impairments in aspects of psychosocial functioning [91].

It has been suggested that the elevations in state and trait negative emotionality observable in people with schizophrenia reflects a general deficit in emotion regulation capacity, defined as the ability to configure emotional experience with regard to its degree, duration, context, and form of expression [92]. Indeed, studies using neurophysiological paradigms such as the Late Positive Potential on event-related potentials (ERP) have shown that people with schizophrenia demonstrate abnormalities in their emotional response to neutral and emotionally-evocative slides such as an inability to down-regulate their negative emotions [92,93]. One possibility is that deficits in emotion regulation capacity contribute to the increased anger and hostility observable in violent schizophrenia patients and raises their likelihood of demonstrating aggressive behavior. Although the connection between deficits in emotion regulation capacity and aggression has yet to be examined and established in people with schizophrenia, this linkage has been demonstrated in non-clinical samples [94,95].

It is unclear how people with schizophrenia develop poor emotion regulation capacities. The cognition-emotion interaction literature suggests that individuals deploy several regulatory strategies that rely on higher-order cognitive processes to regulate emotion [96]. These regulatory strategies include antecedent-focused strategies that are applied before the provocation produces behavioral and physiological changes such as situation selection; situation modification; attentional deployment; and cognitive change or reappraisal. They also include response-focused strategies that are applied after provocation has elicited an emotion and its behavioral and physiological response such as suppression or the inhibition of an outward expression of emotion. Antecedent-focused strategies—particularly the use of reappraisal—have been shown to be more effective than suppression in studies of anger management in health samples [94]. Studies have shown that not only is the use of suppression (a less effective strategy) more prevalent in people with schizophrenia [97] and associated with poor functional outcomes [98], schizophrenia patients are unable to successfully implement reappraisal strategies to regulate emotion [97]. Reappraisal involves updating information in working memory or changing contents to accommodate new information since old ideas about the stimulus (e.g., a hostile situation) have to be replaced with new information. Therefore, the effectiveness of reappraisal for decreasing negative emotions is predicated on intact working memory capacity [98].

Clearly, simply instructing schizophrenia patients to implement reappraisal strategies to regulate their emotions has not proven to be an effective strategy. This state of affairs is rather puzzling given that reappraisal has been shown to reduce aggression in non-clinical samples and patients with mood, anxiety, and substance use disorders [94,95,99]. Moreover, cognitive behavioral therapy includes elements of reappraisal as a method of cognitive restructuring and has been shown to be ineffective for curbing aggression in schizophrenia. It may be that the degree of neurocognitive deficits experienced by people with schizophrenia precludes the effective use of reappraisal or any cognitive change strategies. Perhaps a more effective strategy would be to first attenuating neurocognitive impairments through cognitive remediation and then provide training in the use of reappraisal strategies to be recruited during provocative situations. This recommendation is of course predicated on a demonstration of the effectiveness of progressively combining cognitive remediation with reappraisal training on emotion regulation capacity and aggression.

The treatment milieu as a therapeutic target

As noted earlier, environmental factors may similarly contribute to aggression in people with schizophrenia. The impact of non-modifiable contributors such as childhood physical abuse, sexual abuse, and exposure to violence may be best addressed through psychotherapy. The treatment milieu represents a potentially modifiable contributor to aggression particularly among patients receiving care in psychiatric inpatient settings. There is evidence that certain characteristics of psychiatric wards may be associated with the incidence of aggression. Studies have demonstrated for example that crowded psychiatric inpatient units may be more prone to aggressive incidents than less crowded units [100,101]. It is unclear if the absence of physical space or other factors associated with crowding such as the lack of privacy, disrupted sleep due to noise, actually contribute to aggression. One study demonstrated that a general dissatisfaction with the unit environment may predict disturbance on the psychiatric ward [102]. Further, factors related to the clinical staff predicted aggression such as the competency of the clinical staff at communicating with patients and the frequency of staff changes [103,104].

It is possible that modifications to an inpatient treatment milieu may decrease the risk of aggression incidents. Such changes may however untenable due to administrative limitations or demands

often experienced by most treatment settings. In many hospital settings, the unit census is often determined by the number of beds imposed on the unit by the hospital administration and the number of referrals from the emergency department or other primary care units. Many state hospitals serve several contiguous towns, cities, or counties and receive referrals from multiple sources, rendering it challenging to keep a low census. Gebhardt and Steinert [105] demonstrated that the configuration or distribution of severely disturbed patients could improve unit atmosphere and decrease the overall incidence of aggression. In their study, they found that distributing patients at high risk for aggression across several units rather than concentrating them on one unit decreased the incidence of aggression.

Some psychiatric inpatient units have attempted to improve the unit milieu by providing music playing overhead on the unit or incorporating music therapy groups as active interventions in the hospital. There is evidence that relaxing music can aid in the reduction of anger and distress in psychiatric patients, people with dementia, and highly aggressive children [106-108]. Thus, certain forms of music may reduce the incidence of aggression on psychiatric units by decreasing the overall arousal level of hospitalized patients. There is the possibility that learning and playing a musical instrument may provide an emotional outlet that may be useful for patients who demonstrate anger and aggression. Music may also reduce aggression incidents by improving patients and clinical staff members' degree of satisfaction with the unit milieu. Of course, the putative benefit of music to reduce aggression in people with schizophrenia has yet to be systematically evaluated and remain speculative but findings in other psychiatric populations are rather promising.

Factors related to staff competency at managing aggression may be addressed by providing the necessary training and supervision. Support technicians and nursing staff are often in the front line during aggressive incidents; therefore improving their competency at responding to potentially violent situations may determine the incidence of aggression on the unit. One study demonstrated that clinical staff members with less training and competence in dealing with aggressive incidents were most likely to be assaulted during incidents [109]. It is often required in mental health systems guidelines (e.g., National Institute of Clinical Excellence (NICE) guidelines) that hospital staff members receive training in the management of aggressive incidents, including the use of de-escalation techniques and physical interventions when aggressive episodes become acutely dangerous. De-escalation involves the communication of empathy and support to an individual in a crisis episode, limit-setting, and problem-solving in a collaborative, non-confrontational way with the goal of defusing aggression [110]. Effective implementation requires therapeutic rapport, caution, calmness, and respectful communication. Although a standard intervention in inpatient settings, the effectiveness of de-escalation remains unclear in the absence of methodological-sound clinical investigations [111]. It could however confer the advantage of reducing the frequency of more invasive interventions during crisis episodes such as restraints and seclusion.

CONCLUSIONS

Aggression is a therapeutic challenge in the care of people with schizophrenia, likely a contributing factor in their initial hospitalization, their duration of hospital stay, and limiting their propensity to be discharged into the community. There are currently few interventions to address aggression in people with schizophrenia particularly in the domain of psychosocial interventions. The impact of several other contributors to aggression including neurocognition, social cognition, alexithymia, emotion regulation, and the therapeutic milieu create an opportunity for practitioners to address aggression in a more comprehensive way. Efforts at testing the efficacy of cognitive training, behavioral, or milieu interventions for people with schizophrenia may benefit from an inclusion of aggression as a treatment outcome in clinical trials. A demonstration of their benefits at decreasing the likelihood of aggression would increase the treatment options for aggression in schizophrenia and further establish the status of neurocognition, social cognition, alexithymia, emotion regulation, and the therapeutic milieu as targets for aggression treatment.

REFERENCES

1. Wallace C, Mullen PE, Burgess P. Criminal offending in schizophrenia over a 25-year period marked by deinstitutionalization and increasing prevalence of comorbid substance use disorders. Am J Psychiatry. 2004; 161: 716-727.
2. Fazel S, Gulati G, Linsell L, Geddes JR, Grann M. Schizophrenia and violence: systematic review and meta-analysis. PLoS Med. 2009; 6: e1000120.
3. Arseneault L, Moffitt TE, Caspi A, Taylor PJ, Silva PA. Mental disorders and violence in a total birth cohort: results from the Dunedin Study. Arch Gen Psychiatry. 2000; 57: 979-986.
4. Brennan PA, Mednick SA, Hodgins S. Major mental disorders and criminal violence in a Danish birth cohort. Arch Gen Psychiatry. 2000; 57: 494-500.
5. Eronen M, Hakola P, Tiihonen J. Mental disorders and homicidal behavior in Finland. Arch Gen Psychiatry. 1996; 53: 497-501.
6. Erb M, Hodgins S, Freese R, Müller-Isberner R, Jöckel D. Homicide and schizophrenia: maybe treatment does have a preventive effect. Crim Behav Ment Health. 2001; 11: 6-26.
7. Hodgins S, Cree A, Alderton J, Mak T. From conduct disorder to severe mental illness: associations with aggressive behaviour, crime and victimization. Psychol Med. 2008; 38: 975-987.
8. Hodgins S, Alderton J, Cree A, Aboud A, Mak T. Aggressive behaviour, victimization and crime among severely mentally ill patients requiring hospitalisation. Br J Psychiatry. 2007; 191: 343-350.
9. Teplin LA, McClelland GM, Abram KM, Weiner DA. Crime victimization in adults with severe mental illness: comparison with the National Crime Victimization Survey. Arch Gen Psychiatry. 2005; 62: 911-921.
10. Jorm AF, Reavley NJ, Ross AM. Belief in the dangerousness of people with mental disorders: a review. Aust N Z J Psychiatry. 2012; 46: 1029-1045.
11. Clark T, Rowe R. Violence, stigma and psychiatric diagnosis: the effects of a history of violence on psychiatric diagnosis. Psychiatric Bulletin. 2006; 30: 254–6.
12. Hopko DR, Lachar D, Bailley SE, Varner RV. Assessing predictive factors for extended hospitalization at acute psychiatric admission. Psychiatr Serv. 2001; 52: 1367-1373.
13. Frogley C, Taylor D, Dickens G, Picchioni M. A systematic review

of the evidence of clozapine's anti-aggressive effects. Int J Neuropsychopharmacol. 2012; 15: 1351-1371.

14. Volavka J, Citrome L. Heterogeneity of violence in schizophrenia and implications for long-term treatment. Int J Clin Pract. 2008; 62: 1237-1245.

15. Krakowski MI, Czobor P, Nolan KA. Atypical antipsychotics, neurocognitive deficits, and aggression in schizophrenic patients. J Clin Psychopharmacol. 2008; 28: 485-493.

16. Topiwala A, Fazel S. The pharmacological management of violence in schizophrenia: a structured review. Expert Rev Neurother. 2011; 11: 53-63.

17. Volavka J, Czobor P, Sheitman B, Lindenmayer JP, Citrome L, McEvoy J, et al. Clozapine, olanzapine, risperidone, and haloperidol in treatment-resistant patients with schizophrenia and schizoaffective disorder. Am J Psychiatr 2002; 159: 255-262.

18. Citrome L, Volavka J, Czobor P, Sheitman B, Lindenmayer JP, McEvoy J, et al. Effects of clozapine, olanzapine, risperidone, and haloperidol on hostility among patients with schizophrenia. Psychiatr Serv. 2001; 52: 1510-1514.

19. Krakowski MI, Czobor P, Citrome L, Bark N, Cooper TB. Atypical antipsychotic agents in the treatment of violent patients with schizophrenia and schizoaffective disorder. Arch Gen Psychiatry. 2006; 63: 622-629.

20. Volavka J, Czobor P, Nolan K, Sheitman B, Lindenmayer JP, Citrome L, et al. Overt aggression and psychotic symptoms in patients with schizophrenia treated with clozapine, olanzapine, risperidone, or haloperidol. J Clin Psychopharmacol. 2004; 24: 225-228.

21. Volavka J, Czobor P, Derks EM, Bitter I, Libiger J, Kahn RS, et al. Efficacy of antipsychotic drugs against hostility in the European First-Episode Schizophrenia Trial (EUFEST). J Clin Psychiatry. 2011; 72: 955-961.

22. Citrome L, Volavka J, Czobor P, Brook S, Loebel A, Mandel FS. Efficacy of ziprasidone against hostility in schizophrenia: Post hoc analysis of randomized, open-label study data. J Clin Psychiatry. 2006; 67: 638-642.

23. Volavka J, Czobor P, Citrome L, McQuade RD, Carson WH, Kostic D, et al. Efficacy of aripiprazole against hostility in schizophrenia and schizoaffective disorder: data from 5 double-blind studies. J Clin Psychiatry. 2005; 66: 1362-1366.

24. Citrome L. Akdjunctive lithium and anticonvulsants for the treatment of schizophrenia: what is the evidence? Expert Rev Neurother. 2009; 9: 55-71.

25. Newman WJ, McDermott BE. Beta blockers for violence prophylaxis: case reports. J Clin Psychopharmacol. 2011; 31: 785-787.

26. Caspi N, Modai I, Barak P, Waisbourd A, Zbarsky H, Hirschmann S, et al. Pindolol augmentation in aggressive schizophrenic patients: a double-blind crossover randomized study. Int Clin Psychopharmacol. 2001; 16: 111-115.

27. Lindenmayer JP, Khan A, Iskander A, Abad MT, Parker B. A randomized controlled trial of olanzapine versus haloperidol in the treatment of primary negative symptoms and neurocognitive deficits in schizophrenia. J Clin Psychiatry. 2007; 68: 368-379.

28. Volavka J, Citrome L. Pathways to aggression in schizophrenia affect results of treatment. Schizophr Bull. 2011; 37: 921-929.

29. Volavka J. Clozapine is gold standard, but questions remain. Int J Neuropsychopharmacol. 2012; 15: 1201-1204.

30. Volavka J, Citrome L. Heterogeneity of violence in schizophrenia and implications for long-term treatment. Int J Clin Pract. 2008; 62: 1237-1245.

31. Chan HY, Lu RB, Tseng CL, Chous KR. Effectiveness of the anger-control program in reducing anger expression in patients with schizophrenia. Arch Psychiatr Nurs. 2003; 17: 88-95.

32. Haddock G, Barrowclough C, Shaw JJ, Dunn G, Novaco RW, Tarrier N. Cognitive-behavioural therapy v. social activity therapy for people with psychosis and a history of violence: randomised controlled trial. Br J Psychiatry. 2009; 194: 152-157.

33. Kunz M, Yates KF, Czobor P, Rabinowitz S, Lindenmayer JP, Volavka J. Course of patients with histories of aggression and crime after discharge from a cognitive-behavioral program. Psychiatr Serv. 2004; 55: 654-659.

34. Smith TE, Hull JW, Romanelli S, Fertuck E, Weiss KA. Symptoms and neurocognition as rate limiters in skills training for psychotic patients. Am J Psychiatry. 1999; 156: 1817-1818.

35. Kurtz MM, Wexler BE, Fujimoto M, Shagan DS, Seltzer JC. Symptoms versus neurocognition as predictors of change in life skills in schizophrenia after outpatient rehabilitation. Schizophr Res. 2008; 102: 303-311.

36. Nuechterlein KH, Barch DM, Gold JM, Goldberg TE, Green MF, Heaton RK. Identification of separable cognitive factors in schizophrenia. Schizophr Res. 2004; 72: 29-39.

37. Barch DM, Carter CS, Arnsten A, Buchanan RW, Cohen JD, Geyer M, et al. Selecting paradigms from cognitive neuroscience for translation into use in clinical trials: proceedings of the third CNTRICS meeting. Schizophr Bull. 2009; 35: 109-114.

38. Lipkovich IA, Deberdt W, Csernansky JG, Sabbe B, Keefe RS, Kollack-Walker S. Relationships among neurocognition, symptoms and functioning in patients with schizophrenia: a path-analytic approach for associations at baseline and following 24 weeks of antipsychotic drug therapy. BMC Psychiatry. 2009; 9: 44.

39. Kurtz MM, Tolman A. Neurocognition, insight into illness and subjective quality-of-life in schizophrenia: what is their relationship? Schizophr Res. 2011; 127: 157-162.

40. Chen EY, Hui CL, Dunn EL, Miao MY, Yeung WS, Wong CK, et al. A prospective 3-year longitudinal study of cognitive predictors of relapse in first-episode schizophrenic patients. Schizophr Res. 2005; 77: 99-104.

41. Serper M, Beech DR, Harvey PD, Dill C. Neuropsychological and symptom predictors of aggression on the psychiatric inpatient service. J Clin Exp Neuropsychol. 2008; 30: 700-709.

42. Barkataki I, Kumari V, Das M, Hill M, Morris R, O'Connell P, et al. A neuropsychological investigation into violence and mental illness. Schizophr Res. 2005; 74: 1-13.

43. Soyka M. Neurobiology of aggression and violence in schizophrenia. Schizophr Bull. 2011; 37: 913-920.

44. Naudts K, Hodgins S. Schizophrenia and violence: a search for neurobiological correlates. Curr Opin Psychiatry. 2006; 19: 533-538.

45. Spalletta G, Troisi A, Alimenti S, di Michele F, Pau F, Pasini A, et al. Reduced prefrontal cognitive activation associated with aggression in schizophrenia. Schizophr Res. 2001; 50: 134-135.

46. Barkataki I, Kumari V, Das M, Hill M, Morris R, O'Connell P, et al. A neuropsychological investigation into violence and mental illness. Schizophr Res. 2005; 74: 1-13.

47. Silver H, Goodman C, Knoll G, Isakov V, Modai I. Schizophrenia patients with a history of severe violence differ from nonviolent schizophrenia patients in perception of emotions but not cognitive function. J Clin Psychiatry. 2005; 66: 300-308.

48. Song H, Min SK. Aggressive behavior model in schizophrenic patients. Psychiatry Res. 2009; 167: 58-65.

49. Joyal CC, Putkonen A, Mancini-Marïe A, Hodgins S, Kononen M, Boulay L, et al. Violent persons with schizophrenia and comorbid disorders: a functional magnetic resonance imaging study. Schizophr Res. 2007; 91: 97-102.

50. Krakowski MI, Czobor P. The denial of aggression in violent patients with schizophrenia. Schizophr Res. 2012; 141: 228-233.

51. Harvey PD, Bowie CR. Cognitive enhancement in schizophrenia: pharmacological and cognitive remediation approaches. Psychiatr Clin North Am. 2012; 35: 683-698.

52. Goff DC. Future perspectives on the treatment of cognitive deficits and negative symptoms in schizophrenia. World Psychiatry. 2013; 12: 99-107.

53. Bowie CR, McGurk SR, Mausbach B, Patterson TL, Harvey PD. Combined cognitive remediation and functional skills training for schizophrenia: effects on cognition, functional competence, and real-world behavior. Am J Psychiatry. 2012; 169: 710-718.

54. Wykes T, Huddy V, Cellard C, McGurk SR, Czobor P. A meta-analysis of cognitive remediation for schizophrenia: methodology and effect sizes. Am J Psychiatry. 2011; 168: 472-485.

55. Vinogradov S, Fisher M, Holland C, Shelly W, Wolkowitz O, Mellon SH. Is serum brain-derived neurotrophic factor a biomarker for cognitive enhancement in schizophrenia? Biol Psychiatry. 2009; 66: 549-553.

56. Penadés R, Pujol N, Catalán R, Massana G, Rametti G, García-Rizo C, et al. Brain effects of cognitive remediation therapy in schizophrenia: a structural and functional neuroimaging study. Biol Psychiatry. 2013; 73: 1015-1023.

57. Pe ML, Raes F, Kuppens P. The cognitive building blocks of emotion regulation: ability to update working memory moderates the efficacy of rumination and reappraisal on emotion. PLoS One. 2013; 8: e69071.

58. Gable PA, Harmon-Jones E. Reducing attentional capture of emotion by broadening attention: increased global attention reduces early electrophysiological responses to negative stimuli. Biol Psychol. 2012; 90:150–3.

59. Hofmann W, Gschwendner T, Friese M, Wiers RW, Schmitt M. Working memory capacity and self-regulatory behavior: toward an individual differences perspective on behavior determination by automatic versus controlled processes. J Pers Soc Psychol. 2008; 95: 962-977.

60. Demirtas-Tatlidede A, Vahabzadeh-Hagh AM, Pascual-Leone A. Can noninvasive brain stimulation enhance cognition in neuropsychiatric disorders? Neuropharmacology. 2013; 64: 566-578.

61. Penn DL, Corrigan PW, Bentall RP, Racenstein JM, Newman L. Social cognition in schizophrenia. Psychol Bull. 1997; 121: 114-132.

62. Mancuso F, Horan WP, Kern RS, Green MF. Social cognition in psychosis: multidimensional structure, clinical correlates, and relationship with functional outcome. Schizophr Res. 2011; 125: 143-151.

63. Fett AK, Viechtbauer W, Dominguez MD, Penn DL, van Os J, Krabbendam L. The relationship between neurocognition and social cognition with functional outcomes in schizophrenia: a meta-analysis. Neurosci Biobehav Rev. 2011; 35: 573-588.

64. Waldheter EJ, Jones NT, Johnson ER, Penn DL. Utility of social cognition and insight in the prediction of inpatient violence among individuals with a severe mental illness. J Nerv Ment Dis. 2005; 193: 609-618.

65. McNiel DE, Eisner JP, Binder RL. The relationship between aggressive attributional style and violence by psychiatric patients. J Consult Clin Psychol. 2003; 71: 399-403.

66. Abu-Akel A, Abushua'leh K. 'Theory of mind' in violent and nonviolent patients with paranoid schizophrenia. Schizophr Res. 2004; 69: 45-53.

67. Antonius D, Kline B, Sinclair SJ, White-Ajmani M, Gianfagna S, Malaspina D, et al. Deficits in implicit facial recognition of fear in aggressive patients with schizophrenia. Schizophr Res. 2013; 143: 401-402.

68. Kohler CG, Walker JB, Martin EA, Healey KM, Moberg PJ. Facial Emotion Perception in Schizophrenia: A Meta-analytic Review. Schizophr Bull. 2010; 36: 1009–19.

69. Weiss EM, Kohler CG, Nolan KA, Czobor P, Volavka J, Platt MM, et al. The relationship between history of violent and criminal behavior and recognition of facial expression of emotions in men with schizophrenia and schizoaffective disorder. Aggressive Behavior. 2006; 32: 187–94.

70. Antonius D, Kline B, Sinclair SJ, White-Ajmani M, Gianfagna S, Malaspina D, et al. Deficits in implicit facial recognition of fear in aggressive patients with schizophrenia. Schizophr Res. 2013; 143: 401-402.

71. Hoaken PN, Allaby DB, Earle J. Executive cognitive functioning and the recognition of facial expressions of emotion in incarcerated violent offenders, non-violent offenders, and controls. Aggress Behav. 2007; 33: 412-421.

72. Weiss EM, Kohler CG, Nolan KA, Czobor P, Volavka J, Platt MM, et al. The relationship between history of violent and criminal behavior and recognition of facial expression of emotions in men with schizophrenia and schizoaffective disorder. Aggressive Behavior. 2006; 32: 187–94.

73. Wilkowski BM, Meier BP. Bring it on: angry facial expressions potentiate approach-motivated motor behavior. J Pers Soc Psychol. 2010; 98: 201-210.

74. McNiel DE, Eisner JP, Binder RL. The relationship between aggressive attributional style and violence by psychiatric patients. J Consult Clin Psychol. 2003; 71: 399-403.

75. Fullam R, Dolan M. Emotional information processing in violent patients with schizophrenia: Association with psychopathy and symptomatology. Psychiatry Research. 2006; 141: 29–37.

76. Abu-Akel A, Abushua'leh K. 'Theory of mind' in violent and nonviolent patients with paranoid schizophrenia. Schizophr Res. 2004; 69: 45-53.

77. Majorek K, Wolfkühler W, Küper C, Saimeh N, Juckel G, Brüne M. "Theory of mind" and executive functioning in forensic patients with schizophrenia. J Forensic Sci. 2009; 54: 469-473.

78. Derntl B, Finkelmeyer A, Toygar TK, Hülsmann A, Schneider F, Falkenberg DI, et al. Generalized deficit in all core components of empathy in schizophrenia. Schizophr Res. 2009; 108: 197-206.

79. Kurtz MM, Richardson CL. Social cognitive training for schizophrenia: a meta-analytic investigation of controlled research. Schizophr Bull. 2012; 38: 1092-1104.

80. Luckhaus C, Frommann N, Stroth S, Brinkmeyer J, Wölwer W. Training of affect recognition in schizophrenia patients with violent offences: Behavioral treatment effects and electrophysiological correlates. Soc Neurosci. 2013; 8: 505–514.

81. Maggini C, Raballo A. Alexithymia and schizophrenic psychopathology. Acta Biomed. 2004; 75: 40-49.

82. Parker JDA, Taylor GJ, Bagby RM. The relationship between emotional intelligence and alexithymia. Personality and Individual Differences. 2001; 30: 107–115.

83. Baslet G, Termini L, Herbener E. Deficits in emotional awareness in schizophrenia and their relationship with other measures of functioning. J Nerv Ment Dis. 2009; 197: 655-660.

84. Ates MA, Semiz UB, Algul A, et al. Alexithymia and aggression in patients with antisocial personality disorder. European Psychiatry. 2008; 23: 91.

85. Teten AL, Miller LA, Bailey SD, Dunn NJ, Kent TA. Empathic deficits and alexithymia in trauma-related impulsive aggression. Behav Sci Law. 2008; 26: 823-832.

86. Keltikangas-Järvinen L. Alexithymia in violent offenders. J Pers Assess. 1982; 46: 462-467.

87. Louth SM, Hare RD, Linden W. Psychopathy and alexithymia in female offenders. Canadian Journal of Behavioural Science. 1998; 30: 91-98.

88. Ogrodniczuk JS, Joyce AS, Piper WE. Change in alexithymia in two dynamically informed individual psychotherapies. Psychother Psychosom. 2013; 82: 61-63.

89. Kennedy M, Franklin J. Skill-based treatment for alexithymia: an exploratory case series. Behaviour Change. 2002; 19: 158-171.

90. Cohen AS, Minor KS. Emotional experience in patients with schizophrenia revisited: meta-analysis of laboratory studies. Schizophr Bull. 2010; 36: 143-150.

91. Horan WP, Blanchard JJ, Clark LA, Green MF. Affective traits in schizophrenia and schizotypy. Schizophr Bull. 2008; 34: 856-874.

92. Strauss GP, Kappenman ES, Culbreth AJ, Catalano LT, Lee BG, Gold JM. Emotion regulation abnormalities in schizophrenia: cognitive change strategies fail to decrease the neural response to unpleasant stimuli. Schizophr Bull. 2013; 39: 872-883.

93. Horan WP, Hajcak G, Wynn JK, Green MF. Impaired emotion regulation in schizophrenia: evidence from event-related potentials. Psychol Med. 2013; 43: 2377-2391.

94. Baird AA, Silver SH, Veague HB. Cognitive control reduces sensitivity to relational aggression among adolescent girls. Soc Neurosci. 2010; 5: 519–32.

95. MacDonald KB. Effortful control, explicit processing, and the regulation of human evolved predispositions. Psychol Rev. 2008; 115: 1012–1031.

96. Ochsner KN, Gross JJ. The cognitive control of emotion. Trends Cogn Sci. 2005; 9: 242–9.

97. Perry Y, Henry JD, Nangle MR, Grisham JR. Regulation of negative affect in schizophrenia: the effectiveness of acceptance versus reappraisal and suppression. J Clin Exp Neuropsychol. 2012; 34: 497-508.

98. Henry JD, Rendell PG, Green MJ, McDonald S, O'Donnell M. Emotion regulation in schizophrenia: affective, social, and clinical correlates of suppression and reappraisal. J Abnorm Psychol. 2008; 117: 473-478.

99. Min JA, Yu JJ, Lee CU, Chae JH. Cognitive emotion regulation strategies contributing to resilience in patients with depression and/or anxiety disorders. Compr Psychiatry. 2013; 54: 1190-1197.

100. Nijman HL, Rector G. Crowding and aggression on inpatient psychiatry wards. Psychiatr Serv. 1999; 50: 830-831.

101. Ng B, Kumar S, Ranclaud M, Robinson E. Ward crowding and incidents of violence on an acute psychiatric inpatient unit. Psychiatr Serv. 2001; 52: 521-525.

102. Bouras N, Trauer T, Watson JP. Ward environment and disturbed behaviour. Psychol Med. 1982; 12: 309-319.

103. Bjorkly S. A ten-year prospective study of aggression in a special secure unit for dangerous patients. Scand J Psychol. 1999; 40: 57-63.

104. Bouras N, Trauer T, Watson JP. Effects of staff changes on psychiatric patients. J Nerv Ment Dis. 1982; 170: 107-110.

105. Gerbhardt RP, Steinert T. Should severely disturbed psychiatric patients be distributed or concentrated in specialized wards? An empirical study on the effects of hospital organization on ward atmosphere, aggressive behavior, and sexual molestation. European Psychiatry. 1999; 14: 291-297.

106. Choi AN, Lee MS, Lim HJ. Effects of group music intervention on depression, anxiety, and relationships in psychiatric patients: a pilot study. J Altern Complement Med. 2008; 14: 567-570.

107. Ziv N, Granot A, Hai S, Dassa A, Haimov I. The effect of background stimulative music on behavior in Alzheimer's patients. J Music Ther. 2007; 44: 329-343.

108. Choi AN Lee MS, Lee J. Group music intervention reduces aggression and improves self-esteem in children with highly aggressive behavior: a pilot controlled trial. Evid Based Complement Alternat Med. 2010; 7: 213–217.

109. Little L. Risk factors for assaults nursing staff: childhood abuse and education level. J Nurs Adm. 1999; 29: 22-29.

110. Stubbs B, Dickens G. Prevention and management of aggression in mental health: an interdisciplinary discussion. Int J Ther Rehabil. 2008; 15: 351-357.

111. Muralidharan S, Fenton M. Containment strategies for people with serious mental illness. Cochrane Database Syst Rev. 2006; 3: CD002084.

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