A Longitudinal Study of Violent Behavior in a Psychosis-Risk Cohort

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There is a lack of insight into the relationships between violent ideation, violent behavior, and early, particularly attenuated, psychosis. Our aims were to examine the relationships between baseline violent behavior and violent ideation and outcome violent behavior and conversion to psychosis in at-risk individuals. We longitudinally assessed 200 individuals at clinical high risk for psychosis for violent ideation and violent behavior using the Structured Interview for Psychosis-Risk Syndromes (SIPS), and rated these according to MacArthur Community Violence categories. Fifty-six individuals (28%) reported violent ideation at baseline, 12 (6%) reported violent behavior within 6 months pre-baseline, and 8 (4%) committed acts of violence during the follow-up time period. Information about violent ideation was obtained only by indirect, but not direct, inquiry about violent ideation. Both violent ideation and violent behavior at baseline significantly predicted violent behavior ($RR = 13.9$, $p = 0.001$; $RR = 8.3$, $p = 0.003$, respectively) during follow-up, as well as a diagnosis of psychosis ($RR = 2.3$ and 2.4 , respectively; both $p < 0.001$), independent of more than 40 clinical and demographic variables. The targets of the subjects' violent ideation at baseline were completely different than their subsequent targets of violent behavior. Violent behavior occurred within 7 days (SD 35 days) of a diagnosis of syndromal psychosis. These data suggest that checking carefully for violent ideation and behavior in clinical high-risk patients is essential, as these have predictive value for conversion to psychosis and likelihood of violence in the future.

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INTRODUCTION

Although most mentally ill individuals are not dangerous and most violence is committed by asymptomatic persons, some evidence suggests that positive symptoms in the context of psychotic illness, such as delusions and hallucinations, are related to violent behavior (Coid *et al*, 2013; Keers *et al*, 2014; McNiel *et al*, 2000). Non-adherence with medications (Elbogen *et al*, 2006; Yesavage, 1982) and poor insight (Buckley *et al*, 2004) have been shown to mediate this relationship. Other research suggests that alcohol (Rasanen *et al*, 1998) or drug abuse (Elbogen and Johnson, 2009; Swartz *et al*, 1998) is the key mediating factor, and may account for more of the risk than psychosis (Fazel *et al*, 2009). This was supported by the landmark MacArthur Violence Risk Assessment Study (MVRAS), which identified substance use as a substantial and significant factor affecting risk of violence in psychotic populations (Appelbaum *et al*, 2000; Steadman *et al*, 1998).

Prior studies suggest that the first episode of a psychotic illness is a time of particular risk for violent behavior

(Langeveld *et al*, 2014; Large and Nielssen, 2011; Nielssen and Large, 2010). The first-episode literature suggests that not only does younger age increase risk of violence, but that the prevalence of violent behavior in people with psychotic disorders peaks in the first episode of psychosis, and then quickly declines, although it remains above the rate in the unaffected population (Langeveld *et al*, 2014; Large and Nielssen, 2011; Nielssen and Large, 2010). The possibility that violence risk might increase as an individual at high risk for psychosis approaches a diagnosis of psychosis may also be supported by evidence that more prominent psychotic symptoms and less insight increase the risk of violent acts (Buckley *et al*, 2004; Swartz *et al*, 1998).

Our lack of understanding of violence risk in psychosis, particularly during attenuated or early phases of psychosis, reflects that prior studies were performed in already psychotic individuals, possibly confounded by medication treatment, chronicity, and other factors (Cannon *et al*, 2007; McGorry *et al*, 2001; Miller *et al*, 2003), and/or did not possess longitudinal components or were retrospective. Additionally, the presumed antecedents of violent behavior (ie, violent ideation) were not measured in the majority of studies, possibly partly related to the lack of an available rating scale for violent ideation. These factors complicate the disentangling of links between violent behavior and psychotic symptoms, and preclude an examination of the temporal progression from violent ideation to violent behavior.

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We enrolled 200 individuals at clinical high risk (CHR) for psychosis, measured violent ideation, violent behavior, and symptoms at baseline, and followed them for up to 2 years. Our specific aims were to: (1) identify baseline factors that predict future violent behavior and (2) examine the ability of baseline violent ideation and violent behavior to predict a future diagnosis of psychosis. Our hypotheses were that baseline violent behavior and violent ideation would predict future violent behavior, and that baseline violent ideation and violent behavior would predict a subsequent diagnosis of psychosis, all independent of demographic or other clinical variables, including positive psychotic symptoms.

MATERIALS AND METHODS

Subjects

A cohort of 200 help-seeking individuals at CHR for psychosis, aged 13–30, was ascertained using the Structured Interview for Psychosis Risk Symptoms (SIPS) (Miller *et al*, 2003) between 2003 and 2016, and followed for approximately 2 years. Subjects were enrolled if they met criteria for at least one of the following psychosis-risk syndromes, as defined by the SIPS (Miller *et al*, 2003): (1) Attenuated Positive Symptom Psychosis-Risk Syndrome (APSS); (2) Genetic Risk and Deterioration Psychosis-Risk Syndrome (GRDS); and/or (3) Brief Intermittent Psychotic Psychosis-Risk Syndrome (BIPS). Approval from the NYSPI Institutional Review Board was obtained before any procedures were undertaken, and all subjects provided written informed consent. Individuals less than 18 years old provided written informed assent and at least one parent provided written informed consent.

Measures

Information on violent ideation and violent behavior was obtained at baseline, and on violent behavior at every follow-up, via the SIPS completed with the patient on his or her own and accompanying clinical interview with the patient. Clinical information obtained from the treating research psychiatrist or therapist, and parents were used to confirm or clarify ambiguous information. If a positive report was given, detailed information about the ideation or behavior, such as target, imagined method and setting, perceived likelihood of acting, precipitating factors and/or symptoms, and, for ideation alone, whether it was experienced as intrusive or ego-syntonic. Individuals who endorsed significant risk for violence during the interview were evaluated and clinically treated.

The categories in the MacArthur Community Violence Interview (MCVI) (Steadman *et al*, 1998; Swanson *et al*, 2006) were used to categorize violent behavior as any assault using a lethal weapon or resulting in injury, any threat with a lethal weapon in-hand, or any sexual assault. We also defined other aggressive acts as simple assault without injury (eg, slapping, grabbing) or weapon use. For the baseline assessment of violent behavior and other aggressive acts, this included any such behaviors within the previous 6 months. Outcome data were any violent behavior occurring post-baseline.

Notably, given the lack of availability of rating scales for violent ideation, we took a novel approach by adapting the MacArthur interview to score violent ideation within the same framework as violent behavior, and only at the time of assessment (ie, not in the past 6 months, as with violent behavior).

We defined a third category of non-violent aggression (ideation or behavior) involving acts such as verbal aggression, stalking, property destruction, agitation, etc that did not involve violence towards another person (see the Supplementary Data for more information).

Statistical Analyses

Descriptive statistics, and mean differences in demographics between individuals with and without violent ideation or violent behavior or between patients who later developed a diagnosis of psychosis and those who did not, were derived using SPSS version 22 (IBM Corporation, 2013). Group differences were evaluated using one-way ANOVAs for continuous variables (eg, SIPS scores) and for categorical variables (eg, DSM diagnosis) using χ^2 tests, or Fisher's exact test where warranted by low cell counts. We evaluated the relationships between baseline violent ideation and violent behavior and violence during the follow-up period or a diagnosis of psychosis using logistic regression. We controlled for variables of interest identified in previous analyses and others that were identified as potentially clinically relevant. $p < 0.05$ was used to determine significance.

RESULTS

Baseline Demographics and Clinical Variables

The sample of 200 CHR participants was diverse in terms of both race and ethnicity, young, and primarily male. Sixty participants (30%) developed a diagnosis of psychosis during the follow-up period. All demographic and clinical data are summarized in Table 1 and Supplementary Table S1. Additional demographic and clinical information on this sample has previously been published (Brucato *et al*, in press). The mean time of follow-up was 12.15 ± 12.12 months.

Baseline Violent Ideation and Behavior, Other Aggressive Acts, and Non-Violent Aggression

As in Table 2, violent ideation was reported by 56 (28%) participants at baseline. Violent behavior within 6 months prior to baseline was noted in 12 participants. Other aggressive acts and non-violent aggression were less common (see Supplementary Table S2 for additional information, including on types and targets of ideation and behavior).

Violent Behavior During the Follow-Up Time Period

Eight individuals (4%) engaged in an act of violence during the follow-up period. Committing an act of violence during the follow-up period was significantly related to baseline violent ideation ($RR = 13.9$ ($CI = 1.8-113.0$)) and baseline violent behavior ($RR = 8.3$ ($CI = 2.2-30.3$)). Importantly,

Table 1 Clinical and Demographic Characteristics

Age at baseline (years)	Total <i>n</i> = 200	
	Mean	SD
	20.12 Count	3.86 %
<i>Race</i>		
Caucasian	91	45.5
Black/African American	44	22
Asian/Pacific Islander	15	7.5
More than one race	50	25
<i>Race binary</i>		
Caucasian	91	45.5
Not Caucasian	109	54.5
<i>Ethnicity</i>		
Not Hispanic or Latino	138	69
Hispanic or Latino	62	31
<i>Gender</i>		
Male	144	72
Female	56	28
<i>Medication status</i>		
None	138	69
Neuroleptics	15	7.5
Antidepressants	28	14
Both	19	9.5
GRDS	8	4.2
SPD at baseline	114	57
Baseline suicidal ideation	13	6.5
Baseline suicidal behavior	5	2.5
Non-sexual trauma	30	15
Sexual trauma	21	10.5
Any trauma	47	23.5
<i>SCID diagnoses at baseline</i>		
	Total <i>n</i> = 188	%
Any lifetime axis I disorder at baseline	148	78.7
Lifetime bipolar I, 2 or NOS	14	7.4
Lifetime MDD, depression NOS, or dysthymia	100	53.2
Any lifetime anxiety disorder	94	50
Any past substance use disorder	42	22.3
Any lifetime eating disorder	5	2.7

neither non-violent aggression nor other aggressive acts at baseline was related to violent behavior at follow-up.

In addition to calculating relative risks, we performed logistic regression to further determine the relationships between baseline violent behavior and violent ideation, and violent behavior during the follow-up period. Before analyzing our model, we compared all available baseline demographic and clinical factors (Table 1 and

Supplementary Table S1), including other aggressive acts and non-violent aggression, between individuals who did and did not commit violent behavior during the follow-up period, to determine which additional baseline factors to include in the model. The only variables distinguishing those who did and did not commit violent behavior during the follow-up period were the P3/Grandiose Ideas ($t[14.078] = 2.27$, $n = 200$, $p = 0.047$) and P5/Disorganized Communication ($t[198] = -2.53$, $n = 200$, $p = 0.012$) scores on the SIPS.

We first performed χ^2 analyses to examine differences in baseline violent ideation and baseline violent behavior between individuals who did and did not commit violent behavior during the follow-up period. We found that both violent ideation at baseline ($\chi^2 = 14.6$, $n = 200$, $df = 1$, $p < 0.001$) and violent behavior at baseline ($\chi^2 = 14.7$, $n = 200$, $df = 1$, $p < 0.001$) were significantly associated with violent behavior during the follow-up period.

Using binary logistic regression models, both violent ideation at baseline ($\beta = 3.2$, $p = 0.007$; overall model $p = 0.001$) and violent behavior at baseline ($\beta = 3.0$, $p = 0.004$; overall model $p = 0.003$) significantly and independently predicted violent behavior during follow-up, even when controlling for P3/Grandiose Ideas and P5/Disorganized Communication of the SIPS. P5/Disorganized Communication was significant in the models with violent ideation at baseline ($\beta = 1.1$, $p = 0.01$) and baseline violent behavior ($\beta = 1.1$, $p = 0.007$), and age was significant only in the model with baseline violent behavior ($\beta = -0.3$, $p < 0.05$). Of note, in these models, sex had a high SE. The results were no different with or without sex included as a factor, so we provide the results for the models without sex.

Additional Information on Violent Acts

Eight out of 59 individuals who developed a diagnosis of psychosis had baseline violent behavior and six had outcome violent behavior. Four out of 141 individuals who did not develop psychosis had violent behavior at baseline and two had violent behavior at outcome.

Of the six individuals who committed violent behavior during the follow-up period and also developed a diagnosis of psychosis, one acted out approximately 2 months prior to conversion, one at the same time, one approximately 2 weeks after, and three acted out approximately 1 month after. Four of these individuals converted to schizophrenia or schizoaffective disorder, one to bipolar disorder with psychotic features, and one to psychotic disorder not otherwise specified (NOS). The average time between outcome violent behavior and a diagnosis of psychosis being made was 1 week (SD 35 days).

Of the nine patients who committed any violent behavior or other aggressive acts during the follow-up period, five were not taking any medication, two were taking only antipsychotic medications, and two were taking both antipsychotic medications and antidepressant medications. In addition, the mean time between baseline and the act of violence ($N = 9$) was 7.6 months (SD 4.8).

Among all nine acts of violence or other aggressive acts during the follow-up period, five were against a family member or intimate partner, two were against a stranger, one was against a peer/coworker/therapist, and one was

Table 2 Baseline Frequency of Violent Ideation and Behavior Associated with Follow-up Risk of Violent Behavior and a Diagnosis of Psychosis

	Follow-up period (2 years)									
	Baseline violent ideation or violent behavior		Violent behavior during follow-up given baseline violent ideation or violent behavior				Later diagnosis of psychosis given baseline violent ideation or violent behavior			
	N = 200		N = 8				N = 59			
	%	Count	Risk %	Count	RR	95% CI	Risk %	Count	RR	95% CI
<i>Violent ideation (at baseline interview)</i>										
Violent ideation	28.0	56	12.5	7	13.9	1.8–113.0	46.4	26	2.3	1.5–3.6
Other aggressive acts	4.5	9	0	0	0		33.3	3	1.6	0.6–4.5
Non-violent aggression	10.5	21	0	0	0		33.3	7	1.6	0.8–3.3
None	57.0	114	0.9	1	REF		20.2	23	REF	
<i>Violent behavior</i>										
Violent behavior	6.0	12	25.0	3	10.3	2.6–40.6	66.7	8	2.4	1.5–3.9
Other aggressive acts	2.5	5	0	0	0		40.0	2	1.5	0.5–4.4
Non-violent aggression	9.5	19	5.3	1	2.2	0.3–18.3	21.1	4	0.8	0.3–1.9
None	82.0	164	2.4	4	REF		27.4	45	REF	

indiscriminate (multiple unrelated people). In no case was the target of the violent act during the follow-up period the same as the target identified at baseline.

Among all nine acts of violence or other aggressive acts during the follow-up period, four involved use of a weapon.

None of the individuals who committed an act of violence during the follow-up period reported using an illicit substance or alcohol at the time of the violent act, and none met criteria for any active substance use disorder at baseline.

Prediction of a Later Diagnosis of Psychosis

We similarly sought to examine the relationship between baseline violent behavior and baseline violent ideation, and a later diagnosis of psychosis. Similar to the results for violent behavior during the follow-up period, a later diagnosis of psychosis was significantly related to baseline violent ideation (RR = 2.3; CI = 1.5–3.6) and baseline violent behavior (RR = 2.4; CI = 1.5–3.9; Table 2). Neither ideation nor behavior for non-violent aggression or other aggressive acts was related to a later diagnosis of psychosis.

In addition to calculating relative risks, we further examined relationships between baseline violent ideation and violent behavior and a diagnosis of psychosis by performing χ^2 analyses to examine differences between those patients diagnosed as psychotic and those not diagnosed on our *a priori* predictor variables (baseline violent ideation and baseline violent behavior) and on the outcome of violent behavior. Baseline violent ideation ($\chi^2 = 10.7$, $n = 200$, $df = 1$, $p = 0.001$), baseline violent behavior ($\chi^2 = 8.5$, $n = 200$, $df = 1$, $p = 0.004$), and outcome violent behavior ($\chi^2 = 8.3$, $n = 200$, $df = 1$, $p = 0.004$) all occurred to a significantly greater degree in CHR individuals who developed a diagnosis of psychosis compared with CHR individuals who did not. Importantly,

neither ideation nor behavior for non-violent aggression or other aggressive acts was different between those CHR individuals who did develop a diagnosis of psychosis, and those who did not.

Using binary logistic regression, and controlling for all available baseline demographic and clinical variables (Table 1 and Supplementary Table S1), including other aggressive acts and non-violent aggression, both violent ideation at baseline ($\beta = 1.0$, $p = 0.02$; overall model $p < 0.001$) and violent behavior at baseline ($\beta = 2.6$, $p = 0.003$; overall model $p < 0.001$) significantly and independently predicted conversion to psychosis, even when controlling for SIPS scores (such as P1/Unusual Thought Content and P5/Disorganized Communication that have been replicated to independently predict conversion to psychosis (Addington *et al*, 2015)). In the model with baseline violent ideation, race ($\beta = 1.1$, $p = 0.009$), P1/Unusual Thought Content ($\beta = 0.7$, $p = 0.006$), and G2/Dysphoric Mood ($\beta = -0.3$, $p < 0.05$) were also significant predictors of a diagnosis of psychosis. In the model including baseline violent behavior, race ($\beta = 1.1$, $p = 0.008$) and P1/Unusual Thought Content ($\beta = 0.9$, $p = 0.001$) were also significant predictors of a diagnosis of psychosis.

Sources of Information

Critical to the identification of patients at increased risk for violent behavior is the means by which information about violent ideation is obtained. While violent behavior data are more directly reported by way of questions such as, ‘Have you hurt (or hit or attacked or assaulted or harmed) anybody?’, eliciting information about violent ideation is more complex, in particular because individuals with attenuated psychotic symptoms largely appear to consider these ideas intrusive and ego-dystonic. Importantly, none of

Table 3 Sources of Violent Ideation or Ideation Related to Other Aggressive Acts Reported in this Study

		Any baseline violent ideation or ideation related to other aggressive acts	
		Count	Column N %
P.1.	Have you felt that you are not in control of your own ideas or thoughts?	28	43.10%
P.2.	1. Do you ever feel that people around you are thinking about you in a negative way?	8	12.30%
	2. Have you ever found yourself feeling mistrustful or suspicious of other people?		
	3. Do you ever feel that you have to pay close attention to what's going on around you in order to feel safe?		
	4. Do you ever feel like you are being singled out or watched?		
	5. Do you ever feel people might be intending to harm you?		
P.3.	1. Do you feel you have special gifts or talents?	2	3.10%
	2. Have you ever behaved without regard to painful consequences? For example, do you ever go on excessive spending stress that you can't afford?		
	3. Do people ever tell you that your plans or goals are unrealistic?		
	4. Do you ever think of yourself as a famous or particularly important person?		
	5. Do you ever feel that you have been chosen by God for a special role?		
G.2.	Have you had thoughts of harming anyone else?	0	0%
Other (non-SIPS)		31	47.70%

Note: Column percentages do not add up to 100% because in some cases the same information was elicited from multiple sources (eg, SIPS and interviews).

Table 4 Brief Descriptions of Preempted Violence Using Information Obtained from Sources in Table 3

Age	Gender	Conversion (Y/N)	Clinical scenario
22	M	Y	Claimed to be a member of a religious fundamentalist group. Authorities were notified
19	F	N	Was carrying a knife to attack people who were ridiculing her. She agreed with her therapist to stop carrying around knife or be sent to the emergency room
23	M	N	Was considering hiring and torturing a prostitute. His therapist explained the legal ramifications
20	M	Y	Had thoughts of acquiring a firearm to shoot people whom he thought were talking about him. His therapist discussed the consequences of such an action
18	M	Y	Was considering taking a firearm to a movie theater and shooting men paired with women. He was transferred to a higher level of care and given antipsychotic medications
18	M	Y	Was considering hitting a family member with a hammer. Was hospitalized
28	M	N	Was considering shooting people who were ridiculing him. His therapist discussed the consequences of such an action
19	M	Y	Was shopping online for a gun to shoot neighbors whom he believed were talking about him. Was hospitalized
22	F	Y	Was considering stabbing a roommate with a screwdriver. Discussed the consequences in therapy
22	M	N	Was considering bringing a weapon to school to hurt classmates whom he thought were ridiculing him. Was removed from school and placed in home instruction

the information on violent ideation was obtained by SIPS item G.2, which specifically queries about violent ideation (Have you had thoughts of harming anyone else?). Table 3 describes the source of all violent ideation or ideation related to other aggressive acts reported in the cohort.

Further, we include in Table 4 the instances of violent ideation elicited from the sources in Table 3 that resulted in action being taken to prevent potentially deadly acts. We also include the pre-emptive actions that were taken.

DISCUSSION

This longitudinal study of individuals with attenuated and early psychosis provides preliminary information regarding

violent ideation and violent behavior. The few previous studies exploring violence among CHR persons have either examined smaller samples; not attempted to identify predictors of violence in a longitudinal study; or examined CHR individuals for risk factors associated with a diagnosis of psychosis (Broome *et al*, 2005; Hutton *et al*, 2012; Marshall *et al*, 2014).

Twenty-eight percent of participants in our cohort reported violent ideation at baseline, chiefly characterized by thoughts of assault with or without a deadly weapon. Eleven instances of violent ideation (5.5%) were sexual in nature. Importantly, the entire sample denied violent ideation or ideation related to aggressive acts in response to traditional clinical inquiry (ie, 'Have you had thoughts of

harming anyone else?’ from G2 of the SIPS), but endorsed violent thoughts only when responding to the other portions of the SIPS interview that probed the P1/Unusual Thought Content section regarding thought insertion and any of the inquiries within the P2/Suspiciousness section. It is clear from participants’ responses to P1/Unusual Thought Content that they often took literally the pronoun *you* in traditional risk questions like the one stated above, not perceiving their violent ideation as coming from themselves, but as intruding from some possible external source, with some insight that this was implausible or unlikely. P2/Suspiciousness questions elicited violent ideation involving having to prepare for self-defense or retaliation against perceived hostility. Notably, Marshall *et al* (2014) also reported some violent ideation in response to P1/Unusual Thought Content and P2/Suspiciousness, which supports this finding. These findings are also consistent with the literature on potential relationships between the exposure of young people to violence in media and aggression (Berkowitz, 1984; Browne and Hamilton-Giachritsis, 2005), as well as to findings of the relationship between suicidal ideation and suicide attempts (Klonsky *et al*, 2016). The current findings have significant implications for the manner in which CHR individuals are evaluated for violent ideation, such that a scale or series of standard questions might be developed that address violent ideation as it is uniquely experienced in the psychosis spectrum.

Second, we found that both violent ideation at baseline and violent behavior in the 6 months prior to baseline were related to subsequent acts of violence and a diagnosis of psychosis in the 2 year follow-up period. These findings are novel. There are several potential reasons for the absence of previous studies of violent ideation in psychosis, including the lack of a rating scale for quantifying violent ideation, the relatively infrequent occurrence of violent behavior in psychosis, and the stigmatizing nature of this topic. Importantly, the relationships among violent ideation at baseline and violent behavior in the 6 months prior to baseline and subsequent acts of violence and a diagnosis of psychosis were unaffected by demographic and other clinical factors, such as trauma history, suicidality, and symptoms. Among the latter, P5/Disorganized Communication was found to have a weaker, but still significant, influence. As this is a measure of attenuated thought disorder, the risk of both violent behavior and a diagnosis of psychosis may be further increased by deterioration of executive or inhibitory functions. Alternatively, violent behavior and clinical deterioration may be more likely in persons struggling to communicate their frustrations and concerns clearly.

It should be emphasized that, despite a high degree of violent ideation in our cohort, violent behavior was very uncommon (only 8 (4%) compared with 16.6% in first-episode populations (Large and Nielssen, 2011)) and there were no homicides. This may be related to the treatment provided and potentially preemptive actions taken by our research clinic (Table 4). Interestingly, in no case was the attack’s target the one described at baseline, suggesting that assaults were impulsive or unfocused, simply impacting the nearest individuals, as opposed to more organized and methodically plotted violence. Alternatively, it may be that acts were deliberate, but that over the course of an

average of 7 to 8 months (the mean time between baseline and act of violence), the target of the patient’s aggression shifted.

In all cases, those who developed a diagnosis of psychosis and also displayed violent behavior met criteria for a diagnosis of psychosis within weeks of the violent act, on average 7 days removed (SD = 35 days), suggesting that the violent act itself may have been a manifestation of a diagnosis of psychosis. This supports the finding that many violent acts committed by psychotic individuals occur during their first episodes, prior to initial treatment. This finding can be understood in the context of the finding that violent behavior is in many cases the pathway to diagnosis and treatment in first-episode psychosis (Large and Nielssen, 2011). Of note, in the MVRAS study (Steadman *et al*, 1998), substance use was identified as a substantial and significant factor affecting risk of violence. In our cohort, no violent act occurred in the context of alcohol or illicit substance use disorder. Further, while literature suggests that non-adherence with medications (Elbogen *et al*, 2006) may mediate the relationship between psychosis and violence, our study is unable to support any conclusion about the role of medications.

Interpreting our findings in the context of existing literature on violence in psychosis, we propose a theoretical model, whereby individuals in the CHR phase commonly experience intrusive, ego-dystonic violent ideation, with no immediate intention or compulsion to act, and which constitutes an intrinsic trait of psychosis in some people (analogous to suicidal ideation in depression). With a diagnosis of psychosis, influenced to a degree by deterioration in clarity of thought and communication abilities, there is a period of rapid intensification, during which the individual deals with overwhelming emotions and stimuli, and is most at risk to others.

This model and our findings in CHR individuals are supported by findings from the first-episode literature. While most studies were cross-sectional and examined ‘aggression,’ which was usually a composite of verbal aggression, violent gestures, aggression against objects (eg, throwing furniture), and actual physical aggression, they reveal two main conclusions. First, these articles suggest that the correlates (aka ‘risk factors’) of violence in a first-episode population are similar to those in a chronic population. Namely, worse clinical state (as measured by symptoms scales or by involuntary hospitalization), higher levels of positive symptoms, substance misuse, male gender, younger age, history of criminality and psychopathy were all related to violent behavior (Chang *et al*, 2015; Dean *et al*, 2007; Foley *et al*, 2007, 2005; Langeveld *et al*, 2014; Large and Nielssen, 2011; Spidel *et al*, 2010; Steinert *et al*, 1999; Winsper *et al*, 2013). Importantly, while in our study we found no such relationships, the same studies reported that previous violent behavior predicted later violent behavior, as did our study (Chang *et al*, 2015; Dean *et al*, 2007; Steinert *et al*, 1999). Importantly, we would not expect hospitalizations, positive symptoms, etc at baseline to predict outcome violent behavior in our population given that our population is an at-risk population and by definition would not have experienced positive symptoms, involuntary hospitalizations, etc at baseline related to the psychosis syndrome as they had not yet had a diagnosis of psychosis.

Further, similar to our model in which we suggest that the risk of violence peaks around the time of a diagnosis of psychosis (ie, the first episode), the first-episode literature confirms that not only does younger age increase risk of violence, but that the prevalence of violent behavior peaks early in the first episode of psychosis, and then quickly declines (Langeveld *et al*, 2014; Large and Nielssen, 2011; Nielssen and Large, 2010).

These data suggest that checking carefully for violent ideation and behavior in clinical high-risk patients is essential, as these have predictive value for conversion to psychosis and likelihood of violence in the future. These data also support the potential for links between incipient psychosis and violent behavior and suggest the possibility of identification of a group of patients at elevated risk for violence that might benefit from closer monitoring and rapid treatment interventions.

Importantly, there are several limitations of the current study, including that other potential predictor variables, such as psychopathy, legal involvement, and social/environmental risk factors, were not obtained. In addition, our cohort was help-seeking, and therefore our findings may be inapplicable to the entire population of people in a CHR state, or to a non-clinical population. Further, we did not use scales specifically designed to measure violence, violent ideation, trauma, stress, and other predictor variables, such as social and environmental risk factors, and did not perform urine toxicology tests to confirm that patients were not using substances. Also, critically, that there were only eight patients with outcomes of violent behavior allows the possibility for chance associations and limits the strength of the modeling, given the numerous predictor variables.

In part due to the limitations of this study, these findings pose many questions and require replication. In addition, they support the importance of properly inquiring about violent ideation among persons in the attenuated or burgeoning phases of psychosis; developing an instrument that accurately measures violent ideation and other predictor variables; the need for research aimed at identifying the neurobiological substrates of violent ideation and violent behavior in order to identify treatment targets; and efforts to diminish stigma that may prevent CHR persons from reporting violent ideation, and clinicians from probing for it.

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