Schizophrenia Research 291 (2026) 68–79

Contents lists available at ScienceDirect

Schizophrenia Research

journal homepage: www.elsevier.com/locate/schres

Predictors of violence against others in non-affective psychosis: A systematic review and meta-analysis

Gitte Ahle [a,*], Mads Gram Henriksen [b,c], Ida-Marie Mølstrøm [b], Andreas Rosén Rasmussen [a,d], Mette Brandt Christensen [e], Julie Nordgaard [b,d]

[a] Mental Health Center Amager, Mental Health Services Capital Region, Denmark
[b] Psychiatry East, Region Zealand, Denmark
[c] Center for Subjectivity Research, University of Copenhagen, Denmark
[d] Department of Clinical Medicine, University of Copenhagen, Denmark
[e] Department of Forensic Psychiatry, Mental Health Centre Sct. Hans, Mental Health Services Capital Region, Denmark

ARTICLE INFO

Keywords:
Schizophrenia
Psychopathology
Cognition
Hare Psychopathy Checklist Revised (PCL-R)
Crime

ABSTRACT

Introduction: The risk of committing violence against others is increased in patients with non-affective psychosis compared to the background population. However, the profile of patients with non-affective psychosis, who commit violence against others, is not fully known. Prior reviews and meta-analyses have included heterogenous psychosis populations and operated with broad definitions of violence. In this study, we narrowed the focus to patients with non-affective psychosis and restricted the definition of violence to physical violence committed against others.

Methods: Following the PRISMA guidelines, we searched PubMed, PsycInfo, and Ovid Embase for studies comparing patients with non-affective psychosis with and without a history of violence against others.

Results: 13 studies with a total of 1446 patients were included. Few predictors of violence were identified across the studies. In the meta-analysis, only higher score on Hare Psychopathy Checklist-Revised (PCL-R) and shorter years of education significantly predicted belonging to the violence group across studies. None of these predictors were robust after Bonferroni correction. No differences were found in psychopathology on the Positive and Negative Syndrome Scale (PANSS), substance use, cognition, duration of illness, marital status, employment status, and age of onset of illness between patients with a history of physical violence against others and those without such a history.

Conclusions: Predictors of violence previously identified in other studies proved non-significant in our more narrowly focused and stringent review and meta-analysis. More research is needed to improve characterization and identification of patients with non-affective psychosis at risk of committing violence against others.

1. Introduction

Homicides and other violent crimes against others must be prevented to the greatest extent possible. The consequences of such crimes can be serious or fatal and may involve lifelong consequences and suffering for the victims and their families. Multiple studies have shown that patients with psychotic disorders are at higher risk of committing violent crimes compared with the general population (Bobes et al., 2009; Fazel et al., 2009; Hodgins et al., 2007; Stevens et al., 2010).

Systematic reviews have identified numerous risk factors for violence in psychotic disorders, including criminal history, hostility, poor impulse control, persecutory delusions, command hallucinations, comorbid antisocial personality disorder, substance use, poor insight into illness, and treatment non-adherence (Lamsma and Harte, 2015; Witt et al., 2013). Yet, methodological heterogeneity across studies remains a major barrier to cumulative knowledge. One common issue is the broad grouping of different mental disorders: many reviews combine schizophrenia with affective psychoses such as bipolar disorder, although these groups differ in illness course, persistence of symptoms, and their association with violence. Studies have consistently demonstrated that patients with schizophrenia and related non-affective psychoses have a higher risk of violence than patients with bipolar disorder

* Corresponding author at: Mental Health Center Amager, Gl. Kongevej 33, 1610, Copenhagen V, Denmark.
E-mail address: Gitte.Ahle@regionh.dk (G. Ahle).

https://doi.org/10.1016/j.schres.2026.02.015
Received 22 December 2025; Received in revised form 17 February 2026; Accepted 19 February 2026

(Arseneault et al., 2000; Brennan et al., 2000; Dean et al., 2024). Other studies have compared patients with a history of physical violence against others to patients without such a history in mixed diagnostic samples, potentially blurring certain disorder-specific mechanisms (Rund, 2018; Witt et al., 2013). Given these differences, a disorder-specific approach is necessary to break new ground and identify more precise profiles of patients at risk of committing violence against others.

Importantly, conceptual issues also contribute to the current study heterogeneity, and these issues must also be addressed to increase homogeneity across studies. For example, definitions of "violence" vary widely across studies, often including aggression, verbal threats, violence against property, or even self-harm. As a result, much of the evidence base addresses a broad construct of "aggression" rather than actual violent acts against others. Two reviews (Bo et al., 2011; Rund, 2018) have highlighted this problem but included nonetheless studies with unclear or broad definitions of violence. If violence is defined narrowly and consistently, as actual violent acts against others, it may become possible to generate more robust and clinically actionable knowledge.

The most recent systematic review and meta-analysis (Lagerberg et al., 2025) is a 10-year update of a previous review (Witt et al., 2013), and it reflects the methodological issues mentioned above. While the new study offers valuable insights, it remains constrained by limitations of the original study—i.e., it combined samples of affective and non-affective psychoses into a single category, and it did not apply a consistent definition of violence, making it unclear whether reported associations concern aggression in general or violence against others specifically. In the new study, lack of diagnostic and conceptual precision continues to limit the applicability of the findings.

Recognizing these limitations in the current research landscape, our study adopt a more stringent methodological approach, focusing exclusively on patients with non-affective psychosis and applying a narrow and transparent definition of violence, i.e., physical violence against others. In doing so, we seek to reduce the diagnostic and conceptual heterogeneity that has limited previous reviews, and thereby establish a more precise evidence base for identifying risk factors of violence against others in patients with non-affective psychosis.

The aim of this systematic review and meta-analysis is to examine potential risk factors for violence against others in patients with non-affective psychosis. Specifically, we will (1) compare patients with non-affective psychosis with a history of violence against others to patients with the same diagnosis without such a history, (2) identify predictors associated with a history of violence against others, and (3) conduct meta-analyses where sufficient data are available.

2. Material and method

2.1. Search strategy and selection criteria

Following the Prisma guidelines (Page et al., 2021), on August 10, 2025, we conducted a systematic search of literature in PubMed, PsycInfo, and EMBASE, using the following search string: psychos* or schiz* or psychotic and viol* or crim* or dangerous or antisocial or offend* or psychopathic and predict* or prevent* or risk factor* or "risk factor*" or correlation (in title/abstract). We had no time limit. To secure maximum quality, we did not include gray literature.

The protocol was registered on PROSPERO (CRD42024501155). The following criteria were used for study eligibility:

1.1. Inclusion criteria:

1. Study designs: Cross-sectional studies, case-control studies, randomized studies, cohort studies
2. Published articles
3. Studies must include two groups: patients with a history of violence against others and patients without such a history. All patients must be diagnosed with non-affective psychosis (i.e., according to DSM-5 and ICD-10: schizophrenia, schizoaffective disorder, brief psychotic episode, and other non-organic, non-affective psychoses)
4. Diagnoses must be made according to DSM or ICD
5. It must be specified in the studies that violence concerned violence against other people
6. Participants >18 years
7. Assessment must include face-to-face clinical evaluation and not be restricted to questionnaires or register-based data (to ensure that psychopathological data have sufficient quality)

1.2. Exclusion criteria:

1. Studies in which reported findings of violence against others could not be separated from other, non-person-related forms of violence
2. Not peer-reviewed studies, e.g., conference abstracts (oral presentation or poster)
3. Studies with <20 participants (although comprehensive empirical assessments of forensic patients are resource-intensive and therefore often limited in sample size, we consider studies with at least 20 participants necessary to ensure sufficient robustness, while still retaining valuable smaller-scale research)
4. Studies only examining biological correlates (e.g., blood samples, brain scans)
5. Studies that assessed violent behavior only within a restricted recent timeframe (e.g., past month or year) without evaluating lifetime or long-term (≥10 years) history of violence were excluded.

When several studies reported findings from the same sample, we chose the study with the most comprehensive information.

Inclusion and exclusion criteria were settled in the author group. Two authors (G.A. and J.N.) independently screened titles and abstracts. In cases of doubt, studies were included for full-text assessment. Disagreement regarding study inclusion was resolved through consensus agreement between the authors. We screened all available studies with no restriction on the publication period in the literature search.

We translated non-English language publications using Deep-L and asked a native speaker for clarification when we considered it necessary.

We defined "violence against others" as any intentional physical aggression directed at another person, e.g., hitting, kicking, using a weapon, or other acts likely to cause bodily harm. See flowcharge (Fig. 1).

2.2. Data extraction

The following data were extracted: First author, year of publication, study design, sample, mean age in years, diagnosis, definition of violence, and findings. Data from comparison groups (e.g., healthy controls) in addition to the non-affective psychosis groups with and without histories of violence were not included in our review.

2.3. Quality assessment

Quality assessment of risk of bias of all included studies was performed using The Newcastle-Ottawa Scale (NOS) for non-randomized studies (Wells et al., 2000).

2.4. Meta-analyses

We conducted a series of independent bivariate meta-analyses comparing patients with non-affective psychosis with and without a history of violence across Positive and Negative Syndrome Scale (PANSS) scores, substance use, age of onset, duration of illness, employment, education length, marital status, Brief Assessment of Cognition in Schizophrenia (BACS), and Hare Psychopathy Checklist-Revised (PCL-R). Analyses were performed in IBM, 2023 SPSS

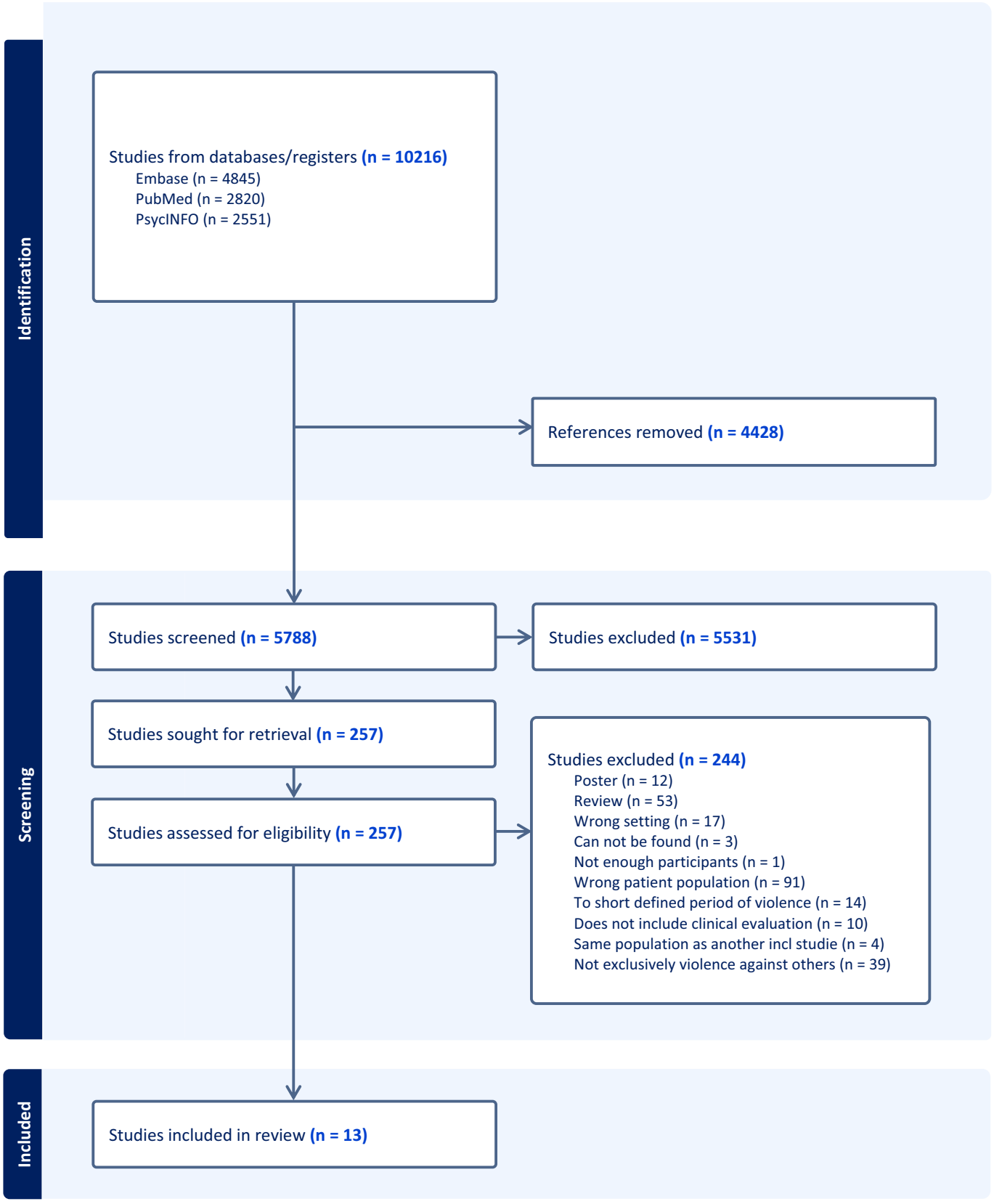


Fig. 1. PRISMA Flowchart.

Statistics (Version 29).

Only variables reported by ≥3 studies were included in meta-analyses in line with current methodological recommendations (Borenstein et al., 2021; Harrer et al., 2021). Studies were pooled only when they assessed the same variable and provided sufficient data, thus non-comparable social or clinical variables were not combined. Given the expected heterogeneity across studies, we used random-effects models (REML), and we used means ± standard deviation (SD) for continuous data and logit-transformed odd ratios for nominal data to calculate the pooled effects. Dependent substance-use measures within studies were aggregated using inverse-variance weighting (assumed $r = 0.5$). Confidence intervals were calculated using Knapp–Hartung adjustments (Knapp and Hartung, 2003). Heterogeneity was quantified with I^2 (Higgins and Thompson, 2002).

We performed leave-one-out, outlier, and sensitivity analyses. Outliers were defined as studies whose confidence intervals did not overlap with the pooled estimate and were excluded in sensitivity analyses (Harrer et al., 2021; Viechtbauer and Cheung, 2010). When ≥10 studies were available, we assessed publication bias using funnel plots, Egger's test, and trim-and-fill (Egger et al., 1997; Sterne et al., 2011). To account for multiple testing across the independent analyses, we applied Bonferroni correction.

3. Results

3.1. Study characteristics

Thirteen studies were included (Abushua'leh and Abu-Akel, 2006; Barlati et al., 2023; Bulgari et al., 2017; de Jong et al., 2018; Engelstad et al., 2018; Guo et al., 2023; Halmai et al., 2017; Iozzino et al., 2022; Karabekiroğlu et al., 2016; Kristof et al., 2018; Lafayette et al., 2003; Oakley et al., 2016; Storvestre et al., 2020), all published between 2003 and 2023. All had a case-control design, and one study was also a prospective study, following the cohort for one year. In ten of the studies, only patients with a diagnosis of schizophrenia were included. In the three remaining studies, patients with schizophrenia or schizoaffective disorder were included. The mean age for the group of patients with a violent history was 37.9 years, ranging from 32 to 47 years. Mean age for the comparison group without a history of violence was 37.7 years, ranging from 27 to 49 years. Study characteristics are presented in Table 1. The 13 studies included a total of 1446 patients (72 females) with non-affective psychosis, with 593 in the group with a history of violence and 853 in the group without a history of violence. Eight of the 13 studies examined predictors of belonging to a group with a history of violence, whereas the remaining five studies simply compared the two groups on certain variables.

3.2. Group comparisons and predictors of belonging to the group with a history of violence

All thirteen studies compared the groups with and without violent histories. Results for variables only examined in a single study are not reported below (see Table 1 for details).

The meta-analytic results for group differences between patients with and without a history of violence are presented in Table 2. Variables explored by at least three studies included PANSS positive, PANSS negative, PANSS general, and PANSS total scores, PCL-R, duration of illness, age of onset, years of education, employment status, substance use, marital status, and BACS scores.

3.3. Psychopathology and comorbidity

Ten studies compared the two groups in terms of psychopathology (Abushua'leh and Abu-Akel, 2006; Barlati et al., 2023; Bulgari et al., 2017; Engelstad et al., 2018; Guo et al., 2023; Halmai et al., 2017; Iozzino et al., 2022; Karabekiroğlu et al., 2016; Lafayette et al., 2003;

Table 1
Sample, definition of violence and major findings of the included studies.

Study	Sample	Definition of violence	Findings
Barlati et al., 2023	$N = 100$ (14 females): 50 in violent group; 50 in non-violent group	Patients in the violent group were convicted for violent crimes (no further description is offered)	**Psychopathology:** Violent group scored higher on CGI severity ($p = 0.006$) and excitatory symptoms ($p < 0.001$). No difference in duration of untreated illness. **Cognition:** Violent group performed worse on Stroop processing speed and BACS Token Motor ($p \approx 0.02$–0.03) but showed better attention on Stroop errors ($p = 0.003$). Mixed results across other subtests. **Risk/forensic tools:** Higher scores on HCR-20 Risk Management ($p = 0.002$) and PCL-R "callous" factor ($p = 0.031$); violent group higher on overall HCR-20 and PCL-R ($p < 0.001$). No significant differences on MOAS. **Comorbidity:** Higher prevalence of lifetime substance use ($p = 0.024$). **Sociodemographic/ other:** More school failures in violent group ($p = 0.002$–0.007). No difference in education, work situation or marital status.
Guo et al., 2023	$N = 507$ (0 females) 121 in the violent group. 386 in the non-violent group	Violence defined as intentional or unprepared acts against others, which caused physical harm to the victims for a total of at least 3 times	**Psychopathology:** Violent group had higher BPRS total ($p = 0.017$) and hostility-suspicion ($p < 0.001$); longer illness duration ($p = 0.009$); higher likelihood of past suicide attempts ($p = 0.003$). **Cognition:** Not assessed. **Risk/forensic tools:** Higher impulsivity ($p = 0.004$), relationship instability ($p = 0.019$), younger age at incident ($p < 0.0001$) on HCR-20; higher PCL-R ($p < 0.05$), higher HCR-20 ($p < 0.001$). **Comorbidity:** Higher likelihood of alcohol use history ($p = 0.032$). **Sociodemographic/ other:** Lower education ($p = 0.029$); more hospitalizations ($p = 0.026$).
Iozzino et al., 2022	$N = 115$ (18 females): 74 in violent group; 41 in non-violent group	Patients in the violent group had committed homicide, attempted homicide or other assaults that caused serious physical	**Psychopathology:** No group differences in PANSS symptoms, illness duration, suicide/self-harm, or substance use. **Cognition:** Violent group had shorter deliberation time ($p = 0.036$) and higher risk-taking ($p =$

(continued on next page)

Table 1 (*continued*)

Study	Sample	Definition of violence	Findings
		injury to another person	0.039) on Cambridge Gambling Task; no differences on BACS. Risk/forensic tools: Not assessed. **Comorbidity:** More comorbidity with personality disorders ($p < 0.003$). No difference in lifetime substance/alcohol use. **Sociodemographic/other:** No differences in family, marital, employment, education, or victimization. Groups differed by country (Italy vs. Poland) ($p = 0.007$).
Storvestre et al., 2020	*N* = 53 (2 females): 19 in violent group; 34 in non-violent group	Patients in the violent group had committed severe violence against others	**Psychopathology:** No group differences on GAF-S, GAF-F, or PANSS positive, negative, and general symptoms. **Cognition:** Not assessed. Risk/forensic tools: Not assessed. **Comorbidity:** No group differences in cannabis or alcohol use. **Sociodemographic/other:** Violent group reported more childhood adversities (Childhood Trauma Questionnaire, $p < 0.009$), was younger at first admission ($p < 0.005$) and psychosis onset ($p < 0.003$) and had fewer years of education ($p < 0.000$).
de Jong et al., 2018	N = 50 (0 females): 23 in violent group; 27 in non-violent group	Patients in the violent group were forensic patients who had committed highly violent crimes	**Psychopathology:** No difference in illness duration. **Cognition:** Violent group showed lower levels of metacognition (self-reflectivity and empathy accuracy; MAS-A). Risk/forensic tools: Not assessed. **Comorbidity:** Not assessed. **Sociodemographic/other:** No group differences in social cognition. Groups were matched at baseline on age, education, diagnosis, and number of hospitalizations.
Engelstad et al., 2018	*N* = 54 (4 females): 26 in violent group; 28 in non-violent group	Patients in the violent group had committed homicide or attempted homicide	**Psychopathology:** Violent group scored higher on PANSS excited subscale ($p < 0.01$). No group differences for positive, negative, disorganized, or depressed symptoms. No difference in illness duration. **Cognition:** Violent group showed greater impairment in verbal learning ($p = 0.03$, $d = 0.82$). No group differences on executive functioning (Color-Word Interference Test) or global cognition (MATRICS). Risk/forensic tools: Not assessed. **Comorbidity:** Not assessed. **Sociodemographic/other:** Violent group was more often male ($p < 0.01$), had shorter education ($p < 0.01$), were more often inpatients ($p < 0.01$), and less often native Norwegian speakers (ns). Violent group also had higher daily medication dose ($p < 0.05$).
Kristof et al., 2018	*N* = 44 (0 females): 22 in violent group; 22 in non-violent group	Patients in the violent group were forensic patients, who had committed violent crimes	**Psychopathology:** Not specifically assessed. **Cognition / social cognition:** Predictors of violent group: higher sensitivity in recognizing surprise ($p = 0.019$) and fear ($p = 0.027$). **Emotional traits:** Violent group expressed more anger inward ($p = 0.059$) and personal distress ($p = 0.065$). **Comorbidity/substance use:** No group differences in substance use. **Sociodemographic/other:** No group differences in age, education.
Bulgari et al., 2017	*N* = 87 (9 females): 50 in violent group; 37 in non-violent group	Patients in the violent group had committed acts against others, which caused (or might have caused) physical harm to the victim	**Psychopathology:** Violent group had fewer negative symptoms (BPRS, $p = 0.004$); no differences in positive symptoms or BPRS total. No differences in insight or impulsivity (BIS-11). No difference in the mean duration of the schizophrenia disorder. **Aggression/anger:** Violent group had higher Brown-Goodwin Lifetime History of Aggression scores ($p = 0.019$) and higher scores on two State-Trait Anger Inventory-2 subscales ($p = 0.049$; $p = 0.002$). **Cognition:** No group differences on BACS, Wisconsin Card Sorting Test, or Iowa Gambling Test. **Functioning:** No differences in social functioning (Personal and Social Performance Scale). **Sociodemographic/clinical:** Violent group more often admitted compulsorily ($p = 0.001$).

(*continued on next page*)

Table 1 (*continued*)

Study	Sample	Definition of violence	Findings
			No differences in education, unemployment, age at first contact, or length of stay.
Halmai et al., 2017	*N* = 41 (0 females) 22 in violent group; 19 in non-violent group	Patients in the violent group had committed homicide or attempted homicide	**Psychopathology:** Violent group scored significantly higher on all three PANSS subscales: positive ($p < 0.001$), negative ($p < 0.001$), and general ($p = 0.003$). Largest differences between groups were in delusions ($p < 0.001$), suspiciousness/ persecution ($p < 0.001$), and hostility ($p < 0.001$). Duration of illness ($p < 0.05$), duration of hospitalization ($p < 0.05$). No difference in Number of psychotic episodes prior to hospitalization or age at the onset of schizophrenia. **Cognition:** Not assessed. Risk/forensic tools: Not assessed. **Comorbidity:** No difference in substance abuse or family history of psychiatric illness. **Sociodemographic/ other**: No difference in childhood abuse.
Karabekiroğlu et al., 2016	*N* = 210 (0 females): 101 in violent group; 109 in non-violent group	Patients in the violent group had committed homicide (*N* = 30) or attempted homicide, resulting in serious injury (*N* = 71)	**Psychopathology:** Violent group had lower insight ($p < 0.001$) and a higher rate of paranoid schizophrenia ($p < 0.001$). No group differences on PANSS positive, negative, and general symptoms, duration of illness, duration of untreated psychosis, number of episodes, or hospitalizations. **Cognition:** Not assessed. **Risk/forensic tools:** Violent group scored higher on the Overt Aggression Scale ($p < 0.001$). **Comorbidity:** Violent group had less family history of psychiatric illness ($p < 0.002$). No differences in substance use. **Sociodemographic/ other:** Violent group was older ($p < 0.001$), had shorter education ($p < 0.001$), higher unemployment ($p < 0.001$), and more often lived alone ($p < 0.002$). No group differences in marital status or place of residency (rural/urban).

Table 1 (*continued*)

Study	Sample	Definition of violence	Findings
Oakley et al., 2016	N = 54 (0 females): 32 in violent group; 22 in non-violent group	Patients in the violent group had committed minor violence (e.g. assault) or major violence (e.g. wounding)	Psychopathology: Not assessed. **Cognition:** Not assessed. **Risk/forensic tools:** High score on PCL:SV predicted violence ($p < 0.001$). **Comorbidity:** Lifetime history of substance use disorder predicted violence ($p < 0.001$). Conduct disorder associated with violence ($p = 0.006$). Antisocial personality disorder predicted violence ($p = 0.004$). **Sociodemographic/ other:** Exposure to domestic violence predicted violence ($p = 0.014$).
Abushua'leh and Abu-Akel, 2006	*N* = 35 (0 females): 19 in violent group; 16 in non-violent group	Patients in the violent group had a history of repeated assaults against others (a least three assaults)	**Psychopathology:** Hostility component of BPRS predicted violence ($p < 0.05$). No group differences on positive and negative symptoms or overall severity on BPRS. No difference in duration of illness. **Cognition:** Not assessed. **Risk/forensic tools:** Violent group scored higher on PCL-R total, Factor 1, and Factor 2 (all $p < 0.0001$). Behavioral component of PCL-R (Factor 2) predicted violence ($p < 0.007$). **Comorbidity:** Violent group had higher rates of alcohol and substance use ($p < 0.005$). **Sociodemographic/ other:** Nodifference in education or marital status.
Lafayette et al., 2003	*N* = 96 (25 females): 34 in violent group; 62 in non-violent group	Patients in the violent group had a history of violent arrest (no further description is offered)	**Psychopathology:** No group differences on PANSS or SANS. **Cognition:** No group differences across tests (WAIS-III, American National Adult Reading Test, Stroop Interference Test, Wisconsin Card Sorting Test, Trails A and B, Finger-tapping test). Risk/forensic tools: Not assessed. **Comorbidity:** No group differences in substance use disorder. **Sociodemographic/ other:** Violent group had a higher percentage of males ($p = 0.02$). No difference in education, marital status or employment status.

Table 2
Meta-analyses.

Outcome	Studies (N)	Participants (N)	Cohens d (95% CI)	*p*-value	I^2	Q
PANSS Total	3	398	−0.019 (−0.49;0.45)	0.88	0.21	2.24
PANSS Positive	6	546	0.200 (−0.34;0.74)	0.36	0.76	15.56
PANSS Negative	6	546	0.284 (−0.19;0.76)	0.19	0.71	16.20
PANSS General	4	419	0.138 (−0.73;1.04)	0.65	0.81	12.32
Substance use (yes/no)	7	895	0.687 (−0.161;1.53)[a]	0.10	0.74	20.54
Age of onset	4	291	−0.061 (−0.63;0.51)	0.78	0.76	21.14
Duration of illness	7	983	0.046 (−0.28; 0.37)	0.74	0.52	12.42
Employment (yes/no)	4	483	0.009 (−1.65;1.67)[a]	0.99	0.82	11.29
Education length	6	584	−0.588 (−1.11;−0.07)	0.03	0.78	23.34
Marital status (married yes/no)	5	533	0.109 (−0.38;0.59)[a]	0.57	0.09	2.97
PCL-R	3	642	1.363 (0.14;2.59)	0.04	0.81	12.88
BACS TL	3	302	−0.090 (−0.63;0.45)	0.55	0.09	2.27
BACS SC	3	302	−0.001 (−0.65;0.65)	1.00	0.38	3.26
BACS CI	3	302	−0.004 (−0.69;0.69)	0.98	0.47	3.74
BACS TMT	3	302	−0.016 (−1.65;1.62)	0.97	0.90	19.07
BACS DS	3	302	−0.151 (−0.72;0.42)	0.37	0.18	2.49
BACS WR	3	302	0.014 (−0.73;0.76)	0.12	0.52	4.17

PCL-R = Psychopathy Checklist revised; PANSS = Positive and Negative Syndrome Scale; BACS = Brief Assessment of Cognition in Schizophrenia (TL = Tower of London, SC = Symbol Coding, CI = Category Instances, TMT = Token Motor Task, DS = Digit Sequencing, WR = Word recall).
[a] LogOR for categorical variable.

Storvestre et al., 2020). The results were mixed—see Table 2 as well as Fig. 2a for the forest plots for PANSS positive, PANSS negative, and PANSS general. Three studies used the Brief Psychiatric Rating Scale (BPRS) to assess psychopathology (Abushua'leh and Abu-Akel, 2006; Bulgari et al., 2017; Guo et al., 2023). The results from these studies were also mixed (see Table 1), and they did not allow for a meta-analysis. Overall, there was no significant difference between the two groups in terms of psychopathology. Importantly, none of the thirteen included studies reported the time duration between the violent offense and the psychopathological assessment.

Looking at the lifetime prevalence of alcohol or substance use, seven studies were included in the meta-analysis (see Table 2 as well as Fig. 2b for a forest plot) (Abushua'leh and Abu-Akel, 2006; Barlati et al., 2023; Guo et al., 2023; Halmai et al., 2017; Iozzino et al., 2022; Kristof et al., 2018; Storvestre et al., 2020). Overall, the two group did not significantly differ in terms of substance use.

Finally, a lower level of insight into illness in the group with a violent history was reported by one study (Karabekiroğlu et al., 2016), while another study (Bulgari et al., 2017) found no such difference.

3.4. Illness trajectories

We found no significant differences in terms of duration of illness across seven studies (Abushua'leh and Abu-Akel, 2006; Bulgari et al., 2017; de Jong et al., 2018; Engelstad et al., 2018; Guo et al., 2023; Halmai et al., 2017; Karabekiroğlu et al., 2016), or age of onset across five studies (Abushua'leh and Abu-Akel, 2006; Barlati et al., 2023; de Jong et al., 2018; Halmai et al., 2017; Karabekiroğlu et al., 2016) (see Table 2).

3.5. Neurocognition

Six studies compared the two groups on measures of cognition (Bulgari et al., 2017; de Jong et al., 2018; Lafayette et al., 2003). Three studies assessed cognition using BACS (Barlati et al., 2023; Bulgari et al., 2017; Iozzino et al., 2022), and these studies were included in the meta-analysis in Table 2. There was no significant group difference. The three remaining studies used other measures of cognition, but none of them used comparable variables or tests (see Table 1).

3.6. Personality

Four studies examined personality using the psychopathy checklist, PCL-R or PCL-SV, and they all found higher scores in the group with a history of violence (Abushua'leh and Abu-Akel, 2006; Barlati et al., 2023; Guo et al., 2023; Oakley et al., 2016). One of the studies excluded the PCL-R items concerning previous criminal behavior in their analyses to avoid inflated scores in the group with a violent history (Abushua'leh and Abu-Akel, 2006). Oakley and colleagues assessed psychopathy using the PCL-SV, which is a screening version of PCL-R (Cooke et al., 1999), and reported an odds ratio from a logistic regression model (OR = 1.37, 95% CI 1.18–1.58), reflecting the increase in odds of violence per one-point increase in score (Oakley et al., 2016). Since this effect estimate is not comparable to group-based mean differences derived from PCL-R scores, this study (Oakley et al., 2016) was not included in the meta-analysis.

Three studies were included in the meta-analysis (Abushua'leh and Abu-Akel, 2006; Barlati et al., 2023; Guo et al., 2023; Oakley et al., 2016). Higher scores on PCL-R significantly predicted membership of the group with a violent history (1.363, $p = 0.04$; see Table 2 as well as Fig. 2b for a forest plot). However, this finding was not robust after Bonferroni correction ($\alpha = 0.003$).

3.7. Socio-demographics

Significantly shorter education was found in the group of patients with a history of violence (−0.588, $p = 0.03$; see Table 2) across six studies (Abushua'leh and Abu-Akel, 2006; Engelstad et al., 2018; Iozzino et al., 2022; Karabekiroğlu et al., 2016; Lafayette et al., 2003; Storvestre et al., 2020). This finding was not robust after Bonferroni correction ($\alpha = 0.003$).

Neither employment status, which was assessed in five studies (Barlati et al., 2023; Bulgari et al., 2017; Iozzino et al., 2022; Karabekiroğlu et al., 2016; Lafayette et al., 2003), nor marital status, which was also assessed in 5 studies (Abushua'leh and Abu-Akel, 2006; Barlati et al., 2023; Iozzino et al., 2022; Karabekiroğlu et al., 2016; Lafayette et al., 2003), differed between the two groups (see Table 2).

3.8. Social functioning

Two studies examined social functioning and found no group differences. One study used PSP (Personal and Social Performance Scale) (Bulgari et al., 2017), and the other used GAF (Global Assessment of Functioning) (Storvestre et al., 2020).

3.9. Aggression

Using different methods, two studies found that the group with a

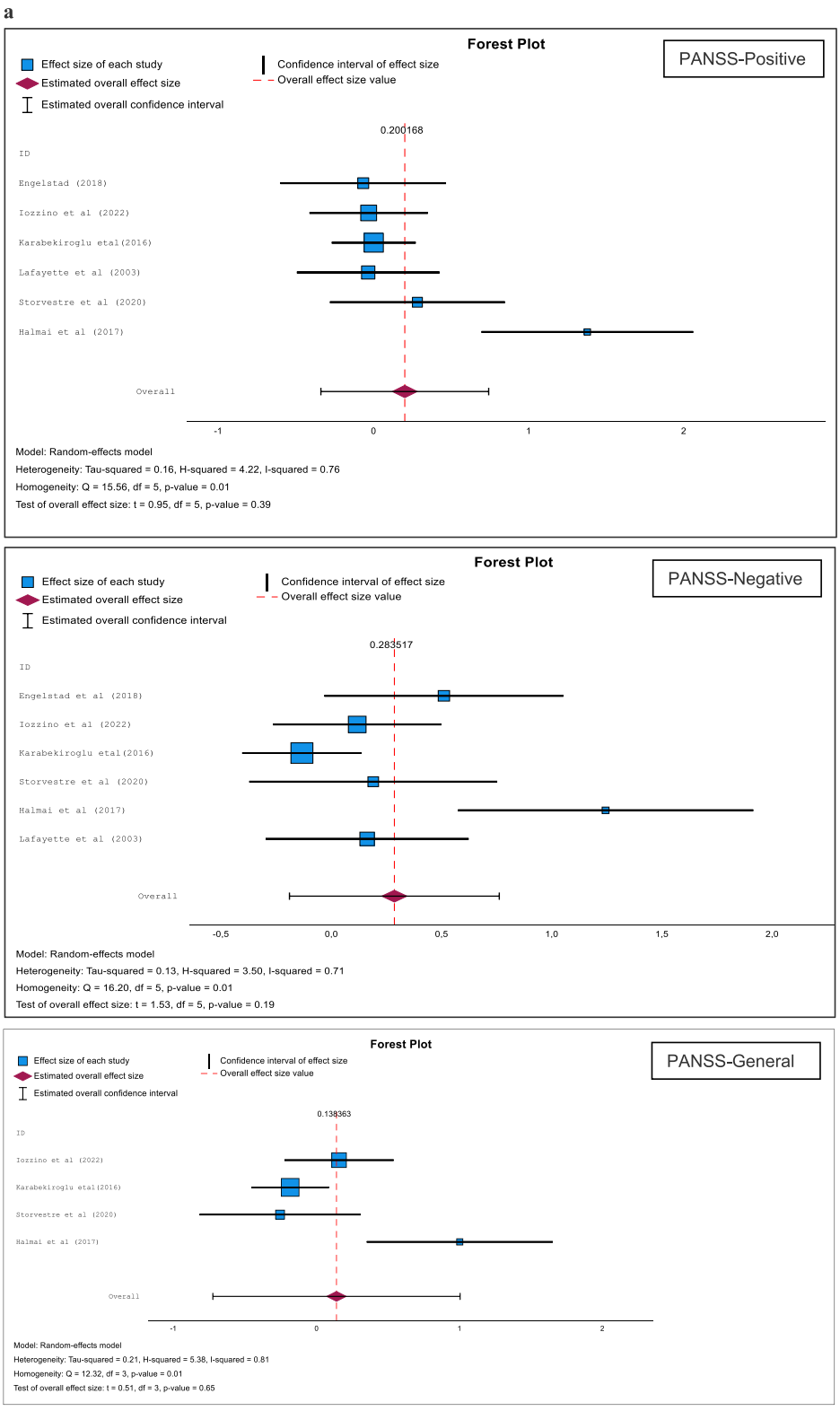


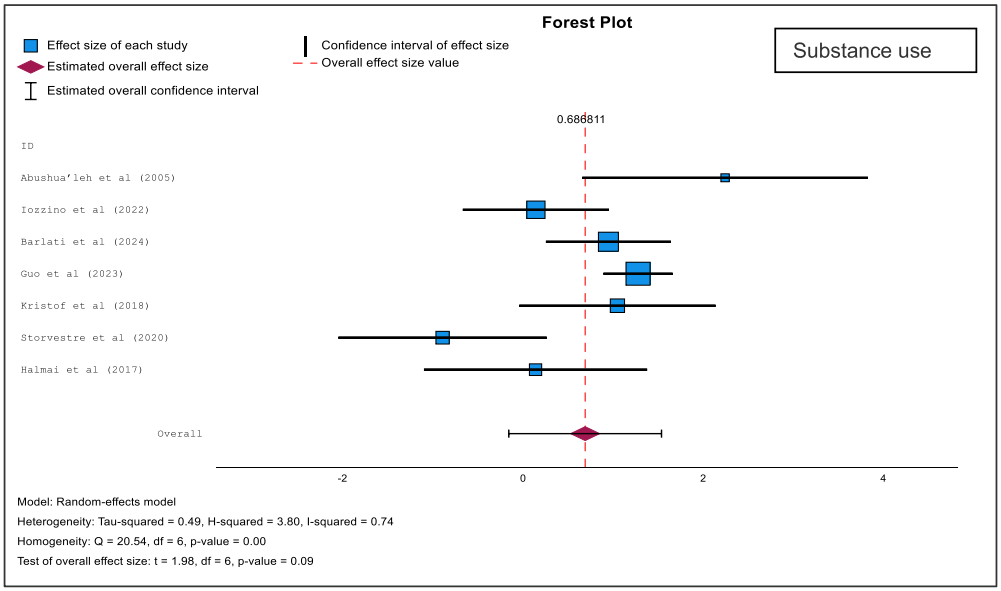
Fig. 2. a. Forest plots for PANSS-positive, PANSS-negative, and PANSS-General b. Forest plots for substance use, years of education and PCL-R Total.

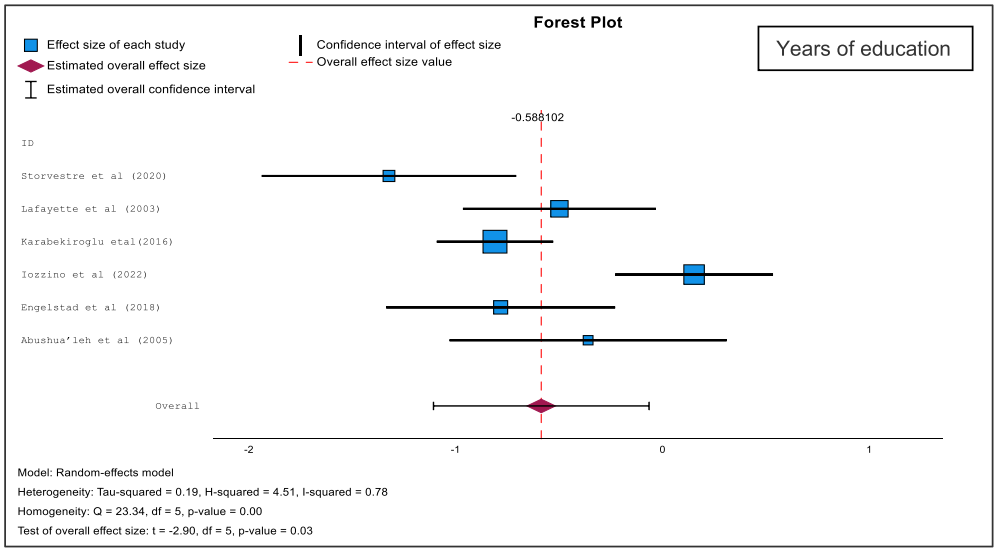
violent history scored higher on aggression than the group without a history violence (Bulgari et al., 2017; Karabekiroğlu et al., 2016), whereas another study found no such difference (Barlati et al., 2023).

3.10. Additional analyses

Outlier analyses flagged a few influential studies. For substance use and duration of illness, excluding one study in each analysis shifted the pooled effect to nominal significance, while exclusion in the education

b





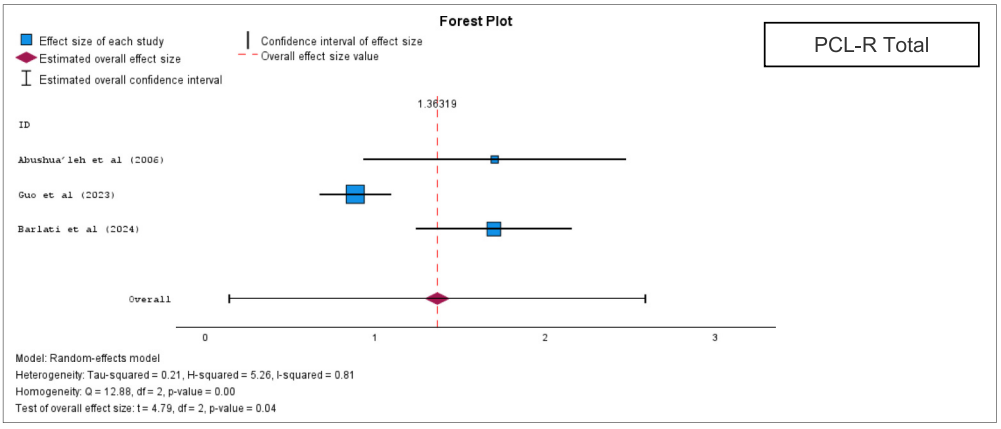


Fig. 2. (*continued*).

analysis shifted the effect to non-significance. However, none of these findings remained significant after Bonferroni correction. Additional leave-one-out analyses did not alter the overall conclusions. None of the meta-analyses included more than 10 studies, so we refrained from conducting tests for publication bias. Forrest plots with confidence intervals for all the meta-analyses are included in the Supplementary Material 2s.

3.11. Quality assessment

Risk of bias for each study is presented in Table 1s of the Supplementary Material. Seven studies were considered of good quality. Four of them received a rating of 8 and three a rating of 7. The remaining six studies were considered of fair quality, receiving ratings of 5 or 6.

4. Discussion

This is the first systematic review and meta-analysis on predictors of belonging to a group with a violent history exclusively in patients with a diagnosis of non-affective psychosis. We focused on non-affective psychosis because the delineation of risk across distinct diagnostic categories is assumed to enhance the precision of risk assessment and to enable more effectively targeted interventions aimed at preventing violent behavior. A recent register-based study found that persons with schizophrenia-spectrum disorders differed substantially from mood disorders in their risk of violent offending (Dean et al., 2024). We also restricted the definition of violence to only include physical violence against others, thereby excluding other, less severe forms of violence such as aggression, verbal threats, or self-directed violence. By applying these stricter criteria, we aimed to reduce some of the methodological heterogeneity and noise that lurk in the design of prior reviews on the topic. Despite its profound clinical and societal importance, only 13 studies met our inclusion criteria. Still, the methodologies of these studies varied considerably.

The main finding of our review is a lack of consistent evidence of predictors of belonging to the group with a history of violence in non-affective psychosis. Across studies, only two predictors of belonging to the violent group emerged with some consistency. By contrast, several variables, frequently highlighted in earlier reviews, such as positive symptoms, cognitive impairment, or comorbid substance use, did not demonstrate a predictive value in our analysis. These findings underscore the limited and fragmented state of current knowledge, emphasizing substantial gaps in the evidence base.

One significant predictor was that patients with non-affective psychosis, who had a history of violence, scored higher on the Psychopathy Checklist (PCL-R) than patients without a history of violence. However, this result was not robust after Bonferroni correction. Furthermore, only three studies were included in this meta-analysis, and the studies had methodological differences, which necessitates caution in interpreting the results. Among studies using PCL-R, specific subscales predicted belonging to the group with a history of violence, but these subscales differed across the studies, making definitive conclusions impossible. Further complicating the interpretation of this finding, the PCL-R includes scoring of past criminal behavior. This implies that individuals with a history of criminal behavior will necessarily score higher on these items, making it complicated to disentangle psychopathy-related risk from history of criminal behavior. Aware of this issue, one study (Abushua'leh and Abu-Akel, 2006) deliberately excluded items related to past criminal behavior from scoring or analysis of the PCL-R. Still, the group with a history of violence scored higher than the group without a history of violence on the PCL-R in this study. Interestingly, a recent prospective study found a positive association between PCL-R scores and subsequent risk of being diagnosed with schizophrenia (Vaurio et al., 2025).

Additionally, years of education were significantly related to belonging to the group with a history of violence before the Bonferroni correction. None of the other social variables differed between the two groups. Poor social conditions are considered a criminogenic factor and suggested to be more pronounced in people with psychosis, who commit crime. Some authors claim that criminogenic risk not only contributes to but is likely the leading factor in criminal behavior committed by persons with mental illness (Morgan et al., 2020). Educational attainment may also reflect premorbid functioning rather than a direct risk factor for violence. The absence of data on childhood psychosocial environment and adverse childhood experiences, well-established predictors of violence in the general population, represents a major limitation of the current literature. Future research should integrate developmental and social risk factors with psychopathological assessments to better identify individuals at increased risk. Overall, our findings suggest that the poor social factors are more related to mental illness than to a history of violence against others in non-affective psychosis.

Comparing psychopathology (e.g., positive, negative, and general symptoms) in patients with and without a history of violence, no significant differences emerged. At first glance, this contrasts with earlier reviews, reporting associations between psychotic symptoms and violent behavior. However, many of those studies compared patients with psychotic disorders to patients with non-psychotic disorders or healthy controls, where the mere presence of positive symptoms naturally differentiated the groups. In our review, both groups were diagnosed with non-affective psychosis, and thus, positive symptoms were present across the groups. It is therefore unsurprising that positive symptoms did not distinguish between patients with and without a history of violence. Other symptom domains, such as negative or general symptoms, could, theoretically, still serve as predictors. However, our findings do not support such a conclusion. It must be emphasized that psychopathology was assessed at some unspecified time point after the violent act had been committed, meaning that the psychopathological assessment most likely didn't capture the patient's mental state at the time of the offense. Recall bias and changes in symptom profile over time may therefore have obscured possible associations between psychopathology and the violence.

Our findings in the domain of cognition were inconsistent, likely reflecting variability in the tests employed and the specific domains assessed across studies. Importantly, these results diverge from those of a prior review and meta-analysis (Reinharth et al., 2014), which reported cognitive impairments as a risk factor for violence. However, that review applied a much broader definition of violence, including verbal aggression and aggression against objects, and included diagnostic groups beyond non-affective psychosis. These methodological differences may explain why the results on cognition in our study differ from those of the prior study.

Our meta-analytic finding of no difference in substance use between the two groups across seven studies is surprising. A prior systematic review and meta-analysis on schizophrenia and violence (Fazel et al., 2009) found that the increased risk of violence in patients with psychosis and comorbid substance use disorder was comparable to that of individuals with substance use disorders alone. Overall, it seems that the relationship between schizophrenia, substance use, and violence is still unclear.

In sum, our review and meta-analysis could not replicate several of the predictors of violence, which have previously been identified in broader psychiatric populations. This discrepancy is likely due to differences in the characteristics of patient populations, control groups, and definitions of violence between our study and prior studies. For example, the inclusion of behaviors such as verbal threats or aggression directed at objects in prior studies may have blurred the distinction between these actions and physical violence against others. By all accounts, kicking a door in anger is vastly different from, e.g., attempting to strangle another person. More fundamentally, the key clinical and scientific question is not whether people with psychosis, as a group, show an elevated risk of violence compared to non-psychiatric controls—that finding is already well established. Instead, the critical issue is why a small minority of patients with psychosis become violent, while the vast majority of them do not. Studying predictors of violence in mixed samples of psychiatric patients or by comparing patients with psychotic disorders to healthy individuals may primarily capture what distinguishes psychotic from non-psychotic groups, rather than identifying the factors that genuinely distinguish patients with phychosis and violent behaviour from patients with psychosis without violent

behaviour. Moreover, future research could also differentiate between different types of psychosis. Our findings on patients with non-affective psychosis emphasize the need for research that directly addresses this distinction. Only by focusing on intra-diagnostic comparisons can we begin to identify the mechanisms and risk factors that may explain why some patients with non-affective psychosis become violent against others. Future studies could preferably prioritize longitudinal designs, delimit the types of violence to be examined to physical violence toward others, and narrow their cases and controls to specific diagnostic groups.

4.1. Limitations

A limitation is the small number of studies included in each meta-analysis, along with the high heterogeneity observed, which requires caution when interpreting the results. Additionally, the time lag between violent behavior and assessment can vary significantly and may have influenced the results of the studies. Finally, we did not conduct a systematic search for gray literature and restricted inclusion to peer-reviewed studies. While this approach was chosen to ensure methodological quality, it may have introduced publication bias, as unpublished null findings could result in weaker true associations than those estimated.

CRediT authorship contribution statement

Gitte Ahle: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Mads Gram Henriksen:** Writing – review & editing, Supervision, Project administration, Funding acquisition, Conceptualization. **Ida-Marie Mølstrøm:** Writing – review & editing, Visualization, Software, Methodology, Formal analysis, Data curation. **Andreas Rosén Rasmussen:** Writing – review & editing, Supervision. **Mette Brandt Christensen:** Writing – review & editing, Supervision. **Julie Nordgaard:** Writing – review & editing, Visualization, Validation, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

Role of funding source

The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing the report.

Funding

Author GA was supported by Mental Health Services in the Capital Region, Denmark.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement

Thanks to Mental Health Services in the Capital Region, Denmark for funding.

The authors would like to thank Annick Urfer-Parnas for translation and clarification of articles written in French.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.schres.2026.02.015.

Data availability

All data included were derived from publicly available documents cited in the references. Extracted data are available upon request to the corresponding author.

References

Abushua'leh, K., Abu-Akel, A., 2006. Association of psychopathic traits and symptomatology with violence in patients with schizophrenia. Psychiatry Res. 143 (2–3), 205–211.
Arseneault, L., Moffitt, T.E., Caspi, A., Taylor, P.J., Silva, P.A., 2000. Mental disorders and violence in a total birth cohort: results from the Dunedin study. Arch. Gen. Psychiatry 57 (10), 979–986.
Barlati, S., Nibbio, G., Stanga, V., Giovannoli, G., Calzavara-Pinton, I., Necchini, N., Lisoni, J., Deste, G., Vita, A., 2023. Cognitive and clinical characteristics of offenders and non-offenders diagnosed with schizophrenia spectrum disorders: results of the Recoviwel observational study. Eur. Arch. Psychiatry Clin. Neurosci. 273 (6), 1307–1316.
Bo, S., Abu-Akel, A., Kongerslev, M., Haahr, U.H., Simonsen, E., 2011. Risk factors for violence among patients with schizophrenia. Clin. Psychol. Rev. 31 (5), 711–726.
Bobes, J., Fillat, O., Arango, C., 2009. Violence among schizophrenia out-patients compliant with medication: prevalence and associated factors. Acta Psychiatr. Scand. 119 (3), 218–225.
Borenstein, M., Hedges, L.V., Higgins, J.P., Rothstein, H.R., 2021. Introduction to Meta-Analysis. John Wiley & Sons.
Brennan, P.A., Mednick, S.A., Hodgins, S., 2000. Major mental disorders and criminal violence in a Danish birth cohort. Arch. Gen. Psychiatry 57 (5), 494–500.
Bulgari, V., Iozzino, L., Ferrari, C., Picchioni, M., Candini, V., De Francesco, A., Maggi, P., Segalini, B., de Girolamo, G., 2017. Clinical and neuropsychological features of violence in schizophrenia: a prospective cohort study. Schizophr. Res. 181, 124–130.
Cooke, D.J., Michie, C., Hart, S.D., Hare, R.D., 1999. Evaluating the screening version of the Hare Psychopathy Checklist—Revised (PCL: SV): an item response theory analysis. Psychol. Assess. 11 (1), 3.
de Jong, S., van Donkersgoed, R., Renard, S., Carter, S., Bokern, H., Lysaker, P., van der Gaag, M., Aleman, A., Pijnenborg, G.H.M., 2018. Social-cognitive risk factors for violence in psychosis: a discriminant function analysis. Psychiatry Res. 265, 93–99.
Dean, K., Laursen, T.M., Marr, C., Pedersen, C.B., Webb, R.T., Agerbo, E., 2024. Absolute and relative risk of violent victimisation and perpetration following onset of mental illness: a Danish register-based study. Lancet Reg. Health 36.
Egger, M., Davey Smith, G., Schneider, M., Minder, C., 1997. Bias in meta-analysis detected by a simple, graphical test. Bmj 315 (7109), 629–634.
Engelstad, K.N., Vaskinn, A., Torgalsbøen, A.-K., Mohn, C., Lau, B., Rund, B.R., 2018. Impaired neuropsychological profile in homicide offenders with schizophrenia. Compr. Psychiatry 85, 55–60.
Fazel, S., Gulati, G., Linsell, L., Geddes, J.R., Grann, M., 2009. Schizophrenia and violence: systematic review and meta-analysis. PLoS Med. 6 (8), e1000120.
Guo, W., Gu, Y., Zhou, J., Wang, X., Sun, Q., 2023. Characteristics and associated factors of violence in male patients with schizophrenia in China. Front. Psych. 14, 1106950.
Halmai, T., Tényi, T., Gonda, X., 2017. Symptom profiles and parental bonding in homicidal versus non-violent male schizophrenia patients. Ideggyogy. Sz. 70 (1–2), 43–52.
Harrer, M., Cuijpers, P., Furukawa, T., Ebert, D., 2021. Doing meta-Analysis with R: A Hands-on Guide. Chapman and Hall/CRC.
Higgins, J.P., Thompson, S.G., 2002. Quantifying heterogeneity in a meta-analysis. Stat. Med. 21 (11), 1539–1558.
Hodgins, S., Alderton, J., Cree, A., Aboud, A., Mak, T., 2007. Aggressive behaviour, victimization and crime among severely mentally ill patients requiring hospitalisation. Br. J. Psychiatry 191, 343–350.
IBM, 2023. SPSS Version 29.0.1.0, 171.
Iozzino, L., Canessa, N., Rucci, P., Iommi, M., Dvorak, A., Heitzman, J., Markiewicz, I., Picchioni, M., Pilszyk, A., Wancata, J., 2022. Decision-making and risk-taking in forensic and non-forensic patients with schizophrenia spectrum disorders: a multicenter European study. Schizophr. Res. Cogn. 29, 100257.
Karabekiroğlu, A., Pazvantoğlu, O., Karabekiroğlu, K., Böke, Ö., Korkmaz, I.Z., 2016. Associations with violent and homicidal behaviour among men with schizophrenia. Nord. J. Psychiatry 70 (4), 303–308.
Knapp, G., Hartung, J., 2003. Improved tests for a random effects meta-regression with a single covariate. Stat. Med. 22 (17), 2693–2710.
Kristof, Z., Kresznerits, S., Olah, M., Gyollai, A., Lukacs-Miszler, K., Halmai, T., Fountoulakis, K.N., Tenyi, T., Dome, P., Gonda, X., 2018. Mentalization and empathy as predictors of violence in schizophrenic patients: comparison with nonviolent schizophrenic patients, violent controls and nonviolent controls. Psychiatry Res. 268, 198–205.
Lafayette, J.M., Frankle, W.G., Pollock, A., Dyer, K., Goff, D.C., 2003. Clinical characteristics, cognitive functioning, and criminal histories of outpatients with schizophrenia. Psychiatr. Serv. 54 (12), 1635–1640.
Lagerberg, T., Lambe, S., Paulino, A., Yu, R., Fazel, S., 2025. Systematic review of risk factors for violence in psychosis: 10-year update. Br. J. Psychiatry 226 (2), 100–107.
Lamsma, J., Harte, J.M., 2015. Violence in psychosis: conceptualizing its causal relationship with risk factors. Aggress. Violent Behav. 24, 75–82.
Morgan, R.D., Scanlon, F., Van Horn, S.A., 2020. Criminogenic risk and mental health: a complicated relationship. CNS Spectr. 25 (2), 237–244.

Oakley, C., Harris, S., Fahy, T., Murphy, D., Picchioni, M., 2016. Childhood adversity and conduct disorder: a developmental pathway to violence in schizophrenia. Schizophr. Res. 172 (1–3), 54–59.
Page, M.J., McKenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., Shamseer, L., Tetzlaff, J.M., Akl, E.A., Brennan, S.E., 2021. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 372.
Reinharth, J., Reynolds, G., Dill, C., Serper, M., 2014. Cognitive predictors of violence in schizophrenia: a meta-analytic review. Schizophr. Res. Cogn. 1 (2), 101–111.
Rund, B.R., 2018. The association between schizophrenia and violence. Schizophr. Res. 199, 39–40.
Sterne, J.A., Sutton, A.J., Ioannidis, J.P., Terrin, N., Jones, D.R., Lau, J., Carpenter, J., Rücker, G., Harbord, R.M., Schmid, C.H., Tetzlaff, J., Deeks, J.J., Peters, J., Macaskill, P., Schwarzer, G., Duval, S., Altman, D.G., Moher, D., Higgins, J.P., 2011. Recommendations for examining and interpreting funnel plot asymmetry in meta-analyses of randomised controlled trials. BMJ 343, d4002.
Stevens, H., Nordentoft, M., Agerbo, E., Mortensen, P.B., 2010. Dom til psykiatrisk behandling. Ugeskr. Laeger 172 (35), 2366–2370.
Storvestre, G.B., Jensen, A., Bjerke, E., Tesli, N., Rosaeg, C., Friestad, C., Andreassen, O. A., Melle, I., Haukvik, U.K., 2020. Childhood trauma in persons with schizophrenia and a history of interpersonal violence. Front. Psych. 11, 383.
Vaurio, O., Tiihonen, J., Lähteenvuo, M., Lieslehto, J., 2025. Psychopathic traits associate with later schizophrenia. Acta Psychiatr. Scand. 152 (6), 432–440.
Viechtbauer, W., Cheung, M.W.L., 2010. Outlier and influence diagnostics for meta-analysis. Res. Synth. Methods 1 (2), 112–125.
Wells, G.A., Shea, B., O'Connell, D., Peterson, J., Welch, V., Losos, M., Tugwell, P., 2000. The Newcastle-Ottawa Scale (NOS) for Assessing the Quality of Nonrandomised Studies in meta-Analyses.
Witt, K., van Dorn, R., Fazel, S., 2013. Risk factors for violence in psychosis: systematic review and meta-regression analysis of 110 studies. PloS One 8 (2), e55942.