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► **To cite this version:**

Margot Trimbur, Ali Amad, Mathilde Horn, Pierre Thomas, Thomas Fovet. Are radicalization and terrorism associated with psychiatric disorders? A systematic review.. Journal of Psychiatric Research, 2021, Journal of Psychiatric Research, 141, pp.214-222. 10.1016/j.jpsychires.2021.07.002 . hal-04595640

HAL Id: hal-04595640

<https://hal.univ-lille.fr/hal-04595640>

Submitted on 22 Jul 2024

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Are radicalization and terrorism associated with psychiatric disorders?

A systematic review

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Word count: 3491 words, 58 references, 1 figure, 1 table

Introduction

Recent waves of attacks around the world (e.g., Paris, 2020, 2015; London and Manchester, 2017; Las Vegas, 2017) have given significant attention to the phenomena of terrorism and radicalization, especially *Islamist radicalization*. Even if there is no consensus about its definition, radicalization is generally defined as the “*process through which people become increasingly motivated to use violent means against members of an out-group or symbolic targets to achieve behavioral change and political goals*” (Doosje et al., 2016). Terrorism, which is an old phenomenon that has taken many forms over the centuries, is defined as “*the threatened or actual use of illegal force and violence by a nonstate actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation*” (Institute for Economics and Peace, 2019). It represents a worldwide issue, as 103 countries reported at least one terrorist incident in 2018, mainly in Africa and the Middle East (Institute for Economics and Peace, 2019). Islamist terrorism is the deadliest in the world and the most frequent in the Middle East; it represents 18.6% of terrorist acts perpetrated in Europe (Europol, 2019). The concepts of terrorism and radicalization are frequently associated with one another. Indeed, radicalization is a dynamic process that may be represented as a pyramid (McCauley and Moskalenko, 2008) or a staircase model (Moghaddam, 2005) following a gradient from radical feelings (the broad base) to radical behavior (the apex). From this perspective, terrorists may be defined as a subgroup in the population of radicalized individuals.

The risk factors for radicalization and terrorism represent a key research area. While there is an abundance of data on the sociological, political, and criminological profiles of radicalized people and terrorists, knowledge about psychiatric disorders among this population remains scarce and contradictory. For decades, the mental health status of radicalized people and terrorists has been a matter of debate (Piccinni et al., 2018; Victoroff, 2005). In the 1970s, it was thought that terrorists had mental disorders such as psychopathy and personality disorders (Cooper, 1977; Pearce and Macmillan, 1977). **However, several authors later formally denied this hypothesis without providing sufficient empirical evidence (Crenshaw, 1981; Horgan and Horgan, 2005; Rasch, 1979).** In the last decade, the increasing number of attacks carried out by lone actors has rekindled the debate on the link between psychiatric disorders, radicalization, and terrorism. Indeed, the apparently

disturbed profiles of some of them have encouraged governments to involve mental health professionals in the terrorist issue (Bhugra, 2017; Bhui et al., 2016a; The Lancet Psychiatry, 2019; Wright and Hankins, 2016).

For this article, we conducted a systematic review of the international literature to synthesize the current knowledge on psychiatric disorders among both terrorist and radicalized populations.

Material and methods

For this systematic review, we followed the PRISMA guidelines (Moher et al., 2009). To identify eligible studies, we performed a systematic search using Medline and Lissa (database of medical articles in French [17]), setting the date up to June 2020 and using the following search term combinations: « terror* AND psychiatr* », «terror* AND mental disorder », « radicaliz* AND psychiatr*», «radicalis* AND psychiatr*», «radicalis* AND mental disorder » and « radicaliz* AND mental disorder ».

Articles were eligible for inclusion if they were original studies written in English or French and dealt with mental disorders related to terrorism or radicalization. **The radicalized population included persons considered as such by the authors (e.g., suspected jihadists or radicalized people, former members of an extremist group).** The terrorist population included perpetrators of terrorist acts and members of terrorist groups. We also included studies investigating support for radicalization and political violence in the general population (i.e., people at risk of radicalization).

Exclusion criteria corresponded to articles not written in English or French, review articles, case reports or opinion articles, and irrelevant papers (e.g., reporting disorders among the victims of terrorism and not the perpetrators).

Article titles and abstracts were screened by two authors (MT & AA) and included according to the criteria mentioned above. Full texts of studies that passed the preliminary screening were reviewed and potentially excluded based on the same criteria. We also hand-examined the reference sections from the selected papers to identify any additional relevant studies. We clustered the selected studies into three groups according to the study

population (i.e., people at risk of radicalization, radicalized populations, and terrorist populations).

Quality assessment was conducted using the *Scottish Intercollegiate Guidelines Network* (SIGN) framework, encompassing the following levels of evidence: 1⁺⁺ - high quality meta-analyses, systematic reviews of randomized controlled trials, or randomized controlled trials with a very low risk of bias; 1⁺ - well-conducted meta-analyses, systematic reviews, or randomized controlled trials with low risk of bias; 1⁻ - meta-analyses, systematic reviews, or randomized controlled trials with high risk of bias; 2⁺⁺ - high-quality systematic reviews of case control or cohort studies; 2⁺ - well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal; 2⁻ - case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal; 3 – non-analytic studies, such as case reports or case series and 4 – expert opinions (https://www.sign.ac.uk/assets/sign_grading_system_1999_2012.pdf).

Results

Search results

Twenty-five articles were eligible for inclusion. The flowchart of our research is presented in **Figure 1**.

Study characteristics

The main characteristics of the 25 studies are summarized in **Table 1**.

The identified studies came from different fields (sociology, criminology, psychology, and psychiatry) and used heterogeneous methodologies. We identified 1 qualitative study, 21 quantitative studies, and 3 mixed-method studies.

Nine studies were based on secondhand data (mean sample size = 91.6 subjects, min: 23, max: 140), mainly open-source data (e.g., legal documents, scholarly and media articles) (Bazex et al., 2017; Corner et al., 2016; Corner and Gill, 2015; Gill et al., 2014; Gruenewald et al., 2013; Meloy et al., 2019; Meloy and Gill, 2016; Morris and Meloy, 2020; Weenink, 2015). Sixteen articles were based on firsthand data (mean sample size = 520.75 subjects, min: 25, max: 3,679), 9 studies were conducted with small samples of radicalized people or terrorists (N. Campelo et al., 2018; Nicolas Campelo et al., 2018; Gottschalk and Gottschalk, 2004; Lyons and Harbinson, 1986; Merari et al., 2010; Oppetit et al., 2019; Rolling and Corduan, 2017; Schbley, 2003; Simi et al., 2016), and 7 studies were carried out among the general population (Bhui et al., 2019, 2016b, 2014a, 2014b; Coid et al., 2016; Rousseau et al., 2019; Victoroff et al., 2010).

Among the studies that used firsthand data (n=16), the evaluation methods to assess psychiatric disorders varied. Eight studies employed standardized tools (i.e., validated scales and tests) without any clinical interview by a psychologist or a psychiatrist (Bhui et al., 2019, 2016b, 2014b, 2014a; Coid et al., 2016; Gottschalk and Gottschalk, 2004; Rousseau et al., 2019; Victoroff et al., 2010). Three studies used a non-structured clinical interview without any standardized tool (N. Campelo et al., 2018; Lyons and Harbinson, 1986; Rolling and Corduan, 2017). Only one study employed a clinical interview associated

with the use of standardized tools (Merari et al., 2010). Finally, four studies used semi-structured interviews by non-clinicians or non-validated scales (Nicolas Campelo et al., 2018; Oppetit et al., 2019; Schbley, 2003; Simi et al., 2016)

Four studies focused on the Middle East (two in Israel (Gottschalk and Gottschalk, 2004; Merari et al., 2010) one in Lebanon (Schbley, 2003) and one in Palestine (Victoroff et al., 2010) whereas other articles examined Western regions, mainly in Western Europe and North America.

Overall, 7 studies included people at risk of radicalization, 8 studies examined radicalized populations, and 10 studies investigated terrorist populations.

People at-risk of radicalization

Among the seven articles that explored people at risk of radicalization, three referred to the same sample (Bhui et al., 2016b, 2014a, 2014b). All samples were assessed with standardized tools. Most of the articles investigated sympathy for violent protests and terrorism (SVPT) among general population samples. SVPT is considered a phase of vulnerability to radicalization, which may be assessed with the “SyfoR” (Bhui et al., 2014b), a 16-item inventory, or the modified “SyfoR” (Bhui et al., 2019, 2016b, 2014a, 2014b; Rousseau et al., 2019). Several studies found that depressive symptoms (assessed with the PHQ-9 and HSCL-25) were associated with a higher risk of SVPT, even when no suicidal thoughts were identified (Bhui et al., 2019, 2016b, 2014a; Rousseau et al., 2019). In a large sample of Canadian college students, depression scores accounted for 47% (95% CI: 0.2-1.15, $p < 0.001$) and 25% (95% CI: 0.10, 0.57, $p < 0.001$) of the total effect between discrimination and the experience of violence and SVPT score, respectively (Rousseau et al., 2019). These results conflict with those of 2 other studies. Indeed, Coid et al. showed that men with neutral opinions were more likely to suffer from depression than those with extremist opinions (Coid et al., 2016). Another study involving 52 teenaged Palestinian boys did not identify any significant association between depression and support for religiopolitical aggression (Victoroff et al., 2010).

With regard to other psychiatric symptoms, Coid et al. found a significant association between antisocial personality disorder and extremist opinions (Coid et al., 2016).

Radicalized populations

Eight articles assessing psychiatric symptoms in radicalized people from France, the US, Scotland, and the Netherlands were identified (Bazex et al., 2017; N. Campelo et al., 2018; Nicolas Campelo et al., 2018; Morris and Meloy, 2020; Oppetit et al., 2019; Rolling and Corduan, 2017; Simi et al., 2016; Weenink, 2015). The prevalence of mental disorders varied greatly from 6% to 41%. Importantly, only two studies used clinical interviews to identify psychiatric disorders (N. Campelo et al., 2018; Rolling and Corduan, 2017), and no study used standardized tools.

Three studies specifically investigated psychotic disorders and found prevalence rates that ranged from 3.4% (including 2% for schizophrenia) to 22% (Bazex et al., 2017; Morris and Meloy, 2020; Weenink, 2015). Severe mental disorders (i.e., psychotic or maniac symptoms) were identified in 12% and 38.2% of two samples of radicalized teenagers, respectively (N. Campelo et al., 2018; Rolling and Corduan, 2017).

The prevalence rates of depression and depressive symptoms were estimated at 33% and 44%, respectively (Nicolas Campelo et al., 2018; Morris and Meloy, 2020). High rates of suicidal ideation or behavior (from 29.3% to 57%) have also been described among French jihadists and former members of violent White supremacist groups (Nicolas Campelo et al., 2018; Simi et al., 2016). The prevalence rates of substance abuse disorders ranged from 22% to 73% (Nicolas Campelo et al., 2018; Morris and Meloy, 2020; Simi et al., 2016).

Finally, the prevalence of pathological personality traits (mostly histrionic, dissocial, and borderline traits) ranged from 12% to 77.7%, and a high prevalence rate of psychological trauma, neglect and child abuse was identified in several samples (Nicolas Campelo et al., 2018; Oppetit et al., 2019; Rolling and Corduan, 2017; Simi et al., 2016).

Terrorist populations

Ten articles explored psychiatric disorders in terrorist populations (Corner et al., 2016; Corner and Gill, 2015; Gill et al., 2014; Gottschalk and Gottschalk, 2004; Gruenewald et al., 2013; Lyons and Harbinson, 1986; Meloy et al., 2019; Meloy and Gill, 2016; Merari et al., 2010; Schbley, 2003). Only one article used both clinical interviews and standardized tools (Merari et al., 2010). One article employed clinical interviews without standardized tools

(Lyons and Harbinson, 1986), and one article used only standardized tools (Gottschalk and Gottschalk, 2004).

Three articles investigated group-terrorist populations in the Middle East (Gottschalk and Gottschalk, 2004; Merari et al., 2010; Schbley, 2003), whereas six articles focused on lone-actor terrorists (i.e., a person who “operates individually, does not belong to an organized terrorist group or network, and whose *modi operandi* are conceived and directed (...) without any direct outside command or hierarchy” (Spaaij, 2010)(Corner et al., 2016; Corner and Gill, 2015; Gill et al., 2014; Gruenewald et al., 2013; Meloy et al., 2019; Meloy and Gill, 2016). One article compared political and non-political people who committed murders in Northern Ireland. As no information regarding group membership was found, they were classified as lone-actor terrorists (Lyons and Harbinson, 1986).

Group terrorism

Three articles investigated terrorist populations in Lebanon and Israel (Gottschalk and Gottschalk, 2004, 2004; Merari et al., 2010). The results suggested that pathological personality traits (according to the DSM-IV) are highly prevalent in this population. **Although they are highly heterogeneous groups, both Israeli and Palestinian terrorists had more psychopathic, paranoid, depressive and hypomanic personality traits than their respective non-terrorist controls (Gottschalk and Gottschalk, 2004).** Ayla Schbley also found a strong relationship between personality disorders and religious terrorism in 405 Hezbollah militants, 341 of whom answered self-questionnaires (Schbley, 2003). Finally, specific features of personality disorders are associated with subgroups of terrorists, with more cluster C traits in the suicidal group (i.e., would-be suicide bombers) and more cluster B traits in the control and organizer groups in a sample of 29 Palestinian terrorists (Merari et al., 2010).

Lone-actor terrorism

Lone-actor terrorism was mostly scrutinized through open-source databases (e.g., legal documents, scholarly and media articles) (Corner et al., 2016; Corner and Gill, 2015; Gill et al., 2014; Gruenewald et al., 2013; Meloy et al., 2019; Meloy and Gill, 2016). The prevalence of psychiatric disorders among lone-actor terrorists varied from 31.9% to 48.5% (Gruenewald et al., 2013; Meloy et al., 2019). The results also showed that the more isolated a terrorist was, the more likely he/she was to have a psychiatric disorder (Corner et al.,

2016). Regarding the type of ideology, three articles distinguished single issue, Islamist and right-wing terrorists (Gill et al., 2014; Corner et al., 2015; Meloy and Gill, 2016). Two articles concluded on the same sample that “*lone actors with a history of mental illness are more likely associated with single-issue ideologies than Al-Qaeda inspired or extreme right-wing ideologies*” (Corner et al., 2015).

Corner, Gill and colleagues found that 31.9% of a sample, including 119 lone-actor terrorists, had a history of mental illness or personality disorder compared to 3.4% of group terrorists (Corner et al., 2016; Corner and Gill, 2015; Gill et al., 2014). The authors found a higher prevalence of schizophrenia (8.5%), autism spectrum disorder (3.3%), and delusional disorder (2%) among lone-actor terrorists than in the general population. Gill et al. identified a “*history of mental problems in the subject’s biography*” in 41% of the same sample, excluding isolated dyads (i.e., pairs of individuals who operate independently of a group) and perpetrators who facilitated violent actions (Meloy and Gill, 2016). However, these results should be nuanced by the work of Meloy et al., who revealed that mental disorders were less frequent among lone-actor terrorists than among non-attackers identified as a national security concern (48.5% vs. 94.1%, OR: 0.06, 95% CI: 0.01-0.50, $p < 0.01$) (Meloy et al., 2019). In the same vein, political murderers had a low rate of mental illness compared to non-political murderers in a study involving political and non-political people charged with murder in Northern Ireland (Lyons and Harbinson, 1986).

Discussion

We conducted the first systematic review of the psychiatric scientific literature, aiming to investigate the prevalence of psychiatric disorders in radicalized and terrorist populations. The results show strong variations in the prevalence rates of psychiatric disorders depending on the study population and methodology.

The quality assessment of the studies shows an overall low level of evidence with a high risk of confounding and/or bias. The heterogeneity and low quality of the studies' methodology do not allow for any definitive conclusion to be drawn. However, certain trends emerge, depending on the population groups considered.

First, four studies suggest that depressive symptoms are associated with SVPT in people at risk of radicalization (Bhui et al., 2019, 2016b, 2014a; Rousseau et al., 2019), but conflicting results do not permit this association to be confirmed (Bhui et al., 2014b; Coid et al., 2016; Victoroff et al., 2010). Second, studies involving radicalized people report an overall prevalence of psychiatric disorders ranging from 6% to 41%. The main psychiatric disorders are depression (Nicolas Campelo et al., 2018; Morris and Meloy, 2020), psychotic disorders, substance abuse disorders, and personality disorders. Third, there are two trends in the terrorist population: low rates of psychiatric disorders in group terrorists (3.4%) compared to lone-actor terrorists (41%) and pathological personality traits in Middle-Eastern group terrorists.

Several explanations can be proposed to explain the important variations in the prevalence rates of psychiatric disorders identified in our systematic review. Importantly, the methodological discrepancies regarding both the psychiatric evaluation and the radicalized or terrorist status could be key elements in shedding light on these results.

First, the way in which radicalized people are identified and categorized, as well as the definitions of radicalization and terrorism, are not consensual and can vary considerably between countries (Bignami, 2011; Roach, 2013). Indeed, radicalization and terrorism are complex, dynamic, multifactorial phenomena closely linked to the prevailing social and political context. For example, recent studies have challenged lone actors' categorization, suggesting that such individuals are in fact often members of a broader network (Lindekilde et al., 2018). **Moreover, some authors consider radicalization as a process by which an**

individual or a group comes to adopt increasingly extreme political, social, or religious ideals and aspirations that reject or undermine the status quo that does not necessarily include violence (Leistedt, 2016; Wilner and Dubouloz, 2011). This highlights the lack of a clear definition of radicalization and terrorism as a major issue.

Second, the methodologies used to assess psychiatric disorders among radicalized and terrorist populations vary widely across studies. Only 4 out of the 25 studies used clinical interviews (by a psychiatrist or a psychologist) to assess psychiatric disorders. For the vast majority of studies, the diagnoses were based on a set of symptoms, behavioral disorders found in open sources, or self-reported surveys. The major limitation of open sources is selection bias since most of the information comes from the media, which mostly covers only very limited aspects of the individuals involved, such as the level of violence, the perpetrator's religion (Chermak, 1994; Chermak and Gruenewald, 2006), or the perpetrator's mental health status.

Several hypotheses can be made to explain the lack of consistent firsthand data sources in terrorist and radicalized populations. There are many obstacles to including terrorists in research protocols such as security concerns, contexts of war, or refusal to be interviewed. In addition, a significant number of individuals who commit terrorist acts die at the time of the offense. The same access difficulties apply to radicalized people who tend to practice concealment. Therefore, direct studies among radicalized and terrorist populations are often monocentric and include small samples that vary according to geographic, political and cultural contexts. Further, recall bias may exist in population-based studies, and retrospective qualitative interviews challenge the reliability of the information gathered.

Although the implementation of well-conducted studies in these populations is challenging, they also appear necessary. Indeed, the recent rise of online radicalization (Institute for Economics and Peace, 2018) and the increasing number of attacks conducted by lone-actor terrorists make this phenomenon a timely field of research (Spaaij, 2010). Moreover, some authors have suggested that mental disorders are likely to be underdiagnosed in the terrorist population, especially when suicidal ideations are present (Lankford, 2016). Finally, the link between lone-actor terrorists and psychiatric disorders, highlighted in our review and pointed by some authors (Misiak et al., 2019; Seidenbecher et al., 2020) deserves to be further clarified.

This work will only be possible if efforts to standardize radicalization and terrorism criteria according to international consensus benchmarks are pursued. It is also imperative that studies in the field use validated, standardized methods to evaluate psychiatric disorders. Only studies of high methodological quality will make it possible to understand the relationship between the three population groups described in our systematic review and the transition from one to the other. Several models used to explain radicalization emphasize that it is a complex and non-linear process (Christmann, 2012; Victoroff, 2005). Indeed, radicalization results from the interactions between risk and protective factors at individual (e.g. genetic, biological, psychological), group (e.g. relational, community) and mass (e.g. political, religious, social) levels (Decety et al., 2018; Kruglanski et al., 2018). In this perspective, mental disorder is an individual factor that should be quantified but also studied throughout the life course of the individual and in relation to co-occurring factors (Gill et al., 2021).

This systematic review has some methodological limitations. First, given the broad inclusion criteria, the studies were heterogenous and complex. We have therefore chosen to categorize the studied population into 3 population groups, which could be discussed. Second, only studies written in French or English were considered. Third, due to the heterogeneity of the studies, no meta-analysis could be performed.

In conclusion, our review did not identify a significant association between radicalization, terrorist activity, and psychiatric disorders. The vast majority of studies were of poor methodological quality. However, further studies will need to investigate the high rate of psychiatric disorders observed among lone actor terrorists. They will have to use a multicenter design, but above all, validated and standardized psychiatric evaluations.

Captions

Figure 1. Flow diagram

Table 1. Studies assessing the prevalence of psychiatric disorders in people at risk of radicalization, radicalized people and terrorist populations

SyfoR: the Sympathy for radicalization Scale, GAD-7: the Generalized Anxiety Disorder Assessment, PHQ-9: the Patient Health Questionnaire, PCL-C: the PTSD Checklist, AQ-10: the Autism Spectrum Quotient, SAPAS: the Standardized Assessment of Personality – Abbreviated Scale, CIS-R: the Clinical Interview Schedule – Revised, PSQ: the Psychosis Screening Questionnaire, SCID-IV: the Structured Clinical Interview for the DSM-IV, HADS: the Hospital Anxiety and Depression Scale, AUDIT: the Alcohol Use Disorders Identification Test, DUDIT: the Drug Use Disorders Identification Test, RIS: the Activism-Radicalism Intention Scale, HSCL-25: the Hopkins Symptom Checklist-25, MPSS: the Multidimensional Scale of Perceived Social Support, BDI: the Beck Depression Inventory, BAI: the Beck Anxiety Inventory, BAQ: the Buss Aggression Questionnaire, IAI: the Islamic Attitudes Inventory, TAT: the Thematic Apperception Test, CPI: the California Personality Inventory, MMPI-2: the Minnesota Multiphasic Personality Inventory

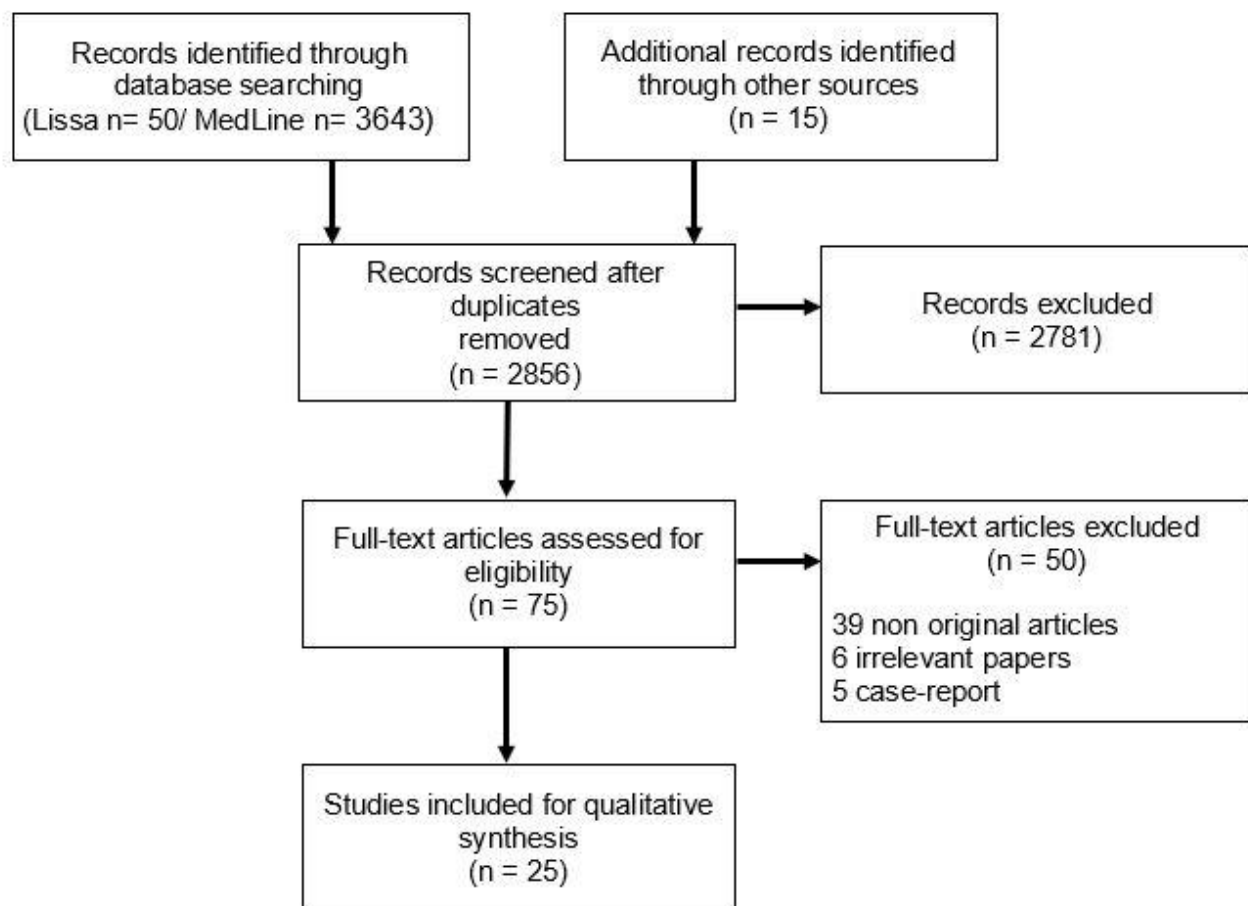
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Authors	Country	Study population	Study design	Assessment tools	Results	Level of evidence
<i>People at-risk of radicalization</i>						
Bhui K et al. (Bhui et al., 2014b)	UK	Muslim men and women of Pakistani and Bangladeshi origin (n=608)	Cross-sectional uncontrolled study	SyfoR (SVPT), GAD-7 (anxiety) and PHQ-9 (depression)	No significant association between anxiety-depressive symptoms and sympathy for violent radicalization and terrorism (SVPT)	2+
Bhui K et al. (Bhui et al., 2014a)	UK	Muslim men and women of Pakistani and Bangladeshi origin (n=608)	Cross-sectional uncontrolled study	SyfoR (SVPT, GAD-7 (anxiety) and PHQ-9 (depression)	Depression (PHQ \geq 5) is associated with SVPT (RR: 5.43, 95% CI: 1.35-21.84, p=0.02)	2+
Bhui K et al. (Bhui et al., 2016b)	UK	Muslim men and women of Pakistani and Bangladeshi origin (n=608)	Cross-sectional uncontrolled study	SyfoR (SVPT), GAD-7 (anxiety) and PHQ-9 (depression)	Depressive symptoms (PHQ \geq 5) are associated with a high risk of SVPT (OR: 2.59, 95% CI: 1.59-4.23, p<0.001)	2+
Bhui K et al. (Bhui et al., 2019)	UK	Men and women of White British and Pakistani heritage (n=618)	Cross-sectional uncontrolled study	Reviewed SyfoR (SVPT), GAD-7 (anxiety), PHQ-9 (depression), PCL-C (post-traumatic stress disorder), AQ-10 (autism), SAPAS (personality disorder), Clinical Interview Schedule – Revised (CIS-R)	Diagnosis of comorbid major depression and dysthymia increased the risk of developing SVPT (RR: 3.50, 95% CI: 1.12-10.93, p<0.05) Symptoms of anxiety and post-traumatic stress are associated with SVPT, respectively (RR: 1.09, 95% CI: 1.03–1.15, P=0.002) and (RR: 1.03, 95% CI: 1.01–1.05, P=0.003)	2+

Coid JW et al. (Coid et al., 2016)	UK	British men (n=3679)	Cross-sectional uncontrolled study	Proxy measures of extremism (represented by questions regarding cultural identity and support for war and the British army), PSQ (psychosis), SCID-IV (personality disorders), HADS (depression and anxiety), AUDIT (alcohol use) and DUDIT (drug use).	Men with neutral views were more likely to suffer from depression compared to the pro- and anti-British groups (OR: 0.72, 95% CI: 0.61-0.85 and OR: 0.64, 95% CI: 0.48-0.86, p<0.05, respectively) Significant association between antisocial personality disorder and extreme opinions in the pro-British group (OR: 1.52, 95% CI: 1.36-1.69) and the anti-British group (OR: 1.54, 95% CI: 1.22-1.94, p<0.001)	2+
Rousseau C et al. (Rousseau et al., 2019)	Canada	College students (n=1894)	Cross-sectional uncontrolled study	Modified SyfoR (SVPT), Radicalism Intention Scale (RIS), HSCL-25 (anxiety and depression), Perceived Discrimination Scale (social adversity), MPSS (social support), Revised religious orientation scale (religious orientation)	Sympathy for violent radicalization scores were significantly higher among students reporting higher depression scores, lower religiosity, and lower social support Depression scores accounted for 47% (95% CI: 0.2-1.15, p<0.001) and 25% (95% CI: 0.10-0.57, p<0.001) of the total effect between discrimination and the experience of violence and SyfoR score, respectively	2-

Victoroff J et al. (Victoroff et al., 2010)	Palestine	14-year-old Muslim Palestinian school boys (n=52)	Cross-sectional uncontrolled study	BDI (depression), BAI (anxiety), BAQ (aggressivity), Oppression Questionnaire (perceived oppression), IAI (religiosity and political attitudes), 2 items documented support for religiopolitical aggression	Moderate-to-high scores of self-reported depression and anxiety Those who reported family members having been wounded or killed by the Israeli Defense Forces expressed greater support for one item of support of religiopolitical aggression (OR: 3.81, 95% CI: 0.937–15.448, p<0.1) No significant relationship between anxiety and depression and support for religiopolitical aggression.	2-
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Radicalized population

Rolling J and Corduan G (Rolling and Corduan, 2017)	France	Radicalized teenagers (n=25)	Descriptive uncontrolled study	Psychiatric assessment No standardized tools	12% of mental disorders (psychotic or maniac) 76% of narcissistic and depressive vulnerabilities, diagnosis of ADHD, conduct disorder and attachment disorder 12% of histrionic personality traits High incidence of psychotrauma	3
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Campelo N et al. (N. Campelo et al., 2018)	France	Young people's cases reported to the Radicalization Prevention Consultation (n=34)	Descriptive uncontrolled study	Psychological and psychiatric assessment No standardized tools	38.2% of the sample suffered from mental disorders (Axis I) 20.6% had delusional symptoms and a diagnosis of schizophrenic or bipolar disorder, clustered as vulnerable to radicalization 17.6% had behavioral disorders 10 subjects (29.03%) were truly radicalized and none of them suffered from psychosis	3
Campelo N et al.(Nicolas Campelo et al., 2018)	France	Young people who aimed to join the Islamic State and contacted the <i>Centre de Prévention contre les Dérives Sectaires liées à l'Islam</i> (n=150)	Mixed methods: qualitative/qu antitative Follow-up study	Semi-structured interviews Analysis of digital content No standardized tools	29.3% had engaged in suicidal behavior or self- harm before radicalization 44% of depressive symptoms 85% of neglect or psychological abuse 22% of addiction and drug abuse 35.3% of psychiatric consultation before radicalization	2-

Oppetit A et al. (Oppetit et al., 2019)	France	Young people who aimed to join the Islamic State and contacted the <i>Centre de Prévention contre les Dérives Sectaires liées à l'Islam</i>	Cross-sectional uncontrolled study	Semi-structured interviews Analysis of digital content No standardized tools	The minors had more self-harm history from before radicalization (44.3% vs. 16.2% for adults, adjusted p<0.001)	2-
Bazex H et al. (Bazex et al., 2017)	France	Minors (n=70) vs. adults (n=80) Criminals reported for radicalization in the Toulouse area (n=112)	Descriptive uncontrolled study	Psycho-criminological interviews for half of the sample Analysis of criminal files No standardized tools	10.7% psychotic disorders or intellectual disability (only one case out of 12) with a history of violence, cannabis and alcohol use	3
Simi P et al. (Simi et al., 2016)	US	Former members of violent White supremacist groups (n=44)	Qualitative study	Self-reported diagnosis or behavioral disorder No standardized tools	41% reported diagnosed mental disorders before/during terrorist engagement and 48% had a family history of mental health problems 57% self-reported suicidal ideation or suicide attempts 73% had a problem with illegal drugs and/or alcohol	3

Weenink A (Weenink, 2015)	Netherlands	Radical islamists (n=140)	Descriptive uncontrolled study	Diagnostic or disorder elements reported in the Dutch National police database No standardized tools	6% had a clinically diagnosed personality disorder or mental illness, with 2% having schizophrenia and 1.4% suffering from psychosis disorder 60% of individuals were under psychiatric treatment	3
Morris A and Meloy R (Morris and Meloy, 2020)	UK	Individuals referred to Prevent as posing a national security risk (n=23)	Descriptive uncontrolled study Follow-up study	ICD-10 Psychiatric diagnoses in medical records No standardized tools	39% had a history of psychiatric disorder and at least one psychiatric diagnosis or more 67% had a diagnosis of substance use disorder (ICD-10: F10-19), 44% had a personality disorder (F60.3, F60.2), 33.3% had depression (F32) and 22% had a psychotic disorder (F20-29) 77.7% showed traits of personality disorder (almost exclusively borderline and dissocial traits)	3

Terrorist populations

Lyons et al. (Lyons and Harbinson, 1986)	Northern Ireland	Charged with political (n=47) and non- political (n=59) murder	Descriptive uncontrolled study	Psychiatric assessment Analysis of case notes, statements, and hospital records	16% of mental illness in political murderers vs. 58% in non-political murderers (p<0.001) 10% of political murderers committed murder under the influence of alcohol vs. 57% of non- political murderers (p<0.001)	3
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Merari A et al. (Merari et al., 2010)	Israel	Incarcerated members of Palestinian terrorist groups (n=29)	Cross-sectional controlled study vs. non-suicide terrorist groups (n=12) and organizers of suicide missions (n=14)	Interview with a clinical psychologist, Rorschach test, TAT, House-Tree-Person drawings, and an adapted version of CPI translated into Arabic	69.2% of individuals with personality traits from Cluster C were in the suicide group. 80% of the control group and 91.7% of the organizer group had traits from Cluster B 40% had suicidal tendencies in the suicide group vs. 0% in the organizer and control groups (statistically significant) 25% had psychopathic tendencies in the control group vs. 0% in the suicide group, (statistically significant)	2-
Gottschalk M et al. (Gottschalk and Gottschalk, 2004)	Israel	Palestinian and Israeli Jewish terrorists (n=90)	Mixed methods: qualitative/quantitative Descriptive controlled study vs. non-terrorist Palestinians (n=30) and Israeli Jews (n=31)	Pathological Hatred Test developed by the authors, MMPI-2 test	Terrorists had higher scores of significant psychopathic, paranoid, depressive and hypomanic deviations Schizophrenic trends among religious fundamentalist terrorists	3

Schbley A (Schbley, 2003)	Lebanon	Hezbollah militants (n=405)	Mixed methods: qualitative/quantitative Cross-sectional uncontrolled study	Self-questionnaire developed by the author, including items from the DSM-IV, sociodemographic and religious criteria No standardized tools	Strong statistical relationship between certain self-reported criteria of Intermittent Explosive Disorder, Oppositional Disorder, and Psychotic Personality Disorder with predisposition to violence in the name of Allah, affinity for martyrdom, susceptibility to the culting process and dogma-induced psychotic depression	2-
Gruenewald J et al. (Gruenewald et al., 2013)	US	Far-right loner extremists in the US (n=47)	Cross-sectional controlled study vs. other types of far-right extremists (n=92)	Diagnostic or disorder elements reported in open-sources No standardized tool	Loners were significantly more likely to have a reported mental health issue compared with other far-rightists (40.4% vs. 7.6%, p<0.001) Lone-actors were significantly more likely to have a history of mental illness before the attack than other far-rightists (OR: 27.1, p<0.01) and more likely to participate in possible suicide missions (25.5% vs. 2.2%, p<0.001)	2-
Gill P et al. (Gill et al., 2014)	US/UK	Lone-actor terrorists (n=119) that were convicted or died	Cross-sectional uncontrolled study	Diagnostic or disorder elements reported in open sources No standardized tools	31.9% had a history of mental illness or personality disorder Single issue terrorists had more frequent history of mental illness vs Al-Qaeda and right-wing terrorists, (52.4% vs 25% and 30% respectively, p<0.05)	2-

Corner E et al. (Corner and Gill, 2015)	US/UK	Lone-actor terrorists (n=119) that were convicted or died	Cross- sectional controlled study vs. 55 US and 64 non-US group actors	Diagnostic or disorder elements reported in open sources No standardized tools	31.9% had a history of mental illness vs. 3.4% in the control group, p<0.001 28.9% of mentally ill lone-actors have a single issue ideology vs 12.3% of non-mentally ill lone-actors, p<0.05 Lone-actor terrorists are 13.59 times more likely to have a mental illness (95% CI: 4,630-40) than group terrorists	2-
Corner E et al. (Corner et al., 2016)	US/UK	Lone-actor terrorists (n=119) that were convicted or died	Descriptive uncontrolled study, compared to other actor types and the general population	Diagnosis or symptoms cross- referenced with ICD-10 criteria from open-source databases No standardized tools	Group terrorists had a lower rate of mental disorders than the general population (3.4% vs. 27.43%) Higher prevalence of schizophrenia (8.5%), autism spectrum disorder (3.3%) and delusional disorder (2%) among lone-actor terrorists than in the general population Higher prevalence of depression, anxiety, posttraumatic stress disorders, and sleep disorders among the general population than the lone-actor sample	3
Meloy R et al. (Meloy and Gill, 2016)	US/UK	Lone-actor terrorists (n=111) that were convicted or died	Descriptive uncontrolled study	Diagnostic or disorder elements reported in open sources No standardized tool	41% had a history of mental illness	3

Meloy R et al. (Meloy et al., 2019)	US/Canada	Lone-actor terrorists (n=33)	Cross-sectional uncontrolled study, compared to non-attack sample, who posed a national security concern (n=23)	Diagnostic or disorder elements reported in open sources No standardized tool	Mental disorders were less frequent in the sample of lone-actor terrorists compared with the sample of non-attackers (48.5% vs. 94.1%, OR: 0.06, 95% CI: 0.01-0.50, p<0.01)	2-
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