Review / Meta-analyses

A systematic review on the relationship between mental health, radicalization and mass violence[☆]

Błażej Misiak[a,b,*], Jerzy Samochowiec[c], Kamaldeep Bhui[d,e], Merryam Schouler-Ocak[f], Hella Demunter[g], Levent Kuey[h], Andrea Raballo[i], Philip Gorwood[j], Dorota Frydecka[b], Geert Dom[k]

[a] Department of Genetics, Wroclaw Medical University, Wroclaw, Poland
[b] Department of Psychiatry, Wroclaw Medical University, Wroclaw, Poland
[c] Department of Psychiatry, Pomeranian Medical University, Szczecin, Poland
[d] Head, Centre for Psychiatry, Wolfson Institute of Preventive Medicine Barts & The London School of Medicine & Dentistry, Queen Mary University of London, United Kingdom
[e] East London NHS Foundation Trust, United Kingdom
[f] Psychiatric University Clinic of Charité at St. Hedwig Hospital, Berlin, Germany
[g] University Psychiatric Center KU Leuven, Belgium
[h] Istanbul Bilgi University, Istanbul, Turkey
[i] Norwegian University of Science and Technology (NTNU), Trondheim, Norway
[j] CMME, Hopital Sainte-Anne, Université Paris Descartes, INSERM U894, Paris, France
[k] Antwerp University (UA, CAPRI), Antwerp University Hospital (UZA), Antwerp, Belgium

ABSTRACT

Radicalization is a process, by which individuals adopt extreme political, social and religious ideation that leads to mass violence acts. It has been hypothesized that mental health characteristics might be associated with a risk of radicalization. However, a qualitative synthesis of studies investigating the relationship between mental health and radicalization has not been performed so far. Therefore, we aimed to perform a systematic review of studies examining the association between mental health characteristics and the risk of radicalization. Two reviewers performed an independent search of online databases from their inception until 8th April 2018 and 12 publications met eligibility criteria. There were several methodological limitations across the majority of eligible publications, including doubtful sample representativeness, use of diagnostic procedures without personal assessment of mental health status or lack of standardized tools for assessment of mental health. Representative cross-sectional studies revealed that depressive symptoms might be associated with radicalization proneness. However, it remains unknown whether depressive symptoms are associated with resilience or vulnerability to radicalization. Another finding from our systematic review is that several personality traits might predispose to develop extreme ideation. Finally, there is some evidence that lone-actors might represent a specific subgroup of subjects with extreme beliefs which can be characterized by high prevalence of psychotic and/or mood disorders. In conclusion, this systematic review indicates that caution should be taken on how the association between 'mental health' and 'radicalization' is being claimed, because of limited evidence so far, and a number of methodological limitations of studies addressing this issue.

© 2018 Elsevier Masson SAS. All rights reserved.

---

1. Introduction

Political violence and terrorism, are increasingly being recognized as a major social threat worldwide. For instance, the 9/11 attacks in 2001 killed almost 3000 individuals, the London 7/7 bombings in 2005 resulted in 52 lethal victims, the Paris 13/11 attack (*Bataclan*) in 2015 killed 90 persons, while the Brussels 22/3

terrorist attacks in 2016 killed 32 people. The number of terrorism-related deaths increased by 80% in the years 2013–2014 [1]. Apart from direct effects related to mortality, violent terrorist attacks aim to initiate fear and anxiety as well as lead indirectly to social diversion. These effects are widely related to several mental health outcomes, including PTSD, depression, anxiety disorders and substance use disorders [1]. Sometimes mass shootings are described as terrorist incidents. Although various definitions are used to capture mass shooting, most commonly they are defined as an event with at least four people killed, not including the perpetrator [2]. In turn, terrorism refers to "the use of violence and intimidation in the pursuit of political aims" [3]. It follows that mass shootings that have political aims through violence or intimidation may indeed be considered forms of terrorism. Others may not be politically motivated but driven by personal grievances or anger. The groups claiming responsibility for terrorism attacks often refer to religious motivation to justify violent activity [4], though other considerations underlying mass violence acts are also invoked, especially in case of lone-actor terrorism [5].

The term radicalization has been proposed to describe the process, by which individuals adopt political, social and religious ideation that leads to the initiation of mass violence acts. According to recent conceptualizations, it is a multi-step process with mutually reinforcing stages [6]. Recognizing risk and protective factors through public health approaches has been proposed as a promising strategy for prevention of radicalization and mass violence [7]. However, risk factors associated with radicalization remain largely unknown. To date, several social determinants have been proposed to promote radicalization, including low cultural integration, discrimination with subsequent sense of inequity and injustice, social disparities and low social cohesion or gang violence [1,8,9]. However, it should also be noted that social backgrounds of terrorist groups might change over time [10]. A recent systematic review further revealed that radical engagement among European youths might be promoted by early experiences of abandonment, perceived injustice, personal uncertainty, family dysfunction, friendships with radicalized individuals and social changes [11]. It should be noted that social determinants of radicalization have been also related to several mental disorders [12]. In addition, mental health of perpetrators is widely commented in case of mass violence acts. However, caution should be taken on the way such causal inferences are being established. It has been reported that mass violence acts trigger fear and anger accompanied by small but significant increases in the stigmatization measures, such as feelings of unpredictability and dangerousness or less desire to help, towards individuals with mental disorders [13–15]. Moreover, there is a limited body of evidence for high prevalence rates of mental disorders among terrorists [3]. Terrorist groups might indeed be unlikely to wish to recruit individuals with mental disorders if this is perceived to risk their mission [16]. Moreover, it has been suggested that lone-actors and group terrorists might differ in terms of radicalization pathways, group dynamics and prevalence rates of mental disorders [17].

This limited body of evidence on the relationship between radicalization and mental health contrasts with the public media and some government actions suggesting violent (terroristic) acts are very frequently associated with perpetrators' mental health status; this is then seen to be a consequence of failings in mental health systems [18]. This stigma-driven prejudgement frequently surfaces in the public eye where mental illnesses are equated with danger and violence. It is important that psychiatrists and mental health professionals are informed of the evidence on this complex problem, in order to help to inform the public opinion correctly and better shape their professions.

Factors associated with mental health that might predict mass violence incidents have not been subjected to qualitative synthesis. Therefore, in this article we aimed to perform a systematic review of studies addressing the relationship between mental health characteristics, radicalization and mass violence acts. We hypothesized that certain variables related to mental health status of personality traits may make individuals more prone to engage in mass violence acts. In addition, we assumed that lone actor terrorists and group terrorists might differ in terms of mental health characteristics, radicalization pathways and group dynamics.

2. Material and methods

2.1. Search strategy

Independent online search was performed by two reviewers and covered the following databases: MEDLINE/Pubmed, ERIC and Health Source: Nursing/Academic Edition from their inception until 8th Apr 2018. In addition, reference lists of eligible publications were reviewed. The following combination of keywords was used to retrieve eligible publications: mental or "psychiatr* or psychosis or delusion or paranoia or schizophr* or personality or depress* or suicid* or PTSD or substance abuse or addiction or bipolar or religious AND terrorism or mass violence or bombing or radicalization or lone-actor or lone-wolf or extremism". Discrepancies regarding the inclusion of particular publications were resolved through discussion with the third reviewer (BM). We included the following publication records: 1) original studies investigating factors related to mental health (specific mental disorders, the measures of psychopathology and personality traits) with respect to radicalization proneness or resistance in terms of political authoritarianism, extreme religious beliefs or being in favour for violent activities; 2) case reports analysing mental health of perpetrators of mass violence acts and 3) articles written in the English language. The following exclusion criteria were used: 1) non-original publications (reviews, commentaries, editorials, perspectives and viewpoints); 2) case reports or case series; 3) studies addressing mental health outcomes of mass violence acts and 4) publications written in non-English language. Publication records based on overlapping samples were not excluded due to a variety of hypotheses tested in each publication. Our search strategy was developed in accordance with the PRISMA guidelines [19].

2.2. Data extraction and quality assessment

The following data was extracted from original studies: sample size, age and sex of participants, study design, mental health assessment tools and main findings. For case reports, we recorded early signs in the radicalization process, mass violence acts in the context of radicalization and terrorism, participation in terrorism organization and activities as well as psychiatric diagnosis. Quality assessment was performed based on the SIGN grading system (1999–2012) that recognizes 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, e.g. case reports or case series and 4 – expert opinions [20].

3. Results

Out of 2768 records identified, 12 studies [21–32] were found to be eligible for systematic review (Fig. 1). General characteristics of these studies and main findings were provided in Table 1. In the majority of studies, radicalization was measured using various self-administered questionnaires of attitudes toward ideology-based violence, political and national self-identification or political activism. One study was based on in-depth interviews with White supremacists [31] and two studies applied the analysis open source information, scholarly articles, public depositories, sworn affidavits, indictments, manifestos, warrants, trial proceeding transcripts, trial memorandums, government and expert witness reports and competency evaluations [27,29]. Quality of evidence was scored 2^+ in three studies [22,25,26]. These studies recruited representative samples of Muslim participants [22,25] or the general population [26]. In the majority of studies, quality of evidence was scored 2^- mainly due to doubtful sample representativeness. One study provided only descriptive statistics based on life-history interviews (level of evidence: 3) [31].

In the studies by Bhui et al. [22,24,25] performed in Muslim participants living in the UK, sympathies for radicalization were associated with the following factors: younger age, being in full education, being born in the UK, speaking English at home, having higher income, higher levels of depression and perceiving religion as an important aspect. In turn resistance to radicalization was predicted by higher number of social contacts, stressful life events, political engagement, less social capital, unavailability for work due to housekeeping or disability and being born outside UK. Depressive symptoms weakly mediated the effects of stressful life events and political engagement on sympathies for violent protest and terrorism. The role of depressive symptoms was also addressed in two other studies providing inconsistent findings. Indeed, the study of 3679 men recruited across England, Scotland and South Wales revealed that Pro-British and anti-British attitudes were both linearly associated with violence [26]. However, both poles of political attitudes were negatively associated with scores of depressive symptoms. The role of depressive and anxiety symptoms in shaping radicalization was not confirmed in a small study of Palestinian refugee adolescents [23]. The authors found that greater support for religious-political violence was only related to the loss of family members in Israeli-Palestinian violent activities or feelings of being treated unjustly.

Prevalence of mental disorders among subjects involved in terrorist activities were evaluated in three studies [27,29,31]. The study by Simi et al. [31] performed by means of life-history interviews with 44 former members of violent White supremacist
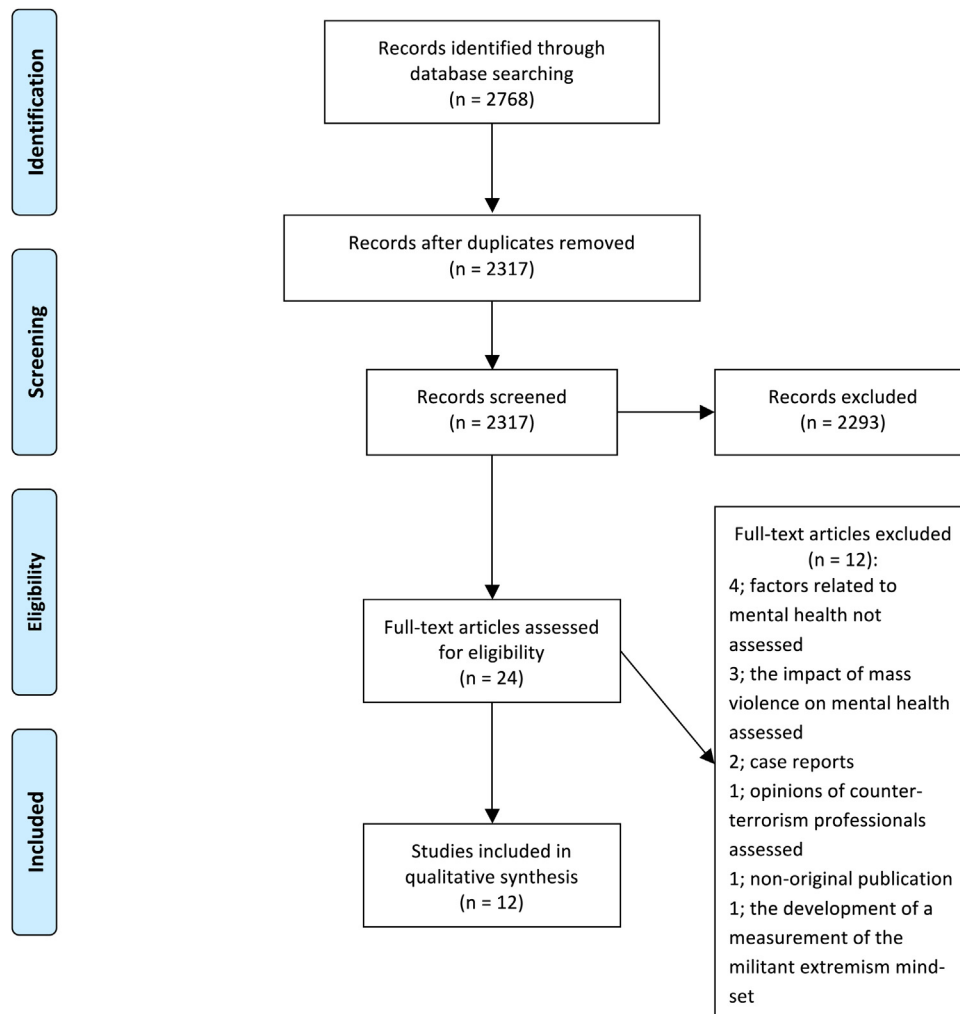

Fig. 1. The PRISMA flow diagram illustrating selection of studies.

Table 1
General characteristics of original studies included in systematic review.

Study	Country	Study design	Assessment tools	Main findings	Level of evidence
Besta et al. [21]	Poland	155 undergraduate students (74 women and 81 men aged 19.6 ± 0.9 years) and 24 football hooligans (2 women and 22 men aged 22.9 ± 2.3 years) were recruited.	Radicalization: willingness to fight and die for one's country [46], acceptance of violent change of social system (authors' own scale) Other measures: SDO scale (social dominance orientation) [47], identity fusion scale [48], group identification scale [49], left- and right-wing authoritarianism [50].	Identity fusion, right-wing authoritarianism and group identification were significant predictors of willingness to defend in-group. Both right- and left-wing authoritarianism were the strongest predictors of acceptance of violent change.	2⁻
Bhui et al. [22]	The United Kingdom	608 men and women (aged 18–45 years) of Muslim heritage living in East London and Bradford recruited by quota sampling.	Radicalization: a survey questionnaire developed by a series of interactive focus groups with young people of Muslim heritage and with members of religious and non-religious organizations. Discrimination was assessed using questions developed in the EMPIRIC study [51]. Other measures: SF-12 (general functioning), GAD-7 (anxiety) and PHQ-9 (depression).	Sympathy for radicalization was associated with younger age (under 20 years), being in full time education (compared to being employed), being born in the UK, speaking English at home and having higher income. Poor self-reported health was associated with lower odds of sympathies for violent protest. Anxiety and depressive symptoms, stressful life events, socio-political attitudes were not associated with sympathy for radicalization.	2⁺
Bhui et al. [25]	The United Kingdom	608 men and women (aged 18-45 years) of Bangladeshi origin and Muslim heritage living in East London and recruited by quota sampling.	Radicalization: a survey questionnaire developed by a series of interactive focus groups with young people of Muslim heritage and with members of religious and non-religious organizations. Other measures: SF12 (general functioning), GAD-7 (anxiety) and PHQ-9 (depression).	Individuals with the most sympathy for violent protest had higher levels of depression scores and were more likely to report religion to be important. Resistance to radicalization was associated with higher number of social contacts, less social capital, unavailability for work due to housekeeping or disability and being born outside UK.	2⁺
Bhui et al. [24]	The United Kingdom	608 men and women of Pakistani and Bangladeshi family origin and Muslim heritage (aged 18–45 years) living in Bradford and East London. Bradford	Radicalization: a survey questionnaire developed by a series of interactive focus groups with young people of Muslim heritage and with members of religious and non-religious organizations. Discrimination was assessed using questions developed in the EMPIRIC study [51]. Other measures: LTE (adverse life events), the UK Department of Communities and Local Government Citizenship Survey (political engagement) and PHQ-9 (depression).	Depressive symptoms were associated with a higher risk of sympathies for violent protest and terrorism. Stressful life events and political engagement were associated with a lower risk of sympathies for violent protest and terrorism. Depressive symptoms weakly mediated this association.	2⁺
Coid et al. [26]	The United Kingdom	3679 men (aged 18–34 years) recruited across England, Scotland and Wales by quota sampling (random location sampling).	Radicalization: proxy measures of extremism were represented by questions regarding political and national self-identification attitudes. Other measures: PSQ (psychosis), SCID-IV (personality disorders), HADS (depression and anxiety), AUDIT (alcohol use) and DUDIT (drug use).	Pro-British respondents were more likely to be White, UK born, not religious. Anti-British men were more likely Muslims, religious, of Pakistani origin and from deprived areas. Pro- and anti-British attitudes were positively associated with violence and negatively associated with depression.	2⁺
Corner and Gill [27]	Individuals who engaged in or planned to engage in lone-actor terrorism in Europe or the United States.	A dataset of 119 lone-actor terrorists and 428 group terrorists who were convicted or died in their offense in the US and non-US countries since 1990.	A codebook that included information obtained from the LexisNexis archive of open source information, scholarly articles, public depositories, sworn affidavits, indictments, manifestos, warrants, trial proceeding transcripts, trial memorandums, government and expert witness reports and competency evaluations. Mental disorders were coded using the ICD-10 system.	The odds of having mental illness were over 13 times higher in the group of lone-actors compared to group terrorists. Terrorists with a history of mental illness were more likely to report a proximate life change, being a recent victim of prejudice, experiencing proximate and chronic stress.	2⁻

Table 1 (*Continued*)

Study	Country	Study design	Assessment tools	Main findings	Level of evidence
Feddes et al. [28]	Italy	46 Muslim adolescents (aged 14 – 23 years) with a migrant background who were assigned to resilience training programme.	Radicalization: attitudes toward ideology-based violence by others and own violent intentions were assessed using the questionnaire described previously. Other measures: Individual and collective relative deprivation, social disconnectedness, Rosenberg Self-Esteem Scale, agency, Narcissistic Personality Inventory, empathy, perspective taking,	The training significantly increased the levels of agency and a marginal increase was found in reported self-esteem, empathy, perspective taking and narcissism. Attitudes toward ideology based violence and own violent intentions were significantly lower after the training. Higher levels of empathy were associated less positive attitudes toward ideology-based violence.	2⁻
Gill et al. [29]	Individuals who engaged in or planned to engage in lone-actor terrorism in Europe or the United States.	A codebook of 119 lone-actor terrorists described above [27].	A codebook of data described above [27].	There were three most prevalent ideologies underlying terrorism acts: right-wing, single-issue (animal rights, antiabortion and environmentalism) and al-Qaeda-related ideologies. Lone-actors holding single-issue ideologies were significantly more likely to have a history of mental illness compared to those representing other ideologies.	2⁻
Laor et al. [30]	Israel	A convenience sample of 245 Israeli-Jewish participants (aged 26.8 ± 7.4 years), 99 university students (aged 23.7 ± 2.8 years), 93 West Bank settlers (aged 24.7 ± 5.3 years) and 53 left-wing activists (aged 29.6 ± 6.02 years).	Radicalization: political activism questionnaire developed for this study. Other measures: TCI (self-transcendence), political transcendence questionnaire developed for this study, ethos of conflict, stressful life events [52] and questionnaires for assessment of socio-political identification and perceived political threat developed for this study.	Extreme political poles were associated with high level of ideological and morbid transcendence. Right extremists had higher perceived threats to physical existence and national identity. Left extremists scored highest on perceived moral integrity threat. Higher perceived threats to national identity and moral integrity, risk, and self-transcendence were associated with morbid transcendence.	2⁻
Simi et al. [31]	United States	Life-history interviews with 44 former members of violent White supremacist groups (38 males and 6 females aged 19 – 61 years)	In-depth interviews without the use of standardized tools.	Mental health problems before/during extremist involvement were present in 41% of participants. A history of childhood trauma was highly prevalent (physical abuse: 43%, sexual abuse: 23%, emotional and physical neglect: 41%). 73% of participants had problems with alcohol and/or illicit drugs.	3
Soliman et al. [32]	Egypt	662 Egyptian adults (Arab Muslim Sunnites with mean age of 27.7 years, 299 males and 363 females) were recruited through acquaintances.	Radicalization: ARIS Other measures: SCATI (personality), CCI (cognitive complexity), IUS-12 (intolerance of uncertainty), RDMS (radical decision making), CSI (cognitive style), FDS (frustration-discomfort) and NTB (need to belong)	Data was analysed using the structural equation modelling. An integrative model that included 22 psychopathological constructs, five cognitive constructs and four psychosocial constructs had superior goodness of fit statistics compared to other models. The majority of constructs loaded on psychopathological factor suggesting that personality traits play a key role in predicting radicalism. Especially rational decision-making, dependent decision style, cognitive complexity, uncertainty and an analytical cognitive style predicted radicalism.	2⁻

Table 1 (*Continued*)

Study	Country	Study design	Assessment tools	Main findings	Level of evidence
Victoroff et al. [23]	Palestine	[53] 14-year-old Muslim Palestinian boys living in the refugee camp in the Palestinian Autonomous Territory of Gaza. They were recruited via an appeal for participation to two randomly selected classes at a school run by the United Nations Relief and Works Agency.	Radicalization: Islamic Attitudes Inventory [54] Other measures: BDI (depression), BAI (anxiety), BAQ (aggression) and the Oppression Questionnaire [55]	Greater support for religio-political aggression was associated with reporting family members to be wounded or killed by Israeli Defense Forces and feelings of being treated unjustly.	2⁻

Abbreviations: ARIS – the Activism-Radicalism Intention Scale [56], AUDIT – the Alcohol Use Disorders Identification Test [57], BAI – the Beck Anxiety Inventory [58], BAQ – the Buss Aggression Questionnaire [59], BDI – the Beck Depression Inventory [60], CCI – the Cognitive Complexity Instrument [61], CSI – the Cognitive Style Index [62], DUDIT – the Drug Use Disorders Identification Test [63], FDS – the Frustration-Discomfort Scale [64], GAD-7 – Generalized Anxiety Disorder Assessment [65], HADS – the Hospital Anxiety and Depression Scale [66], IUS-12 – the Intolerance of Uncertainty Scale – short form [67], LTE – the List of Life Threatening Experiences [68], NTB – the Need to Belong Scale [69], PHQ-9 – the Patient Health Questionnaire [70], PSQ – the Psychosis Screening Questionnaire [71], RDMS – the Radical Decision Making Scale [72], SCATI – the Short Coolidge Axis II Inventory [73], SCID-IV – the Structured Clinical Interview for DSM-IV (personality disorders screening) [74], SF12 – the Short-Form Health Survey [75], TCI – the Temperament and Character Inventory [76].

groups demonstrated that mental health problems before or during extremism involvement as well as problems with alcohol or illicit drugs were present in 41% of participants. Suicidal ideation and family history of mental disorders were reported by 57% and 48% of extremists, respectively. However, some important limitations of this study should be taken into account, including a study design based on convenience sample, potential recall bias and a lack of using standardized tools for assessment of current and lifetime history of mental disorders. Similar limitations might be relevant to other publications [27,29] that addressed social and mental health characteristics of lone-actor terrorists. Both publications were based on the analysis of the same sample of 119 lone-actor terrorists. The authors found that the odds of having mental illness (ICD-10 codes F00 – F99) were over 13 times (OR = 13.49, 95%CI: 4.63–40.0) higher in lone-actor terrorists compared to group terrorists. Specific ICD-10 diagnoses were recorded based on extensive analysis of the Lexis Nexus database, sworn affidavits, indictments, manifestos, warrants, trail proceeding transcripts, trial memorandums, government and expert witness reports, and competency evaluations. Terrorists who injured in an attack were almost 12 times more likely to have a diagnosis of schizophrenia-spectrum disorders (F20 – F29) and almost 46 times more likely to be diagnosed with mood disorders (F30 – F39). Schizophrenia-spectrum disorders and mood disorders were also more likely in individuals, whose spouse or partner was involved in terrorism activities. Additionally, terrorists with a history of mental illness were more likely to report a proximate life change, being a recent victim of prejudice, experiencing proximate and chronic stress. Lone-actors confessing single-issue ideologies (animal rights, antiabortion and environmentalism) were significantly more likely to have a history of mental disorders compared to those holding other ideologies (right-wing-related or al-Qaeda-related ideology).

In some studies, personality traits related to radicalization proneness were also addressed [21,28,30,32]. Feddes et al. [28] investigated the effects of resilience training on own violent intentions and attitudes toward ideology-based violence in 46 Muslim adolescents with migrant background. The authors found that the training significantly increased the levels of agency and a marginal increase was found in reported self-esteem, empathy, perspective taking and narcissism. Attitudes toward ideology based violence and own violent intentions were significantly lower after the training. Higher levels of empathy were associated with less positive attitudes toward ideology-based violence. In two studies [21,30], factors associated with left- and right-wing authoritarianism were explored. In the study of undergraduate students and football hooligans, identity fusion, right-wing authoritarianism and group identification

were significant predictors of willingness to defend in-group [21]. Both right- and left-wing authoritarianism were the strongest predictors of acceptance of violent change. Similarly, both poles of political extremism were associated with high level of ideological and morbid transcendence in the study by Laor et al. performed in a convenience sample of Israeli-Jewish participants [30]. Additionally, right-wing extremists had higher perceived threats to physical existence and national identity. Left-wing extremists scored highest on perceived moral integrity threat. Higher perceived threats to national identity and moral integrity, risk, and self-transcendence were associated with morbid transcendence. More complex associations were tested by Soliman et al. [32], who examined several cognitive, behavioural and personality characteristics with respect to radicalization proneness in 662 Egyptian adults. On the basis of structural equation modelling, the authors found that a number of personality traits play a key role in radicalization. The most important predictors of radicalization included rational decision-making, dependent decision style, cognitive complexity, uncertainty and an analytical cognitive style. Radicalization was also associated with higher scores of paranoid personality disorder, self-defeating personality disorder and schizotypal personality disorder.

4. Discussion

Results of this systematic review indicate that a unique profile of psychopathology or personality traits that makes individuals more prone to radicalization cannot be proposed based on available evidence. Results of studies included in this review should be interpreted with caution taking into account a number of limitations. Firstly, these studies were mostly cross-sectional and thus causal associations between mental health status and radicalization proneness cannot be established. At this point, it is important to note that the extent of psychopathology might be different in individuals at various stages of radicalization process, including subjects in the development of extreme beliefs, early and late offenders or convicts. For instance, these differences might underlie discrepancies across studies testing the association between depressive symptoms and radicalization proneness. The use of various measures of radicalization might further complicate drawing unequivocal conclusions. Further, the majority of studies did not control for the effects of general criminality falling beyond radical ideation that might bias the association between mental health characteristics and radicalization. Another point is that mental health of participants was not assessed using standardized tools or only self-administered tools were used.

Additionally, sample representativeness in some of these studies remains doubtful. Finally, in-depth interviews or self-reports that were used in some studies might also create recall biases.

There is some evidence from large population-based surveys that depressive symptoms might be related to radicalization proneness. However, studies addressing this association have provided mixed results. Cluster analysis performed by Bhui et al. in the study of Muslim participants living in the UK revealed that the participants being most sympathetic for violent protest had the highest scores of depressive symptoms [25]. However, a linear association with depressive symptoms was not found in neither of clusters capturing participants with various degrees of sympathies for violent protest (most condemning, intermediary group and most sympathetic for violence). A cross-sectional study design does not allow to infer regarding causality. Therefore, a steady or staged association should be also considered. At this point, it should be noted that depression shares overlapping characteristics with radicalization. A recent Swedish study comparing 47,158 outpatients with a diagnosis of depressive disorders and 898,454 individuals with a negative history of depression demonstrated three times higher odds (OR = 3.0, 95%CI: 2.8–3.3) of committing violent crimes in the depressed sample [33]. Moreover, depression has been widely associated with a number of vulnerabilities that have been linked to radicalization in some studies, including social isolation and adverse life events [34,35]. Finally, depression has been associated with high risk of suicide. In turn, the largest survey of 3679 men recruited across England, Scotland and Wales demonstrated that pro- and anti-British had been related to higher levels of violence but lower levels of depression [26]. These findings imply that individuals with ambiguous or undecided views might be vulnerable to develop depressive symptomatology. The authors proposed that a lack of identity and uncertainty might serve as risk factors for depression. In other studies, the association between depression and radicalisation was not confirmed [22,23]. These discrepancies might be explained by several factors. Firstly, the relationship between depressive symptoms and radicalization has been addressed in various samples recruited by different methodological approaches, using various tools for assessment of depressive symptomatology. Secondly, a cross-sectional study design does not enable to establish causal inferences. Finally, it has long been argued that depression might have various clinical manifestations that cannot be comprehensively assessed using distinct instruments [36]. In addition, our understanding of affective symptomatology evolves with ongoing research in the field and changes of international classification systems. For instance, a new diagnosis of disruptive mood dysregulation disorder has been recently added in the DSM-5 for children and adolescents with persistent irritability accompanied by violent behaviours and depressive symptoms [37]. Moreover, subthreshold depressive symptoms are also prevalent in a number of mental disorders, including personality disorders, that might contribute to violent behaviours. Finally, it seems important to understand whether suicide terrorists share similar mental health characteristics with others who commit "conventional" suicide [38].

Emerging evidence from studies included in this systematic review suggests that lone-actors and group terrorists might be two distinct groups of radicalized individuals in terms of mental health characteristics. According to studies based on a database of lone-actor terrorists [27,29], prevalence of mental disorders is significantly higher in this group of radicalized individuals, especially those motivated by single-issue ideologies, compared to group terrorists. This is in agreement with the observation that terrorism groups are reluctant to recruit individuals with a history of mental illness [3]. More specifically, the authors observed higher prevalence of schizophrenia-spectrum and affective disorders in lone-actors. Further, prevalence rates of various mental disorders

in terrorist groups were compared to the general population data [17,39]. These comparisons should be interpreted with caution as general population data comes from representative samples that were examined using valid assessment tools as opposed to data derived from terrorist groups. The analysis of descriptive statistics revealed that only schizophrenia, delusional disorder and autism-spectrum disorders might be more prevalent among lone-actors compared to the general population. Prevalence of all diagnostic categories of mental disorders was considerably lower among group terrorists than in the general population. Interestingly, the authors found no significant differences in criminality rates before terrorism acts between those with a history of mental illness compared to individuals without a psychiatric diagnosis [27]. This observation raises the question whether terrorism acts appear as the first manifestation of mental illness. In agreement with a number of previous studies [40], authors confirmed that terrorists with a history of mental illness had been more likely to be the victims of prejudice, and experience proximate and chronic stress. One study [31] also revealed high prevalence rates of childhood adversities among group terrorists similar to those observed in patients with psychotic disorders [41]. Although there are certain limitations of these studies, originating from a lack of head-to-head clinical assessment or selectivity bias associated with using open-source data, mental health of lone-actors warrants further investigation. The observation that lone-actors with single-issue ideologies might be more likely to present with higher rates of mental disorders compared to other lone-actor terrorists raises further questions whether there are differences in mental health characteristics between religious and secular groups or between ideologically-driven and grievance-driven terrorism [42].

Some studies revealed that certain personality traits might predispose to develop extreme beliefs. The following characteristics were associated with radicalization proneness: identity fusion, the need for group identification, low levels of empathy, morbid transcendence, feelings of being treated unjustly together with harbouring high levels of grievance, rational decision-making, dependent decision style, cognitive complexity, uncertainty and an analytical cognitive style [21,28,30,32]. These findings indicate that radicalized individuals are aware of their decisions, analyse available information and are able to anticipate potential outcomes of violent acts. The study by Soliman et al. [32] also revealed that radicalized individuals might have the traits of following personality disorders: paranoid personality disorder, self-defeating personality disorder and schizotypal personality disorder.

Due to several limitations and methodological heterogeneity addressing mental health correlates of radicalization process, caution should be taken on the way final conclusions are being established. Mental disorders, especially depression, are often evoked as direct causes of terrorism acts by mass media. A recent study Peterson et al. [43] demonstrated that out of 429 investigated crimes, only 4% were directly related to psychosis, 3% were directly related to depression and 10% were directly associated with bipolar disorder. Media coverage of terrorism evokes anxiety-inducing effects that appear to be desirable for terrorist groups [44]. However, an indirect effect related to increasing stigmatizing attitudes toward people with mental disorders should be also taken into account as shown in experimental studies [45] and population-based surveys [13–15].

In summary, available data does not allow to indicate a predefined profile of mental health characteristics that makes individuals prone to develop radical beliefs and attitudes. Some personality traits might play a role but more research is needed in this field. There is some evidence that lone-actor terrorists, who often remain socially isolated, might present higher prevalence rates of some mental disorders compared to group-terrorists and the general population. The relationship with social isolation

indicates that targeting at risk individuals might be achieved through the activity of community services. However, more studies taking into account methodological limitations raised in this systematic review are needed to address the effects of mental disorders on radicalization proneness. It is unlikely that mental disorders directly impact the development of radical ideation and thus investigating the processes or characteristics that mediate or moderate the effects of mental health problems should serve as an imperative in future studies. Translation of findings from this systematic review towards clinical practice remains difficult, mainly due to a scarcity of studies and methodological heterogeneity. However, reviewing current evidence in the field is a point of further debate within professional community that might shape individual opinion and decision making processes.

Conflict of interest

None to declare.

Acknowledgements

References

[1] Alcalá HE, Sharif MZ, Samari G. Social determinants of health, violent radicalization, and terrorism: a public health perspective. Heal Equity 2017;1:87–95, doi:http://dx.doi.org/10.1089/heq.2016.0016.

[2] McPhedran S, Baker J. Mass shootings in Australia and New Zealand: a descriptive study of incidence. Justice Res Policy 2011;8:68–89.

[3] Dom G, Schouler-Ocak M, Bhui K, Demunter H, Kuey L, Raballo A, et al. Mass violence, radicalization and terrorism: A role for psychiatric profession? Eur Psychiatry 2018;49:78–80, doi:http://dx.doi.org/10.1016/j.eurpsy.2018.01.001.

[4] Ripley A. Why suicide bombing is now all the rage. Time 2002;159:33–9.

[5] Rahman T, Resnick PJ, Harry B, Breivik Anders. Extreme beliefs mistaken for psychosis. J Am Acad Psychiatry Law 2016;44:28–35.

[6] McCauley C, Moskalenko S. Mechanisms of political radicalization: pathways toward terrorism. Terror Polit Violence 2008;20:415–33, doi:http://dx.doi.org/10.1080/09546550802073367.

[7] Bhui KS, Hicks MH, Lashley M, Jones E. A public health approach to understanding and preventing violent radicalization. BMC Med 2012;10:, doi:http://dx.doi.org/10.1186/1741-7015-10-16.

[8] McGilloway A, Ghosh P, Bhui K. A systematic review of pathways to and processes associated with radicalization and extremism amongst Muslims in Western societies. Int Rev Psychiatry 2015;27:39–50, doi:http://dx.doi.org/10.3109/09540261.2014.992008.

[9] Victoroff J. The mind of the terrorist : a review and critique of psychological approaches. J Conflict Resolut 2005;49:3–42, doi:http://dx.doi.org/10.1177/0022002704272040.

[10] Strentz T. A terrorist psychosocial profile: past and present. FBI Law Enforc Bull 1988;57:13–9.

[11] Campelo N, Oppetit A, Neau F, Cohen D, Bronsard G. Who are the European youths willing to engage in radicalisation? A multidisciplinary review of their psychological and social profiles. Eur Psychiatry 2018;52:1–14, doi:http://dx.doi.org/10.1016/j.eurpsy.2018.03.001.

[12] Allen J, Balfour R, Bell R, Marmot M. Social determinants of mental health. Int Rev Psychiatry 2014;26:392–407, doi:http://dx.doi.org/10.3109/09540261.2014.928270.

[13] Von Dem Knesebeck O, Mnich E, Angermeyer MC, Kofahl C, Makowski A. Changes in depression stigma after the Germanwings crash - Findings from German population surveys. J Affect Disord 2015;186:261–5, doi:http://dx.doi.org/10.1016/j.jad.2015.07.029.

[14] Schomerus G, Stolzenburg S, Bauch A, Speerforck S, Janowitz D, Angermeyer MC. Shifting blame? Impact of reports of violence and mental illness in the context of terrorism on population attitudes towards persons with mental illness in Germany. Psychiatry Res 2017;252:164–8, doi:http://dx.doi.org/10.1016/j.psychres.2017.02.053.

[15] Schomerus G, Stolzenburg S, Angermeyer MC. Impact of the Germanwings plane crash on mental illness stigma: results from two population surveys in Germany before and after the incident. World Psychiatry 2015;14:362–3, doi:http://dx.doi.org/10.1002/wps.20257.

[16] Bhui K, James A, Wessely S. Mental illness and terrorism. BMJ 2016;354:, doi:http://dx.doi.org/10.1136/bmj.i4869.

[17] Corner E, Gill P, Mason O. Mental health disorders and the terrorist: a research note probing selection effects and disorder prevalence. Stud Confl Terror 2016;39:560–8, doi:http://dx.doi.org/10.1080/1057610X.2015.1120099.

[18] DeFoster R, Guns Swalve N. Culture or mental health? Framing mass shootings as a public health crisis. Health Commun 2017;1–12, doi:http://dx.doi.org/10.1080/10410236.2017.1350907.

[19] Moher D, Liberati A, Tetzlaff J, Altman DG, Altman D, Antes G, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med 2009;6:, doi:http://dx.doi.org/10.1371/journal.pmed.1000097.

[20] SIGN grading system (1999–2012). SIGN Grading Syst (1999–2012) n.d. http://www.sign.ac.uk/assets/sign_grading_system_1999_2012.pdf (Accessed July 1, 2018).

[21] Besta T, Szulc M, Jaskiewicz M. Political extremism, group membership and personality traits: who accepts violence? Rev Psicol Soc 2015;30:563–85, doi:http://dx.doi.org/10.1080/02134748.2015.1065085.

[22] Bhui K, Warfa N, Jones E. Is violent radicalisation associated with poverty, migration, poor self-reported health and common mental disorders? PLoS One 2014;9:, doi:http://dx.doi.org/10.1371/journal.pone.0090718.

[23] Victoroff J, Quota S, Adelman JR, Celinska B, Stern N, Wilcox R, et al. Support for religio-political aggression among teenaged boys in Gaza: part II: neuroendocrinological findings. Aggress Behav 2011;37:121–32, doi:http://dx.doi.org/10.1002/ab.20376.

[24] Bhui K, Silva MJ, Topciu RA, Jones E. Pathways to sympathies for violent protest and terrorism. Br J Psychiatry 2016;209:483–90, doi:http://dx.doi.org/10.1192/bjp.bp.116.185173.

[25] Bhui K, Everitt B, Jones E. Might depression, psychosocial adversity, and limited social assets explain vulnerability to and resistance against violent radicalisation? PLoS One 2014;9:, doi:http://dx.doi.org/10.1371/journal.pone.0105918.

[26] Coid JW, Bhui K, MacManus D, Kallis C, Bebbington P, Ullrich S. Extremism, religion and psychiatric morbidity in a population-based sample of young men. Br J Psychiatry 2016;209:491–7, doi:http://dx.doi.org/10.1192/bjp.bp.116.186510.

[27] Corner E, Gill P. A false dichotomy? Mental illness and lone-actor terrorism. Law Hum Behav 2015;39:23–34, doi:http://dx.doi.org/10.1037/lhb0000102.

[28] Feddes AR, Mann L, Doosje B. Increasing self-esteem and empathy to prevent violent radicalization: a longitudinal quantitative evaluation of a resilience training focused on adolescents with a dual identity. J Appl Soc Psychol 2015;45:400–11, doi:http://dx.doi.org/10.1111/jasp.12307.

[29] Gill P, Horgan J, Deckert P. Bombing alone: tracing the motivations and antecedent behaviors of lone-actor terrorists. J Forensic Sci 2014;59:425–35, doi:http://dx.doi.org/10.1111/1556-4029.12312.

[30] Laor N, Yanay-Shani A, Wolmer L, Khoury O. A trauma-like model of political extremism: psycho-political fault lines in Israel. Ann N Y Acad Sci 2010;1208:24–31, doi:http://dx.doi.org/10.1111/j.1749-6632.2010.05693.x.

[31] Simi P, Sporer K, Bubolz BF. Narratives of childhood adversity and adolescent misconduct as precursors to violent extremism: a life-course criminological approach. J Res Crime Delinq 2015;53:536–63, doi:http://dx.doi.org/10.1177/0022427815627312.

[32] Soliman A, Bellaj T, Khelifa M. An integrative psychological model for radicalism: evidence from structural equation modeling. Pers Individ Dif 2016;95:127–33.

[33] Fazel S, Wolf A, Chang Z, Larsson H, Goodwin GM, Lichtenstein P. Depression and violence: a Swedish population study. Lancet Psychiatry 2015;2:224–32, doi:http://dx.doi.org/10.1016/S2215-0366(14)00128-X.

[34] Ge L, Yap CW, Ong R, Heng BH. Social isolation, loneliness and their relationships with depressive symptoms: a population-based study. PLoS One 2017;12:, doi:http://dx.doi.org/10.1371/journal.pone.0182145.

[35] Tennant C. Life events, stress and depression: a review of recent findings. Aust N Z J Psychiatry 2002;36:173–82, doi:http://dx.doi.org/10.1046/j.1440-1614.2002.01007.x.

[36] Goldberg D. The heterogeneity of "major depression.". World Psychiatry 2011;10:226–8, doi:http://dx.doi.org/10.1002/j.2051-5545.2011.tb00061.x.

[37] Copeland WE, Shanahan L, Egger H, Angold A, Costello EJ. Adult diagnostic and functional outcomes of DSM-5 disruptive mood dysregulation disorder. Am J Psychiatry 2014;171:668–74, doi:http://dx.doi.org/10.1176/appi.ajp.2014.13091213.

[38] Sela Y, Shackelford TK. The myth of the myth of martyrdom. Behav Brain Sci 2014;37:376–7, doi:http://dx.doi.org/10.1017/S0140525X13003488.

[39] The ESEMeD/MHEDEA Investigators. Prevalence of mental disorders in Europe: results from the European Study of the Epidemiology of Mental Disorders (ESEMeD) project. Acta Psychiatr Scand 2004;109:21–7.

[40] Green MJ, Girshkin L, Teroganova N, Quidé Y. Stress, schizophrenia and bipolar disorder. Curr Top Behav Neurosci 2014;18:217–35, doi:http://dx.doi.org/10.1007/7854_2014_290.

[41] Bonoldi I, Simeone E, Rocchetti M, Codjoe L, Rossi G, Gambi F, et al. Prevalence of self-reported childhood abuse in psychosis: a meta-analysis of retrospective studies. Psychiatry Res 2013;210:8–15, doi:http://dx.doi.org/10.1016/j.psychres.2013.05.003.

[42] Atran S. Genesis of suicide terrorism. Science (80-) 2003;299:1534–9, doi:http://dx.doi.org/10.1126/science.1078854.

[43] Peterson JK, Skeem J, Kennealy P, Bray B, Zvonkovic A. How often and how consistently do symptoms directly precede criminal behavior among offenders with mental illness? Law Hum Behav 2014;38:439–49, doi:http://dx.doi.org/10.1037/lhb0000075.

[44] Slone M. Responses to media coverage of terrorism. J Conflict Resolut 2000;44:508–22, doi:http://dx.doi.org/10.1177/0022002700044004005.

[45] Corrigan PW, Powell KJ, Michaels PJ. The effects of news stories on the stigma of mental illness. J Nerv Ment Dis 2013;201:179–82, doi:http://dx.doi.org/10.1097/NMD.0b013e3182848c24.

[46] Swann WB, Gómez Á, Seyle DC, Morales JF, Huici C. Identity fusion: the interplay of personal and social identities in extreme group behavior. J Pers Soc Psychol 2009;96:995–1011, doi:http://dx.doi.org/10.1037/a0013668.

[47] Pratto F, Sidanius J, Levin S. Social dominance theory and the dynamics of intergroup relations: taking stock and looking forward. Eur Rev Soc Psychol 2006;17:271–320, doi:http://dx.doi.org/10.1080/10463280601055772.

[48] Gómez Á, Brooks ML, Buhrmester MD, Vázquez A, Jetten J, Swann WB. On the nature of identity fusion: insights into the construct and a new measure. J Pers Soc Psychol 2011;100:918–33, doi:http://dx.doi.org/10.1037/a0022642.

[49] Mael F, Ashforth BE. Alumni and their alma mater: a partial test of the reformulated model of organizational identification. J Organ Behav 1992;13:103–23, doi:http://dx.doi.org/10.1002/job.4030130202.

[50] Van Hiel A, Duriez B, Kossowska M. The presence of left-wing authoritarianism in Western Europe and its relationship with conservative ideology. Polit Psychol 2006;27:769–93, doi:http://dx.doi.org/10.1111/j.1467-9221.2006.00532.x.

[51] Bhui K, Stansfeld S, McKenzie K, Karlsen S, Nazroo J, Weich S. Racial/ethnic discrimination and common mental disorders among workers: findings from the EMPIRIC study of ethnic minority groups in the United Kingdom. Am J Public Health 2005;95:496–501, doi:http://dx.doi.org/10.2105/AJPH.2003.033274.

[52] Wolmer L, Laor N, Yazgan Y. School reactivation programs after disaster: Could teachers serve as clinical mediators? Child Adolesc Psychiatr Clin N Am 2003;12:363–81, doi:http://dx.doi.org/10.1016/S1056-4993(02)00104-9.

[53] Post JM, Sprinzak E, Denny LM. The terrorists in their own words: interviews with 35 incarcerated middle eastern terrorists. Terror Polit Violence 2003;15:, doi:http://dx.doi.org/10.1080/09546550312331293007.

[54] Schbley AH. Torn between god, family, and money: the changing profile of lebanon's religious terrorists. Stud Confl Terror 2000;23:175–96, doi:http://dx.doi.org/10.1080/105761000412760.

[55] Victoroff J. In: Kuriansky Judy, editor. The emotional impact of the intifada on Palestinian youth: implications for finding the path to peace. Westport, CT, US: US Praeger Publ Publ Group; 2006. p. 161–280171 Terror Holy L Insid Anguish Isr Confl (Pp 161-171) Xii, 280 Pp.

[56] Moskalenko S, McCauley C. Measuring political mobilization: the distinction between activism and radicalism. Terror Polit Violence 2009;21:239–60, doi:http://dx.doi.org/10.1080/09546550902765508.

[57] Babor T. The alohol use disorders identification test. Who 2001;1–40.

[58] Beck AT, Epstein N, Brown G, Steer RA. An inventory for measuring clinical anxiety: psychometric properties. J Consult Clin Psychol 1988;56:893–7, doi:http://dx.doi.org/10.1037/0022-006X.56.6.893.

[59] Buss AH, Perry M. The aggression questionnaire. J Pers Soc Psychol 1992;63:452–9, doi:http://dx.doi.org/10.1037/0022-3514.63.3.452.

[60] Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. Arch Gen Psychiatry 1961;4:561–71, doi:http://dx.doi.org/10.1001/archpsyc.1961.01710120031004.

[61] Bagdasarov Z. Developing and validating a measure of cognitive complexity: the role of cognitive complexity in processing of health messages. 2009.

[62] Allinson CW, Hayes J. The cognitive style index: a measure of intuition-analysis for organizational research. Int J Manag Stud Res 1996;33:119–35, doi:http://dx.doi.org/10.1111/j.1467-6486.1996.tb00801.x.

[63] Berman AH, Bergman H, Palmstierna T, Schlyter F. Evaluation of the Drug Use Disorders Identification Test (DUDIT) in criminal justice and detoxification settings and in a Swedish population sample. Eur Addict Res 2005;11:22–31, doi:http://dx.doi.org/10.1159/000081413.

[64] Harrington N. The frustration discomfort scale: development and psychometric properties. Clin Psychol Psychother 2005;12:374–87, doi:http://dx.doi.org/10.1002/cpp.465.

[65] Swinson RP. The GAD-7 scale was accurate for diagnosing generalised anxiety disorder. Evid Based Med 2006;11:184, doi:http://dx.doi.org/10.1136/ebm.11.6.184.

[66] Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand 1983;67:361–70, doi:http://dx.doi.org/10.1111/j.1600-0447.1983.tb09716.x.

[67] Freeston MH, Rhéaume J, Letarte H, Dugas MJ, Ladouceur R. Why do people worry? Pers Individ Dif 1994;17:791–802, doi:http://dx.doi.org/10.1016/0191-8869(94)90048-5.

[68] Bebbington P, Hurry J. The list of threatening experiences: a subset of 12 life event categories with considerable long-term contextual threat. Psychol Med 1985;15:189–94, doi:http://dx.doi.org/10.1017/S003329170002105X.

[69] Leary MR, Kelly KM, Cottrell CA, Schreindorfer LS. Construct validity of the need to belong scale: mapping the nomological network. J Pers Assess 2013;95:610–24, doi:http://dx.doi.org/10.1080/00223891.2013.819511.

[70] Kroenke K, Spitzer R, Willams J. Validity of a brief depression severity measure. J Gen Intern Med 2001;16:606–13, doi:http://dx.doi.org/10.1046/j.1525-1497.2001.016009606.x.

[71] Bebbington P, Nayani T. The psychosis screening questionnaire. Int J Methods Psychiatr Res 1995;5:11–9, doi:http://dx.doi.org/10.1037/t30040-000.

[72] Scott SG, R a Bruce. Decision-making style: the development and assessment of a new measure. Educ Psychol Meas 1995;55:818–31, doi:http://dx.doi.org/10.1177/0013164495055005017.

[73] Coolidge FL, Segal DL, Cahill BS, Simenson JT. Psychometric properties of a brief inventory for the screening of personality disorders: the SCATI. Psychol Psychother Theory, Res Pract 2010;83:395–405, doi:http://dx.doi.org/10.1348/147608310X486363.

[74] Ullrich S, Deasy D, Smith J, Johnson B, Clarke M, Broughton N, et al. Detecting personality disorders in the prison population of England and Wales: comparing case identification using the SCID-II screen and the SCID-II clinical interview. J Forensic Psychiatry Psychol 2008;19:301–22, doi:http://dx.doi.org/10.1080/14789940802045182.

[75] Ware J, Kosinski M, Keller SD. A 12-Item SHort Health Survey: construction of scales and preliminary tests of reliability and validity. Med Care 1996;34:220–33, doi:http://dx.doi.org/10.1097/00005650-199603000-00003.

[76] Cloninger CR, Przybeck T, Svrakic DM, Wetzel R. Temperament and character inventory. DoiOrg 2012, doi:http://dx.doi.org/10.1037/t03902-000.