Lone-Actor Terrorism - A Systematic Literature Review

Jonathan Kenyon

HMPPS Interventions Services, London, UK

Chris Baker-Beall

Disaster Management Centre, Bournemouth University, UK

Jens Binder

Department of Psychology, Nottingham Trent University, UK

Research Note: Lone-Actor Terrorism - A Systematic Literature Review

Jonathan Kenyon[a][1], Christopher Baker-Beall[b] & Jens Binder[c]

[a]HMPPS Interventions Services, London, UK; [b]Disaster Management Centre, Bournemouth University, UK; [c]Department of Psychology, Nottingham Trent University, UK

Abstract

A systematic review of the empirical literature on lone-actor terrorism, the first of its kind, is presented. Across 109 sources, ten main themes that characterise this domain are identified and described: definitions of lone-actor terrorism and typologies; heterogeneity of lone-actor terrorists; presence of mental health issues and/or personality disorders; similarities with other lone-offender criminal types; motivation to act driven by personal and ideological influences; increasing prominence of internet use; ties with other extremists, groups or wider movements; processes of attack planning and preparation; role of opportunity/triggers; and a tendency towards leakage/attack signalling.

Introduction

On 15 March 2019, a lone gunman, Brandon Tarrant, walked into the Al Noor mosque in Christchurch, New Zealand, and opened fire on those assembled for prayer. The attacker then moved to the Linwood Islamic Centre and continued the shooting. By the end of the violence, 51 people had lost their lives and 49 were left seriously injured.[1] Initially, the attacker was described as a lone-actor or 'lone wolf' terrorist, thought to have acted by himself. In many ways, the attack resembled that of Norwegian Anders Breivik who murdered 77 people, mostly children, in Oslo and on the island of Utøya on July 22, 2011.[2] Not only had Tarrant been influenced by online content associated with the politics of the extreme-right, mirroring the pathway to violence followed by Breivik, he further claimed he was inspired by the actions of Breivik and other lone actors.[3]

Since 2011, there have been a spate of lone-actor terrorist incidents across Europe and the U.S. in a period described by Hamm and Spaaij as 'the age of lone wolf terrorism'.[4] In 2016, Mohamed Lahouaiej-Bouhlel murdered 86 people driving a vehicle into crowds celebrating Bastille Day in the French city of Nice, while in Germany, Anis Amri drove a truck into the Breitscheidplatz Christmas market in Berlin killing 12 people. Lone-actor terrorist incidents in the U.S. include the Orlando nightclub shooting by Omar Mateen, who killed 49 people and wounded 53 others. These attacks have given rise to a perception that lone-actor terrorism is becoming increasingly more frequent and deadly. They have brought lone-actor terrorism to the forefront of political debate, with counter-terrorism increasingly focused on uncovering how lone actors were 'radicalised' and understanding their 'pathways' into terrorism. Lone-actor terrorists are considered exceedingly difficult to combat. They are generally assumed to be socially isolated individuals who do not communicate with others before they plan, prepare and execute their acts of violence;[5] due to associated connotations of monikers such as 'lone wolf', lone-actor terrorists are often viewed as highly capable; and they seemingly act on their own, largely undetectable and hard to disrupt.[6]

---

[1] Contact: Jonathan Kenyon | jonathan.kenyon@justice.gov.uk | National Specialist Lead for Extremist Offending (HMPPS Interventions Services) 8th Floor, 102 Petty France, London, SW1H 9AJ

Recent work has challenged many of these assumptions.[7] Lone-actor attacks are found to be relatively infrequent and less deadly than attacks carried out by groups.[8] Spaaij examined all terrorist incidents that had occurred between 1968 and 2010 across 15 countries and found only 1.8% of attacks were carried out by lone actors, with attacks characterised by low lethality due to a disconnect between intention and capability.[9] Lone-actor terrorism was also found to be more prevalent in the U.S. than in other Western countries, with Spaaij attributing this to the relative popularity of leaderless resistance strategies among American right-wing and anti-abortion activists. Similarly, research carried out for the European Commission as part of the PRIME project has challenged the belief that lone actors do indeed act alone, noting that, as with group terrorism, lone terrorists do not emerge in a vacuum.[10] Following Spaaij and Hamm, we concur that current ideas regarding lone-actor terrorists are often based on conceptually and methodologically questionable assumptions, largely borne out by a lack of data-driven research within the literature.[11]

At present, although there is an emerging body of research in this area, a systematic review of studies on lone-actor terrorism is noticeably missing. Existing reviews come with limitations. The review by Pantucci, Ellis and Chaplais was not systematic, engaged with only a small number of studies and was conducted before a new wave of influential research begun to emerge.[12] Another notable review, by Spaaij and Hamm, likewise was not systematic, but rather focused on definitional, conceptual, and methodological issues inherent to research on lone-actor terrorism.[13] Building on the examples set by Silke and Ranstorp with notable surveys of the 'state of the art' of terrorism studies, and following Campana and Lapointe's suggestion that 'literature reviews are much needed to better understand the main trends in the field', we offer the first systematic review of the literature on lone-actor terrorism.[14] The aim is not only an overview, but also critical engagement given that the assumptions contained in the literature can have real effects on policy and the efforts of those tasked with combatting terrorism.

This review is structured as follows: first, we outline the method used to systematically review the literature, before identifying and critically analysing the key themes identified. The review will then discuss and summarise the current state of knowledge around lone-actor terrorism, specifically focusing on who they are, what characterises their actions and what behaviours are exhibited prior to an attack. Ten key themes are identified that underpin the literature. We also highlight where gaps and debate still remain and conclude with implications for future research.

Method

The review process was based on the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement, with deviation where necessary due to the nature and format of the literature.[15] The PRISMA statement is an evidence-based standard for reporting evidence in systematic reviews and meta-analyses, consisting of a 27-item checklist and a 4-phase flow diagram.

Retrieval of Articles and Inclusion/Exclusion Criteria

Literature had to meet the following inclusion criteria: (1) only empirical, data-driven studies focusing on lone-actor terrorists; specifically who they are, what drives them, what characterises their actions and what pathway behaviours are exhibited prior to an attack; (2) any book, book chapter or journal article from any subject area, as it was recognised the

literature base is still developing, with multi-disciplinary interest in the topic; (3) any published research (3a) written in English and (3b) produced between 1st January 2001 and 30th April 2020 (when the search was conducted) as the focus was on contemporary forms and incidents. Where necessary, supplementary literature relating to the study of terrorism, radicalisation and extremism more generally has been included to critically reflect on the claims made in the lone-actor terrorism literature and add substance to the analysis that follows.

Literature Search and Screening Process

Four online databases were searched: PsycINFO, PubMed, SCOPUS and Google Scholar. For three of the online databases (PsycINFO, PubMed and SCOPUS), keyword searches were conducted within the title/abstract using all combinations of a three-part search term approach, using Boolean and wildcard operators to increase search sensitivity. This consisted of one 'Lone Actor' term (Lone wol* OR Lone actor), one 'Terrorism' term (Terror* OR Extrem*) and one 'Pathway' term (Radicali* OR Pathway OR Route OR Journey). Given the restricted search specifications with Google Scholar and substantially different inclusion criteria of the database, a two-part search term approach was used. This consisted of including the 'exact phrase' of one 'Lone Actor' term (Lone wolf, Lone wolves, Lone actor, Lone actors), paired with 'at least one' of the following 'Pathway' terms: Radicalisation, Radicalization, Journey, Pathway, Route or 'at least one' of the following 'Terrorism' terms: Terrorist, Terrorism, Extremist, Extremism. For Google Scholar, key-word searches were restricted to the title of the source only.

Initial searches identified 394 records across all four online databases. Following a duplicate screen, 261 unique records remained. The title and abstract of each record was reviewed against the specific inclusion criteria set out above, followed by detailed scrutiny and full-length reading of each record to establish suitability for inclusion in the review. This resulted in 73 records remaining. Reference lists of each of these records were manually reviewed to identify any other records meeting the inclusion criteria, leading to a further 28 records being included. Following peer review feedback, 8 more records were added.[16] The final selection of 109 records consisted of 97 journal articles, 10 books/book chapters and 2 reports for the U.S. Department of Justice.[17] Of the 97 journal articles, 42 (43%) were published in terrorism-specific journals, whilst the others were published in journals from other disciplines.

Of the final 109 records, all were published between 2010 and 2020. Of these, 86 (79%) focused specifically on lone actors, whilst 23 (21%) featured lone actors as a sub-set of a wider analysis. Sample sizes were reported in all but seven records, with lone-actor terrorists making up the sample in 104 of the 109 (95%) records. For five records (5%), the sample included members of the police, professionals with direct experience of working with lone-actor terrorists or a selection of channels on social media platforms. For the type of data analysis undertaken, 39 (36%) records included large N quantitative analysis (sample size > 70), with 17 (15%) records utilising medium N quantitative analysis (16 < sample size < 70). For 28 (26%) records, data analysis involved qualitative analysis of small N case studies, whilst 21 (19%) records featured single case studies. Of the 49 records featuring single or small number case studies, Anders Breivik was the most cited case study, featuring in 20% of records. Three (3%) articles combined both quantitative and qualitative analysis, whilst one (1%) employed a qualitative ethnographic approach.

Data Synthesis and Content Analysis

To synthesise the data from all 109 records, content analysis and grounded theory methods were applied.[18] This was an iterative process completed in two stages. First, each source was read with the intention of identifying common or recurrent topics, issues, concepts and/or ideas about lone-actor terrorism across sources. Second, having identified a broad set of topics from the literature, these concepts and ideas were refined and then merged and grouped into the broader thematic categories discussed below. The analysis employed a 'grounded theory' approach; it was assumed to be complete when a subsequent review of the literature could not identify any new thematic categories beyond those identified in the previous iteration. Adopting an interpretive approach to the content analysis, we did not determine codes or categories beforehand; instead, themes emerged as the texts were analysed.[19]

Through this process, ten overarching themes were identified, capturing current debate on lone-actor terrorism in a navigable structure. Themes are presented in a specific order intended to address four key questions: First, who are lone-actor terrorists? Second, what drives them? Third, what characterises their actions? Fourth, what behaviours do they exhibit preceding an attack? The ten themes identified from the literature review include: (1) Ambiguity over the definition of lone-actor terrorism and the use of typologies; (2) Heterogeneity of lone-actor terrorists; (3) Presence of mental health issues and/or personality factors; (4) Similarities with other lone offender criminal types; (5) Motivation to act driven by personal and ideological influences; (6) Increasing prominence of internet use; (7) Ties with other extremists, groups or wider movements; (8) Attack planning and preparation; (9) Role of opportunity/triggers; and (10) Tendency towards leakage/attack signalling. Each theme is reviewed below.

Theme 1: Ambiguity of lone-actor definitions and use of typologies

The first theme concerns a lack of clarity over the definition of the term 'lone-actor' and the use of typologies. The definitions proposed are diverse with no agreed description of what constitutes lone-actor terrorism, similar to definitional issues characterising the literature on terrorism and radicalisation more widely. Those classified as lone-actors have been found to behave in different ways from terrorist organisations, making it critical for researchers studying lone-actor terrorism to only include genuine lone-actor cases. However, doing so is problematic given the lack of consensus over the criteria for identifying when an individual who has carried out a terrorist offence can be considered a 'lone-actor'. The use of various labels for lone-actor terrorists has added to the confusion.

One key area of disagreement concerns the degree of support an individual can receive from others, or whether a prior affiliation with extremist groups is acceptable, in order to be labelled a lone-actor terrorist. Some definitions have stipulated the attacker must act alone, others allow for the involvement of one or two people. Some definitions completely exclude cases if there is evidence of outside (group) support or direction, others allow for some outside contact or even a formal command and control structure (provided the individual is acting alone). Another key area of disagreement includes the intentions behind acts of violence. Some researchers, like Spaaij, apply the label of lone-actor terrorist only to cases with clear evidence of underlying ideological, political or religious objectives, whilst others, including De Roy van Zuijdewijn and Bakker, have extended the label to also include personal motivations.[20]

Clemmow, Bouhana and Gill propose that typologies can be a way of conceptualising complex, heterogeneous offending populations and crime events.[21] Unsurprisingly, several typologies have been applied to lone-actor terrorism. Some are sparse, such as the two types of lone-actor terrorists proposed by Phillips and Pohl, based on an economic approach to offender profiling: a risk-averse or risk-taking type of lone-actor.[22] Others are more complex, including the one offered by Pantucci aimed at identifying specific types of lone actors within 'Islamist terrorism'.[23] First, the 'Loner', described as 'isolated individuals who seek to carry out an act of terrorism using… extremist Islamist ideology as their justification'.[24] Second, the 'Lone Wolf', described as individuals who 'appear to carry out their actions alone' but are supported or controlled by other extremists.[25] Third, the 'Lone Wolf Pack', similar to the 'Lone Wolf', but rather than 'a single individual who becomes ideologically motivated, it is a group of individuals who self-radicalise'.[26] The 'Lone Wolf Pack' has no face-to-face contact with known militant extremists or groups. Finally, the 'Lone Attacker', operating with direct support and operational control from a terrorist or extremist organisation but executing their attacks alone.

The distinction between 'Loners' and 'Lone Wolves' received support from Holt et al., who argued a loner operates individually and lacks affiliations with extremist groups, while the lone wolf also operates individually, but is affiliated with other active extremists within a group context.[27] Further support for these two types has been offered by Gruenewald, Chermak and Freilich who found loners are more likely to have a military background, be married, commit a suicide attack, and have a mental illness compared to lone wolves.[28] Schuurman et al. also described loners as different from lone wolves in that the acts they carry out are less lethal, in part because they do not have the skills necessary to carry out a more sophisticated terrorist act.[29] Spaaij and Hamm have been critical of more inclusive types, arguing that 'if two or three people carry out an act of terrorism, then it is no longer a 'lone' act of violence committed by 'unaffiliated' individuals'.[30] They explain that broader definitions can 'inflate the incidence of lone wolf terrorism', and 'render invisible important differences and nuances that … policymakers need to keep in mind as they develop interdiction and prevention strategies'.[31] Similarly, Feldman argued against using typologies such as 'Lone Wolf Pack' as this would fundamentally change the lone-actor terrorist dynamic.[32]

The term 'lone wolf' is closely associated with the strategy of 'leaderless resistance', popularised by the American far right in the 1980-90s.[33] According to Nesser, it was white supremacist Tom Metzger who first introduced the term 'lone wolfism' to promote the image of the lonesome, patriotic warrior. However, the use of 'lone wolf' as a label has received criticism.[34] Spaaij and Hamm have argued convincingly that this term is no more than 'a construct of the media and of radical political actors themselves rather than a social science concept or legal terminology'.[35] Joose stated 'the recent movement in the terrorism literature towards using the term "lone actors" is to be welcomed…since this further de-claws these "wolves" of their rhetorical ferocity'.[36] Likewise, Schuurman et al. prefer the term lone-actor, given that 'lone wolf' often implies a high degree of lethality and cleverness that is rarely the case among these individuals.[37]

As an alternative approach, Borum, Fein and Vossekuil suggest viewing dimensions of lone-actor terrorism along a continuum, rather than attempting to force categorical distinctions or developing narrow or wide definitions.[38] Three dimensions are proposed to classify and analyse lone-actor attacks: first, the degree of loneness of the individual involved in the

terrorist offence; second, the degree of direction the individual receives; third, the clarity of motivation that underpins the actions.[39] This approach was applied by Gill et al. to a sample of 49 individuals who engaged in or planned to engage in lone-actor terrorism in the UK between 1995 and 2015.[40] They found that the continuum approach held significant utility in demonstrating the diversity of behaviours exhibited by lone-actor terrorists.

A collaborative approach was taken by Danzell et al. based on multiple key personality and environmental drivers.[41] With reference to Internal Pack Conflicts theory, they found pack conflict was a common feature among all three lone-actor cases within their study, with each having experienced internal pack conflict (e.g. feeling aggrieved by or outcast in society) at different points in their lives, resulting in similar acts of terror. Their conceptualisation supports their view that lone actors go through various stages in transformation.[42]

The analysis of this first theme reveals that there is currently no commonly accepted definition for lone-actor terrorism, with a wide variety of labels and terminology adding to the confusion on this issue. This reflects definitional issues within the literature on terrorism and radicalisation more generally.[43] Although we view typologies as having potential to provide a solution to the contested nature of the definitional debate, typologies themselves are similarly contested within the academic literature. Moving forward, we support the approach suggested by Clemmow et al. Rather than defining lone-actor terrorists based on fixed characteristics, a multidimensional typology may help account for the heterogeneity found within lone actors, while maintaining coherence within a general and clearly articulated analytical framework.[44]

Theme 2: Heterogeneity of lone-actor terrorists

The second theme relates to a general consensus regarding the lack of a single comprehensive socio-demographic profile for lone-actor terrorists.[45] Lone actors have been found to come from a variety of educational, socioeconomic, ethnic and family backgrounds, with differences in education levels, operational ability, training and access to financing. Although some basic traits do emerge, including a tendency for lone actors to be male and under 50 years old, these alone are insufficient to differentiate them from other criminal offender populations.[46]

In terms of basic traits, Hamm and Spaaij found gender differences between lone-actor terrorists when comparing pre-9/11 with post-9/11 cases within a U.S. sample.[47] They reported just five female cases pre-9/11, but no cases post-9/11. In relation to age, pre-9/11 the average age of lone actors at time of attack was 38, more than ten years older than average members of terrorist groups. Post-9/11, average age at time of attack reduced to 31 years. The authors suggested these age discrepancies were due to differences in radicalisation pathways. With lone-actor radicalisation being more individualised, internalisation of terrorism-enabling views takes longer compared to group terrorists who experience peer pressure within their networks.[48] Even in smaller sub-groups of lone actors, general socio-demographic characteristics have not yielded a unique attacker profile.[49] Perry et al. suggest this heterogeneity of lone-actor terrorists can be accounted for by such individuals operating in very different geographical, legal and political environments, motivated by an array of ideologies and inspired by different groups and organisations.[50] The lack of a single socio-demographic profile for lone-actor terrorists is consistent with findings of a field-wide systematic review of risk and protective factors for radicalisation outcomes conducted by Wolfowicz at al.[51] They found that not only do socio-demographic factors have a relatively

small impact, but also that significant overlaps exist between terrorists and ordinary criminals regarding behavioural patterns, motivations and demographics.

There is some indication of predominance of negative emotions among lone-actor terrorists, including high levels of resentment and anger, along with high levels of cognitive sophistication.[52] However, the interplay between emotions and cognition in lone-actor terrorism is still not fully understood. In other studies, an inclination for criminality and violence was evident before the individual became radicalised. This includes Khan and Nhlabatsi who, based on media reports, found that five out of six lone-actor cases who had committed attacks across Europe in 2016/17 had a violent past, with all six possessing a prior criminal record.[53]

Herrington found evidence of past violence convictions, along with problematic drug and alcohol use, in all six Islamist extremist lone actors studied who engaged in suicide terrorism in Europe from 2013-17.[54] Further support includes the study by Gill et al. where 41% of lone-actor cases were found to have previous criminal convictions, a rate significantly higher than reported anecdotally for those with links to wider terrorist networks.[55] Similarly, when investigating ideology-based profiles in a sample of North American and European cases, Bouhana et al. found that extreme right-wing lone actors, compared with other lone-actor terrorists, were more likely to be non-religious thrill seekers who were born and raised in the country of attack.[56] They were also more likely to have a violent past, less likely to live alone at the time they adopted their terrorism-supportive ideology, more likely to be involved in legal fundraising activities and to have consumed literature and propaganda related to lone actors.

Based on the research conducted to date, no clear socio-demographic profile has emerged for lone-actor terrorists. We agree with Perry et al. that this reflects the fact that lone actors are operating in different geographical, legal and political environments, motivated by an array of ideologies and inspired by different groups and organisations.[57] However, the literature has suggested certain commonalities exist in relation to behaviours that lone actors exhibit in the lead-up to a terrorist offence.[58] Some of the subsequent themes focus on these behaviours within trajectories towards lone-actor terrorism.

Theme 3: Presence of mental health issues or personality disorder

The third theme concerns the prevalence of mental and personality disorder characteristics exhibited by lone-actor terrorists, particularly when compared to group-based terrorists and the general population. A common perception, based on the literature, is that lone actors suffer from a certain degree of psychological problems or exhibit symptoms of personality disorders. As part of a larger study, Spaaij reported for three of five cases of alleged lone-actor terrorism that the individual concerned had a personality disorder, while all five demonstrated some type of psychological disorder: one was diagnosed with obsessive-compulsive disorder and four had experienced severe depression at least once in their life.[59]

Further evidence for the relevance of personality issues includes the study by Lazzari, Nusair and Rabottini.[60] They used ethnographic research based on internet sources and found that for some lone actors, narcissistic and grandiose traits were prevalent in terms of exaggerating the effectiveness of their radical actions. Similarly, Leonard et al. suggested such traits were relevant for Anders Breivik after analysing his writing style within his manifesto and reviewing two psychiatric reports, even suggesting his grandiosity may have led to an initial

premature diagnosis of paranoid schizophrenia.[61] In support of the presence of mental health issues, Zeman et al. conducted a study involving 93 lone actors who had committed terrorist attacks across the U.S., Canada, Australia and Europe from 1998 to 2016.[62] The presence of mental disorder was a distinctive feature for lone-actor terrorists, with close to half (43%) being diagnosed with some kind of mental disorder prior to committing their first terrorist attack. Similarly, de Roy van Zuijdewijn and Bakker found that 35% of lone-actor terrorists from a European sample of 120 cases between 2000 and 2014 had suffered from some kind of mental disorder.[63] Hamm and Spaaij reported differences in rates of mental illness when comparing lone-actor terrorists' pre-and post-9/11 in the U.S.[64] Fully half of the pre-9/11 lone actors suffered from a diagnosed mental illness, compared to 42% of those post-9/11, although for post-9/11 cases, the number of unknown diagnoses was higher.

Both Pantucci and Spaaij have suggested higher rates of mental disorder among lone-actor terrorists in contrast with the more general (group-based) terrorist population, where psychological disturbances are found to be rare.[65] Cotti and Meloy offered Tamerlan Tsarnaev, one of the brothers involved in the 2013 Boston Marathon bombing, as an example of a terrorist with a mental disorder, suggesting he projected his paranoid feelings onto the outside world with the help of a radical ideology.[66] In another study, Prats, Raymond and Gasman described a lone-actor case, diagnosed with schizophrenia and with long-standing experience of identity crisis, who had reportedly adopted a radical Islamist ideology at a time when he was questioning the purpose of life and experiencing suicidal thoughts.[67]

Further support for the role of mental illness has been presented by Corner and Gill who found lone-actor terrorists were over 13 times more likely to have psychological disorders than terrorist group members.[68] Similarly, Hewitt found the rate of psychological disturbance was higher among lone actors than among other U.S. terrorists.[69] Building on their earlier research, Corner, Gill and Mason compared the prevalence of diagnosed mental disorders in a general population with that in lone actors and group-based terrorists.[70] Although group actors were found to have lower levels of mental disorder than would be expected within a general population, this was not the case for lone actors where substantially higher levels of schizophrenia, delusional disorder and autism spectrum disorder were found. Variation in mental illness for lone actors has been reported across extremist ideologies. Gill et al. found that lone actors holding single-issue ideologies (e.g., animal rights, anti-abortion and environmentalism) were significantly more likely to have histories of mental illness compared to those representing other ideologies (right-wing or al-Qaeda-related ideology).[71]

Gattinara, O'Connor and Lindekilde have suggested that a higher rate of clinical and sub-clinical mental illness for lone-actor terrorists should not be regarded as a causal factor by itself.[72] Instead, disorders like narcissism, psychopathy or depression result in different interactional challenges for lone actors with their immediate social environment. Indeed, despite a higher prevalence of mental disorder among lone-actor terrorists, it has been shown that those diagnosed with mental illness frequently display rational motives and are capable of engaging in rational and purposive attack planning.[73]

Overall, the literature indicates a higher prevalence of mental illness and personality disorders for lone-actor terrorists than group-based terrorists and the general population. The rates of mental illness for lone-actor terrorists within both the U.S. and Europe appear similar, at around 40%. Yet, the higher prevalence of mental disorder and personality issues within the lone-actor group has not prevented many individuals from engaging in sophisticated and organised planning in the lead-up to - and carrying out of - violent

extremist acts. Although mental illness or personality disorder may be considered risk factors for lone-actor terrorism, these should not be considered causal factors by themselves and are one of many factors that typically 'crystalize' within the individual.[74]

Theme 4: Similarities with other lone offender types

The fourth theme relates to similarities between lone-actor terrorists and other types of lone offender criminals, particularly school shooters, assassins, non-ideologically motivated mass shooters or individuals who commit 'ordinary' homicide. Comparing politically motivated lone-actor terrorist attacks and lone-actor school shootings in the U.S., McCauley, Moskalenko and Van Son found both sets of perpetrators planned their actions in advance, were driven more by emotional or social factors rather than material or instrumental needs, and had experiences of weapons use outside the military.[75] Both types had experienced feelings of grievance, depression, despair and suicidal tendencies with significant differences only found for age and marital status (i.e. politically motivated attackers were considerably older and more likely to be married). Given these similarities, McCauley and Moskalenko suggested that lone-actor terrorists, assassins and school attackers may all form part of a larger phenomenon of grievance-motivated lone-actor violence.[76]

Capellan, studying ideological and non-ideological shooter events in the U.S., found similarities in the profiles of lone actors, but also significant behavioural differences.[77] Within a sample of nearly 200 ideological and non-ideological mass shooters, the majority in both groups were white males in their thirties with dysfunctional adult lives, either single or divorced, with lower levels of education and a history of mental illness. However, ideologically inspired shooters were considered to act more methodically, to show more sophisticated planning, to have had some military training, and use a greater number of firearms. In related work, Capellan and Anisin argued for the importance of group grievance to be present for ideologically motivated violence to occur.[78]

Other studies of note include Lankford and Hakim, who compared rampage shooters in the U.S. with volunteer suicide bombers in the Middle East.[79] Retroactive psychological autopsies were compiled from witness statements, family interviews, journal diaries, suicide notes and other biographical information. Differences found were largely cultural, not individual, indicating that underlying psychological factors were quite similar. Common characteristics included troubled childhoods, being products of oppressive social environments, suffering low self-esteem and experiencing a triggering personal crisis. In another comparative analysis of suicide terrorists and rampage, workplace and school shooters in the U.S., Lankford reported further commonalities in terms of struggling with similar personal problems prior to attacks, including social marginalization, family problems, work/school problems, and precipitating crisis events.[80] In another study on school rampage shootings and lone-actor terrorist attacks, Malkki highlighted the use of symbolic violence with a clear intention to communicate a message to a wider audience.[81]

Horgan, Gill, Bouhana, Silver and Corner compared demographic, psychological and offence-related variables between 71 lone-actor terrorists and 115 solo mass murders based in the U.S.[82] Little was found to distinguish both groups based on socio-demographic variables. Differences were found, however, for the extent of interaction with co-conspirators and engagement in leakage behaviours prior to an attack. Lone-actor terrorists were more likely to attempt to recruit others, interact with members of a wider network (virtually and face-to-face), produce letters and/or statements prior to the attack and join a wider movement. They

were also more likely to verbalise their intent to commit violence to a wider audience. Further, lone-actor terrorists were more likely to have university and military experience, have criminal convictions, live alone, show escalating anger and stockpile weapons, whereas solo mass murders were more likely to have a substance abuse history, experiences of degradation and poor treatment, problems with personal relationships and experiences of recent and chronic stress.

Clemmow et al. utilised cluster analysis to identify variables to distinguish between lone-actor terrorists and mass murderers within a U.S. sample.[83] Although some differences were noted, including lone-actor terrorists being more likely to engage in leakage behaviours, much commonality was found across propensity factors, situational factors, preparatory indicators and network factors examined. For Europe, comparing lone-actor terrorists with 'ordinary' homicide offenders, Liem et al. found lone actors to exhibit higher levels of education.[84] In contrast to other studies, however, they found lone-actor terrorists were not usually socially isolated and operated in dyads and triads more often than homicide offenders.

In sum, lone-actor terrorists share many common characteristics with other lone offender types, particularly with respect to demographic and personality profiles. Aside from more obvious similarities of acting alone, lone-actor terrorists and other lone offender types are generally found to have planned their actions in advance, been motivated by emotional and social needs and use symbolic violence for communicating a message to a wider audience. It has been argued that lone-actor terrorism is part of a larger phenomenon of grievance-motivated lone-actor violence. However, some differences are also apparent, including lone-actor terrorists demonstrating higher levels of education, acting more methodically, showing higher levels of sophisticated planning, having more military training and their weapon choice.

Theme 5: Motivation driven by personal and ideological influences

The fifth theme suggests the motivation behind violent acts for lone-actor terrorists does not centre purely on ideology. Instead, motivation is generally considered to be the culmination of a complex mix of personal, political and social drivers that converge at the same time.[85] Significantly, a number of studies have focused on the important role played by ideology (see for example Gartenstein Ross).[86] Springer reported that it was only when individuals found themselves isolated, alone and not accepted into a group, they formulated rigid ideologies, which took years to cultivate, to compensate.[87] Pitcavage also found that ideology played a prominent role in decisions to engage in violence for the majority in a sample of 35 lone-actor terrorists.[88] In addition, Perry et al. found over half of the 62 perpetrators of lone-actor vehicle attacks in Israel and the West Bank had declared nationalistic/religious motivation stemming from a desire to sacrifice themselves in light of conflict events.[89]

Despite the suggestion that lone actors increasingly identify with an ideological worldview, their belief systems have been described as often being superficial.[90] Spaaij proposed that lone actors frequently combine their own personal vendettas and frustrations with religious or political grievances.[91] In support, Teich reported that all of five Islamist extremist lone-actor cases studied had immense personal grievances, along with broader goals.[92] Perpetrators were found not to have been religiously devout all their lives, and radical Islam was often used as a comfort after suffering personal grievances. Similarly, Khan and Nhlabatsi found that none of the six Islamist extremist lone actors in their study had examined, performed or observed religious activities.[93] Some were involved in behaviours against the doctrine of their

religion, including consuming alcohol, taking drugs and engaging in causal sexual encounters. Perry et al. proposed that lone actors may at times react to political events as an excuse to deal with their own personal grievances.[94]

Within a sample of 120 lone-actor terrorists across Europe, Ellis et al. found that the motivations expressed varied greatly.[95] Perpetrators harboured a range of disgruntlements with sectors of the public, governments or social movements, or they manifested anger over specific events (personal or political) for which they were seeking retribution. Jackson used the example of Thomas Mair, who murdered British MP Jo Cox in 2016, to suggest that grievances of lone actors, while articulated in the language of an extremist ideology, are often rooted in non-ideological, wider social issues.[96] The important role played by personal grievances alongside ideology was highlighted in a Delphi study involving expert psychiatrists.[97] As key aspects of lone-actor radicalisation, core emotional drivers were identified including a basic feeling of vulnerability and feeling victimised, while feeling blocked in reaching such goals through popular or legal routes.

The typical motivation to commit acts of violence by lone-actor terrorists stems from a combination of personal and ideological influences. Many lone-actor cases have been found to share a mixture of unfortunate life circumstances, coupled with an intensification of beliefs/grievances, which resulted in subsequent plans to engage in violent acts. Whilst the motivations of lone-actor terrorists are often articulated in the language of an extremist ideology, they appear to be often rooted in non-ideological, wider social issues.

Theme 6: Increasing prominence of internet use

The sixth theme relates to the increasingly prominent role of the Internet for lone-actor terrorists, including altering their means of radicalisation and learning. Research has indicated that the Internet has been used to support ideological or extremist debate, to advance the radicalisation process and engage in operational planning; online behaviours are potential key signals an individual is on a pathway to committing lone-actor terrorism. The Internet can also provide lone actors with vital information, including instructional material for bomb making, weapons access or terrorist tactics, thus enabling lone actors to act truly independently. Frequently cited is the case of Roshonara Choudhry in the UK, who stabbed her local MP Stephen Timms, ostensibly in response to his parliamentary vote in favour of the 2003 Iraq war.[98] This attack was considered to be the result of solitary online radicalisation and an example of a pure lone-actor attack.

Hamm and Spaaij highlighted the significant role of the Internet in the radicalisation process for lone-actor terrorists in the U.S.[99] They found that prior to 9/11, radicalisation was mostly associated with previous membership with an extremist group, whilst post 9/11, the source of radicalisation has gradually been replaced by the Internet and online social networks. In another study, Gill et al. compared a cohort of violent lone actors from 1990 to 2005, comprising both lone-actor terrorists and solo mass murderers, with a cohort from 2006 to 2013.[100] They found the latter significantly more likely to have used the Internet for purposes of attack planning. Van Burren and de Graaf described the emergence of the Internet and social media as having led to the formation of digital "communities of belief".[101] These were described as substitute networks that have partly replaced face-to-face contacts and provide lone actors with ideological frameworks, knowledge of tactics, equipment and targets, as well as a sense of being part of a vivid, supporting social community.

Having reviewed 120 lone-actor cases from across Europe, Ellis et al. (2016) found 50% had conducted at least part of their engagement in a virtual online setting, including downloading videos, images and literature, as well as online interaction on official forums and web pages in some cases.[102] Chronological analysis showed a steady increase in the use of mainstream social media platforms in plots, particularly from 2004, when platforms became established and grew in popularity. They also found the Internet had been used for tactical knowledge acquisition in 33% of cases.[103] Zeman, Bren and Urban argued that whilst the Internet clearly enables lone actors to become acquainted with extremist ideas, search for ideological texts or establish contact with other co-ideologues, it plays a more limited role during the actual preparation of terrorist attacks.[104] Similarly, Gill found that the Internet played a particularly important role in reinforcing the perpetrator's own radical thoughts, ideas and beliefs to legitimise violent action, in disseminating propaganda, or when informing others of the imminent act of violence.[105] Teich reported the Internet to play a facilitative role in the radicalisation of three out of five lone-actor case studies (e.g. watching sermons by extremist clerics online), whilst the Internet was used for sourcing bomb-making recipes in one case.[106]

Gill et al. conducted a comprehensive study of 223 terrorist offenders in the UK, including a number of lone-actor cases.[107] Lone actors were 2.64 times more likely to learn online than group-based terrorists. Gill et al. found ideological differences when exploring the degree to which 119 lone-actor terrorists engaged in online activities, with Al-Qaeda-inspired lone actors significantly more likely to learn through virtual sources than right-wing-inspired terrorists (65% vs. 37%).[108] Shehabat, Mitew and Alzoubi investigated use of the encrypted communication application Telegram within Daesh-inspired lone-actor attacks in Europe between 2015-16, concluding that Telegram channels played a critical role in personal communication between potential recruits and dissemination of propaganda that encouraged such attacks.[109] Weimann suggests that the recent increase in lone-actor terrorism can be partly explained by use of various online platforms for disseminating lone-actor tactics, however, terrorist groups also reach out to potential lone actors by seducing, teaching and encouraging them to launch attacks within online forums, chatrooms and social media applications.[110]

To summarise, increased use of the Internet over time by lone-actor terrorists may be unsurprising given its ubiquity in everyday lives generally. What is noteworthy is that the Internet is particularly useful as a means by which lone actors can reinforce their own radical thoughts, ideas and beliefs as a way of legitimising violent action. The Internet is also increasingly seen as a crucial tool for intelligence gathering, tactical knowledge acquisition and attack planning. The literature suggests that lone-actor terrorists are more likely to engage in online learning than their group-based counterparts. Alongside this, the Internet appears to be providing a substitute network for lone actors, redefining what constitutes a social community given the general absence of face-to-face contacts.

Theme 7: Ties with other extremists, groups or wider movements

The seventh theme states that, contrary to popular belief, lone-actor terrorists do have ties with other extremists, groups or wider movements. Hofmann suggests that the popularised view is that lone actors radicalise, operate, plan and execute plots in relative anonymity, with little connection to formal or more organised terrorist groups and networks.[111] Recent studies have increasingly challenged the 'loneness' of lone actors, with some claiming the notion of a completely self-reliant lone-actor has been resoundingly debunked.[112] The literature suggests that lone-actor terrorist attacks without outside influence, encouragement or inspiration are

rare. Outside ties are considered key elements in the adoption and maintenance of the motive for lone actors, and sometimes the means to commit terrorist violence.[113] Importantly, although some lone actors may appear socially isolated in real life, they often establish social ties and communicate with other like-minded individuals within social media contexts.[114]

In their analysis of 119 individual cases, Gill et al. reported a number of findings relating to lone actors interacting with others: one in six directly sought some form of legitimisation from religious, political, social, or civic leaders; a third of cases tried to recruit others to their cause; almost 60% of cases shared with others specific information relating to their research, planning, and/or preparation prior to the terrorist act itself; and more than half linked their actions to some form of wider movement or specific group.[115] Likewise, Schuurman et al., analysing 55 cases, found that in 62% of cases the individual had prior contacts with larger radical circles; 78% were encouraged by external supporters; and 58% engaged in some sort of signalling by informing others of their plans.[116] Gattinara et al. and Lindekilde et al. proposed two dominant patterns of radicalisation for lone actors, both resting on interactions with others and wider social ties.[117] The first pattern refers to 'peripheral' lone actors, who internalise the beliefs of an ideological milieu to such an extent that they commit, or attempt to commit, a violent attack but fail to fully gain acceptance by their co-ideologues. The second pattern refers to 'embedded' lone actors, who are socially recognised and respected actors in the extremist milieu or formal members of groups and organisations. However, these individuals still decide to plot and carry out violent attacks alone.

Becker convincingly argues that lone actors communicate with others or become radicalised through exposure to group-based grievances.[118] If lone actors were totally isolated throughout the attack cycle, he claims, their activity could hardly be political and would therefore fail to meet definitions of terrorism. Corner, Bouhana and Gill found lone actors often benefit from interactions with wider networks that provide them with access to propaganda.[119] This often results in either immediate attack planning, stockpiling of weapons, further research, arrest, an attack, or what is labelled a 'secondary stream'. There, the lone actor moves in a cycle of proclaiming their ideology and attack preparations to others in written and verbal statements. The signalling of intentions has been found to be a common occurrence (further discussed in theme ten), which again demonstrates the importance of interactions with others for trajectories towards lone-actor terrorism.[120] Further evidence of lone actors attempting to form external ties with likeminded others includes the study by Danzell and Maisonet Montañez.[121] They found instances of lone actors failing to affiliate with, or being rejected by, an extremist group, leading them to experience more social isolation and to develop a belief system supportive of violence (see also Malthaner and Lindekilde).[122] For some lone actors, identification with an extremist cause or ideology becomes increasingly important for their sense of self-worth or as an 'identity stabiliser', particularly if they struggle to fit in socially.[123]

Importantly, the literature supports the notion that lone-actor terrorists, in the strictest sense of the term, do not exist.[124] As summarised by Hartleb, lone actors are not really 'lone' as they are usually part of, often virtual, subcultures and networks, which contradicts the assumption that they do not communicate with others.[125] Allely therefore suggests that lone-actor terrorists are better understood as alone only with respect to the commission of the attack itself, highlighting that connections to others play an important role in the adoption and maintenance of their motivation to carry out their attack.[126]

Theme 8: Attack planning and preparation

The eighth theme relates to lone-actor attack characteristics, including planning duration, target choice, weapon selection and lethality. Pitcavage found the majority of the 35 lone actors within his sample (63%) engaged in lengthy planning prior to conducting an attack in the U.S.[127] Depending on circumstances, planning consisted of the construction of explosive devices, stockpiling of weapons and ammunition, target selection and overcoming other obstacles. Smith et al. examined patterns of lone-actor terrorism in the U.S. covering 264 incidents and found that, on average, lone actors had a significantly longer life span as terrorists than group-based actors, from their first preparatory behaviour to the time of their arrest. [128]

Further evidence of substantial planning includes the study by Bouhana et al., where those inspired by an extreme right-wing ideology were found to have generally started planning attacks months or years earlier, through involvement with radical milieus.[129] Other studies have reported claims by Anders Breivik that he had been thinking about his plot for almost a decade, with direct attack planning taking place over at least a year.[130][131] Poppe conducted a micro-level analysis of the case of Nidal Hasan by reviewing a range of previously unpublished sources. Hasan was found to have made the decision to attack the U.S. military several years before the incident took place.[132]

Much research has focused on identification of targets that precipitate lone-actor terrorism. Becker, studying 84 'lone wolf' attacks in the U.S. between 1940 and 2012, reported that lone actors tended to select civilian or 'soft' targets (rather than government or military) due to their relative weakness compared to terrorist organisations.[133] Further, this relative weakness is related to firearms being their weapon of choice, followed closely by explosives.[134] Ellis et al. also found firearms were the weapon of choice within a European sample, but that attacks using firearms were more likely to occur in countries with higher rates of legal gun ownership.[135] Some studies have found that lone-actor weapon choice is largely determined by the tools they have at hand. For example, Bartal found Palestinian residents used knives and vehicles when committing terror attacks in Jerusalem 2014-15.[136] Others have claimed that targets chosen by lone-actor terrorists tend to be at the intersection of their daily routines (e.g. local areas, such as routes taken to commute) and the ideology to which they subscribe.[137]

Regarding attack lethality, Ackerman and Pinson found lone actors typically engage in cruder and smaller scale attacks compared to group actors, including being less likely to utilise sophisticated chemical, biological or radiological weapons.[138] Further support includes Ramsay and Marsden who found that leaderless jihadists, unconnected to organised militant groups, were unlikely to carry out attacks leading to mass civilian casualties or a significant economic impact.[139] In a study including 263 cases across 15 countries, Phillips found that lone-actor terrorist attacks were far less deadly than those committed by other types of terrorist actors.[140] The general view of decreased lethality was echoed by Spaaij and Hamm stating that the bomb attacks at the Atlanta Olympic Games in 1996 and the Boston Marathon bombings in 2013 were remarkably lethal compared to the average lethality of lone-actor terrorist attacks.[141] Gordon, Sharan and Florescu explored future projections of attack lethality by lone-actor terrorists with 60 worldwide experts within a Delphi study. A split view was found as to whether 100,000 fatalities from a single attack would occur before 2050 using weapons of mass destruction.[142]

Interestingly, Carson and Suppenbach reported that many differences found between lone-actor and group-based actor attacks in other studies were not evident for lone-actor terrorism in Afghanistan from 1997-2013.[143] Not only did they find lone-actor attacks to be relatively rare but they also found that, for such attacks, lethality, destruction, and success were comparable to those of group-based terrorism, extending to typical targets and tactics employed. For lone-actor sub-groups, Bouhana et al. found differences in target choice when comparing extreme right-wing lone actors with other lone-actor types.[144] The former were more likely to target private citizens and religious locations, whilst other lone actors were more likely to attack government targets and business locations. Further, Gruenewald, Chermak and Freilich found that far-right lone-actor homicides in the U.S. often involved perpetrators and victims unknown to each other, indicating that symbolic victims were chosen at random, whilst perpetrators and victims of average homicides were more likely to know each other.[145]

Based on a number of high-profile case studies, Kaplan and Costa distinguished between Islamist and non-Islamist lone actors, suggesting the aims of the former are to conduct "spectacular operations with large body counts" to send messages with global resonance and the prospect of escape for perpetrators not much of a consideration.[146] In contrast, non-Islamist lone actors generally focused on "longevity at the cost of the spectacular", with more emphasis placed on escape.[147] Alrajeh and Gill, examining the contribution of characteristics and behaviours of 111 lone actors, found the presence (or absence) of mental health problems moved target choices toward civilians or high-value targets respectively, but this also depended on other factors, including whether individuals had university experience or the presence of a criminal past.[148] Some factors such as criminal history and living alone were associated with high-value targeting for religious and right-wing ideologies, whilst the opposite was true for those inspired by single issue ideologies.

Regarding target location, Marchment, Bouhana and Gill examined the residence-to-attack journeys for 122 lone-actor terrorist acts committed by 70 lone-actor terrorists in the U.S. and Europe.[149] The frequency of attacks decreased as the distance from home locations increased suggesting that distance was a constraining factor that governed target selection for lone-actor terrorists, in much the same way as for traditional criminals. This pattern was also observed by Hasisi et al. when examining spatial characteristics of 71 vehicular attacks by lone-actor terrorists between 2000 and 2017 in Israel.[150] In contrast, when comparing residence-to-attack journeys of lone actors versus group actors in a sample of 267 U.S. terrorists, Smith et al. found lone actors on average travelled almost three times further.[151]

To summarise, lone-actor terrorists have generally been found to engage in lengthy attack planning, with longer life spans as terrorists than group-based actors. For target choices, these tend to be civilian or 'soft' targets, yet there appear to be ideological differences regarding typical targets. Target location is generally at the intersection of the lone-actor's daily routines, with frequency of attacks decreasing as the distance from home location increases. The chances of a successful attack appear heightened when lower value targets and members of the public are chosen. Whilst the literature suggests that firearms are the weapon of choice, this depends on legal gun ownership within countries, suggesting that accessibility of weapons is a key factor. Regarding lethality, lone-actor attacks are generally cruder, smaller scale and less lethal compared with group actors, although exceptions have been found.

Theme 9: Role of opportunity and triggers

The ninth theme relates to the importance of opportunity given that lone-actor terrorists are generally considered to operate outside of a command structure and decide individually when to attack, along with the relevance of triggers for acts of violence to occur. Such triggers can be personal, political or a combination of both, but are often the catalyst to lone actors viewing acts of violence as both justified and necessary to achieve their goals.

Clarke and Newman, referring to theories of situational crime prevention, suggest that terrorists, as generally rational decision-makers, carefully assess opportunities to commit attacks.[152] Specifically, the level of target attractiveness and vulnerability, as well as the weaponry required for specific forms of attack, are important elements of opportunity and shape decision-making processes. Other key elements include the type of group structure under which terrorists operate and facilitating conditions that may increase the likelihood of an attack. Clarke and Newman described these elements as the four pillars of opportunity: weapon, target, tools and training, and facilitating conditions.[153]

Without organised group structures to overcome the logistical difficulties of attack planning, lone-actor terrorists are relatively weak, meaning their range of feasibly attackable targets is much smaller.[154] Lone-actor terrorists lack the infrastructure of terrorist groups, with typically fewer resources, more limited access to useful knowledge or expertise and reduced surveillance capabilities, all of which can impact on the success of any plot. Analysing 62 run-over attacks in Israel and the West Bank, Perry, Hasisi and Perry found that lone-actor attacks were dictated by the immediate circumstances and directly shaped by the four pillars of opportunity.[155] Lone attackers compensated for their lack of resources by choosing easily accessible locations frequented by members of the public and security forces for their attack. The sites selected were familiar, located in close proximity to where attackers lived or conducted their daily lives. Perry et al. also found the fortification of potential targets such as bus stations by the authorities impacted on opportunity. These measures were seen as helping reduce the number of run-over attacks and the severity of consequences when attacks occurred.[156]

Others have highlighted the role of opportunity within lone-actor terrorism. Examining the case of Abu-Mulal Al-Balawi who was recruited by Jordanian intelligence, but blew himself up killing CIA agents and one Jordanian agent, Turcan and McCauley reported that it took him nine months before both means and opportunity came together in a plan for attack.[157] Phillips conceptualised the lone-actor terrorist as a criminal guided by opportunity and operating by observing a cost-benefit analysis for targeting.[158] Gill and Corner concluded that the choice of target type (e.g. general public vs. high-value targets) occurs very early in the process.[159] However, from there, opportunities for specific target and attack method are sought from a variety of sources, often including social and logistical support from others.

Some researchers have argued that certain key triggers help determine whether a lone-actor attack is ultimately committed such as pressure to act (e.g., immediate danger of discovery) or re-traumatising events activating past negative emotions.[160] Other triggering events may include social interactions perceived as legitimising ideological beliefs and intentions, or experiences of loss.[161] Such triggers result in the lone-actor viewing an act of violence as necessary, justified, inevitable and meaningful. In support, Moskalenko and McCauley found that the common denominator in two lone-actor case studies was a crucial event to make the political personal and to generate a personal moral obligation to act.[162]

One potential trigger attracting interest from researchers is violence perpetrated towards women. Hamm and Spaaij identified interpersonal conflicts with women as triggering events for some of the most lethal lone-actor terrorist attacks, whilst Issa presented eight case studies of mass shootings where perpetrators had histories of domestic violence.[163] McCulloch et al. suggested that violence against women emerges as a factor from known biographies of many lone-actor terrorists, with some mass casualty attacks seemingly triggered or motivated by hatred or hostility towards women.[164] McCulloch et al. provide a strong argument that lone actors with histories of violence towards women should not be regarded as having turned towards terrorism, but instead considered as violent men continuing their violence to targeted or random members of the public.[165]

When investigating the role of triggers in their study of vehicle-borne lone attackers, Perry et al. found that evidence of extreme emotional distress preceding the attack was common.[166] For 35.5% of the sample, there was evidence the individual was expressing extreme anger leading up to the event. For 14.5% of offenders, personal issues including involvement in family conflict (e.g., an argument with spouse or parents, divorce) occurred shortly before the attack. Meloy and Pollard referred to the pathway becoming a runway for some cases of lone-actor terrorism where triggering events resulted in perpetrators acting precipitously, despite the considerable planning and preparation undertaken over weeks and months.[167]

Theme 10: Tendency towards leakage/attack signalling

The tenth and final theme relates to a tendency among lone-actor terrorists to disregard operational security measures, or execute them poorly, due to a desire to share their convictions and sometimes their violent plans with others.[168] Therefore, the majority of lone actors are not the stealthy and highly capable terrorists that the term 'lone wolf' implies, but instead are prone to informational leakage.[169] The prevalence of leakage behaviours by lone-actor terrorists has been reported extensively throughout the literature and is considered central to threat assessment.[170]

In one noteworthy study, Gill and Corner utilised a dataset of 111 lone actors, comparing those who targeted the general public with those who plotted against high-value targets.[171] Little was found to distinguish between the two groups, except for leakage behaviours. Those targeting members of the public were found as more likely to leak aspects of their plot or information regarding their extremist beliefs (96%) compared to high-value target plotters (83%).

In a sample of 120 lone-actor terrorists across 30 European countries, Ellis et al. found 46% of lone actors exhibited leakage behaviours regardless of ideology.[172] In 35% of cases, leakage involved only an indication of the perpetrator's extremist ideology. However, 44% communicated some indication of an intention to act, whilst 21% shared some details of the planned attack with others. Hamm and Spaaij found the rate of leakage behaviour was more pervasive among a U.S. sample, with evidence in 84% of cases pre-9/11 and 76% of cases post-9/11.[173] Leakage does not appear to be unique to lone-actor terrorists, with similar behaviours also exhibited by non-extremist U.S. solo mass murderers.[174]

As an explanation for leakage behaviours, Bouhana et al. suggested that a desire to communicate an affiliation with a particular extremist milieu, along with the benefits of status, a sense of belonging and fame (or infamy), seem to outweigh more practical principles of maintaining a low profile prior to carrying out an attack.[175] Leakage behaviours may

explain the finding by Hewitt that while use of informants and surveillance plays a key role when investigating terrorist organisations, lone-actor terrorists are more vulnerable to witness identification and information provided by members of the public.[176] Gill formulates a 'lone-actor terrorist dilemma': without leakage prior to an attack, others may attribute actions to an insane person, rather than a rational terrorist with ideological drivers.[177]

In sum, leakage behaviours are common for lone-actor terrorists, with nearly half having displayed leakage within a European sample and higher rates among a U.S. sample. Yet, despite this tendency, there is some indication that over time lone-actor terrorists have become more attune to operational security measures. Spaaij and Hamm reported a decrease in leakage behaviours from pre-9/11 to post-9/11 lone-actor cases, whilst Gill et al. found a significant decrease in leakage when comparing a cohort from 1990 to 2005 with one from 2006 to 2013.[178]

Conclusion

This systematic review represents a comprehensive summary of the current state of knowledge regarding lone-actor terrorism in terms of who they are, what drives them, what characterises their actions and what behaviours are exhibited prior to an attack. It is clear that many of the same barriers and criticisms relevant to terrorism and radicalisation research more widely are applicable to research on lone-actor terrorism, including difficulties establishing agreed-upon definitions and overall lack of primary and high quality, data-driven research.

The themes within this review are considered important to inform future research agendas for lone-actor terrorism. There remain some areas of disagreement within the literature, including: the extent to which lone actors are socially isolated, how central a role ideological influences play compared with personal influences, and fully establishing pre-attack behaviours, including the prevalence of leakage behaviours, distances travelled to commit attacks and extent to which the attacks themselves are comparable to those by group-based terrorists. Some of these disagreements are due to conflicting geographical findings, such as: higher rates of pre-attack leaking occurring more frequently in the U.S. than in Europe; lone actors being found to commit attacks closer to home when cases across Europe and the U.S. are considered together, but greater travel distances in the U.S. alone; U.S. cases suggesting lone-actors travel substantially further afield than group-based terrorists; lone-actor terrorism generally being found to be less lethal than group-based terrorism across U.S. and European samples, whilst similar lethality rates were found within a sample from Afghanistan. Changes in lone-actor behaviour over time are also likely to have contributed to disagreements within the literature, for example there is evidence that the average age of lone-actor terrorists has reduced over time, along with the finding that leakage behaviours are less prevalent post 9/11 compared with pre 9/11.

The themes identified within this review can help with moving policy forward. First, the time lone actors dedicate to attack planning and preparation, their social ties to like-minded others, their increased internet use and limited attention paid to operational security measures all mean early-detection and prevention of this threat is distinctly possible. This should provide encouragement to security and law enforcement agencies, particularly when individuals of concern are reviewed using tools such as the Terrorist Radicalisation Assessment Protocol, which helps with prioritising potential lone-actor cases for monitoring or risk management.[179] Second, the finding that lone-actor attacks are typically characterised by low levels of

sophistication and are generally less lethal than group-based terrorist attacks suggests that high levels of concern around the perceived risk posed by lone actors, including by law enforcement personnel, may be somewhat over-emphasised when compared to the actual reality of the threat.[180] Third, the literature highlights the relevance of both opportunity and trigger events in trajectories towards lone-actor terrorism. Although trigger events may still occur, there is likely to be a benefit to law enforcement and security agencies in focusing on situational prevention as a way of affecting assessments of the chances of success, thereby making decisions by lone actors to commit terrorist acts less attractive.

While this systematic review focused solely on empirical articles, there are noteworthy limitations to the studies included. Although the majority of articles (51%) included larger number datasets, findings were primarily descriptive and concerned with behavioural indicators associated with lone-actor terrorism. Although useful, these studies are limited in furthering our understanding of underlying causes. Related to this, many studies included were derived from secondary source information from databases, where publicly available information on cases is limited. Further, a number of articles (45%) relied upon small or single number case studies. Bouhana et al. have previously drawn attention to difficulties generalising findings to a wider population from small number case studies and therefore the external validity of conclusions from such articles may be limited. [181]

To conclude, further research in this area should aim to include primary source data where possible, including specialist assessment reports by those working directly with this cohort. Importantly, like Gill et al., we view the use and analysis of closed source data, where possible, as a necessity for further progress.[182] Although barriers to accessing quality primary source data are significant, overcoming these issues will be necessary if we are to gain a more holistic understanding of the structural, relational, and social dynamics surrounding lone-actor terrorists. Where direct interviews with lone-actor terrorists are not possible, researchers could overcome these barriers to an extent by accessing court transcripts, personal journals, biographies, video statements or written correspondence. Another avenue for research includes use of specialist assessment reports such as Extremism Risk Guidance (ERG22+) data for lone actors convicted of extremist offences in the UK, as far as these are accessible.

---

[1] S Petersman, "Christchurch: The myth of the lone wolf attacker", *DW* (March, 2009). Retrieved from: https://www.dw.com/en/christchurch-the-myth-of-the-lone-wolf-attacker/a-47970011

[2] *L. E. Berntzen & S Sandberg, "The collective nature of lone wolf terrorism: Anders Behring Breivik and the anti-islamic social movement", *Terrorism and Political Violence* 26:5 (2014), 759-779; *M. H. Johnsen, "A case study of Anders B. Breivik's intergroup conceptualisation", *Journal of Terrorism Research* 5:2 (2014), 1-11; *S Meyer, "Impeding lone-wolf attacks: Lessons derived from the 2011 Norway attacks", *Crime Science* 2:7 (2013), 1-13; M Ranstorp, "Lone wolf terrorism. The case of Anders Breivik", *Sicherheit und Frieden* 31:2 (2013), 87-92.

[3] Petersman, 'Christchurch'.

[4] *M. S. Hamm & R. Spaaij, *The age of lone wolf terrorism* (New York: Columbia University Press, 2017).

[5] *J De Roy van Zuijdewijn & E Bakker, "Analysing personal characteristics of lone-actor terrorists: Research findings and recommendation", *Perspectives on Terrorism* 10:2 (2016), 42-49; *L Lindekilde, S Malthaner & F O'Connor, "Peripheral and embedded: Relational patterns of lone-actor terrorist radicalization", *Dynamics of Asymmetric Conflict* (2018); B Schuurman, L Lindekilde, S Malthaner, F O'Connor, P Gill & N Bouhana, "End of the Lone Wolf: The Typology that Should Not Have Been", Studies in Conflict & Terrorism (2018). Advanced online publication.

[6] *L Lindekilde, F O'Connor & B Schuurman, "Radicalization patterns and modes of attack planning and preparation among lone-actor terrorists: An exploratory analysis", *Behavioral Sciences of Terrorism and Political Aggression* 11:2 (2019), 113-133.

[7] *P Gill, J Horgan & P Deckert "Bombing Alone: Tracing the motivations and antecedent behaviors of lone-actor terrorists", *Journal of Forensic Sciences* 59:2 (2014), 425-435; *E Corner & P Gill, "A false dichotomy? Mental illness and lone-actor terrorism", *Law and Human Behavior* 39 (2015), 23-34. *B Schuurman, E Bakker, P Gill & N Bouhana, "Lone Actor Terrorist Attack Planning and Preparation: A Data-Driven Analysis", *Journal of Forensic Sciences* 63:4 (2018), 1191-1200.

[8] *B Alakoc, "Competing to kill: Terrorist organizations versus lone wolf terrorists", *Terrorism and Political Violence* 29:3 (2015), 509-532.

[9] *R Spaaij, *Understanding lone wolf terrorism: Global patterns, motivations and prevention* (Dordrecht: Springer, 2012).

[10] Schuurman et al, 'Lone Actor Terrorist Attack Planning'.

[11] R Spaaij & M Hamm, "Key issues and research agendas in lone wolf terrorism", *Studies in Conflict & Terrorism* 38:3 (2015), 167-178.

[12] R Pantucci, C Ellis and L Chaplais, "Lone-Actor Terrorism: Literature Review". *Countering Lone-Actor Terrorism Series No. 1*. (Royal United Services Institute, 2015)

[13] Spaaij & Hamm, 'Key issues'.

[14] A Silke, "The road less travelled: recent trends in terrorism research", *Research on terrorism: Trends, achievements and failures* (2004): 186-213.M Ranstorp "Introduction: Mapping Terrorism Research—Challenges and Priorities". In: Magnus Ranstorp (ed.), *Mapping Terrorism Research: State of the Art, Gaps and Future Direction* (London, New York: Routledge, 2007). A Campana & L Lapointe, "The Structural "Root" Causes of Non- Suicide Terrorism: A Systematic Scoping Review", *Terrorism and Political Violence* 24:1 (2012), 79-104.

[15] PRISMA Group, "Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. Annals of Internal Medicine", 151:4 (2009), 264-269.

[16] Following a review of these additional records, it was found these did not change the thematic structure of the narrative of the review and they were, at least in part, related to literature that had already been acknowledged and cited.

[17] Full references selected in the systematic literature search are marked with an asterisk.

[18] B Glaser and A Strauss, *The Discovery of Grounded Theory: Strategies for Qualitative Research* (Chicago: Aldine, 1967); O Holsti, *Content Analysis for the Social Sciences and Humanities* (Reading, MA: Addison-Wesleym, 1969).

[19] See C Baker-Beall, *The European Union's fight against terrorism: Discourse, policies, identity* (Manchester University Press, 2016).

[20] *R Spaaij, "The enigma of lone wolf terrorism: An assessment", Studies in Conflict & Terrorism, 33:9 (2010), 854–870; J De Roy van Zuijdewijn & E Bakker, "Lone-Actor terrorism: Policy paper 1: Personal characteristics of Lone-Actor terrorists", (The Hague: International Centre for Counter-Terrorism, 2016).

[21] *C Clemmow, N Bouhana & P Gill, "Analyzing person-exposure patterns in lone-actor terrorism. Criminology and Public Policy", 19:2 (2020).

[22] *P Phillips, "The lone wolf terrorist: Sprees of violence", *Peace Economics, Peace Science and Public Policy* 18:3 (2012), 1-11; *P Phillips & G Pohl "Economic profiling of the lone wolf terrorist: Can economics provide behavioural investigative advice?" *Journal of Applied Security Research* 7:2 (2012), 151-177.

[23] *R Pantucci, "What have we learned about lone wolves from Anders Behring Breivik?" *Perspectives on Terrorism* 5:5-6 (2011), 27-42.

[24] Ibid. 14.

[25] Ibid. 20-24.

[26] Ibid. 24.

[27] *T Holt, J Freilich, S Chermak, C Mills & J Silva, "Loners, colleagues, or peers? Assessing the social organization of radicalization", *American Journal of Criminal Justice* 22:1 (2018), 83-105.

[28] *J Gruenewald, S Chermak & J Freilich, "Distinguishing "loner" attacks from other domestic extremist violence: A comparison of far-right homicide incident and offender characteristics", *Criminology and Public Policy* 12:1 (2013), 63–91.

[29] Schuurman et al., 'End of the Lone Wolf'.

[30] Spaaij & Hamm, 'Key issues and research agendas'.

[31] Ibid. 169.

[32] *M Feldman, "Terrorist 'radicalising networks': A qualitative case study on radical right lone-wolf terrorism". In: K Steiner & A Önnerfors (Eds.) *Expressions of radicalization: Global politics, processes and practices* (Cham, Switzerland: Palgrave Macmillan, 2017), 39-60.

[33] *P Nesser, "Individual jihadist operations in Europe: Patterns and challenges", *CTC Sentinel* 5:1 (2012), 15-18; *M Sweeney, "Leaderless resistance and the truly leaderless: A case study test of the literature-based findings", *Studies in Conflict and Terrorism* 42:7 (2012), 617-635.

[34] *P Nesser, "Research note: Single actor terrorism: Scope, characteristics and explanations", *Perspectives on Terrorism* 6:6 (2012), 61-73.

[35] Spaaij and Hamm, 'Key issues and research agendas', 168.

[36] *P Joose, "Leaderless resistance and the loneliness of lone wolves: Exploring the rhetorical dynamics of lone actor violence", *Terrorism and Political Violence* 29:1 (2015), 52-78.

[37] Schuurman, 'End of the Lone Wolf'.

[38] R Borum, R Fein, & B Vossekuil, "A dimensional approach to analyzing lone offender terrorism*",* *Aggression and Violent Behavior* 17:5 (2012), 389-396.

[39] Ibid.

[40] *P Gill, E Corner, A McKee, P Hitchen & P Betley, "What Do Closed Source Data Tell Us About Lone Actor Terrorist Behavior? A Research Note", *Terrorism and Political Violence*, (2019) DOI:10.1080/09546553.2019.1668781.

[41] *O Danzell & L Maisonet Montañez, "Understanding the lone wolf terror phenomena: Assessing current profiles", *Behavioral Sciences of Terrorism and Political Aggression* 8:2 (2016), 135-159.

[42] Ibid.

[43] *K Gradon, "Placing "lone-actor terrorism" in context: Who are we dealing with and what threat do they pose?", *Preliminary results of the FP7 PRIME Project*, Studia Luridica, 67 (2016), 165-180.

[44] Clemmow, et al., 'Analyzing person-exposure patterns'.

[45] Clemmow, et al., 'Analyzing person-exposure patterns'; *C Ellis, R Pantucci, R, J de Roy van Zuijdewijn, E Bakker, M Smith, B Gomis, & S Palmobi, "Analysing the processes of lone-actor terrorism: Research findings", *Perspectives on Terrorism* 10:2 (2016); Gill et al. 'Closed source data'.

[46] Gill et al. 'Bombing Alone'; *S Perry, B Hasisi & G Perry, "Who is the lone terrorist? A study of vehicle-borne attackers in Israel and the West Bank", Studies in Conflict and Terrorism, 41:11 (2018), 899-913; *L Smith, J Gruenewald, P Roberts & K Damphousse, "The emergence of lone wolf terrorism: Patterns of behaviour and implications for intervention. Terrorism and Counterterrorism Today", *Sociology of Crime, Law and Deviance* 20 (2015), 89-110; *T Zeman, J Bren & R Urban, "Profile of a lone wolf terrorist: a crisis management perspective", *Journal of Security and Sustainability Issues* 8:1 (2018), 5-18.

[47] Hamm & Spaaij, 'The age of lone wolf terrorism'.

[48] Ibid.

[49] For example, vehicle-borne lone terrorists in Israel and the West Bank. S Perry, B Hasisi & G Perry, "Lone terrorists: A study of run-over attacks in Israel", *European Journal of Criminology* 16:1 (2019), 102-123

[50] Ibid.

[51] M Wolfowicz, Y Litmanovitz, D Weisburd, D & B Hasisi, "A field-wide systematic review and meta-analysis of putative risk and protective factors for radicalization outcomes", *Journal of Quantitative Criminology* (2019), 1-41.

[52] *S Baele, "Lone-actor terrorists' emotions and cognition: An evaluation beyond stereotypes", *Political Psychology* 38:3 (2017) 449-468.

[53] *K Khan, & A Nhlabatsi, "Identifying common behavioural traits of lone-wolves in recent terrorist attacks in Europe", *International Journal of Humanities and Social Sciences* 11:7 (2017).

[54] *L Herrington, "Predicting and preventing radicalisation: An alternative approach to suicide terrorism in Europe", *Intelligence and National Security* 34:4 (2019), 480-502.

[55] Gill et al. 'Bombing Alone'.

[56] *N Bouhana, E Corner, P Gill, & B Schuurman, "Background and preparatory behaviours of right-wing extremist lone actors: A comparative study", *Perspectives in Terrorism* 12:6 (2018), 150-163.

[57] Perry et al. 'Who is the lone terrorist?'

[58] Gill et al. 'Closed source data'.

[59] Spaaij, 'The enigma of lone wolf'.

[60] *C Lazzari, A Nusair & M Rabottini, "Psychiatry of radicalization and terrorism in the lone wolf, children, and women: An E-ethnographic approach for analysis", *American Journal of Psychiatry and Neuroscience* 7:3 (2019), 57-68.

[61] *C Leonard, G Anna, J Knoll & T Tørrissen, T., "The case of Anders Behring Breivik – Language of a lone terrorist", *Behavioral Sciences and the Law* 32(:3 (2014), 408-422.

[62] Zeman at al., 'Profile of a lone wolf terrorist'.

[63] De Roy van Zuijdewijn & Bakker, 'Lone-Actor terrorism'.

[64] Hamm & Spaaij, 'The age of lone wolf terrorism'.

[65] Pantucci, 'What have we learned'; Spaaij, 'The enigma of lone wolf terrorism'.

[66] *P Cotti, & J Meloy, "The Tamerlan Tsarnaev case: The nexus of psychopathology and ideology in a lone actor terrorist", *Journal of Threat Assessment and Management* 6:3-4 (2019), 138-158.

[67] *M Prats, S Raymond, & I Gasman, "Religious radicalization and lone-actor terrorism: A matter for psychiatry?", *Journal of Forensic Sciences* (Advanced online publication, 2018).

[68] E Corner, & P Gill, 'A false dichotomy?'

[69] C Hewitt, Understanding terrorism in America. From the Klan to al Qaeda (London: Routledge, 2003).

[70] *E Corner, P Gill & O Mason, "Mental Health Disorders and the Terrorist: A Research Note Probing Selection Effects and Disorder Prevalence", *Studies in Conflict & Terrorism* 39:6 (2016), 560-568.

[71] Gill et al. 'Bombing Alone'.

[72] *P Gattinara, F O'Connor & L. Lindekilde, "Italy, no country for acting alone? Lone actor radicalisation in the neo-fascist milieu", *Perspectives on Terrorism* 12:6 (2018), 136-149.

[73] Gill et al. 'Bombing Alone'; *P Gill, *Lone-Actor Terrorists: A Behavioural Analysis* (London: Routledge, 2015).

[74] *P Gill & E Corner, "Lone-actor terrorist use of the Internet and behavioural correlates". In: L. Jarvis, S. Macdonald, and T. M. Chen, (Eds). *Terrorism Online: Politics, Law, Technology and Unconventional Violence* (Routledge, London, 2015); *F Hartleb, *Lone wolves: The new terrorism of right-wing single actors* (Cham: Springer, 2020).

[75] *C McCauley, S Moskalenko & B Van Son, "Characteristics of lone-wolf violent offenders: A comparison of assassins and school attackers", *Perspectives on Terrorism* 7:1 (2013), 4-24.

[76] *C McCauley & S Moskalenko, "Toward a profile of lone wolf terrorists: What moves an individual from radical opinion to radical action", *Terrorism and Political Violence* 26:1 (2014), 69-85.

[77] *J Capellan, "Lone wolf terrorist or deranged shooter? A study of ideological active shooter events in the United States, 1970-2014", *Studies in Conflict & Terrorism* 38:6 (2015), 395-413.

[78] *J Capellan & A Anisin, "A distinction without a difference? Examining the causal pathways behind ideologically motivated mass public shootings", *Homicide Studies* 22:3 (2018), 235-255.

[79] *A Lankford & N Hakim, "From Columbine to Palestine: A comparative analysis of rampage shooters in the United States and volunteer suicide bombers in the Middle East", *Aggression and Violent Behaviour* 16 (2011), 98-107.

[80] *A Lankford, "A comparative analysis of suicide terrorists and rampage, workplace, and school shooters in the United States from 1990 to 2010", *Homicide Studies: An Interdisciplinary & International Journal* 17:3 (2013), 255–274.

[81] *L Malkki, "Political elements in post-Columbine school shooting in Europe and North America", *Terrorism and Political Violence* 26:1 (2014), 185-210.

[82] *J Horgan, P Gill, N Bouhana, J Silver & E Corner, *Across the universe? A comparative analysis of violent behaviour and radicalisation across three offender types* (Washington, DC: US Department of Justice, 2016).

[83] *C Clemmow, P Gill, N Bouhana, J Silver & J Horgan, "Disaggregating lone-actor grievance fuelled violence: Comparing lone-actor terrorists and mass murderers", *Terrorism and Political Violence* (2020), 1-26.

[84] *M Liem, G Van Buuren, J de Roy van Zuijdewijn, H Schönberger, & E Bakker, "European lone actor terrorists versus "common" homicide offenders: An empirical analysis", *Homicide Studies* 22:1 (2018), 45-69.

[85] P Gill, J Silver, J Horgan & E Corner, "Shooting alone: The pre-attack experiences and behaviors of U.S. Solo Mass Murderers", *Psychiatry and Behavioral Sciences* 62:3 (2017), 710-714.

[86] *D Gartenstein-Ross, "Lone wolf Islamic terrorism: Abdulhakim Mujahid Muhammad (Carlos Bledsoe) case study", *Terrorism and Political Violence* 26 (2014), 110-128.

[87] *N Springer, "Patterns of Radicalization: Identifying the Markers and Warning Signs of Domestic Lone Wolf Terrorists in our Midst". In Strickland, L. F. (Ed.) *Violent Behaviour – Select Analyses of Targeted Acts, Domestic Terrorists and Prevention Pathways* (New York: Nova Science Publishers, 2009).

[88] *M Pitcavage, "Cerberus Unleashed: The Three Faces of the Lone Wolf Terrorist", *American Behavioural Scientist* 59:13 (2015), 1655-1680.

[89] Perry et al. 'Who is the lone terrorist?'

[90] *J A Marvasti & M Rahman, "The lone wolf terrorist and radicalization: The role of forensic psychology", American Journal of Forensic Psychology, 35:4 (2017), 43-67.

[91] Spaaij, 'The enigma of lone wolf terrorism'.

[92] *S Teich, "Trends and developments in lone wolf terrorism in the western world: An analysis of terrorist attacks and attempted attacks by Islamic extremists", (International Institute for Counter Terrorism, 2013).

[93] Khan & Nhlabatsi, 'Identifying common behavioural traits'.

[94] Perry et al. 'Who is the lone terrorist?'

[95] Ellis et al., 'Analysing the processes of lone-actor terrorism'.

[96] *P Jackson, "The murder of Jo Cox MP: A case study in lone actor terrorism". In: A. Waring (Ed.), *The New Authoritarianism, Vol. 2: A risk analysis of the European Alt-Right phenomenon* (Stuttgart: Ibiden Press, 2019), 149-169

[97] *C Lazzari, G Mousailidis, A Nusair, B Papanna & A Shoka, "Psychiatric Assessment and Interventions in Radicalised Individuals: A Delphi Study of the 'Lone-Wolf' Terrorism", *Journal of Psychiatry Depression Anxiety* 5:028 (2019).

[98] Europol, *EU Terrorism Situation and Trend Report (*Brussels, 2011).

[99] *M Hamm & R Spaaij, *Lone wolf terrorism in America: Using knowledge of radicalization pathways to forge prevention strategies* (Washington, DC: U.S. Department of Justice, 2015).

[100] *P Gill, J Horgan, E Corner & J Silver, "Indicators of lone actor violent events: The problems of low base rates and long observational periods", *Journal of Threat Assessment and Management* 3:3-4 (2016), 165-173.

[101] *J Van Buuren and Beatrice De Graaf, "Hatred of the system: Menacing loners and autonomous cells in the Netherlands", *Terrorism and political violence* 26:1 (2014), 156-184, see 176.

[102] Ellis et al., 'Analysing the processes of lone-actor terrorism'.

[103] Ibid.

[104] *T Zeman, J Bren & R Urban, "Role of internet in lone wolf terrorism. Journal of Security and Sustainability Issues", 7:2 (2017), 185-192.

[105] Gill, 'Lone-Actor Terrorists'.

[106] Teich, 'Trends and developments'.

[107] *P Gill, E Corner, M Conway, A Thornton, M Bloom & J Horgan, "Terrorist use of the internet by the numbers: Quantifying behaviors, patterns, and processes", *Criminology and Public Policy* 16:1 (2017), 99-117.

[108] Gill et al. 'Bombing Alone'.

[109] *A Shehabat, T Mitew & Y Alzoubi, "Encrypted jihad: Investigating the role of Telegram app in lone wolf attacks in the west", *Journal of Strategic Security* 10:3 (2017), 27-53.

[110] *G Weimann, "Lone wolves in cyberspace", *Journal of Terrorism Research* 3:2 (2012), 75-90.

[111] *Hofmann, 'How "alone" are lone-actors? Exploring the ideological, signalling, and support networks of lone-actor terrorists, Studies in Conflict and Terrorism, 43:7 (2018), 657-678.

[112] Bouhana et al., 'Background and preparatory behaviours'; Gattinara, 'Italy, no country for acting alone'; *A Hankiss, "The legend of the lone wolf", *Journal of Strategic Studies* 11:2 (2018), 54-72.

[113] *S Moskalenko & C McCauley, The psychology of lone-wolf terrorism, *Counselling Psychology Quarterly* 24:2 (2011), 115-126; Schuurman et al., 'Lone Actor Terrorist Attack Planning'.

[114] Zeman et al., 'Role of internet in lone wolf terrorism'.

[115] Gill et al. 'Bombing Alone'.

[116] Schuurman et al., 'Lone Actor Terrorist Attack Planning'.

[117] Gattinara, 'Italy, no country for acting alone'; Lindekilde et al., 'Peripheral and embedded'.

[118] M Becker, "A response to "Key issues and research agendas in lone wolf terrorism", *Studies in Conflict & Terrorism*, 39:5 (2016), 472-476.

[119] *E Corner, N Bouhana & P Gill, "The multifinality of vulnerability indicators in lone-actor terrorism", *Psychology, Crime and Law*, Advanced online publication (2018).

[120] Gill, 'Lone-Actor Terrorists'; Zeman et al., 'Role of internet in lone wolf terrorism'.

[121] Danzell & Maisonet Montañez, 'Understanding the lone wolf terror phenomena'.

[122] *S Malthaner & L Lindekilde, "Analyzing pathways of lone-actor radicalization: A relational approach". In: *Constructions of Terrorism: An Interdisciplinary Approach to Research and Policy* (University of California Press, 2017), 163-180.

[123] *N Böckler, J Hoffmann & A Zick, "The Frankfurt airport attack: A case study on the radicalization of a lone-actor terrorist", *Journal of Threat Assessment and Management* 2:3-4 (2015), 153-163.

[124] Gradon, 'Placing "lone-actor terrorism" in context'.

[125] Hartleb, 'Lone wolf'.

[126] *C Allely, *The psychology of extreme violence. A case study approach to serial homicide, mass shooting, school shooting and lone-actor terrorism* (New York: Routledge, 2020).

[127] Pitcavage, 'Cerberus Unleashed'.

[128] Smith, 'The emergence of lone wolf terrorism'.

[129] Bouhana et al., 'Background and preparatory behaviours'.

[130] Pantucci, 'What have we learned'.

[131] *A Dafnos, "Lone wolf terrorism as category: Learning from the Breivik case", Journal Exit-Deutschland 3 (2013), 96-114.

[132] *K Poppe, "Nidal Hasan: A case study in lone-actor terrorism", GW Program on Extremism, (2017).

[133] *M Becker, "Explaining lone wolf target selection in the United States", *Studies in Conflict & Terrorism* 37:11 (2014), 959-978. See also: Pitcavage, 'Cerberus Unleashed'; Ellis et al., 'Analysing the processes of lone-actor terrorism'.

[134] Becker, 'Explaining lone wolf target selection'.

[135] Ellis et al., 'Analysing the processes of lone-actor terrorism'.

[136] *S Bartal, "Lone wolf or terror organisation members acting alone: New look at the last Israeli-Palestine incidents", *Middle Eastern Studies* 53:2 (2017), 211-228.

[137] Becker, 'Explaining lone wolf target selection'.

[138] *G Ackerman & L Pinson, "An army of one: Assessing CBRN pursuit and use by lone wolves and autonomous cells", *Terrorism and Political Violence* 26 (2014), 226-245.

[139] *G Ramsay & S Marsden, "Leaderless global jihadism: The paradox of discriminate violence", *The Journal of Strategic Studies* 38:5 (2015), 579-601.

[140] *B Phillips, "Deadlier in the U.S.? On lone wolves, terrorist groups, and attack lethality", *Terrorism and Political Violence* 29:3 (2015), 533-549.

[141] *R Spaaij & M Hamm, "Endgame? Sports Events as Symbolic Targets in Lone Wolf Terrorism", *Studies in Conflict and Terrorism* 38:12 (2015), 1022-1037.

[142] *T Gordon, Y Sharan & E Florescu, "Prospects for Lone Wolf and SIMAD terrorism", *Technological Forecasting & Social Change* 95 (2015), 234-251.

[143] *J Carson & M Suppenbach, "Lone wolf terrorism: The new form of the global jihadist movement? Evidence from Afghanistan (1997-2013)", *The Journal of the Middle East and Africa* 7:4 (2016), 441-453.

[144] Bouhana et al., 'Background and preparatory behaviours'.

[145] *J Gruenewald, S Chermak & J Freilich, "Far-right lone wolf homicides in the United States", *Studies in Conflict and Terrorism* 36:12 (2013), 1005-1024.

[146] *J Kaplan & C Costa, "On tribalism: Auxiliaries, affiliates and lone wolf political violence", *Terrorism and Political Violence* 26:1 (2014), 13-44.

[147] Ibid. 31.

[148] *D Alrajeh & P Gill, "A logic-based approach to understanding lone-actor terrorism", *Proceedings of the Technical Communications of the 31st International Conference on Logic Programming* (ICLP15, 2015).

[149] *Z Marchment, N Bouhana & P Gill, "Lone actor terrorists: A residence-to-crime approach", *Terrorism and Political Violence* (Advanced online publication, 2018).

[150] *B Hasisi, S Perry, Y Ilan, & M Wolfowicz, "Concentrated and close to home: the spatial clustering and distance decay of lone terrorist vehicular attacks", *Journal of Quantitative Criminology* 11:4 (2019), 124-135.

[151] Smith, 'The emergence of lone wolf terrorism'.

[152] R Clarke & G Newman, *Outsmarting the terrorists* (New York: Praeger, 2006).

[153] Ibid.

[154] Becker, 'Explaining lone wolf target selection'.

[155] Perry et al. 'Lone terrorists: A study of run-over attacks'.

[156] Ibid.

[157] *M Turcan & C McCauley, "Boomerang: Opinion versus action in the radicalization of Abu-Mulal al-Balawi". *Dynamics of Asymmetric Conflict* 3:1 (2010), 14-31.

[158] *P Phillips, "Lone wolf terrorism", *Peace Economics, Peace Science and Public Policy* 17:1 (2011), 1-29.

[159] *P Gill & E Corner, "Lone-Actor Terrorist Target Choice", *Behavioral Sciences and the Law* 34:5 (2016), 693-705.

[160] *N Böckler, V Leuschner, V Roth, A Zick, & H Scheithauer, "Blurred boundaries of lone-actor targeted violence: Similarities in the genesis and performance of terrorist attacks and school shootings", *Violence and Gender* 5:2 (2018), 70-80; *N Böckler, V Leuschner, A Zick, & H Scheithauer, "Same but different? Developmental pathways to demonstrative targeted attacks", *International Journal of Developmental Science* 12:1-2 (2018), 5-24.

[161] On important relationships or employment see *B Erlandsson & J Reid Meloy, "The Swedish School Attack in Trollhattan", Journal of Forensic Sciences, 63:6 (2018), 1917-1927; On loss defined more broadly, such as an inability to find one's place in society, see *D Zierhoffer, "Threat assessment: Do lone terrorists differ from other lone offenders?", Journal of Strategic Security 7:3 (2014), 48-62.

[162] Moskalenko & C McCauley, The psychology of lone-wolf terrorism

[163] Hamm & Spaaij, 'The age of lone wolf terrorism'; *Y Issa, "A profoundly masculine act: Mass shootings, violence against women, and the amendment that could forge a path forward", *California Law Review* 107:2 (2019), 673-706.

[164] *J McCulloch, S Walklate, J Maher, K Fitz-Gibbon & J McGowan, "Lone wolf terrorism through a gendered lens: Men turning violent or violent men behaving violently?", *Critical Criminology* 27 (2019), 435-450.

[165] Ibid.

[166] Perry et al. 'Who is the lone terrorist?'

[167] *J Meloy & J Pollard, "Lone-actor terrorism and impulsivity", *Journal of Forensic Sciences* 62:6 (2017), 1643-1646.

[168] Schuurman et al., 'Lone Actor Terrorist Attack Planning'.

[169] Gill & Corner, 'Lone-Actor Terrorist Target Choice'.

[170] Gill et al. 'Bombing Alone'; Schuurman et al., 'Lone Actor Terrorist Attack Planning'; *M Gardell, "Urban terror: The case of lone wolf Peter Mangs", *Terrorism and Political Violence* 30:5 (2018), 793-811; *J R Meloy & P Gill, "The lone-actor terrorist and the TRAP-18", *Journal of Threat Assessment and Management* 3:1(2016), 37-52.

[171] Gill & Corner, 'Lone-Actor Terrorist Target Choice'.

[172] Ellis et al., 'Analysing the processes of lone-actor terrorism'.

[173] Hamm & Spaaij, 'The age of lone wolf terrorism'.

[174] Gill et al. 'Shooting alone'.

[175] Bouhana et al., 'Background and preparatory behaviours'.

[176] *C Hewitt, "Law enforcement tactics and their effectiveness in dealing with American terrorism: Organizations, autonomous cells, and lone wolves", *Terrorism and Political Violence* 26 (2014), 58-68.

[177] Gill, 'Lone-Actor Terrorists'.

[178] Hamm & Spaaij, 'The age of lone wolf terrorism'; Gill et al. 'Indicators of lone actor violent events'.

[179] *J Meloy, & J Genzman, "The clinical threat assessment of the lone-actor terrorist", The Psychiatric Clinics of North America, 39:4 (2016), 649-662; Meloy & Gill, 'The lone-actor terrorist and the TRAP-18'; *J Meloy, M Goodwill, M Meloy, G Amat, M Martinez & M Morgan, "Some TRAP-18 indicators discriminate between terrorist attackers and other subjects of national security concern", *Journal of Threat Assessment and Management*, 6:2 (2019), 93–110; *J Meloy, K Roshdi, J Glaz-Ocik & J Hoffmann, "Investigating the individual terrorist in Europe", *Journal of Threat Assessment and Management* (2015), 140-152; *A Goodwill & J Meloy, "Visualizing the relationship among indicators for lone actor terrorist attacks: Multidimensional scaling and the TRAP-18", *Behavioral Sciences & the Law* 37:5 (2019), 522-539.

[180] *S Chermak, J Freilich & J Simone, "Surveying American state police agencies about lone wolves, far-right criminality, and far-right and Islamic jihadist criminal collaboration", *Studies in Conflict and Terrorism* 33:11 (2010), 1019-1041.

[181] *N Bouhana, S Malthaner, B Schuurman, L Lindekilde, A Thornton & P Gill, "Lone-actor terrorism – Radicalisation, attack planning and execution". In A. Silke (Ed.), *Routledge Handbook of Terrorism and Counterterrorism* (London, Routledge, 2018), 112-124.

[182] Gill et al. 'Closed source data'.