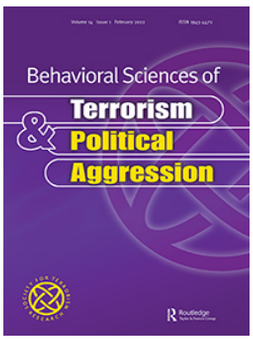

Routledge
Taylor & Francis Group

Behavioral Sciences of Terrorism and Political Aggression

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rirt20

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To cite this article: Guri Nordtorp Mølmen & Jacob Aasland Ravndal (2021): Mechanisms of online radicalisation: how the internet affects the radicalisation of extreme-right lone actor terrorists, Behavioral Sciences of Terrorism and Political Aggression, DOI: 10.1080/19434472.2021.1993302

To link to this article: https://doi.org/10.1080/19434472.2021.1993302

Published online: 30 Oct 2021.

BEHAVIORAL SCIENCES OF TERRORISM AND POLITICAL AGGRESSION
https://doi.org/10.1080/19434472.2021.1993302

Mechanisms of online radicalisation: how the internet affects the radicalisation of extreme-right lone actor terrorists

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ABSTRACT

How does the internet affect the radicalisation of extreme-right lone actor terrorists? In the absence of an established theoretical model, this article identifies six mechanisms seen as particularly relevant for explaining online radicalisation. Having first reviewed a larger set of relevant lone actor terrorists, the study traces these mechanisms in three selected cases where the internet was reportedly used extensively during radicalisation. The findings show that the internet primarily facilitated radicalisation through information provision, as well as amplifying group polarisation and legitimising extreme ideology and violence through echoing. In all three cases, radicalisation was also affected considerably by offline push-factors that through their presence made extreme online messages more impactful. The results challenge the view that offline interaction is necessary for radicalisation to occur but also the view that online influence itself is sufficient.

ARTICLE HISTORY
Received 15 June 2021
Accepted 11 October 2021

KEYWORDS
Online radicalisation; lone actor terrorism; extreme-right; causal mechanisms

Introduction

The exponential development of the internet and social media has made it possible for extremists of all kinds to communicate and spread their ideas to a larger audience than before. The role played by the internet in fostering radicalisation has therefore become a pervasive subject in discussions of violent extremism among scholars and policymakers (Conway, 2017, p. 77).

Existing research on the role(s) played by the internet in radicalisation is scarce, often descriptive, and replete with research gaps. First, there is an abundance of research on the 'supply'-side of online extremist content, rather than *how* interaction with this content impacts radicalisation. Meanwhile, the 'demand'-side of online radicalisation, i.e. how individuals engage with the internet, remains understudied (Bastug et al., 2020; von Behr et al., 2013). Second, there seems to be an imbalance in existing research stemming from an enduring focus on Islamic extremism, while other forms of extremism such as the extreme-right have received less attention (Feldman, 2018, p. 40; Winter et al.,

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Supplemental data for this article can be accessed https://doi.org/10.1080/19434472.2021.1993302.

2020, p. 2). One notable exception is Bouhana et al. who explores the background and preparatory behaviours of extreme-right lone actors compared to other ideologically motivated lone actors (Bouhana et al., 2018). Existing research has also mainly focused on group-based radicalisation and been less devoted to lone actors and self-radicalisation (Spaaij, 2010, p. 855). This is unfortunate, as the most potent terrorist threat from the extreme-right comes from lone actors groomed in transnational online networks (Bjørgo & Ravndal, 2019).

To narrow these research gaps, this study examines how the internet and social media influenced the radicalisation processes of extreme-right lone actors[1] who carried out or attempted to carry out large-scale terrorist attacks[2] in Western democracies since 2000. Drawing on existing literature of both online radicalisation and lone actor radicalisation, the article investigates six mechanisms proposed as particularly relevant for explaining how online radicalisation occurs: (1) compensation, (2) isolation, (3) facilitation, (4) acceleration, (5) echoing, and (6) action triggering.

By tracing these mechanisms in three cases purposely drawn from a larger set of extreme-right lone actor terrorists who reportedly used the internet extensively during their radicalisation, the study finds that the internet played a role in facilitating radicalisation through making extreme ideology and information accessible, as well as amplifying group polarisation and legitimising extreme speech and violence through echoing. However, our findings also suggest that offline mechanisms such as pre-existing vulnerabilities and offline isolation remain important preconditions for online radicalisation to occur.

The article is organised into four parts. First, we review existing literature on both offline and online radicalisation and then we develop a theoretical model derived from this literature review. In part two, we present our research design and methodology. Part three presents and discusses the results of our analysis. Finally, the article concludes by discussing some theoretical and practical implications of our findings.

Theoretical framework – mechanisms of online radicalisation

Our focus in this study is on the processes and pathways that connect radical ideas to violent actions through exposures to various types of internet context. For this purpose, we use Borum's conceptualisation of violent radicalisation as our point of departure, modifying it by applying an online element based on the definition of online radicalisation by Bermingham et al. (2009, p. 10). In this study, we define online radicalisation as a process by which individuals through interactions with and exposures to various types of internet content come to adopt beliefs that not only justify violence but compel it to the point where these beliefs are translated into violent action (Borum, 2011, p. 8).

Research on online radicalisation is often criticised for its weak empirical foundation (Archetti, 2012; Odağ et al., 2019; von Behr et al., 2013; Winter et al., 2020). Existing research is often theoretical and descriptive, relying heavily on secondary sources, and case studies with low generalisability (Gill et al., 2017, p. 101). Thus, there is a dearth of empirical research examining the relationship between the individual and the internet in the process of radicalisation (Odağ et al., 2019, p. 269).

What research does exist tells a largely contingent story. Most conclude that while the internet *plays a role* in the radicalisation processes of lone actors, it does not *drive*

radicalisation on its own. Most empirical research shows a far more complex pathway to extremist violence, reliant on not only online elements, but offline elements as well (Gill et al., 2015, 2017; Koehler, 2014; von Behr et al., 2013).

Furthermore, exactly *how* the internet impacts radicalisation has been unclear to date (Koehler, 2014, p. 116). Gill et al. (2015, p. 4) note a tendency in existing research to present mono-causal explanations of extremist behaviour, with all online activity being recorded into the category of online radicalisation, and online activity thus being understood publicly as a primary driver for radicalisation. This is problematic, as it may result in a lack of complete understanding of a complex issue. Furthermore, while we were able to identify some existing theoretical frameworks that have conceptualised and aggregated online factors that may lead to violent radicalisation, they tend to incorporate aspects of *group influence* and influence from terrorist recruiters (Neo, 2016, p. 216; Torok, 2013, p. 7). They therefore lack the nuances to fully explain all the factors that fuel online self-radicalisation into lone actor terrorism.

To remedy this, we examine causal mechanisms that might fuel the process of online radicalisation. By mechanisms, we refer to recurrent processes generating specific kinds of outcomes (Mayntz, 2004), in this case, online processes generating lone actor terrorist attacks.

To identify relevant mechanisms, we conducted a literature review of existing research in the field of online radicalisation. We sought to identify the key assumptions and insights in existing research about how the internet impacts processes of radicalisation. Identifying central trends in the literature, we used these as foundations to establish, define and name a selection of mechanisms.

Literature was collected from open-source science databases like Google Scholar and the Oslo University library database. The literature was primarily collected through a keyword search in the relevant databases using keywords like 'online + radicali (z)sation'. Complementing the keyword search, we employed snowballing (Wohlin, 2014, p. 1). Using key documents as a starting point (Gill et al., 2015; Odağ et al., 2019; von Behr et al., 2013), we consulted the references in these studies to identify further relevant titles. The collected data included academic studies, books and book chapters, government reports and conference protocols. We excluded studies that addressed radicalisation without a specific focus on the internet, as well as studies that addressed the narrow radicalisation-impact of specific websites.

We classified candidate mechanisms into three phases of a wider radicalisation process, inspired by existing phase-based radicalisation models (Hamm & Spaaij, 2017; Neo, 2016; Weimann & Von Knop, 2008). First, some mechanisms relate to a *pre-radicalisation phase*, illustrating the impact of pre-existing triggers, needs and vulnerabilities in making individuals susceptible to alternative worldviews online. Second, some mechanisms relate to the *radicalisation phase*, illustrating the individual encountering, and becoming influenced by radical or extremist content online. Finally, some mechanisms relate to the *operational phase*, illustrating the individual translating violent belief into action, and the operational planning that follows.

By and large, existing research suggests that online radicalisation should not be understood as an online-only process, but rather one that is contingent on partly or fully offline mechanisms as well. It is unlikely that any mechanisms identified as particularly relevant in this study are sufficient as isolated causes of radicalisation. Some may affect the process

more strongly, while others may have no impact at all, depending on how they interact with offline circumstances in each case.

We selected mechanisms based on their prominence in the literature covering online or lone actor radicalisation. We included fully online mechanisms, as well as mechanisms that have both online and offline elements. Purely offline mechanisms were excluded. Several mechanisms may also appear in more than one phase of the process. For example, isolation may occur in both the pre-radicalisation and radicalisation phases, and facilitation in the radicalisation and operational phases. Table 1 summarises the framework and the online/offline dimensions of each mechanism.

Compensation

Compensation appears mainly in the pre-radicalisation phase and refers to an attempt by the individual to compensate for offline vulnerabilities through an alternative online presence. Compensation connects offline vulnerabilities to online radicalisation processes. The underlying assumption is that easily available content online provides vulnerable individuals with alternative worldviews as espoused by their shared ideology. Individuals may seek affiliation in an alternative social environment where the threshold for inclusion is low. This ease of access for unmoored and vulnerable individuals sets online compensation apart from compensation through seeking out and joining radical networks offline.

It is rarely possible for scholars to categorically conclude that an individual was solely radicalised by the consumption of online media and that they would not have radicalised without it. Borum argues that radicalising factors may 'include broad grievances that "push" individuals towards a radical ideology and narrower "pull" factors that attract them' (Borum, 2011, p. 57). The online radicalisation frameworks of both Weimann and Knop and Neo include a pre-radicalisation phase detailing the impact of pre-existing vulnerabilities as factors that 'push' radicalisation. Neo argues that these vulnerabilities influence the individual's belief systems, creating 'cognitive openings', i.e. a moment which may disrupt the 'certainty in previously accepted beliefs' leaving individuals more receptive to alternative viewpoints (Neo, 2016, p. 206). Thus, individuals who encounter extreme online narratives will make a choice to ignore the material or continue engaging with it, laying the groundwork for further radicalisation. This choice is contingent on the presence of these push-factors that make individuals vulnerable to the information they access (Neo, 2016, p. 208).

Pre-existing vulnerabilities may refer to personal crisis (Smith, 2018, p. 5), mental health issues and trauma (Malthaner & Lindekilde, 2017, p. 12), a previous history of violence

Table 1. Theoretical framework.

Mechanism	Online/offline dimension	Radicalisation phase
Compensation	Online/offline	Pre-radicalisation phase
Isolation	Online/offline	Pre-radicalisation phase Radicalisation phase
Facilitation	Online	Radicalisation phase Operational phase
Acceleration	Online	Radicalisation phase
Echoing	Online	Radicalisation phase
Action triggering	Online/offline	Operational phase

(Schuurman et al., 2018, p. 1194), family and upbringing experiences (Gielen, 2015), neighbourhood socioeconomics (Boukhars, 2017), or a loss of work or school positions (Ramakrishna, 2007, p. 2). The loss of jobs or education may unmoor people from social activities and networks, leading them on a search for new sources of meaning and making them more open to exploring new ideas. These types of vulnerabilities may over time cause disillusionment with the political system or dissatisfaction with the status quo. To compensate for this, the individual may use the internet to seek alternative worldviews and vent their frustrations.

Isolation

Isolation refers to a process whereby individuals who experience social alienation offline seek alternative social belonging online. Social context often plays a role in the radicalisation process. Central to many radicalisation push-factors is that they lead to disembeddedness from offline networks and relationships. The internet as a medium attracts individuals who experience this kind of weakening of offline relationships or an alienation from the norms and beliefs in society (Bergin et al., 2009). Thus, offline isolation is often coupled with online immersion as individuals become increasingly absorbed into online communities. Social alienation and radical immersion are processes often identified in traditional radicalisation trajectories. However, the online immersion aspect of the mechanism may be particularly relevant for lone actors, as these often are members of forums and (see themselves as part of) virtual communities (Sageman, 2008, p. 122).

Isolation may occur at different points in the radicalisation process. In pre-radicalisation, isolation refers to an individual's feelings of alienation from society that may lead to a reorientation where they are more likely to respond positively to radical narratives (Weimann & Von Knop, 2008). Online forums and messaging boards may attract individuals who feel alienated by their communities and who by extension may identify with ideas proliferated in online forums that may not be shared by their community.

In the radicalisation phase, isolation appears as a dynamic process of 'conflictive interactions and isolation' and 'virtual integration and withdrawal from personal relations' (Malthaner & Lindekilde, 2017, p. 176). While radicalised individuals are not usually completely separated from the offline world, they often exhibit a social withdrawal, as the online community starts to take precedence over their physical environment (Torok, 2013, p. 2). Individuals become increasingly 'trapped' or 'absorbed' in radical communities, which erodes personal relationships, often through confrontations with family members and offline friends.

Facilitation

Facilitation illustrates the aspects of the online sphere that intensify and facilitate exposure to and interaction with extremist content. It is widely accepted among researchers that the internet acts as a facilitative tool that affords opportunities for both ideological development and operational planning. Analysing data derived from interviews with both extreme-right and jihadi offenders, von Behr et al. argued that the internet facilitated radicalisation through acting as a 'key source of information, communication and of propaganda for their extremist beliefs', providing a 'greater opportunity than offline

interactions to confirm existing beliefs' (von Behr et al., 2013, p. 25). Similarly, in a quantitative study of the role of the internet in the terrorist activity of 227 convicted extremists, Gill et al. found that the internet facilitated radicalisation by enabling it rather than driving it (Gill et al., 2017, p. 35).

Weimann and Knop categorise facilitative aspects of online radicalisation into instrumental and communicative uses (Weimann & Von Knop, 2008, p. 899). In other words, where offline information provision and ideology building may be informed by written literature or face-to-face interaction with other extremists, online facilitation has drastically simplified and streamlined this process by providing a one stop shop both for one-way consumption of extremist materials, as well as online social interaction around this material.

Facilitation may occur both in the radicalisation phase and the operational phase, first in facilitating ideological development in the radicalisation phase through informing and developing ideology, then in facilitating the operational phase through providing resources for the planning and execution of terrorist attacks.

Echoing

Echoing describes how constant interaction with people who hold similar and similarly extreme views as oneself may amplify and reinforce radical beliefs and legitimise violent action (Neumann, 2013, p. 436).

The most dangerous impact of the internet is likely not passive exposure to radical rhetoric, but that it provides access to a community of like-minded individuals where extreme thoughts and ideas can be exchanged and validated (Neo, 2016, p. 210). Torok describes how the internet may act as 'insulation from pervasive outside influence, particularly when it comes to ideas and competing rationalities,' (Torok, 2013, p. 6) meaning that the internet allows for the existence of virtual echo-chambers devoid of dissenting opinions. This may amplify and reinforce radical messages and over time increase support for the use of violence.

Furthermore, many argue that the sense of anonymity and protection from detection provided by the internet lowers the threshold for engagement with extreme materials. In turn, this may embolden individuals to express behaviours and attitudes that are otherwise unacceptable (Koehler, 2014, p. 118).

Exposure to echo-chambers may also have a polarising effect where individuals start to identify with the 'in-group' or community, while the 'out-group' becomes dehumanised and perceived as an enemy. Thus, echoing impacts the radicalisation process through legitimising not only violent discourse but also through lowering the individual's inhibitions against the use of violence to bring about political change. The individual internalises radical ideas and builds a new social identity around the online community.

While one may point to similar mechanisms impacting on an individual in the offline realm, for example through the influence of extremist groups or radical networks, echoing as an online mechanism sets itself apart. Compared to offline networks, the online aspect of echoing provides an individual with forums and networks with a higher sense of security ensured by the anonymity that the internet provides. The online aspect of echoing may thus have a disinhibiting effect, causing individuals to 'feel less restrained, [and] express themselves more open' (Stevens & Neumann, 2009).

In this, online echoing impacts on a different and wider user base than its offline counterparts.

Acceleration

By virtue of the internet functioning as a facilitator of radicalisation through information provision and communication, the internet may function as an 'incubator' or 'accelerator' of online radicalisation (Weimann & Von Knop, 2008, p. 79). Some have pointed to a correlation between the proliferation of extremist online content, and rapid radicalisation (Holt et al., 2015, pp. 107–120; Precht, 2007, p. 58). Thus, as a mechanism, acceleration refers specifically to the reduced timeframe of radicalisation online, when compared to traditional offline radicalisation trajectories (von Behr et al., 2013, p. 19). While this may be a result of facilitative aspects of the internet, it is a separate mechanism to facilitation as it refers to time rather than substance.

We assume that acceleration can play out in two ways. First, the timeframe of the entire process, from the first moment of exploration to the final terrorist act, becomes considerably shorter than the average timeframe for offline radicalisation. As a baseline for offline radicalisation, we rely on Klausen et al., who found that the mean timespan for radicalisation is five years while the median was four years and two months (Klausen et al., 2016). Thus, acceleration may have occurred if the timeframe of radicalisation is considerably shorter than five years. A second possible scenario is that the introduction of an online element into a radicalisation process that is already underway may speed up the pace of the process in such a way that the individual in a very short time starts to express markedly more extreme political views.

Action triggering

Action triggering refers to the moment that creates the impetus to commit acts of political violence. A distinction should be made between the decision to commit violence and willingness to participate in radical networks and discourse (Taylor & Horgan, 2006). Most scholars specify the need for an action trigger to link existing grievances to an enemy (Beadle, 2017, p. 5).

Crenshaw (1981) distinguishes between preconditions that set the stage for violent radicalisation, and precipitants referring to specific events that immediately precede or trigger the terrorist act. While Crenshaw's study describes precipitators specifically as momentous violent events that compels retaliation through terrorism, the consensus today seems to be that trigger causes do not have to be acts of violence.

More generally, action triggering has been related to 'cognitive openings', i.e. a moment which may disrupt the 'certainty in previously accepted beliefs' leaving individuals more receptive to alternative viewpoints (Schuurman et al., 2018, p. 1195). For example, Neo describes a 'tipping point' preceding violent behaviour that is brought upon by an individual encountering 'new issues and/or circumstances (i.e. triggers) that supplied the resolution to act in adherence to one's newly internalised radical worldview' (Neo, 2016, p. 213).

Experiences that trigger violent action are entirely subjective to the individual. As described by Hamm and Spaaij, they may be 'personal or political or some combination

of the two' (Hamm & Spaaij, 2017, p. 122). Catalysts can include personal setbacks or social events (Jensen et al., 2020, p. 7), inspiration from another successful terrorist attack (Schuurman et al., 2018, p. 1195), an event causing 'moral outrage', or the belief that one's community is under attack (Neo, 2016, p. 213). Importantly, scholars agree that action triggering may take place solely online, for example through 'video or written messages from an organisation's leadership or through online chat forums, email, social media posts' (Anderson, 2020, p. 16). According to Beadle, 'being exposed to such events on the media rather than in the "real world" appears to be sufficient […] if the individual can somehow identify with the victim' (Beadle, 2017, p. 5). Thus, for the purposes of this study, we categorise the mechanism as online/offline and register it as active if the online element is present.

Research design

To measure impact from these proposed mechanisms, we adopt a comparative case study design, using standard process-tracing to observe how each mechanism unfolds across different cases (Bennett & Checkel, 2015; George et al., 2005). By comparing multiple cases, we may identify scope conditions under which different causal mechanisms impact the outcome (George et al., 2005), while process-tracing allows us to accurately trace the actual steps linking possible causes to the outcome, thereby making strong within-case inferences (Beach & Pedersen, 2019).

Case selection

The number of cases included in a comparative case study relies on a trade-off between informational breadth and depth. Because process-tracing requires considerable depth, a low number of cases ensures that sufficient information can be collected for each case. For the purpose of this article, we chose three cases, having first analysed a larger set of candidate cases at a more generic level. The choice to delimit our study to three cases was partly influenced by practical considerations related to the vast amount of time and data required by the process-tracing analysis, and partly by our intention to focus on cases with the high societal impact.

The low number of cases brings with it obvious issues with representativity and generalisability. Note that we do not claim here that our three cases are representative of the full universe of lone actor terrorists, and it is not our intention in this study to draw broad generalisations about the relationship between internet use and radicalisation outside our sample. Rather, our intention is to identify and trace general mechanisms of online radicalisation that in all likelihood combine in different configurations across multiple cases, as lone actor terrorism is a social phenomenon characterised by considerable causal complexity. At the same time, we do suspect that the mechanisms included in our framework are recurrent among lone actor terrorists, and that future theory development might benefit from tracing the same mechanisms in a higher number of cases. As such, our findings may inform a larger academic debate about the nature and scope conditions of lone actor online radicalisation.

We began by compiling a dataset of individuals ($N = 25$) using the following selection criteria: The individuals had to (1) be lone actors in accordance with Spaaij's definition[3]

who (2) had conducted or planned to conduct a large-scale violent terrorist attack, (3) in a Western democracy, (4) motivated by extreme-right ideology, and (5) were reliably reported to have used the internet in some way during their radicalisation process. We opted for Spaaij's typology of lone actors because it distinguishes between solo terrorists who maintain plot-relevant social ties and lone actors who plan and carry out attacks in isolation. In other words, cases of solo terrorism where an individual has been trained by a terrorist group but perpetrated an attack alone were excluded from our sample.

To avoid unnecessarily burdening the individuals in the registered sample, we included only convicted terrorists and anonymised the registered data. Information about the sample was collected and stored on a secure research platform available for researchers only. Furthermore, measures were taken to minimise the amount of data collected and stored, and unnecessary data was deleted continuously. The project follows GDPR regulations and was approved by national data protection authorities before data collection commenced.

Around half the sample (13 of 25) conducted successful attacks. The average death toll for successful attacks was 14.3. Removing extreme outliers makes the average death toll 5.5. The sample was overwhelmingly white male (24 Caucasian, 25 male), the mean age when perpetrating the attack was 30.4 years old, with a median age of 29.5. The sample used weapons such as firearms (13) and/or homemade bombs (10) with fewer using bladed weapons (5) or conducting vehicle-borne attacks (2). The sample overwhelmingly targeted ethnic minorities (20) or had an anti-minority reasoning behind their attacks. In terms of internet use, 22 had consumed online propaganda, 15 had contact with others online, and 16 used the internet in attack preparations. In terms of social relations, 19 were unmarried and without children, while 16 were unemployed (of the 9 employed individuals, 5 were students, while 3 had solitary professions such as truckers). Furthermore, 9 had criminal records, while 15 had a history of mental illness or personality disorders.

Next, we purposively selected three cases from this universe using a 'diverse case' logic to achieve maximum variation across relevant dimensions (Gerring, 2008, p. 98). Considering our sample characteristics, we chose Peter Mangs, Anders Behring Breivik, and Dylann Roof. Each case exemplifies typical characteristics for the group in terms of age, gender, race and marital status (see: Table 2), while also being diverse on three key variables. First, the cases represent different points in time in the evolution of the internet,

Table 2. Comparison of selected cases to sample: paersonal characteristics.

Variables	Average attributes in sample ($N = 25$)	Peter Mangs	Anders Behring Breivik	Dylann Roof
Age (at first known terrorist activity)	30.4	31	32	21
Gender	100% male	Male	Male	Male
Ethnicity	96% White	White	White	White
Country		Sweden	Norway	USA
Marital status	76% unmarried and without children	Unmarried and without children	Unmarried and without children	Unmarried and without children
Employment status	64% Unemployed	Employed on/off	Self-employed on/off	Unemployed
Pre-radicalisation criminal history	36% With criminal record	No criminal record	No criminal record	Criminal record

Table 3. Comparison of selected cases to sample: Attack characteristics.

Variables	Average attributes (n = 25)	Peter Mangs	Anders Behring Breivik	Dylann Roof
Target group	28% Muslims 40% other minorities	Immigrants	Political party	African Americans
Weapon	52% firearm 40% homemade explosives 28% other	Firearm	Firearm Homemade explosive	Firearm
Casualties	14.3 (including outliers) 5.5 (excluding outliers)	2	77	9

encapsulating the beginning of web 2.0 and the rise of social media. Second, the cases are geographically diverse, capturing different national contexts. Lastly, the cases vary in terms of target group, attack method and number of casualties (Table 3).

Sources

Our analysis relies on a comprehensive selection of publicly available sources to counteract possible biases and ensure robust findings (Eisner, 2017, p. 110). This includes interviews, biographies, news articles, police interviews, and manifestos.

For Peter Mangs, we relied heavily on insights from interviews and biographies (Gardell, 2018; Palmkvist, 2015). Most important was a book by Mattias Gardell, a scholar who conducted a series of in-depth interviews and was given unrivalled insight into non-public sources, including Mangs' ideological writings.

For Anders Behring Breivik, we relied on thousands of emails and posts on radical websites that were made available in court documents or published works (Stormark, 2012), biographies by authors who had access to non-public sources (Seierstad, 2015), as well as his 1200-page manifesto outlining his radicalisation and attack planning process.

For Dylann Roof, we relied on sources made publicly available by The South Carolina district court, including his manifesto, his internet activity on extremist websites and expert evaluations into his mental health. In addition, we collected 10 news and feature articles covering this case in depth.

Mechanisms and indicators

When using process-tracing, we seek to examine 'the observable implications of hypothesised causal mechanisms within a case to test whether a theory on these mechanisms explains the case' (Bennett & Checkel, 2015, pp. 7–8). Combining deductive reasoning with insights from our literature review, we identified 29 indicators as illustrated in Table 4.

Findings

The aim of our analysis was to determine *how* the internet impacts on the radicalisation of extreme-right lone actor terrorists. To investigate this, we traced six mechanisms proposed as particularly relevant by the literature in three cases. Figure 1 summarises our findings.

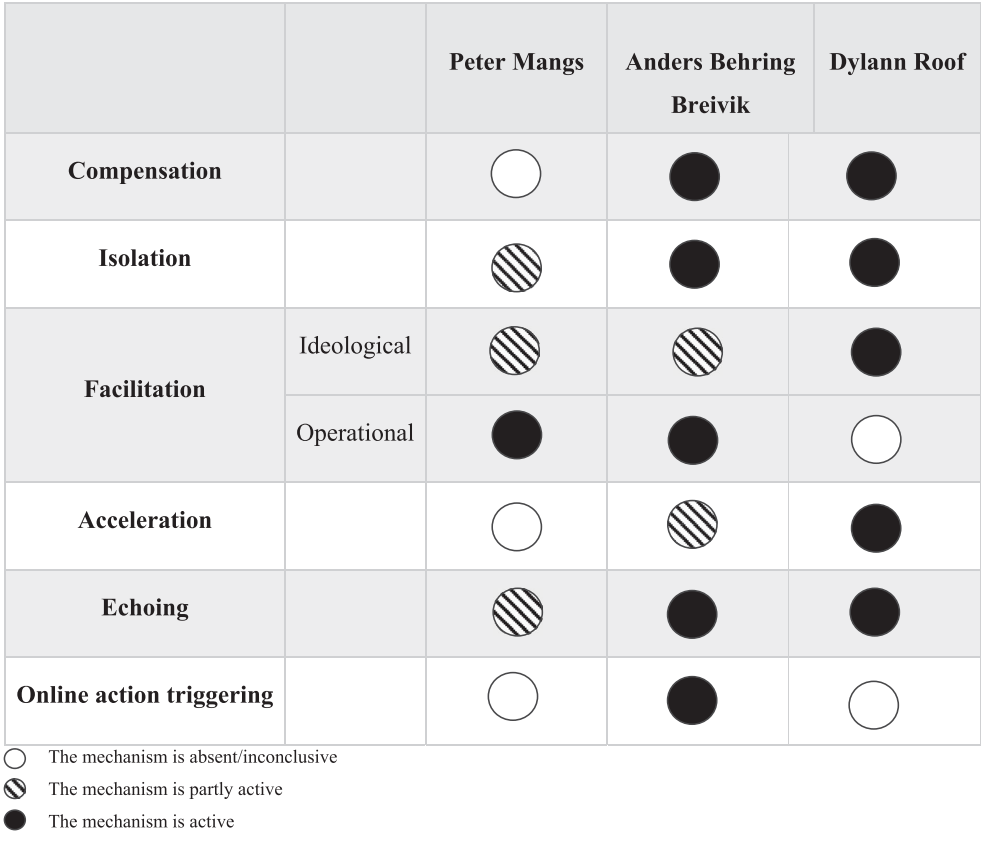

Figure 1. Findings.

Compensation

Our findings indicate the impact of pre-existing vulnerabilities in all three cases. However, the degree to which compensation occurs varies. It is likely that childhood experiences and family situations had an impact on the radicalisation processes in all three cases. All came from divorced households. Parental discord is a relatively frequent trauma-indicator prestaging radicalisation, possibly due to the parental authority falling apart, leaving the individuals with insufficient supervision (Klausen et al., 2016, p. 76).

Furthermore, all three seem to have experienced neglect in childhood. Peter Mangs 'had to care for himself' while his mother worked, particularly after his sister died from a drug overdose (Gardell, 2018, p. 794). Breivik lost contact with his father at an early age and was at one point almost removed from his mother's home by Norwegian Child Protective Services due to instability in the home (Østli & Andreassen, 2011). Fewer indicators were identified in the case of Dylann Roof; however, sources suggest the presence of domestic abuse in the home (Robles & Stewart, 2015). It is likely that these experiences lead to vulnerabilities that laid the foundation for later ideological development.

All three experienced failures, alienation and dissatisfaction with self, consistent with personal crisis. Experiences like loneliness, unemployment and economic struggles are

Table 4 Mechanisms and empirical indicators

Mechanism	Online/ offline dimension	Empirical indicators	Sources
Pre-radicalization phase			
Compensation Individuals who experience pre-radicalization vulnerabilities may compensate for these vulnerabilities through seeking alternative world views online.	Offline/ online	Vulnerabilities: – Individual experiences a personal crisis – event leading to dissatisfaction with self (family crisis, drug abuse, incarceration, unemployment, homelessness) – Alienation/rejection from peers – Prior criminal history – Individual experiences/has experienced an event causing a shock or injury. Online compensation: – Individual searches for alternative world views/ vents frustrations online.	(Borum, 2011, 2013; Gill et al., 2014, 2017; Malthaner & Lindekilde, 2017; Meleagrou-Hitchens & Kaderbhai, 2017; Neo, 2016; Ramakrishna, 2007; Schuurman, Bakker, Gill, & Bouhana, 2017; Smith, 2018; Weimann & Von Knop, 2008)
Isolation Individuals who are disembedded from offline social networks seek community online. Over time they become increasingly "trapped" or "absorbed" in radical online communities.	Online/ offline	Isolation: – Weak/no personal offline relationships – Online precedence/immersion: – Individual starts living "second life" online – More time spent online than with offline relationships – (Offline) Detachment: – Disconnection interpersonal relationships – Withdrawal from educational programs /failing classes – Withdrawal from work/pursuing work with little supervision	(Bergin et al., 2009; James, 2019; Malthaner & Lindekilde, 2017; Neo, 2016; Sageman, 2008; Sunde, 2013; Torok, 2013; Weimann, 2012; Weimann & Von Knop, 2008)
Radicalization phase			
Facilitation Individuals use the internet to access radical materials and communicate with other extremists and plan operational aspects of terrorist activity.	Online	Ideological: – Individual accesses propaganda texts/videos/content/ information about extreme ideologies – Individual communicates with other extremists online Operational: – Individual searches information and acquires weapons/ materials to build weapons – Operation recognizance – Acquisition of finances/funding for attack	(Anderson, 2020; Ducol et al., 2016; Gill et al., 2015, 2017; Jensen et al., 2020; Schuurman, 2020; Schuurman et al., 2018; Sunde, 2013; von Behr et al., 2013; Weimann, 2014; Weimann & Von Knop, 2008))

(*Continued*)

Table 4 Continued.

Mechanism	Online/ offline dimension	Empirical indicators	Sources
Echoing Constant interaction with people who hold similar - and similarly extreme - views amplify and reinforce radical beliefs and legitimize violent action over time.	Online	Echo chamber effect: – Individual spends time on webpages where dissenting opinions are absent Group polarization: – Individual starts using "us versus them"-rhetoric/ dehumanizing language about out-group Legitimation: – Downloading/consuming material that calls for/ legitimizes violence – Verbalized acceptance of/desire to use violence for political means	(Anderson, 2020; Bowman-Grieve, 2009; Cilluffo et al., 2006; Geeraerts, 2012; Hussain & Saltman, 2014; Koehler, 2019; Meleagrou-Hitchens et al., 2017; Neo, 2016; Neumann, 2013; Patton et al., 2013; Sageman, 2008; Schuurman et al., 2018; Sunde, 2013; von Behr et al., 2013; Wojcieszak, 2010)
Acceleration The time frame of radicalization processes is reduced in the online sphere, when compared to traditional offline radicalization processes.	Online	Acceleration: – The time frame of the radicalization process was (significantly) shorter than the average timespan of radicalization (5 years) – (Very) short time frame from immersion in online milieus to conduction of plot – (Very) short timespan from immersion in radical milieus to outwardly more extreme behavior.	(Bouhana et al., 2018; Holt et al., 2015; Precht, 2007; von Behr et al., 2013; Weimann, 2012)
Operational phase **Action triggering** The individual experiences a catalyzing moment which creates the impetus to commit acts of political violence.	Offline/ online	Catalyst: – Individual experiences an (offline or online) personal/ social event that inspires them to act – Individual is inspired to act by other successful attack – Individual believes their ingroup is under attack – Individual responds to (offline or online) calls for violence.	(Anderson, 2020; Beadle, 2017; Jensen et al., 2020; Neo, 2016; Schuurman et al., 2018)

likely to have led to a disillusionment with the status quo. Mangs failed in several different educational programs and suffered long stints of unemployment before he succeeded in completing an online education program and became a dental assistant (Hartleb, 2020,

p. 93). Breivik experienced failures in social life, political life and business ventures, and a loss of trust in the political system (Hartleb, 2020, p. 82). Fewer indicators of personal failures were identified in Dylann Roof's case, likely because he withdrew from society when he was 15 years old (Robles & Stewart, 2015). It is possible that his frustrations were primarily rooted in mental health and substance abuse and that he isolated from society and immersed himself online as a response (Robison, 2016, p. 10).

Indicators of pre-existing triggers, needs and vulnerabilities were present in the lives of each individual terrorist. However, it does not seem like the online compensation mechanism is active in each case to the same extent. For example, after Breivik was rejected for a political position in the Norwegian Progress Party, his posts in the party's online forums became increasingly radical. His comments became notably skeptical towards the current political system and antagonistic towards Islam and socialism (Seierstad, 2015, p. 105). These increasingly radical online comments can be interpreted as compensation for his frustrations with the current status quo. Secondly, following failures in business, Breivik withdrew almost completely from society to play video games, then later immersing himself into radical online milieus between 2008 and 2009 (Seierstad, 2015, p. 169).

We found similar behaviour of withdrawal and immersion in Roof's case. It seems clear that he turned to the internet to compensate for vulnerabilities tied to mental health and social issues that caused struggles with offline interactions (Robison, 2016, p. 10). After withdrawing almost completely from society at age 15, the computer became his window to the outside world. In a later instance of compensation, specifically regarding use of the internet to search for alternative worldviews, Roof turned to the internet to seek out information about the 2012 Trayvon Martin shooting. Trayvon Martin was a black teenager who was shot to death by neighbourhood watch coordinator George Zimmerman. Roof wrote in his manifesto that he believed Zimmerman was in the right. This prompted him to search for information about the case and 'black on white crime' online, something which led him to radical-right websites, starting his radicalisation (Roof, 2015).

Mangs' case differs. While we identified several pre-radicalisation vulnerabilities, he did not compensate through online behaviour. Instead, he was introduced to alternative worldviews through interactions with other extremists after moving to the US in 1996 (Gardell, 2015, p. 28). He did not start using the internet for extremist purposes until he began writing his unpublished political manifesto in 2001 (Gardell, 2015, p. 96).

The differences between the cases may stem from Mangs' radicalisation process taking place in the latter half of the 1990s, in the early days of the internet, when fewer radical websites existed. Mangs did not even own a personal computer until after he had undergone his radicalisation process, relying on public library computers to do research (Gardell, 2015, p. 95). By extension, he did not have the same easy access to extremist content as Breivik and Roof did.

Isolation

All three cases display some degree of offline isolation and offline immersion. Notably, all three are suggested to have spectrum disorders. Both Mangs and Breivik have been suggested to have Asperger's disorder (NTB, 2012), while Roof has been diagnosed with autism (Smith & Hawes, 2017). This is in line with findings by Corner and Gill that suggest lone actors are more likely than group-based terrorists to suffer from mental

illnesses, particularly spectrum disorders (Corner & Gill, 2015, p. 30). These types of challenges often impact negatively on social competence, possibly fuelling offline isolation and online immersion.

Offline isolation was present in all three cases. Both Roof and Breivik withdrew totally from society for years as their radicalisation unfolded, interacting with the outside world almost entirely through the internet. Mangs did not isolate to this extent but struggled with making personal connections throughout his life. He became increasingly introverted and lonely after returning from the US in 1998 and struggling to reintegrate into Swedish society. However, he was not totally isolated at any point in his radicalisation, being active in an Asperger support group, as well as having several close friendships with people who held the same radical beliefs as him (Gardell, 2018, p. 807). These friends were also seemingly aware of Mangs' violence towards immigrants, while not being involved in his terrorist campaign.

In terms of online immersion, Mangs started immersing himself in radical websites as he began researching his ideology online in 2001. His online activity escalated significantly from 2008 culminating with him spending 'hundreds of hours in online forums' (Gardell, 2015, p. 231).

Both Breivik and Roof isolated for a relatively long time before immersing themselves in radical websites. It appears that it is not necessarily extremist websites that promote offline detachment, but rather that isolated individuals may be drawn towards the internet as a medium where interaction is simpler. Once immersed, both Roof and Breivik made unsuccessful attempts to establish offline contact with other extremists (Smith et al., 2017; Torgersen et al., 2011). Thus, the internet did not in itself replace the individual's need or wish for offline interaction, but it rather provided an alternative avenue for interaction for people who seemingly struggled to connect with others – even in extremist communities.

In all three cases, online radicalisation escalated after isolation occurred. While this does not indicate that isolation is the root cause for radicalisation, isolated individuals may have time and opportunity to immerse themselves into online extremist milieus.

Facilitation

Facilitation was at least partially present in all three cases. Mangs was initially introduced to radical ideology offline, through his father who was a nationalist believing in the superiority of the Aryan race. Later, his beliefs were shaped and strengthened in US militia milieus, as well as through literature like *The Turner Diaries* (Gardell, 2018, pp. 795–796). As he immersed himself in extreme ideology, Mangs began doing research online as he wrote his unpublished political manifesto, 'den Germanska Filosofin' [the Germanic Philosophy] (Gardell, 2015, p. 348). Despite extensive use of the internet between 2001 and 2009, the core of his ideology remained heavily influenced by his initial interactions with the militia milieus in the US. Thus, the internet was not the initial facilitator for radicalisation in his case. It did, however, facilitate his ideological development beyond its initial point as it became his preferred platform for research.

Breivik too likely held somewhat radical beliefs before his online activity. One notable example is his comments on the Norwegian Progress Party forums in 2002 mirroring counter-jihad ideology years before he became active in extremist websites (Ravndal,

2013, p. 175). He radicalised further during his self-imposed isolation, writing a political manifesto between 2009 and 2010 that was composed entirely from online sources. This illustrates how the internet facilitated his ideological development. For both Breivik and Mangs the internet was crucial in developing radical thoughts into violent action. The internet clearly facilitated radicalisation in both cases, ensuring access to information they could not easily access otherwise. However, both held notably radical beliefs prior to the introduction of the online element. This indicates that online facilitation may not have been decisive, but that it likely provided an easier path of radicalisation.

By comparison, for Roof, the internet was the most important tool in the facilitation of his ideological development. From initially being exposed to extremist websites to conducting his attack, Roof relied solely on the internet for learning. He first encountered radical ideology in the aftermath of the Trayvon Martin case and the following civil unrest in 2012. This became a catalyst for a fast-paced radicalisation wherein Roof quickly became absorbed in racist blogs and forums. Thus, the internet facilitated Roof's radicalisation through making propaganda texts and websites easily available, laying the foundation for radicalisation.

In terms of operational facilitation, the internet was decisive for both Mangs and Breivik's ability to carry out their attacks effectively. Mangs researched his victims extensively online, finding home addresses, dates of birth and more (Gardell, 2018, p. 797). Breivik used the internet for almost all his operational planning, including acquisition of information and materials for building a complex fertiliser bomb as well as funding his operation (Pantucci, 2011, p. 36). By contrast, there is little to indicate that Roof used the internet to the same degree in his planning. This may be because Roof as a U.S. offender had easy access to weapons through legal means, not needing the internet to facilitate weapon acquisition (Scmidt, 2015). While it is possible that he chose his targets based on online information, there is little information available to support this. However, like Breivik, he posted a manifesto online prior to conducting his attack, using the internet to spread his message.

Acceleration

Acceleration varied across the cases. Mangs and Breivik began their radicalisation prior to immersion in radical websites and both exceeded the average timespan of five years from first exposure to attack. However, it is possible that the internet had an acceleratory effect on the processes in each case. The time between the moment Peter Mangs started researching ideology online and the day he conducted his first attack was around three years (2000–2003). The time between the moment when he first joined radical websites and the escalation of his campaign was around one year (2008–2009) (Gardell, 2015, p. 238; 2018, p. 797). However, there is no evidence that he started acting more radically during the time he was researching his ideology online, as he was already radicalised prior to using the internet. We thus cannot conclude that acceleration occurred in this case.

Breivik radicalised over a longer period, arguably holding radical beliefs prior to joining radical forums (Ravndal, 2013, p. 176). However, there are clear indications that he became increasingly radicalised after joining online extreme forums. Already in 2008, the first year we can confidently trace activity in radical websites, he is described as holding 'long lectures' about 'extreme topics' when he spent time with friends outside

of the internet (Seierstad, 2015, p. 166). The same year, he started criticising central counter-jihad bloggers online for not being sufficiently radical (Ravndal, 2013, p. 176). By 2010, after spending two years writing the book that would become his manifesto, he was expressing opinions that his mother described as 'crazy' (VG., n.d., p. 80).

By contrast, Roof's entire radicalisation process took place over three years, immediately indicating an acceleratory impact of radical websites. His radicalisation was solely facilitated by the internet. It is possible that the degree of immersion coupled with the fact that both Roof and Breivik went into self-imposed isolation fuelled the acceleratory effect of the internet. Constant consumption of extreme content while remaining largely unexposed to the outside world appears to have impacted on the speed of radicalisation for both Breivik and Roof.

Echoing

It is rarely possible to categorically conclude that an individual was solely radicalised by consumption of online media and that they would not have radicalised without it. We do not have the privilege of access to the full internet history of the individuals and thus, we cannot say with certainty how much time they spent in extremist online spaces compared to non-radical websites. Nonetheless, the information we have indicates high activity in – and a strong impact of ideologically homogenous websites in all three cases.

Breivik joined Stormfront in 2008 and the Nordic anti-immigration forums Dokument.no and Nordisk.nu in 2009. Also in 2008, he became familiar with the Gates of Vienna, a radical-right blog (Seierstad, 2015, p. 169). Roof joined Stormfront in 2015 (Loftin, 2016, p. 25). Mangs differs as he conducted his first attack in 2003, years before we can trace any activity on radical websites. His online activity was primarily centered around xenophobic websites or conspiracy blogs, none of which existed at the point of his first attack. Thus, echoing likely did not affect him at the beginning of his campaign. However, this does not mean that echo-chambers didn't have a great influence on Mangs throughout his campaign. According to Gardell, Mangs turned to online forums as his campaign escalated for 'confirmation that he was not alone in his beliefs' (Gardell, 2015, p. 229). It is possible that during the latter parts of his campaign, the collective call for violence on these pages egged him on and provided him with inspiration and motivation to continue his attacks (Gardell, 2015, p. 359).

Group polarisation seems not to have occurred because of echo-chambers for Breivik or Mangs. Both expressed negative feelings towards outgroups prior to online immersion, indicating that exposure to echo-chambers did not cause these polarised worldviews. This contrasts with Roof, who did not – at least to the same extent – have a bias towards the out-group prior to his online immersion (Roof, 2015).

Both Roof and Breivik started making comments consistent with legitimisation of violence after exposure to echo-chambers. Six months prior to conducting his attack, Roof had expressed wishes to shoot black people to a friend (Robles et al., 2015). Breivik started saying 'crazy' things after having been immersed in echo-chambers for two years, and during one incident in a bar in Oslo, he apparently bragged to some girls about a prospective attack (Brustad et al., 2011). By contrast, Mangs also expressed opinions indicative of legitimising violence prior to conducting

his attacks, he returned from the USA holding these beliefs, long before being immersed in echo-chambers.

Roof's online activity has been described as mostly one-way communication, contributing with little original thought (Robison, 2016, p. 9). It is notable that echoing occurred in the absence of active participation in the discourse, indicating that the effect may not be reliant on continuous and mutual correspondence between the individual and the community. Instead, the importance of echo-chambers could be that they create a *sense of community* that can be experienced even when interaction is almost exclusively one-way. Arguably, this is highlighted by the fact that all three expressed a belief that it was their responsibility to conduct attacks on behalf of their community (Gardell, 2015, p. 348; Phillips, 2016; Svendsen et al., n.d.). All seemingly felt compelled to turn extreme ideas into action.

Action triggering

Online action triggering could be reliably traced in only one of the three cases.

Mangs conducted several attacks between 2003 and 2010 and was therefore likely impacted by multiple triggers. He has pointed to one specific incident where he felt threatened by immigrants as the catalyst for his operational phase (Gardell, 2015, pp. 84–85). Furthermore, it's possible that other events acted as triggers as well, such as failing school, becoming unemployed or struggling financially (Palmkvist, 2015). When it comes to online-specific triggers, it is possible that his activity in echo-chambers prior to and during the escalation of his campaign impacted his decisions to continue carrying out his attacks. Mangs claims that he joined radical websites to learn how his attacks were received by his peers (Gardell et al., 2017). A positive reception may have compounded his resolve and triggered more attacks. However, there is little in the empirical material to draw an actual conclusion.

Breivik's operational phase coincided with a rejection of his book project by his idols in the radical milieu (Torgersen et al., 2011). It's possible that this experience became a catalyst for his decision to take to extreme actions, as all non-violent courses of action had failed (Ravndal, 2013, p. 177). This has been recorded as an online trigger as the milieu, the communication, and the rejection took place online.

We were unable to connect the beginning of Roof's operational phase to a specific offline or online catalyst. It is likely that the catalyst in this case was prolonged exposure in extremist forums and websites to calls of violence against outgroups such as African Americans, rather than one specific incident.

Seen together, the cases highlight the subjectivity of action triggers. It is impossible to identify events that always trigger attacks. One person's trigger may be another person's nuisance. Others, in turn, may decide to act without a specific catalyst. This, in turn, suggests that online radicalisation is not solely an online process. Despite the presence of online mechanisms in all other aspects of the radicalisation process, the final trigger may still take place offline – if present at all.

Discussion

We found that different online radicalisation mechanisms were active in all three cases and that no single mechanism was fully active in all cases, suggesting considerable

causal complexity (Braumoeller, 2003). Three mechanisms were at least partially active in all cases: isolation, facilitation, and echoing, suggesting that these mechanisms may be particularly relevant for online radicalisation.

Isolation seems especially significant. Pre-existing vulnerabilities likely played a role in isolating individuals, making the internet their main source of information and interaction. Online immersion was also present to some extent in all three cases. Once vulnerable individuals become detached from offline social networks, the internet may pave the way for online immersion.

We also found that the internet facilitated ideological development, impacting the radicalisation processes in all three cases. In terms of operational facilitation, we did not find that Roof used the internet in his attack planning, while Mangs and Breivik used it extensively. Thus, the internet is an effective venue for the planning of terrorist attacks, allowing anonymous information-gathering, possibly alleviating the fear of capture that may stop some individuals from acting.

Finally, our material suggests that echoing had an impact on all three individuals through legitimising, strengthening and shaping their ideology as well as their sense of attachment to a community. In all three cases, the individuals expressed a belief that they were acting on behalf of their community. Thus, echo-chambers likely provided a venue where – possibly due to the anonymity of the medium – the threshold is lowered for engaging in conversations about taboo subjects. This may promote a sense of community even in the absence of reciprocal interaction between the individual and the community.

We could not identify online radicalisation as a solely online process. While the internet was important for facilitating radicalisation by making information easily accessible, as well as amplifying polarisation and legitimising extreme ideology through echoing, it is not effective on its own. Offline aspects, in particular isolation, remain important, because it provides the locus for individuals to seek out information and belonging in online milieus where communication is voluntary, and the individual is in control. Finally, our findings show that face-to-face interaction is not necessary for radicalisation to occur. While Mangs' radicalisation included an element of face-to-face interaction, this was not the case for Breivik or Roof.

Conclusion

While the presence of the internet as a radicalising platform has been largely accepted as truth by policymakers, researchers, and the media, it has been generally unclear how the mechanisms behind online radicalisation work. In this study, we found that different mechanisms were active in each case and that no single mechanism was fully active in all cases. Isolation, echoing and (ideological) facilitation was at least partly active in all three cases, suggesting that these may be particularly relevant in explaining online radicalisation. Thus, the study both confirms and disputes our theory. We were not able to identify online radicalisation as a solely online process as offline detachment as well as offline vulnerabilities were impactful in all three cases. This confirms the consensus in existing research that the internet cannot drive the radicalisation of individuals alone. Furthermore, we did not find that face-to-face interaction with other extremists was necessary or present in all three cases, indicating that online communication with others who hold views is sufficient for radicalisation to occur.

The notable incongruity between the three cases, especially between Mangs and the other two, may have to do with Mangs' case being older. We found that the prevailing theory mostly held for Roof and Breivik, but not for Mangs. This is likely due to Mangs radicalising when the internet was less accessible. This may also indicate a growing importance of the internet for radicalisation as internet develops and becomes more accessible. Our findings would likely be different if we had chosen more recent cases. Furthermore, applying the same framework to a larger number of cases could provide more conclusive findings. Conducting a similar analysis of a larger number of newer cases of online radicalisation could be a way forward for future research.

Our findings may also have some practical implications for counterterrorism. First and foremost, radicalisation often starts offline, in the form of push-factors that make individuals more susceptible to online pull-factors once being exposed to them. Individuals who drop out of school or become unemployed or otherwise disengage from society may be vulnerable to extreme messages online. Knowing the signs and identifying these individuals before they radicalise, may be an important part of a wider effort to prevent violent radicalisation.

Second, individuals who conduct violent attacks do not necessarily post violent messages online. Identifying those who will conduct violence among the many who use extreme rhetoric, but are not violent, is very difficult. Monitoring radical websites may not be sufficient to identify those who are violent. Awareness about potential online mechanisms, such as those investigated in this study, may be important for revealing ongoing online radicalisation processes.

Third, in all three cases, ideologically extreme statements were expressed to close friends or family before their attacks. Had these people reported this to the authorities, the damage may have been minimised or avoided completely. Thus, facilitating tips from people close to individuals undergoing radicalisation process may be an effective preventive tool. However, alerting the authorities about someone close to you is not easy, especially if your trust in the authorities is already low or you suspect that such a tip might lead to severe legal punishment. It is therefore important to provide arenas where tips can be provided perhaps with a guarantee of no severe punishment unless a severe plot is in the making. In addition, such a strategy must be balanced against a concern not to invade personal spheres or encourage an Orwellian surveillance society.

In the end, it seems clear that the internet impacts on lone actor radicalisation in a variety of ways and is one out of several likely causes of radicalisation. In reality, online radicalisation involves real people whose actions cannot be considered without also considering the socialising settings that form their beliefs and inform their actions both within the online sphere and outside of it.

Notes

1. By extreme-right, we refer to those who promote social inequality through violence or other non-democratic means. See Ravndal and Bjørgo (2018) for a more detailed conceptual discussion. By lone actors we mean single perpetrators who prepare and carry out attacks alone at their own initiative. For a more detailed conceptual discussion, see Spaaij (2010).

2. By large-scale terrorist attacks, we mean terrorist attacks that resulted in, or had the potential of resulting in, five or more deaths, and have received widespread media attention.
3. Spaaij defines lone actor terrorism as '[…] terrorist attacks carried out by persons who (a) operate individually, (b) do not belong to an organized terrorist group or network, and (c) whose modi operandi are conceived and directed by the individual without any direct outside command or hierarchy' (Spaaij, 2010, p. 856).

Disclosure statement

No potential conflict of interest was reported by the author(s).

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