

Exposure to Extremist Online Content Could Lead to Violent Radicalization: A Systematic
Review of Empirical Evidence

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Abstract

The main objective of this systematic review is to synthesize the empirical evidence on how the Internet and social media may, or may not, constitute spaces for exchange that can be favorable to violent extremism. Of the 5,182 studies generated from the searches, 11 studies were eligible for inclusion in this review. We considered empirical studies with qualitative, quantitative, and mixed designs, but did not conduct meta-analysis due to the heterogeneous and at times incomparable nature of the data. The reviewed studies provide tentative evidence that exposure to radical violent online material is associated with extremist online and offline attitudes, as well as the risk of committing political violence among white supremacist, neo-Nazi, and radical Islamist groups. Active seekers of violent radical material also seem to be at higher risk of engaging in political violence as compared to passive seekers. The Internet's role thus seems to be one of decision-shaping, which, in association with offline factors, can be associated to decision-making. The methodological limitations of the reviewed studies are discussed, and recommendations are made for future research.

Keywords: Online violent radicalization, Internet, social media, extremist online content, systematic review

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Research on violent radicalization shows that extremist groups disproportionately recruit youth, often via narratives that resonate with their grievances and need for belonging or excitement (Bramadat & Dawson, 2014; Dalgaard-Nielsen, 2008; Rousseau et al., 2016). Youth, particularly adolescents, are indeed considered more vulnerable with regards to radicalization, compared to young or older adults. Roy (2015) speaks of a generational revolt, as well as a personal and psychological drift, while most authors evoke the marginalization and disillusionment of youth because of the lack of political and economic opportunities, underemployment, ostracism, and discrimination (e.g., Bhui, Warfa, & Jones, 2014; Costanza, 2012; Schmid, 2013). In turn, scholars from radicalization research highlight the vulnerability of adolescents to narratives that address personal identity crises, the need for group belonging, and the search for a positive social identity (e.g., McCauley & Moskaleiko, 2009; Moghaddam, 2005; Wiktorowicz, 2004) – domains that are also relevant for developmental scientists. Because adolescence is a period where personal and social ideals are sought, those without a sense of belonging or positive national identity are considered at higher risk of being attracted to radical groups (Sklad & Park, 2017).

In contrast to the discourse on the apparent political disengagement of youth (Hildreth, 2012; Martínez, Silva, Carmona, & Cumsille, 2012; Ribeiro, Malafaia, Neves, Ferreira, & Menezes, 2014), there is evidence that many young people want to be civically engaged (Delli Carpini, 2000) and aspire towards a diversified and active citizenship that benefits all members of society (Martínez et al., 2012). Young people increasingly engage in alternative forms of “Do It Yourself citizenship” (Harris & Roose, 2014) that can go unnoticed when viewed through a

conventional lens. Additionally, research indicates that the Internet and mobile technologies play a major role in the new citizenship of young people's lives, particularly as they approach adolescence (Westlund & Bjur, 2014). Indeed, the ability of Web 2.0 to instantaneously disseminate information in different media formats has expanded the possibilities for new forms of participation in youth citizenship (Delli Carpini, 2000). The Internet allows young people to share information about their activities, promote their commitments, learn about social causes, and find opportunities for engagement and action (Frith, 2017).

The production, dissemination, and consumption of multimedia via the open online Internet has however also been instrumental in the propagation of hateful utterances (Venkatesh et al., 2016). The Internet, especially since the emergence of social media in 2005, is increasingly depicted as an active vector for violent radicalization. Research linking Internet/social media and violent radicalization is, to date, mostly descriptive in nature and includes three broad types: a) analyses of the uses of the Internet/social media by radicalized individuals or groups (e.g., Holt, Freilich, & Chermak, 2017; Philipp, 2017); b) content or network analyses of extremist or terrorist groups' websites/forums (e.g., Diaz, Choi, Holt, Chermak, & Freilich, 2016; Miller, 2017; Philipp, 2017); and c) analyses of users' and recruiters' characteristics and behaviors online (e.g., Ferrara, Wang, Varol, Flammini, & Galstyan, 2016).

A recent UNESCO report (Alava, Frau-Meigs, & Hassan et al., 2017) summarized this body of research and showed that the Internet offers a host of advantages for extremist groups. To begin with, commonly used communication channels are low-cost, fast, decentralized, and globally connected, thus allowing networking across geopolitical borders, bypassing time and space constraints (Koehler, 2014; Parent & Ellis, 2016). These communication channels are not bound to national jurisdictions; they are informal, favor large groups, and allow for anonymity

and confidentiality amongst users (Hale, 2012; Neumann, 2013). In addition, extremist groups tap into the Internet's inherent properties and functionalities in many ways. They build engaging, interactive platforms and enter into one-on-one communication to attract younger audiences (Farag, 2017; Weimann, 2015). They propagate hate speech and violent content (Schafer, Mullins, & Box, 2014; Simi & Futrell, 2006). They identify likely recruits and forge new micro-communities in order to push individuals to join "the cause" (Farag, 2017), as well as mobilize "lone actors" (Schafer et al., 2014). They enable the radicalization of new recruits by severing offline ties and creating opportunities to participate in online and offline activities (Bowman-Grieve, 2009). Finally, they provide tactical learning and gathering of information necessary to organize attacks.

The conclusions reported in the UNESCO report (Alava et al., 2017) have also been echoed in a recent literature review on online radicalization (Meleagrou-Hitchens & Kaderbhai, 2017). In addition to the conclusions outlined above, the authors found that in the recent years, research on online radicalization was overwhelmingly focused on the global jihad movement at the expense of other forms of radicalization, such as white supremacist movements. They also highlighted that there is little agreement on how to define online radicalization, leading to a broad and unfocused swathe of literature. However, neither Meleagrou-Hitchens and Kaderbhai (2017) nor Alava et al. (2017) explicitly focused on empirical studies, and they did not use a systematic review procedure, limiting the inferences that can be drawn from their conclusions, and accordingly, this field of research.

Taken together, the collective evidence generated from research on online radicalization does not inform us adequately on the impact of online practices and strategies of terrorist groups on their targets. Consequently, the link between exposure to violent radical material online and

violent radical behavior online and/or offline remains unknown, largely due to the lack of integration of available empirical evidence into a meaningful whole for policy, research, and prevention purposes.

The Present Study

The main objective of this paper, therefore, is to synthesize the available empirical evidence on how the Internet and social media may, or may not, constitute spaces that can be favorable to violent radical forms of engagement – both online and offline. The specific objectives of the study are as follows: a) to conduct a systematic review of empirical studies that assess the effects or relations between exposure to any facet of the Internet occupied by extremist, violent radicalized, or terrorist groups (e.g., websites, social networks, and their related digital environment) and the violent radicalization of individuals who consume (or are exposed to) this type of online content; b) to assess (i.e., qualify) the current state of evidence; and c) to identify gaps and limitations in the literature and highlight future research needs. Consistent with the recommendations of Meleagrou-Hitchens and Kaderbhai (2017), we structured our search to include literature related to multiple forms of radicalization.

Method

The systematic search strategy is based on the Campbell Collaboration (<https://www.campbellcollaboration.org>) review methods. The Campbell Collaboration is considered today as the standard-bearer in systematic reviews, particularly in the social and human sciences.

Step 1: Formulate the Review Question and Set the Definitions

To guide the review's objectives and methods, we formulated the main research question as follows: "What are the links between exposure to violent radicalized content online and online

or offline violent radical outcomes among users?” This question structured the review process by identifying the target population, operationalizing the definitions of exposure variables and expected outcomes, and illustrating the links among different concepts of interest.

For the purposes of the current review, the term violent radicalization is defined as an individual or collective process that emerges from the friction of intercommunity relations and is associated with a situation of socio-political polarization, where the practices of dialogue between different groups are abandoned in favor of an escalation of confrontational and violent tactics (Schmid, 2013). Because Schmid’s (2013) definition provides an overarching and ecosystemic understanding of the phenomenon, it is of limited utility to operationalize micro-level/individual manifestations of violent radicalization. In order to operationalize the expected outcomes from the reviewed studies, we also employed Khosrokhavar’s (2014) and McCauley and Moskalenko’s (2009) definitions. More specifically, Khosrokhavar (2014) defines violent radicalization as the process of engagement and indoctrination into violent actions, taking into account its emotional and cognitive aspects. The process by which an individual or group comes to take a violent form of action is, in addition, directly linked to an extremist ideology that contests the established order at the political, social, or cultural level. McCauley and Moskalenko (2009) provide an additional distinction between political activism (participation in legal and non-violent political actions) and violent radicalization (political actions that are specifically violent and/or illegal).

Thus defined, violent radicalization may manifest itself as expressions of violent attitudes, participating in violent activities, or taking part in acts of political violence in order to defend the interests of one’s group through the attack, persecution, or elimination of members of the outgroups. Violent radicalization outcomes thus include hate-based emotions and attitudes, as

well as actual physical violence. We also accepted favorable attitudes towards violent radical online material as a valid outcome, as attitudes can be related to intentions and to actions.

For the purposes of this article, the Internet and social media encompassed static webpages with limited interaction features (“Web 1.0”), as well as social networking sites (e.g., Facebook, Twitter), blogs, wikis, video sharing sites (e.g., YouTube), and discussion forums, which would all fit under the “Web 2.0” umbrella (Cormode & Krishnamurthy, 2008).

Step 2: Set Inclusion/Exclusion Criteria

Inclusion and exclusion criteria were designed to maximize inclusiveness, which increases the likelihood of locating studies that, while using different conceptual frameworks (e.g., studies on terrorism), address outcomes most relevant to our review. This method also improves generalizability, consistency, and enables triangulation of evidence. The following inclusion criteria laid the rules for the evidence we considered admissible:

- Written in English, French, Spanish, Russian, Arabic, or Chinese (languages spoken by the members of the research team);
- Had to include qualitative or quantitative measures of effects/relations between violent radicalization or extremism or terrorism AND Internet or social media, on individuals’ emotions, cognitions, or behaviors;
- If this condition was met, we did not impose any restriction for study design, type, method, or date (up to April 2018).

Studies that did not empirically assess the relation between online exposure to radicalized violent content and cognitive, emotional, or behavioral outcomes were excluded from the review.

Step 3: Search the Literature

In consultation with a library science expert, we developed a search strategy that aimed to target an array of bibliographic databases and grey literature resources. Wherever possible, we made use of controlled vocabulary terms from database thesauri, and adapted the strategy by database to make full use of their features. To reduce “publication bias” (Bernard, Dercon, Orkin, & Taffesse, 2014), we conducted a thorough search for grey literature by searching the Web using Google for studies, reports, electronic journals, conference proceedings, and other relevant documents. Further, the websites of organizations working in the subject area of radicalization and countering violent extremism were manually searched for additional materials. If a set of authors published multiple papers using the same sample, analyses, and objectives (e.g., a government report later published in a scientific journal), only the latest version was retained. The complete list of examined databases, as well as sample search statements from our database and Google searches, can be found in the Supplementary materials.

Step 4: Select Studies for Inclusion in the Review

To eliminate clearly ineligible studies and assess inter-rater agreement, we cross-screened the abstracts among three pairs of raters. Inter-rater agreement was satisfyingly high (Cohen’s kappa of .81). Next, the teams reviewed and cross-reviewed the full-text documents for final eligibility. We used the PRISMA (<http://www.prisma-statement.org>) template to record the results of the literature searches in a flowchart (see Figure 1).

[Insert Figure 1 about here]

Step 5: Gather Information from Studies

We used preset coding sheets to extract the data and information from each selected study. Once completed, these sheets provided information on 18 categories (e.g., study design, participants, online exposure, online content, measures, outcomes, results, limitations).

Steps 6 to 8: Analyze, Integrate the Outcomes, Interpret the Evidence and Finalize the Report

We performed parallel aggregations of evidence according to types of study, exposure, outcomes, etc. The advantage of this aggregation method is that it can organize very heterogeneous data/evidence sets into meaningful wholes. We then synthesized the accumulated evidence as follows: a) the different themes that emerged from the literature; b) the degree of trust in each conclusion (e.g., robustness of studies); c) the generalizability and applicability of conclusions; and d) the limitations of existing knowledge and research gaps. Finally, we used a narrative synthesis method to integrate the results (Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009).

Results

Of the 5,178 studies generated from the searches, only 10 were eligible for inclusion in this review as they included some measure of relations between online exposure and online/offline outcomes. Following the reviewers' suggestions, four more were included, one was removed due to ethical concerns¹ (Bouzar, Caupenne, & Valsan, 2014), and two were removed because their dependent variables could not be clearly considered as manifestations of violent radicalization (Wojcieszak, 2008; 2011). The final set of 11 studies² reached a total sample of 6,935+³ individuals and around 44,000 Twitter accounts from seven countries (Belgium, Egypt, France, Germany, Kyrgyzstan, UK, USA), with sample sizes ranging from 8 (Koehler, 2014) to 6,020+ (Pauwels & Schils, 2016) participants. Among the six quantitative

¹ It was unclear if their data had been collected with the participants' full consent.

² They are identified in the References section by an asterisk.

³ Pauwels and Schils (2016) used two samples, but reported the number of participants for only one of them ($n = 6,020$), hence the suffix "+".

studies, two were cross-sectional (Pauwels & Schils, 2016; Wojcieszak, 2010), two were retrospective (Gill et al., 2017; Magdy, Darwish, Abokhodair, Rahimi, & Baldwin, 2016), and two included pre/post measures (Lee & Leets, 2002; Rieger, Frischlich, & Bente, 2013).

Qualitative studies extracted data from focus groups (Baines et al., 2010), interviews (Drevon, 2016; Koehler, 2014; Sikorskaya, 2017; Von Behr, Reding, Edwards, & Gribbon, 2013), and case studies (Drevon, 2016; Von Behr et al., 2013). Three of the 11 studies used samples mainly comprising young participants (Lee & Leets, 2002; Pauwels & Schils, 2016; Sikorskaya, 2017).

Authors reported three types of exposure to online content: a) radical Islamist propaganda and participation in radical Islamist forums/online groups (Baines et al., 2010; Drevon, 2016; Gill et al., 2017; Pauwels & Schils, 2016; Rieger et al., 2013; Sikorskaya, 2017; Von Behr et al., 2013); b) right-wing/neo-Nazi propaganda and participation in right-wing/neo-Nazi forums/online groups (Koehler, 2014; Lee & Leets, 2002; Magdy et al., 2016; Pauwels & Schils, 2016; Rieger et al., 2013; Von Behr et al., 2013; Wojcieszak, 2010); and c) radical left/environmentalist propaganda and participation in radical left/environmentalist forums/online groups (Pauwels & Schils, 2016). Authors also assessed three types of outcomes influenced by exposure to online radical material: a) emotional reactions (e.g., empathy, disgust) towards the presented radical content (Baines et al., 2010; Sikorskaya, 2017); b) change in radical attitudes (e.g., tolerance of terrorist acts after seeing propaganda videos) (Drevon, 2016; Koehler, 2014; Lee & Leets, 2002; Magdy et al., 2016; Rieger et al., 2013; Von Behr et al., 2013; Wojcieszak, 2010); and c) measurable behaviors (e.g., acts of terrorism/political violence) (Drevon, 2016; Gill et al., 2017; Pauwels & Schils, 2016).

Synthesis of Evidence

The following section synthesizes the current state of evidence on the links between exposure to online radicalized content and the emotions, cognitions, and behaviors of exposed individuals. Table 1 summarizes the details for each study.

[Insert Table 1 about here]

Emotional reactions to online radical material. Baines et al. (2010) documented participants' perceptions and emotional responses to five audio-visual clips extracted from a news channel offering a wide range of Islamist propaganda material. In general, the videos did not resonate with the participants, although some agreed with certain political segments of the propaganda speech. Videos showing perpetrators of violent acts triggered an empathic response in mothers because they perceived that perpetrators were mostly victims of socio-economic circumstances.

Sikorskaya (2017) interviewed 108 young people in Kyrgyzstan who were exposed to propagandist radicalized material. The author reported that online exposure to propagandist content generally elicited positive responses, especially content with violent or emotion-laden scenes. A considerable number of participants likely trusted the material because a) it was disseminated by people they identified with, b) was in their local language, c) contained quotations from the Quran, or d) matched what was shown on official media channels.

Link between exposure to online radical material and radical attitudes. Seven studies assessed the link between exposure to online radical material and radical attitudes. In an 18-month ethnographic study involving unstructured observations of Egyptian participants, Drevon (2016) found that Internet exposure facilitated the propagation of the Salafi jihadi ideology, but did not trigger its adoption. Unaffiliated youths were more inclined to adopt the Salafi jihadi

ideology, as expressed by certain participants who explained how exposure to certain messages and websites “opened their eyes”.

In Koehler (2014), eight former German right-wing extremists stated that the Internet contributed to their own radicalization process. For them, the Internet provided a cheap and efficient way to communicate and network, represented a “safe space” to exchange radical ideas, and gave the impression that their movement reached a critical mass of supporters. The in-depth analyses of the qualitative interviews suggested that the Internet was a major driving factor in “transmitting radical and violent ideologies and translating them into political activism” (Koehler, 2014).

Lee and Leets (2002) examined the responses of (mostly) Caucasian US adolescents who were exposed to white supremacist material online. The authors reported several interaction effects on persuasiveness ratings by types of exposure (implicit, explicit) and content (with/without plots or characters). For example, while persuasiveness ratings were initially highest for implicitly extremist content with plots or characters, these dropped significantly over time. In contrast, persuasiveness ratings were most stable for explicitly extremist content with plots or characters. They also increased over time for content that was explicitly or implicitly extremist and without plots or characters. Pre-held attitudes mattered, as greater predisposition to white supremacy led to higher increases in persuasiveness ratings – especially for plot or character-free material – while lower predispositions resulted in bigger drops in persuasiveness.

Magdy et al. (2016) analyzed the network features and content of Twitter users who expressed views on Muslims and Islam prior to and after the Paris attacks on Charlie Hebdo. The authors reported significant correlations between exposure to conservative media and holding violent views on Muslims and Islam after the attacks. Networking features, especially retweets

and mentions, had high predictive accuracy towards these opinions. Homophily (the inclination to interact with similarly minded individuals) was associated with stronger negative views on Muslims and Islam.

Rieger et al. (2013) studied the effects of extremist right-wing and Islamic propaganda videos on German male university students and vocational school pupils. Results showed that openness towards terrorist acts (as legitimate means to achieve one's goals) did not change among German-born non-Muslim students, regardless of the type of propaganda they viewed. However, non-Muslim immigrant students felt terrorism was more justified after watching right-wing videos, but their attitudes did not change after watching the Islamic extremist clips. In contrast, Muslim students increased their justification of terrorism after watching Islamic extremist videos, but not right-wing clips.

Von Behr et al. (2013) interviewed individuals either accused of terrorism or considered vulnerable to extremism. The results suggested that the Internet acts as an "echo chamber" that provides a greater opportunity to confirm existing beliefs than what is found in offline settings. While it did create more opportunities to become radicalized, it did not accelerate the process or allow radicalization to occur in the absence of "real world" social contact. For these individuals, the Internet seemed to be more of a catalyst than a cause of violent radicalization.

Wojcieszak (2010) analyzed cross-sectional and textual data from neo-Nazi and extremist environmentalist online discussion forums. For neo-Nazi participants, extremist attitudes were associated with more online participation. Offline exposure to views that were dissimilar to the extremist group's values reinforced the individual's radical beliefs (Wojcieszak, 2010). Textual analysis of postings in neo-Nazi forums provided supplementary support for the ability of

radicalized content to alter the participants' attitudes (some described an "awakening" following their interaction with other forum members; Wojcieszak, 2010).

Link between exposure to online radical material and radical behaviors. Three studies linked radical online content with radical behaviors. Gill et al. (2017) retrospectively examined open-source data for convicted UK-based terrorists. They reported that half of the actors used the Internet to learn about some aspect of their intended activity, while one third prepared their attacks using online resources (e.g., bomb-making instruction videos, surveillance advice). Furthermore, the authors estimated that 14% of the offenders engaged in violence after receiving online invitations to join the radical movement or commit a violent attack.

Similar results were found by Drevon (2016), who reported that three individuals successfully migrated to fight in Syria after being exposed to websites promoting radical Salafist ideas and taking part in online debates.

Pauwels and Schils (2016) found that consuming online radicalized content (white power, radical Islamism, or radical left) was positively associated with self-reported political violence among high school students from Antwerp and Liège and young adults in Flanders and Wallonia. The effect size and significant relation withstood despite control for potentially competing variables, such as predispositions towards radical ideas, thrill-seeking/impulsive personality traits, offline radicalized content, etc. Interestingly, actively seeking online content was more highly correlated with engagement in political violence compared to passive exposure.

Discussion

The reviewed studies provide tentative evidence that exposure to radical online content is associated with extremist online and offline attitudes, as well as higher risk of committing violent political acts. This was observed for individuals exposed to all types of radical

propaganda, highlighting the importance of focusing on all forms of extremism (Meleagrou-Hitchens & Kaderbhai, 2017). In addition, active seekers of violent radical material seemed to be at higher risk of engaging in political violence compared to passive seekers (Pauwels & Schils, 2016).

There is some evidence that the Internet and social media act as catalysts of extremist violence because individuals at risk can actively seek material to feed their interests, join online and offline groups, and obtain information to plan attacks (e.g., Gill et al., 2017). Interacting online with like-minded people can exacerbate extremist attitudes (e.g., Wojcieszak, 2010) and determine negative views about a community (e.g., Magdy et al., 2016). Furthermore, online interaction in homogeneous groups can strengthen extremist opinions, particularly when individuals interact offline with people who hold dissimilar views (Wojcieszak, 2010).

There is, however, no clear support for the claim that the Internet and social media act independently of other offline factors. In this sense, Drevon's (2016), Gill et al.'s (2017), and Von Behr et al.'s (2013) observations on the intricacies of online and offline networks in the trajectory to violent radicalization are relevant and merit further attention. Given the current state of evidence, it can be concluded that the roles of the Internet and social media seem to be ones of decision-shaping, which, in association with offline factors, can trigger or facilitate decision-making, particularly so for active seekers of extremist online content (Alava et al., 2017).

Limitations

The current state of the evidence is limited on several topics of importance such as: a) the intersections between online participation and offline violent actions; b) the efficacy of "training" in online environments; c) the influence of cloaked websites; d) the effect of active

seeking vs. passive and accidental online encounters; e) the common and differential impacts of frequency and type of exposure; and f) gender-related differences.

Researchers interested in the field of online-to-offline violent radicalization (and vice versa) face significant conceptual, methodological, and ethical challenges. A first limitation is the paucity of explicit developmental, process, or trajectory based theoretical approaches to inform research designs, objectives, and the interpretation of data. Authors a) seldom mention any theory of online effects on offline behaviors among youth, b) how the Internet, in interaction with the developmental needs of adolescents, for example, may contribute to radicalization dynamics, and c) they typically adhere to different paradigms (Meleagrou-Hitchens & Kaderbhai, 2017). That said, there has been a welcome shift away from the online vs. offline dichotomy (Gill et al., 2017) towards a more holistic model that considers the ways online and offline dimensions interact with complex political, social, interpersonal, and psychological processes.

A second limitation is the failure to properly define what is meant by radical violent outcomes. They are operationalized imprecisely, and it is not always apparent why some outcomes are qualified as examples of violent radicalization. Given the prevalence of terms such as “radicalization,” “extremism,” and “terrorism” in research and mainstream/social media debates, it is important for researchers to question the ideological and socio-political connotations these terms imply in order to arrive at some impartial research-guiding definitions (Rousseau et al., 2016). This also applies to the definition of the Internet and social media, as they are often taken for granted and not described in much detail.

On a methodological level, studies suffer from important limitations not always acknowledged by their authors. Most quantitative studies use retrospective (Gill et al., 2017;

Magdy et al., 2016) or cross-sectional designs (Pauwels & Schils, 2016; Wojcieszak, 2010), which makes direction of effect impossible to determine. Most studies are based on self-reports with small (e.g., Koehler, 2014), convenience, or self-selected samples (e.g., Drevon, 2016), which limits generalizations. They also typically lack comparison groups or do not include baseline measures of pre-held violent radical cognitions or behaviors, making it impossible to determine the actual change in outcomes due to online exposure (e.g., Baines et al., 2010). In addition, most authors do not compare differences in outcomes across sources, frequency of exposure, or type of content.

Further limitations pertain to the ethical challenges related to this type of research, such as the associated security risks and the measures adopted to alleviate them (e.g., Drevon, 2016) or the bias and chilling effect on participants' online activities (Alava et al., 2017). Other issues include respect of privacy rights, protection of vulnerable individuals, and the potential misuse of information by different stakeholders. Meanwhile, researchers who study criminalized violent radicals often work without access to crucial information that is classified (e.g., Gill et al., 2017). In fact, obtaining data on sources or frequency of exposure is very difficult for researchers, and most likely only feasible within intelligence agencies, as it requires access to backdoors in social media operators. This poses the tremendous ethical challenge of extracting data without users' knowledge and consent.

Conclusions and Desiderata

Research into online-to-offline radicalization has yet to gain a critical mass for it to appear credible in its conclusions. The extent to which online exposure has an effect on actual violent radicalization remains under-researched, and models of influence are under-theorized. As

a result, the reviewed studies fail to provide evidence on how radicalized online content influences offline outcomes, in interaction with external and internal risk and protection factors.

Nonetheless, the scarcity of empirical research offers vast opportunities for future studies in terms of topics and methodologies. One promising avenue comes from longitudinal, prospective studies of political violence or of offending over the life-course. These designs unravel questions such as how people become exposed to extremist settings (Gill et al., 2017) and how they develop propensities for political violence (Pauwels & Schils, 2016). Researchers should consider increasing the number of concurrent/comparative analyses, as this would clarify the impact of variables such as developmental needs/stages, gender, platform types, content, and online to offline reciprocity (Wojcieszak, 2010). Future studies would also benefit from baseline or pre/post measures (e.g., ideological predispositions, previous engagement in radical violent groups) in order to determine more clearly the effect of online exposure on online and offline behaviors (Magdy et al., 2016). Finally, even though youth are among those most likely to be targeted online by violent radicalized groups, only a limited number of studies focused on young participants (Lee & Leets, 2002; Pauwels & Schils, 2016; Sikorskaya, 2017). Future studies could explore if exposition to radicalized content online affects youth differently than adults, and if so, by which specific processes. Additionally, it could explore the efficacy of counter-narratives, as young people have the potential to play a central role in opposing radical groups and the violent ideologies they promote, namely through the construction and dissemination of alternative narratives that will compete with radicalized ones.

On a parting note, the misbalance in the number of studies coming from Europe and North America compared to other regions is likely to somewhat bias not only the construction and validity of theoretical models, but also the interpretation of results. Since violent

radicalization is a global phenomenon, research may benefit from becoming more globalized itself. Given their size and funding advantages, research centers in North America and Europe should aim for greater interdisciplinarity and invest more heavily in projects that reflect the rich mosaic of research contexts that surround them.

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Tables

Table 1
Study Characteristics and Summary of Evidence

Study	Design	Sample Characteristics	Measures of Exposure	Measures of Radicalization	Main Results and Conclusions	Limitations Not Covered by Authors
Baines et al. (2010)	Qualitative (focus groups)	British Muslims of Pakistani and Bangladeshi background ($N = 31$) recruited by Ipsos MORI street interviews to take part in four discussion groups	Audio-visual clips with radical content (Islamist propaganda from the memri.tv online platform)	Perceptions and emotional responses to the content (being empathetic or in agreement)	-Most of the material was received with disagreement -For some (e.g., mothers), the material triggered feelings of empathy -Some of the clips seemed appealing to a certain point for some respondents (e.g., Zawahiri's speech regarding US imperialism)	-No pre/post measures -Unclear if the online material had an impact or if it reflected pre-held opinions
Drevon (2016)	Qualitative (interviews + case studies)	Semi-structured interviews and unstructured observations (18-month ethnographic research in Cairo [$N = 31$])	Participation in online debates about Salafism and exposure to websites promoting jihadism	Changes in attitudes and behaviors (becoming receptive to Salafi jihadi ideas, immigrating to Syria to join the fight)	-The Internet alone did not trigger the adoption of Salafi jihadi ideational frames -Online publications can facilitate the propagation of the Salafi jihadi ideology -Unaffiliated youth are vulnerable to adopting these new ideas -Three participants moved to Syria, and four others contemplated the idea	-Information about the sample are missing -No recommendations are made
Gill et al. (2017)	Quantitative (retrospective)	Terrorists ($N = 223$) convicted in the UK or that died while carrying out an act of terrorism in the UK	Exposure to online radicalized content (Islamist propaganda) before acting out	Terrorist attacks	-61% had evidence of online radicalization and/or planning an attack -54% used the Internet to learn about some aspect of their intended activity -32% prepared for their attacks by using online resources -14% engaged in violence after witnessing something online	None noted by the coder

Koehler (2014)	Qualitative (interviews analyzed in MAXQDA)	Eight former German right-wing extremists (six men, two women, mean age = 26.6). Four of the interviewees entered the right-wing movement before the Internet was available nationwide and commonly used.	Self-reported level of participation in right-wing online groups	Patterns found in the interviews revealing how the Internet fostered the radicalization process of the participants	<p>The Internet:</p> <ul style="list-style-type: none"> -Provides a cheap and efficient way to communicate and network, resulting in a better integration of each member into the movement -Provides anonymity and a constraint-free space, motivating individuals to speak more radically online than they would offline -Provides a space to share information about the chosen lifestyle -Leads to radicalization through online discussions -Gives individuals the perception of a critical mass within the movement -Is the most important retailer space for right-wing merchandise <p>Some interviewees, mostly the ones who entered the movement before the rise of the Internet, were skeptical about its role in individual radicalization processes.</p>	None noted by the coder
Lee & Leets (2002)	Quantitative (pre/post)	US teenagers recruited online by a market research firm (<i>N</i> = 108)	Exposure to a text and image found on a white supremacist forum	<p>Three measures were taken a) immediately after watching the content and b) two weeks later:</p> <ul style="list-style-type: none"> -Acceptance of the content -Approval of the content -Resistance to the content through the degree of directionality, intensity, and focus of the participants' open-ended answers 	<ul style="list-style-type: none"> -Participants responded favorably to content that was plot- or character-based, as well as ambiguous, but this effect decreased over time -Responses to content that was "high-narrative" and clear remained constant -Responses to content that was either a) not plot- or character-based and "implicit" or b) "high-narrative" and "implicit" increased somewhat -These responses were differentially influenced by the participants' initial receptivity to the content 	<ul style="list-style-type: none"> -Single exposure to white supremacist material among a restricted sample -Certain findings are difficult to interpret and not fully developed -Future research recommendations remain at the "what" rather than the "how" level

Magdy, Darwish, Abokhodair, Rahimi, & Baldwin (2016)	Quantitative (retrospective)	Information and tweets of 44k US-based Twitter accounts that made tweets related to the Paris attacks	Network interactions, tweet content, and identity of users (pre-attack)	Negative and/or hateful attitudes towards Muslims and Islam (post-attack)	-23% of the accounts/tweets held negative views on Muslims and Islam -Significant correlation between exposure to conservative media and holding negative views on Muslims and Islam -Homophily cemented peoples' attitudes -The most frequent hashtags after the attacks were #KillAllMuslims, #DeportAllMuslims	-Characteristics of the Twitter accounts are not provided -No discussion about any possible limitations to the study
Pauwels & Schils (2016)	Quantitative (cross-sectional with control variables)	Two settings: -Paper-and-pencil survey in 66 high schools in Antwerp and Liège (<i>n</i> unspecified) -Facebook web survey of young adults in Flanders and Wallonia (<i>n</i> = 6,020)	-Actively seeking contact with violent extremists on social media -Forum discussions on white power, radical Islamism, or radical left -Having online or offline contacts with radicals in the last 12 months	Self-reported political violence towards property and persons	-Different measures of exposure to violent extremism were related to political violence -Actively seeking online extremist content was more predictive than passive exposure -Exposure to online content still had an effect after control variables were accounted for (prior dispositions, thrill-seeking/impulsivity, peer racism/delinquency, etc.)	Some important details were missing from the sample (most notably, the <i>N</i>)
Rieger, Frischlich, & Bente (2013)	Quantitative (pre/post)	German male university and vocational school students of different cultural backgrounds watched extremist propaganda videos (<i>N</i> = 277)	Self-reported evaluations of the videos (two types: right-wing and Islamic extremist)	Changes in attitudes expressed in the "Justifications of Terrorism Scale"	-German students did not show a change in attitudes towards terrorism regardless of the type of extremist propaganda viewed -Non-Muslim immigrant students increased their justification of terrorism after watching right-wing videos (but not after watching the Islamic extremist clips) -Muslim students increased their justification of terrorism after watching Islamic extremist videos (but not right-wing clips)	None noted by the coder
Sikorskaya (2017)	Qualitative (interviews)	108 young social media users from selected regions of Kyrgyzstan who were likely targets for ISIS recruitment	Reported exposure to ISIS online propaganda (videos, reports, slideshows, etc.)	Attitudes and behaviors towards ISIS propaganda	-61% of the respondents were in favor of and trusted the radicalized messages -20% sympathized with the cause -19% felt their moderate version of Islam was incompatible with the presented materials -Recruitment comprised a four-stage process occurring "locally" (i.e., via relatives, friends, classmates, coworkers, etc.)	The researcher did not know at which stage of the recruitment process each respondent was positioned

<p>Von Behr, Reding, Edwards, & Gribbon (2013)</p>	<p>Qualitative (interviews + case studies)</p>	<p>15 individuals from the UK: -9 were convicted for terrorism -1 was disengaged from Al-Qaeda -5 were considered vulnerable to violent extremism and going through the PREVENT program</p>	<p>-Self-reported use of the Internet to seek out radical content (Islamist and right-wing) -Self-reports were cross-referenced with trial documents and computer registries</p>	<p>Five possible outcomes whereby the Internet: 1) Creates more opportunities to become radicalized 2) Acts as an “echo chamber” 3) Accelerates the process of radicalization 4) Allows radicalization to occur without physical contact 5) Increases opportunities for self-radicalization</p>	<p>-Evidence from the case studies supported hypotheses 1, 2, but not 3, 4, and 5</p>	<p>None noted by the coder</p>
<p>Wojcieszak (2010)</p>	<p>Quantitative (cross-sectional) + text analysis to support interpretation of quantitative findings</p>	<p>Participants who took part in discussions in neo-Nazi online forums and who responded to an online survey sent by the authors (<i>N</i> = 114)</p>	<p>Self-reported level of participation in radicalized online groups (neo-Nazi forums)</p>	<p>Opinion extremism: ideology-specific statements (e.g., violence against non-white people is a natural ritual passage into true manhood) presented and rated by participants</p>	<p>-Opinion extremism was predicted by participation in online groups -Having a social group who either strongly approves or strongly disapproves radicalized ideas was associated with higher levels of extremism - Being exposed to moderate opinions could be a protective factor -Textual analysis were in line with the two quantitative results</p>	<p>-Problems with operationalization of some variables -Not enough relevant control variables -Sample limitations (no non-radicalized participants)</p>

Figures

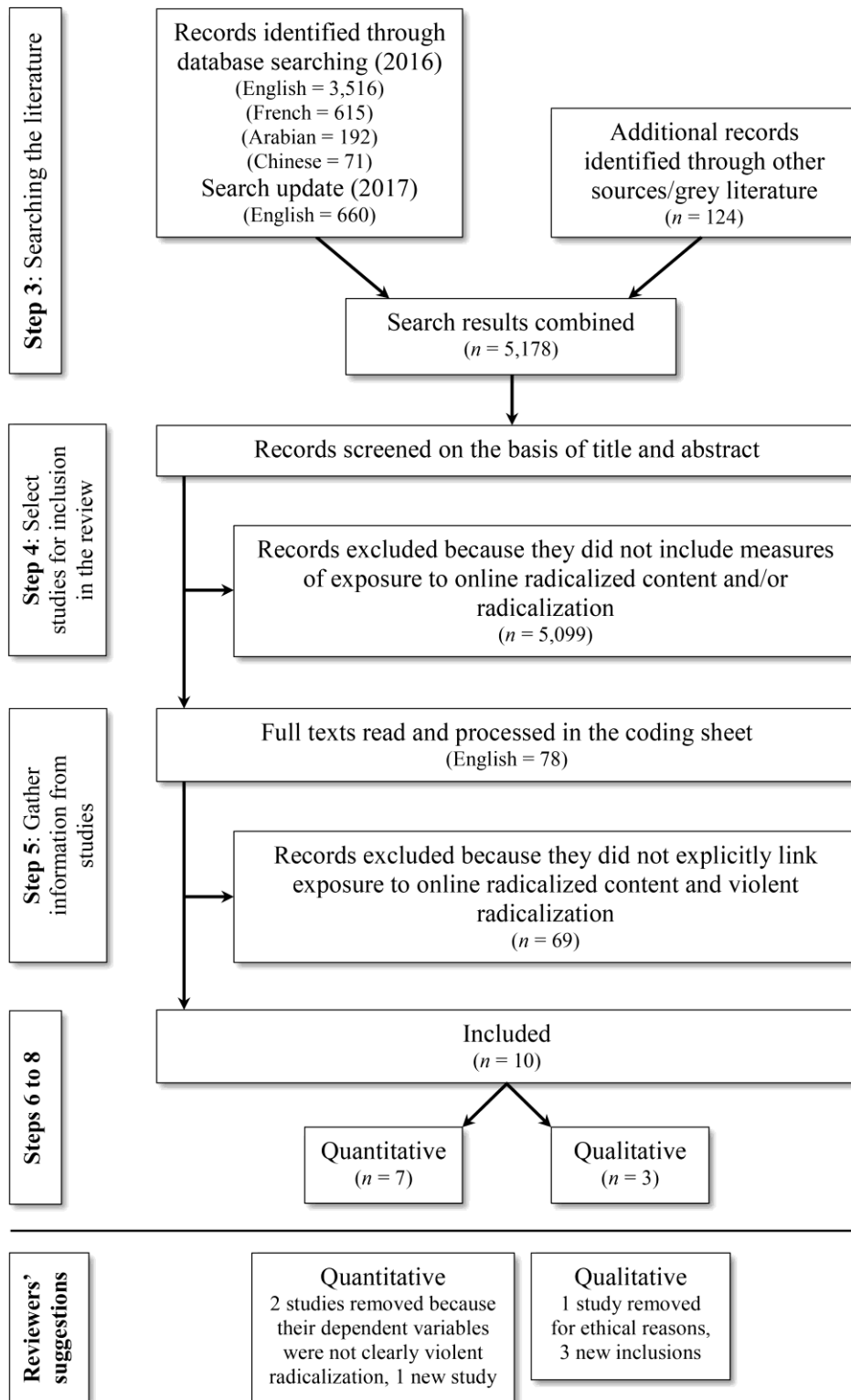


Figure 1. Flowchart of the literature search

Supplementary Materials

Databases Searched

Databases searched were: PsycINFO (EBSCO), Political Science Complete (EBSCO), Academic Search Complete (EBSCO), Education Source (EBSCO), ERIC (EBSCO), Communication Abstracts (EBSCO), Dissertations & Theses Global (ProQuest), Sociological Abstracts (ProQuest), SocINDEX (EBSCO), Francis, and Web of Science.

Database Search Example

The following example is the search run in the Political Science Complete database:

("Radical Islam*" OR "Islamic Extrem*" OR Radicali* OR "Homegrown Terror*" OR "Homegrown Threat*" OR "Violent Extrem*" OR Jihad* OR Indoctrinat* OR Terrori* OR "White Supremacis*" OR Neo-Nazi OR "Right-wing Extrem*" OR "Left-wing Extrem*" OR "Religious Extrem*" OR Fundamentalis* OR Anti-Semitis* OR Nativis* OR Islamophob* OR Eco-terror* OR "Al Qaida-inspired" OR "ISIS-inspired" OR Anti-Capitalis*)

AND

(DE "CYBERSPACE" OR DE "ONLINE social networks" OR DE "ONLINE social networks -- Law & legislation" OR DE "TELECOMMUNICATION systems" OR DE "INFORMATION technology -- Political aspects" OR DE "INTERNET & immigrants" OR DE "INTERNET" OR DE "INTERNET & activism" OR DE "INTERNET & terrorism" OR DE "VIRTUAL communities" OR DE "ELECTRONIC discussion groups") OR ("social media" OR "social networking" OR online OR bebo OR facebook OR flickr OR foursquare OR friendster OR hulu OR instagram OR linkedin OR meetup OR pinterest OR reddit OR snapchat OR tumblr OR xing OR twitter OR yelp OR youtube)

Google Search

Searches were conducted by the library science expert and run using the Google search engine; because the goal was to locate grey literature and non-traditional publication types, the full Google search engine was used and not Google Scholar, which would have returned mainly journal articles. An exhaustive single search statement is not possible using Google so a series of searches were run, varying the keywords employed. The first five pages of results were reviewed and relevant materials manually entered into the project's Endnote database. Some sample searches were:

- radicalization research report (online OR "social media" OR "social network") filetype:pdf
- radicalisation research report (online OR "social media" OR "social network") filetype:pdf
- de-radicalisation research report (online OR "social media" OR "social network") filetype:pdf
- de-radicalization research report (online OR "social media" OR "social network") filetype:pdf
- radicalization Internet recruitment research study filetype:pdf
- radicalization ("social media" OR "social network") empirical study filetype:pdf
- ("countering violent extremism" OR CVE) ("social media" OR "social network") filetype:pdf