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# A Diachronic Cross-Platforms Analysis of Violent Extremist Language in the Incel Online Ecosystem

Stephane Baele <sup>a</sup>, Lewys Brace <sup>b</sup>, and Debbie Ging <sup>c</sup>

<sup>a</sup>Department of Social and Political Sciences, Philosophy, and Anthropology, Centre for Advanced International Studies (CAIS), University of Exeter, UK; <sup>b</sup>Department of Social and Political Sciences, Philosophy, and Anthropology, Q-Step Centre, University of Exeter, UK; <sup>c</sup>School of Communications, Dublin City University, Ireland

## ABSTRACT

The emergence and growth of incel subculture online has triggered a considerable body of research to date, most of which analyzing its worldview or mapping its position and connections within the broader manosphere. While this research has considerably enhanced our understanding of the incel phenomenon, it tends to offer a somewhat static, one-dimensional portrayal of what is—like all online subcultures and communities—a highly dynamic and multi-layered environment. Consequently, we lack sufficiently nuanced answers to what is arguably a critical question for law enforcement and academics alike: is this a violent extremist ideology? Using a uniquely extensive corpus covering a range of online spaces constitutive of the incelsphere spanning several years, we analyze the evolution of incel language across both time and platforms. Specifically, we test whether this language has grown more extreme over time as online spaces shutdown and others emerged. Our findings demonstrate that, while levels of violent extremist language do vary across the incelsphere, they have steadily increased in the main online spaces over the past 6 years. Further, we demonstrate that, while activity on these online spaces is responsive to offline events, the impact of these on violent extremist ideation is not uniform.


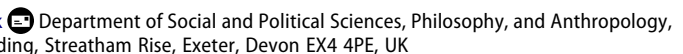
## KEYWORDS

Incel; incels; incelsphere; extremism; ecosystem

## Introduction

In recent years, acts of violence inspired by “incel” ideas—either directly or partially as part of “Mixed, Unclear, Unstable” (MMU) ideologies—have become regular occurrences in the United States, Canada, and more recently the UK, fuelling a growing concern and uncertainty among Western security and intelligence services over this online subculture and its offline impact. When prosecuting acts such as Minassian’s van rampage in Canada or Friel’s preparation of an attack in Scotland,<sup>1</sup> law-enforcement often struggled to identify the appropriate legal categories. Similarly, academic debates have questioned the exact nature of the phenomenon, crucially whether there is such a thing as an incel “ideology” and whether it really constitutes a form of extremism.<sup>2</sup> Far from being mere terminological controversies, these debates have critical consequences for the evolution of terrorism legislation and the attitude of law enforcement vis-à-vis incel communities. In the UK, for example, the 2019 Report from the Independent Reviewer of Terrorism Legislation<sup>3</sup> directly addressed this issue, and in the same year Canada decisively listed Inceldom as a violent extremist ideology. Academics have weighed in, intensifying their scrutiny of the “incelsphere”<sup>4</sup> and critically assessing the pertinence of the terrorism label to characterize this form of misogynistic violence.<sup>5</sup>

At the heart of these debates lies the question of exactly how concerning discussions found in the incelsphere are, from a violent extremism perspective. Most scholars point to the extreme level of

**CONTACT** Lewys Brace  L.Brace@exeter.ac.uk 

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misogyny in these discussions and their regular endorsement of violence against women,<sup>6</sup> even suggesting that incel spaces score similar levels of “toxicity of discussion” as far-right platforms.<sup>7</sup> Others nuance this analysis by showing that most incel content exhibits typical anxieties of young men transitioning to adults,<sup>8</sup> and that most incels reject violence and struggle with mental health issues.<sup>9</sup> While providing important, initial insights into the incel worldview and narratives, most of the existing research has, we argue, been limited by focusing on a single online space and with little consideration for evolution across time. Research into this phenomenon now needs to be complemented by more dynamic approaches, offering both diachronic and cross-platform analyses, in order to construct a more sophisticated appraisal of violent extremist ideation in the incelsphere. Inspired by new ecological/ecosystems approaches to online extremism,<sup>10</sup> the present paper makes an ambitious step in this direction, selecting linguistic markers of violent extremism—narrowly understood here as the endorsement of violence against dehumanized outgroups—and tracking their evolution across time on multiple platforms constituting the incelsphere. This diachronic cross-platform analysis complements Ribeiro and colleagues’<sup>11</sup> recent analysis of the chronological evolution of the structure of the manosphere (including the incelsphere), which paved the way towards dynamic evaluations of misogynistic ecosystems.

We proceed in three main steps. *First*, we situate our research question within the broader literature on the incel worldview, using the scholarship on extremist language and the evolution of extremist ideologies to raise the specific hypotheses guiding our research. *Second*, we present our data—a unique corpus of 11,717,516 posts (331,708,990 words and associated metadata) collected across seven different types of platforms (thirty-two separate entities) used by incels—and explain our computer-assisted content analysis method. We built a custom, incel-specific dictionary capturing the intensity of violent extremism in incel text and used it to conduct two types of analyses (longitudinal time-series and semantic correspondence), tracking the evolution of this type of language across time and platforms. *Third*, we present and discuss our results, which indicate a clear, steady overall increase of violent extremist language in the main lineage of incel online spaces across six years. Our findings also demonstrate the heterogeneity of the incelsphere, which is constituted by a range of platforms whose respective toxicity can vary widely. A conclusion summarizes our main findings and acknowledges shortcomings to pave the way for further research.

This research contributes to existing scholarship in three important ways. *Empirically*, this paper provides a rigorous analysis of the evolution of violent extremism in the incelsphere across both time and platforms, building a solid basis for ongoing evaluations and debates on the extremist or ideological character of the incel phenomenon. *Theoretically*, it advances our understanding of how extremist ideologies evolve and change,<sup>12</sup> and enriches the diverse research agenda on the role of the internet in fostering extremism and terrorism.<sup>13</sup> *Methodologically*, we offer to the research community, not only a uniquely large corpus of incel content but also a new dictionary of incel violent language.

## **Towards a dynamic evaluation of incel violent extremism**

Research on incel online spaces has proliferated over the past few years, especially in the wake of Minassian’s attack in April 2018, with efforts mostly concentrated on deciphering the jargon-heavy lexicon and underlying worldview. Building on Ging’s<sup>14</sup> pioneering contextualization of incel communities as a particularly problematic corner of the broader ideational landscape of the “manosphere,” both Jaki and colleagues<sup>15</sup> and Baele, Brace, and Coan<sup>16</sup> have used a variety of computational text analysis methods to raise concerns about the toxicity of the incel worldview. The former showed that a “considerable proportion of the discourse classifies as hate speech, with the forum brimming with misogynist, anti-feminist, and homophobic utterances,”<sup>17</sup> while the latter concluded that “the Incel worldview as expressed in online spaces like Incels.me is an extremist one in terms of its logics of categorization and explanation.”<sup>18</sup> For Baele and colleagues, incel discourse demonstrates typical markers of extremist language: an essentialist categorization of society into sharply delineated

ingroups and outgroups where the latter are linguistically dehumanized, and a conspiratorial narrative presenting the ingroup as the victim of an all-powerful structure of oppression.<sup>19</sup> Subsequently, Chang<sup>20</sup> unpacked how the “femoid” label used by incels works to dehumanize women, and O’Malley, Holt, and Holt<sup>21</sup> concluded that the incel worldview is organised around five key normative orders: women being naturally evil and cruel, men being oppressed, traditional masculinity being legitimized and desirable, society being a sexual marketplace, and finally violence being excused as a result of the four others. This worldview and its justification for violence is being cemented in online discussions through a range of linguistic and visual practices; for example, Witt<sup>22</sup> has documented how a glorified, “sanctified” figure of Elliot Rodger—who killed six people in California in 2014—became ubiquitous in incel forums, serving as an alternative “reality construction that allows for the justification, enactment, and celebration of extreme violence.” A qualitative analysis of more than 3,000 forum posts discussing the 2018 Toronto van attack similarly revealed “overwhelming support among self-proclaimed incels for the attack and violence more generally”<sup>23</sup>

Scholars have situated these ideas within the broader ideational landscape of the “manosphere” and, while other parts of the manosphere might quantitatively have greater offline impact, it has been suggested that the incelsphere constitutes its most extreme or toxic subculture in terms of content.<sup>24</sup> Many incel terms and concepts—e.g., lookism, feminism as a corruption of the natural order, society as a sexual marketplace, “pillings” metaphors (blue, red, and black pills), and dehumanizing conceptions of women as only driven by lust—stem from pre-existing communities of a more mainstream “networked misogyny,”<sup>25</sup> such as Men’s Rights Activists (MRA), Men Going Their Own Way (MGTOW) or Pick Up Artists (PUA). These groups are similarly concerned with the alleged feminization of the world, the concept of masculinity in crisis, and the perceived erosion of binary and hierarchical gender views, which ultimately creates a sense of male victimization and hatred towards women and liberals.<sup>26</sup> Social media platforms have also created novel opportunities for these misogynistic views to evolve and be disseminated more widely than ever before, resulting in a large online misogynistic ecosystem that some have referred to as a “toxic technoculture.”<sup>27</sup> As a result, the manosphere has come to house increasingly violent and hostile views towards women and other select groups, with subcultures such as incels and MGTOW representing the most extreme elements.<sup>28</sup> Moreover, recent work has pointed at both direct overlaps and ideological cross-pollination between the incel (but also the broader manosphere) and far-right online ecosystems,<sup>29</sup> with some arguing that far-right entrepreneurs actively use the insecurities of incels and their anti-female supremacist views to lure them into forms of white supremacy.<sup>30</sup>

While this research has greatly enhanced our understanding of the incel worldview and its connections to ideas of the surrounding manosphere and adjacent far-right ecosystem, we suggest that it fails to capture the dynamism and heterogeneity of different incel formations, and therefore points to a simplistic understanding of extremism and associated acts of violence. In reality, incel subculture comprises a range of intersecting communities hosted by diverse platforms, which have their own unique conventions and affordances (sub-Reddits, “chan” image-boards, internet forums, etc.) and logic of evolution over time. Now that a good baseline understanding of the subculture has been established, research needs to adopt a more dynamic, ecological approach to account for potential chronological evolutions and cross-platform differences. Crucially, Ribeiro and colleagues<sup>31</sup> have provided a first diachronic analysis of the broader manosphere, documenting that “milder and older communities, such as Pick Up Artists and Men’s Rights Activists, are giving way to more extremist ones like Incels and Men Going Their Own Way,” and suggesting that “these newer communities are more toxic and misogynistic than the older ones.” The present paper continues in this vein by zooming in on the incelsphere and assessing whether its different online spaces display similar or different levels of violent extremism, and whether these levels have evolved across time. This approach also dovetails with some of the survey research that has been conducted among self-identified incels, which shows that extremist views and the endorsement of violence are not uniformly held.<sup>32</sup>

A number of theoretical frameworks relating to the evolution of extremist views, spaces, and communities across time allow us to raise specific hypotheses on the evolution of extremism in the



incelosphere. At the most general level, work carried out in the lineage of Myers' paradigm of polarization through group deliberation<sup>33</sup> has repeatedly shown that discussion between politically like-minded people gradually leads, under certain circumstances, to enhanced support for radical views and greater endorsement of violence.<sup>34</sup> These processes apply to the online world: politically coherent online spaces tend to become echo-chambers that foster polarization,<sup>35</sup> and some of these echo-chambers radicalize their members even if they have no offline contact with extremists.<sup>36</sup> From this literature, we can raise our first, main hypothesis:

**H1:** Discussions hosted by the incelosphere have displayed increasing levels of violent extremism over time.

However, other theoretical frameworks encourage us to nuance this general hypothesis. *First*, detailed genealogies of extremist movements, including terrorist ones, document the commonality of “splintering” processes, whereby extremist ideologies tend to fragment over time into a range of sub-ideologies supported by rival factions, with one splintering “avenue,” usually a minority one going towards increasing radicalism.<sup>37</sup> Indeed, as the aforementioned study by Ribeiro and colleagues<sup>38</sup> demonstrates, the incel subculture is already a more extreme splinter of the manosphere. *Second*, studies of other extremist online ecosystems revealed that established extremist spaces can induce a chain-reaction of increasingly radical offshoots, with the main platform closure sometimes acting as a trigger. Baele, Brace, and Coan's<sup>39</sup> analysis of the Chan image-boards, for example, showed that the proliferation of boards on the back of 4chan ended up producing a “three-tier” hierarchy of decreasing popularity but increasing extremism. *Third*, significant external events are known to encourage/discourage extremism. Of special relevance here are acts of violence inspired by the ideology, which can either inspire or disgust members, thereby increasing extremism or/and triggering the creation of sub-communities with a clear stance against violence. Baele, Brace, and Coan, for example, documented a “Tarrant effect” on 8chan, where the Christchurch shooting was applauded and inspired further violence.<sup>40</sup> Similarly, Witt's<sup>41</sup> abovementioned study offered qualitative evidence that Elliot Rodger is celebrated as a “saint” in incel forums in ways that imply an endorsement of violence. Also relevant for the incel case is the impact of the COVID-19 pandemic and lockdown(s); Davies, Wu and Frank have already shown that one incel forum experienced a “sustained increase in activity” during the pandemic, which constitutes a fertile situation for more extremist views to develop.<sup>42</sup> In sum, these three different strands of the literature suggest, in different yet convergent ways, that extremist (online) ideologies do not evolve in a uniform, linear way but rather through a more uneven process involving splintering into both more and less radical variants. We can therefore offer the following, second hypothesis with its two sub-hypotheses:

**H2:** The general evolution of incel online discussions towards more violent extremism has not been uniform.

**H2a:** Different platforms host more/less violent extremist content, representing lineages of ideological splintering of the incel community.

**H2b:** External events—acts of incel-inspired violence and the COVID-19 lockdown—have triggered increases/decreases in violent extremist content.

## Data and methods

To evaluate whether the incelosphere's violent extremism increased in such a way over time and platforms, we harness computational methods to analyze a uniquely large corpus of online incel content and accompanying metadata.

## Data

After extensive exploration of incel online spaces using classic snowballing and outlinks techniques, a series of custom-built web scrapers were developed in the generic high-level programming language Python to collect the content of a range of pertinent spaces. These scrapers utilised several common packages such as *Scrapy* (<https://scrapy.org/>) and *Requests* (<https://pypi.org/project/requests/>). Depending on the platform being scraped, various APIs were used to aid data extraction where appropriate, for example the Telegram scraper we developed used the Telethon API (<https://docs.telethon.dev/en/stable/>). Data collection was done first-hand by the researchers, following a double process of ethics clearance, with the only exception of the sub-Reddits */r/Incel*, */r/Incels*, */r/Braincels*, and */r/IncelsWithoutHate*.<sup>43</sup> These sub-Reddits were shut down for violating Reddit's terms of service in relation to hate speech and bullying long before this project began, so their content was extracted from the [Pushshift.io](https://pushshift.io) open-source data archiving site, which has been collecting Reddit data and making it freely available to researchers since 2015.<sup>44</sup> **Table 1** below provides key descriptive statistics for the assembled corpus. This dataset totalling no less than 11,717,516 posts and 331,708,990 words (with associated metadata) is made available to the scholarly community for further analysis.<sup>45</sup>

**Figure 1** below plots the activity on the main types of platforms across time, with daily posts for each online space aggregated to the level of platform type; for example, the blue line depicts the total number of posts made to all forums listed in the above dataset on any given day. **Figure 2** breaks down the data underpinning **Figure 1** by displaying the total posts per individual online space on any given day for the various platforms (forums, sub-Reddits, and chan boards,

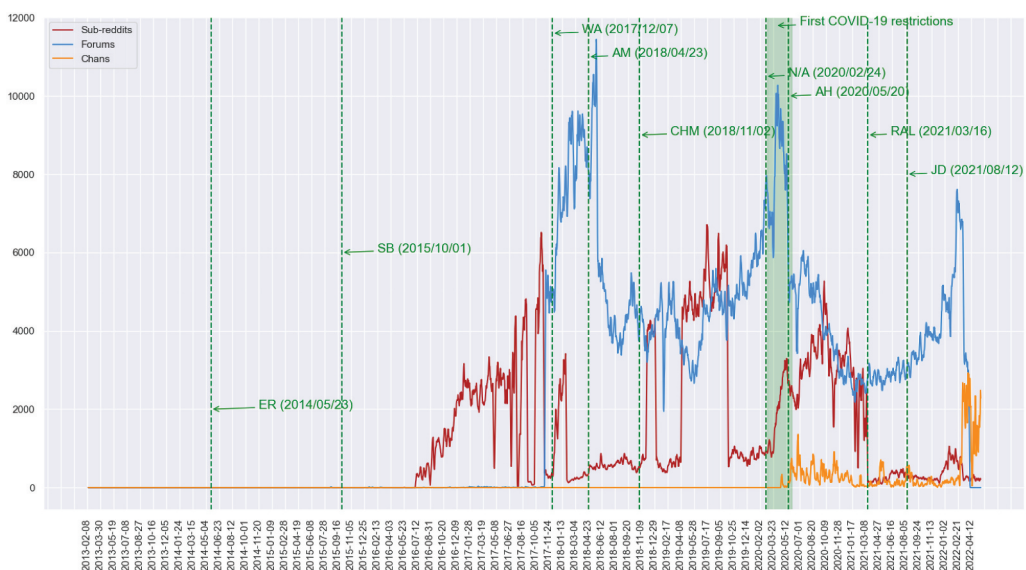
**Table 1.** Corpus descriptive statistics

Platform name	Type	Earliest date	Latest date	Average post length (words)	Total posts	Total words
Redpill blog	Blog	13/05/2015	25/01/2022	116.87	483	56,451
Incel blog	Blog	13/07/2020	12/09/2021	675.15	26	17,554
4chan/r9k	Chan board	27/02/2022	18/05/2022	28.71	133,020	3,819,405
9chan/leftcel	Chan board	21/04/2020	17/05/2022	52.42	157,372	8,250,335
Incel.me	Forum	08/11/2017	23/05/2018	47.19	769,854	36,336,939
Incel.is	Forum	07/11/2017	05/04/2022	22.52	6,211,489	139,900,477
Incel.net	Forum	13/11/2017	06/07/2021	27.7	288,552	8,012,000
Blackpill club	Forum	14/12/2021	11/03/2022	69.79	871	60,788
Looksmaxxing.com	Forum	04/07/2019	11/03/2022	44.02	25,638	1,128,674
Looksmax.org	Forum	10/08/2018	13/03/2022	68.65	255,440	17,538,233
Neets	Forum	26/09/2020	11/03/2022	44.41	42,079	1,869,106
Wizchan	Forum	23/12/2014	12/03/2022	55.13	27,795	1,532,385
Lookstheory.org	Forum	17/10/2019	11/03/2022	77.46	624	48,339
Noncuck united	Forum	11/11/2020	12/03/2022	72.51	9,764	708,063
Reddit/r/Antifeminist	Reddit	16/12/2021	09/03/2022	39.80	34,828	1,386,270
Reddit/r/BlackpillScience	Reddit	17/04/2018	18/05/2022	46.31	14,178	656,674
Reddit/r/FA30plus	Reddit	11/05/2021	18/05/2022	62.01	26,728	1,657,531
Reddit/r/Incelexit	Reddit	10/06/2021	18/05/2022	88.39	35,915	3,174,621
Reddit/r/Supportcel	Reddit	04/10/2017	25/01/2022	65.58	2,876	188,628
Reddit/r/TheRedPill	Reddit	23/07/2020	18/05/2022	71.66	71,785	5,144,661
Reddit/r/Braincels	Reddit	21/10/2017	30/09/2019	25.84	1,091,976	28,221,003
Reddit/r/Incel	Reddit	08/02/2013	01/04/2017	38.57	7,551	291,306
Reddit/r/Incels	Reddit	04/01/2014	03/11/2017	27.90	983,898	27,451,194
Reddit/r/incelsWithout hate	Reddit	09/04/2017	11/03/2021	27.06	1,399,358	37,872,578
Instagram _incels_	Instagram	21/03/2018	11/02/2022	16.25	105	1,707
Instagram blackpill memez	Instagram	08/03/2022	09/03/2022	8.27	70	649
Instagram involuntarycelibate	Instagram	01/11/2020	14/02/2022	10.61	704	7,471
Instagram #blackpill	Instagram	07/03/2022	18/05/2022	18.80	799	15,025
Telegram BlackPillBasedGlobal	Telegram	16/08/2015	18/05/2022	7.02	28,676	198,802
Telegram Blackpilled	Telegram	21/07/2021	16/05/2022	15.63	635	9,162
Telegram incel	Telegram	25/12/2018	03/03/2022	7.17	2,156	15,377
Telegram incels_co	Telegram	29/10/2020	18/05/2022	29.01	2,302	66,756
Incels.wiki	Wiki	16/07/2018	15/02/2022	10690.27	68	737,629

respectively).<sup>46</sup> Both of these graphs also feature a light green shaded area depicting the time of the first COVID-19 lockdowns in the U.S., Canada, and Europe, as well as vertical green lines that indicate when prominent acts of incel-related violence occurred in these countries, details of which are contained in [Table 2](#) where the initials used in these graphs are connected to incidents. While this is not an exhaustive list of incel-related violent attacks, it provides a useful overview of those that have had considerable media attention and that might have triggered increases/decreases in violent extremism as per **H3**.

Four important observations can already be made at this stage, paving the way for the evaluation of our hypotheses in the next section. *First*, forums currently dominate the incelsphere, with Incels.is occupying a major role as the longstanding anchor of the community since the closure of the sub-Reddit /r/Braincels.<sup>48</sup> With more than four years of continuous text data, this forum provides an excellent source for the analysis of language evolution across time. [Figure 2](#) shows that the less active Incels.net started to increase in activity during 2019 and reached its peak during 2020 at the height of the COVID-19 lockdown(s), but given that this increase started in the summer of 2019, it is hard to establish whether these fluctuations are related to the pandemic or just a natural increase and decrease in site traffic. The recent establishment of another new forum in 2022—Blackpill.club—also allows us to test whether a rival, initially much smaller forum, occupies a more extremist niche. Additionally, [Figure 2](#) shows that, although their activity is dwarfed by that of Incels.is, there are a number of thematic forums that have had relatively stable levels of activity that started to increase from mid-2021 into 2022. This includes Wizchan.org, an incel space dedicated to incels who are over thirty years of age, and Neets.me, which is an acronym of “Not in Education, Employment, or Training.” While NEETS does not present as an incel space, shared concepts and outlinks between NEETS.me and other incel spaces indicate a significantly large shared userbase. The forum Looksmaxxing.org also appears to share a similar userbase and also started to grow in popularity during 2021.<sup>49</sup>

*Second*, although Reddit has hosted important incel spaces, particularly during the initial formative years of the ideology, the platform’s implementation of terms of use on hate speech and bullying and its quarantine policy<sup>50</sup> have made it a more unstable place for incel communities. As a result, the Reddit region of the incelsphere has produced a series of different, shorter lived communities with overlapping



**Figure 1.** Evolution of posts across time, aggregated to platforms types. Graph shows a 5-day rolling average of number of posts per day.

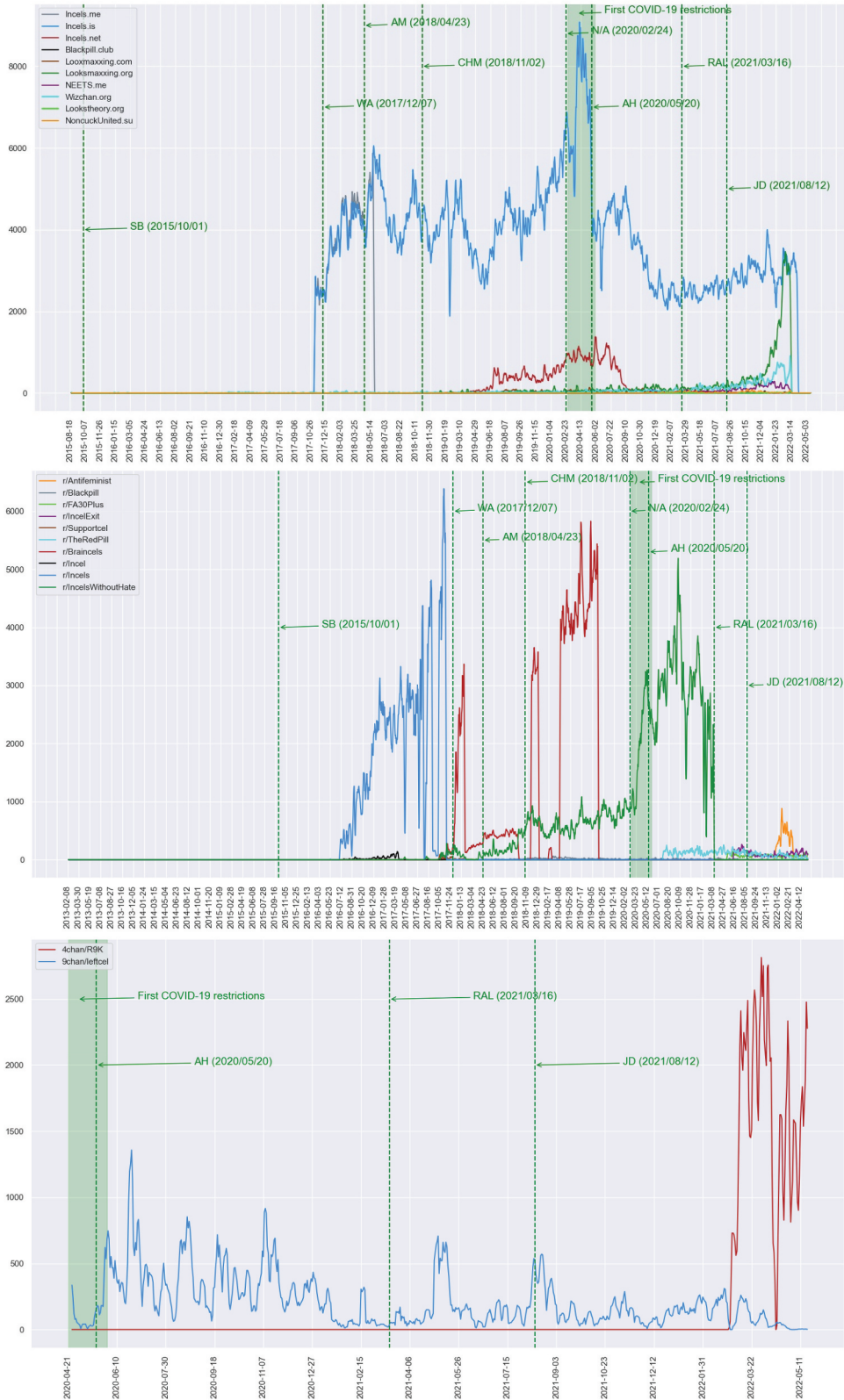


Figure 2. Evolution of posts across time on forums (top row), sub-Reddits (middle row), and chans (bottom row),<sup>47</sup> graph shows 5-day rolling average.

**Table 2.** Key acts of incel-related violence that have gained substantial media attention

Initials	Name	Date	Location
ER	Elliot Rodger	23/05/2014	Isla Vista, USA
SB	Scott Beierle	01/10/2015	Tallahassee, USA
WA	William Atchison	07/12/2017	Aztec, USA
AM	Alek Minassian	23/04/2018	Toronto, Canada
CHM	Chris Harper-Mercer	02/11/2018	Roseburg, USA
N/A	Undisclosed name due to the perpetrator being 17 years old	24/02/2020	Toronto, Canada
AH	Armando Hernandez	20/05/2020	Glendale (Phoenix), USA
RAL	Robert Aaron-Long	16/03/2021	Atlanta, USA
JD	Jake Davison	12/08/2021	Plymouth, UK

yet not identical membership, a situation prone to the appearance of new ideological positionings, especially on the issue of violence. Looking at [Figures 1](#) and [2](#), we see that the first major online space dedicated to incels (in our dataset) was the sub-Reddit [/r/Incels](#), which quickly gained a high number of daily posts. The closure of this original sub-Reddit resulted in the creation of [Incels.is](#) and [/r/Braincels](#), and the spikes and slopes in daily posts exhibited by these two platforms in [Figure 2](#) is indicative of some inter-platform competition. The other large incel sub-Reddit was [/r/IncelsWithoutHate](#), which claimed to be an online space for those who struggled with finding sexual relationships but did not agree with the language and themes of other incel online spaces. While this was also shut down for violating Reddit's terms of service, it does also appear to show some interaction with [Incels.is](#).

*Third*, the recent rise of incel activity on the Chan imageboards provides a good occasion to evaluate ideological splintering. Indeed, the longstanding [/R9K](#) board of [4chan](#), which has played a historic role in the development of the incelosphere, is now accompanied—and overcome—by the [/leftcel](#) board, which claims to offer a different, radical left-leaning ideological take on incel issues.

Finally, *fourth*, the above figures seem to indicate an impact of external events, namely the initial COVID-19 lockdowns and the crimes of Minnassian and Hernandez, on online engagement dynamics. On the one hand, a clear spike of activity corresponding to the COVID-19 pandemic lockdown can be seen, as already noticed by Davies, Wu, and Frank's abovementioned work; whether this event has enhanced violent extremism in discussions therefore ought to be assessed.<sup>51</sup> On the other hand, some acts of incel-inspired violence correspond with spikes/drops in activity on certain online spaces, potentially indicating discussions on their nature and morality as well as membership increase/dropout (and platform shutdown) that could have led to more/less violent extremist language. In particular, Minnassian's and Hernandez' crimes correspond to sharp spikes or drops in a couple of online spaces, which warrants specific investigation for **H2b**.

## Methods

Given the size of the corpus, we leverage computational methods to assess in the language of the incelosphere the evolution of violent extremism; we believe that such a zoomed-out, large-N, study aptly complements the qualitative approach taken so far by the majority of the scholarship on incel spaces, hence participating in the development of a multidimensional understanding of the phenomenon.

Our method rests on the now well-established idea that violent extremists' language possesses specific markers both in terms of content<sup>52</sup> and non-content features,<sup>53</sup> as demonstrated in a wide range of empirical cases. Specifically, we adopt a dictionary approach that locates these markers, using a custom-built, incel-specific lexicon to measure the salience of violent extremism in the linguistic content of the incelosphere. A range of alternative computational text analysis methods are available and potentially



relevant to the present inquiry, such as those focusing on the grammatical structure of texts<sup>54</sup> or measuring the specific semantic markers of aggressive language.<sup>55</sup> We believe, however, that at this stage a dictionary-based method is a best first step, which can be further complemented by these other approaches at a later stage, due to the possibility of tailoring the dictionary to the incel lingo and therefore increasing the likelihood of it providing a solid first set of findings. Following Cohen's argument that dictionaries ought to be adapted to the specific lexical fields under scrutiny, we established a composite dictionary of incel-specific linguistic markers of violent extremism, and measured fluctuations of this ratio (number of dictionary words/total number of words) across time and platforms.<sup>56</sup> Three published experts of incel language independently selected, from the 5,000 most frequently words of the entire corpus, three types of words; in a second step, disagreements on initial categorizations were settled by consensus. *First*, they included verbs unambiguously expressing acts of violence (e.g., “stab,” “kill,” “rape”). Beyond the mere fact that these verbs denote discussions of violent actions, evidence indicates that they are more common in violent groups' texts than in non- or less-violent extremist ones. *Second*, and in the same vein, we included nouns that label weapons (e.g., “gun,” “knife,” “acid”), which are obvious proxies for discussions of violence. *Third*, we included nouns that dehumanize the outgroups (e.g., “femoid”/“foid,” “roasties”; “curry”). Research indeed insists that dehumanizing outgroup labels—which are “the most extreme form of negative out-group identity construction”<sup>57</sup> and usually constitute the cornerstone of radical essentialist “discursive strategies”<sup>58</sup>—are a strong indicator for the endorsement of, encouragement for, and engagement in violence, as they imply extremely negative evaluations, foster moral disengagement, and encourage depersonalization.<sup>59</sup> Roozen and Shulman's<sup>60</sup> study of the language of the extremist Hutu radio RTLM showed, for instance, that the use of dehumanizing labels increased in the build-up to the Rwandan genocide and then even further as the killings intensified, and Miller-Idriss' work demonstrated the role of dehumanizing labels in far-right narratives claiming that outgroups pose an existential threat to the ingroup.<sup>61</sup> Chang's study of the “femoid” label on /r/Braincels already showed how important this particular dehumanizing label is to the incel worldview.<sup>62</sup> Overall, our composite “Incel Violent Extremism Dictionary” (IVED), which coalesced these three types of words, comprised 172 words (e.g., “landwhale,” “kill”) including some of the most recognizable incel terms (e.g., “femoid”). The full dictionary is made available to the scholarly community in Appendix 1. The online spaces discussed above were sliced into monthly sub-corpora, and for each, the IVED score was calculated to allow for an analysis of the evolution of the language captured by the dictionary.

In the analysis below, we use the IVED scores to build two types of graphs with associated statistics, each providing a different way to identify and visualize potential diachronic and cross-platforms evolutions. *First*, we conducted a classic longitudinal time-series analysis, plotting the monthly scores of each platform. This enabled the visualization of fluctuations in linguistic markers of extremist violence across time-(online)space as well as the statistical evaluation of potential changes across time (with a particular attention paid to COVID-19 and incel-inspired violence, as per H3). *Second*, two different correspondence analyses were carried out in order to explore, in an alternate way, the differences between each platform's corpus. Correspondence analysis is a “multivariate exploratory space reduction technique for categorical data analysis,” which allows for the identification of patterns of association and disassociation in complex categorical datasets<sup>63</sup> through the generation of “a low-dimensional projection space with simultaneous placement of both documents and features, making it ideal for explorative analysis in text mining”—in our case, the underpinning categorical dataset is the matrix table including, for each word in the multi-platform corpus, its frequency on each platform.<sup>64</sup> Here, we innovated by including in the graphs both the most frequent incelsphere-related yet non-extremist words (such as “woman,” “girl,” “man,” which serve as an indicator of the typical discussion) and the entire IVED, each coalesced into a single signifier that condenses semantic variety into a unique, easily readable datapoint. We constructed two types of correspondence analyses. First, we built a static correspondence analysis, positioning each platform as a single point according to the relative importance of violent extremist language in its content; this provides a general visualization of potential lexical differences between individual online spaces, without consideration for diachronic change. Second, we constructed a dynamic correspondence analysis representing with  $x$  timepoints what we identify as the four most

scientifically relevant platforms of the incelsphere (*/r/Incels*, */r/Braincels*, *Incels.is*, and *Incels.net*), where  $x$  is the number of sub-corpora yielded by a platform when its entire corpus is divided into three-month chunks, in order to display the evolution of these four spaces over time.<sup>65</sup> This not only allows for the identification of potential trajectories of platforms towards more/less violent extremist language, but also displays the relative positions of the four platforms with regard to their violent extremist content at different points in time.

## Results and discussion

To test our hypotheses, we therefore proceed in three steps. *First*, we look at the static correspondence analysis encompassing all the digital spaces from our dataset. *Second*, we focus on the dynamic correspondence analysis zooming in on the four most prominent online spaces from our corpus. *Third*, we conduct the time-series analysis based on the online spaces' monthly IVED scores.

### Static all-spaces correspondence analysis

Figure 3 includes, as datapoints, all online spaces from our dataset, as well as the two dictionaries (IVED, and most frequently occurring non-extremist incel terms); this model accounts for 90.2 percent of the variance in the corpora, which is an excellent fit for such a multi-platform corpora. At this stage, the reader should be reminded that correspondence analysis graphs do not show absolute frequencies (in this case highly occurring words on a platform) but instead depicts relatives. In comparing online spaces in the figure, it is therefore important to understand that uniqueness of a space or word is represented by how far it is from the graph's origin (point 0,0 on the graph where the vertical and horizontal lines meet), with data points that are further away from the origin being more differentiated. In contrast, online spaces and words that are closer to the origin are less distinct, with data points that are centred on the origin having (in the figure below) an 87.37 percent chance of not having any distinguishing features, as shown by this value being the variance accounted for on the x-axis and why the two dictionaries are on opposing ends of this axis. Comparing a platform datapoint and a term datapoint thus involves evaluating the length of the line between the graph origin and both the term and platform datapoint independently, with longer lines indicating an association between them; the angle between these two lines are then assessed, with smaller angles indicating a strong association, 90-degree angles indicating no association, and 180 degrees or near indicating a negative association. Because correspondence analysis can be prone to misinterpretation, we offer a full explanation on how to interpret our graphs in Appendix 2, with examples from our dataset individually described.

Two main observations stem from Figure 3. First, the various platforms used by incels appear to occupy different lexical spaces. All forums (with the exception of *lookstheory.com* and *Wizchan.org*, which was expected)<sup>66</sup> are situated close together in the graph, as are the two chans and the subreddits, denoting the fact that incel forums, chans and subreddits are generally different when it comes to their violent extremist content. In particular, incel violent extremist language is more specific to the forums than to the chans and the redds; indeed, the very small angle between the IVED dictionary and the forums, centring on the origin, means that the extreme words are very specific to the forums, relative to the chans and subreddits which have a closer relationship with the non-extreme incel words like “incel,” “women,” etc. This evidences that forums host a greater proportion of violent words than the other two platforms. To summarize, the incelsphere is not homogenous in terms of violent extremist language use in its constitutive platforms; as a result, any assessment of violent extremism in the incel online ecosystem should take stock of the differences between relevant online spaces.

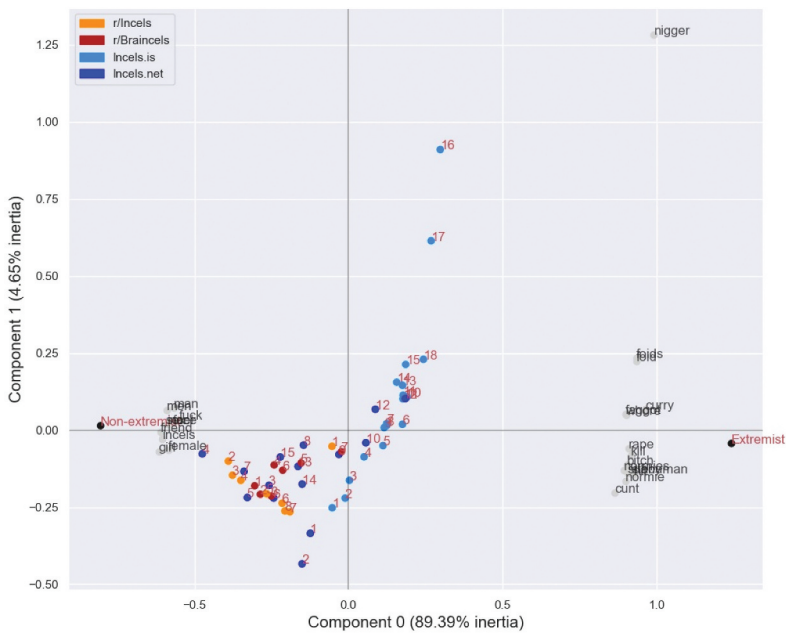
Second, differences also exist within subreddits that capture key moments in the evolution of the incel online ecosystem across time; specifically, the differences between */r/Incel*, */r/Incels*, and */r/Braincels* are important.<sup>67</sup> As the first two dedicated incel subreddits—*/r/Incels* and */r/Incel* (which had a life span that partially overlapped)—were shut down, the */r/Braincels* sub-reddit came into being and quickly became the most notable online incel space before being shut down again. Our graph shows that these three





**Dynamic 4-spaces correspondence analysis**

Figure 4 zooms in on the diachronic lexical development of this main lineage, plotting together /r/ Incels, /r/Braincels, Incels.is, and Incels.net at three-month intervals (with the platform datapoint labels following a sequential order). The relative specificity of generic incel language and incel violent extremist language to each of these time-stamped online spaces is thus displayed, leaving two evident “trails.” First, the dominant, longest running platform—Incels.is—started off not strongly associated with terms from either dictionary, before moving towards the more extreme one, particularly using misogynistic and racist terms, in near sequential order over time. In other words, extreme incel terms have gradually become more specific to Incels.is compared to the three other online space displayed here, denoting an increased prevalence of these words in the discussions they hosted. Second, the first major dedicated incel online space—/r/Incels—initially had more extreme content similar to that seen in the later forums, before toning down: its first time point is closer to the graph origin than its later iterations, meaning that its content was at that time less differentiated between the non-extreme incel language and the violent extremism one. Time points 2, 3, 4, 6, 7, 8 then show a greater distance from



Time point	r/Incels	r/Braincels	Incels.is	Incels.net
1	05/2016 – 07/2016	10/2017 – 12/2017	11/2017 – 01/2018	11/2017 – 01/2018
2	08/2016 – 10/2016	01/2018 – 03/2018	02/2018 – 04/2018	02/2018 – 05/2018
3	11/2016 – 01/2017	04/2018 – 06/2018	05/2018 – 07/2018	06/2018 – 08/2018
4	02/2017 – 04/2017	07/2018 – 09/2018	08/2018 – 10/2018	09/2018 – 11/2018
5	05/2017 – 07/2017	10/2018 – 12/2018	11/2018 – 01/2019	12/2018 – 02/2019
6	08/2017 – 10/2017	02/2019 – 05/2019	02/2019 – 04/2019	03/2019 – 05/2019
7	11/2017	06/2019 – 08/2019	05/2019 – 07/2019	06/2019 – 08/2019
8		09/2019	08/2019 – 10/2019	09/2019 – 11/2019
9		* No available	11/2019 – 01/2020	12/2019 – 02/2020
10		r/Braincels data for	02/2020 – 04/2020	03/2020 – 05/2020
11		01/2019.	05/2020 – 07/2020	06/2020 – 08/2020
12			08/2020 – 10/2020	09/2020 – 11/2020
13			11/2020 – 01/2021	12/2020 – 02/2021
14			02/2021 – 04/2021	03/2021 – 05/2021
15			05/2021 – 07/2021	06/2021 – 07/2021
16			08/2021 – 10/2021	*No posts were
17			11/2021 – 01/2022	made to Incels.net
18			02/2022 – 04/2022	in 03/2018.

Figure 4. Dynamic time-split correspondence analysis for four foundational incel platforms’ lexical proximity with violent extremist language (IVED). The graph displays the fifteen most frequently occurring IVED words as well as the ten most commonly occurring “non-extreme” terms.

the origin towards the left, combined with an increasing angle with typical non-extremist terms such as “incels,” “female,” “girl.” /r/Braincels and Incels.net do not display very clear evolutions towards more/less violent content. /r/Braincels’ later timepoints do move closer toward the graph’s origin, and in spite of some later timepoints for Incels.net having a closer association with extreme terms such as “foids,” the forum does not mark a constant lexical evolution. In sum, our dynamic correspondence analysis of the four main online spaces constitutive of the main incel lineage chiefly evidence the particularity of the ecosystem’s premier community, Incels.is, which relative to its predecessors has hosted an increasingly differentiated language moving towards greater relative proportions of violent extremist terms. If we understand this forum to be the main discussion space of the ecosystem, then the graph confirms **H1** of increasing violent extremism over time, as words denoting general incel considerations leave more and more room to IVED words denoting dehumanization and violent aggression. Yet again, outside this forum the evolution has been less linear.

### All-platforms time-series

Figure 5 plots the salience of the IVED (ratio per one hundred words) across time for each of the online spaces of our dataset. This final step allows us to confirm and further clarify the findings of the correspondence analyses when it comes to **H1**, **H2** and **H2a**, and offer new evidence on **H2b**.

First, the most important online spaces of the incelsosphere—where the main “discussions” are taking place—are indeed marked by increasing levels of violent extremism in language, confirming **H1**, with the four major online spaces included in our dynamic correspondence analysis having positive slopes (incels.is = 0.00023; incels.net = 3.21993; /r/Incels = 6.12044; /r/Braincels = 0.00029). As shown in Figure 6 for Incels.is (and Appendix 3 for the other three platforms), plotting these ratios as a box-and-whisker plot shows with even greater clarity the steady year-on-year increase in the ratio of IVED terms.

Second, Figure 5 further evidences that this increase has not been uniform across incel online spaces, some of which do not display increases of IVED words across time. Particularly noteworthy are the lower scores of subreddits since quarantine policies were enforced and the closure of /r/Braincels. Newer sub-Reddits indeed exhibit significantly lower levels of violent extremist language than the forums—Wizchan.org being the only exception—or the two chan image-boards. After

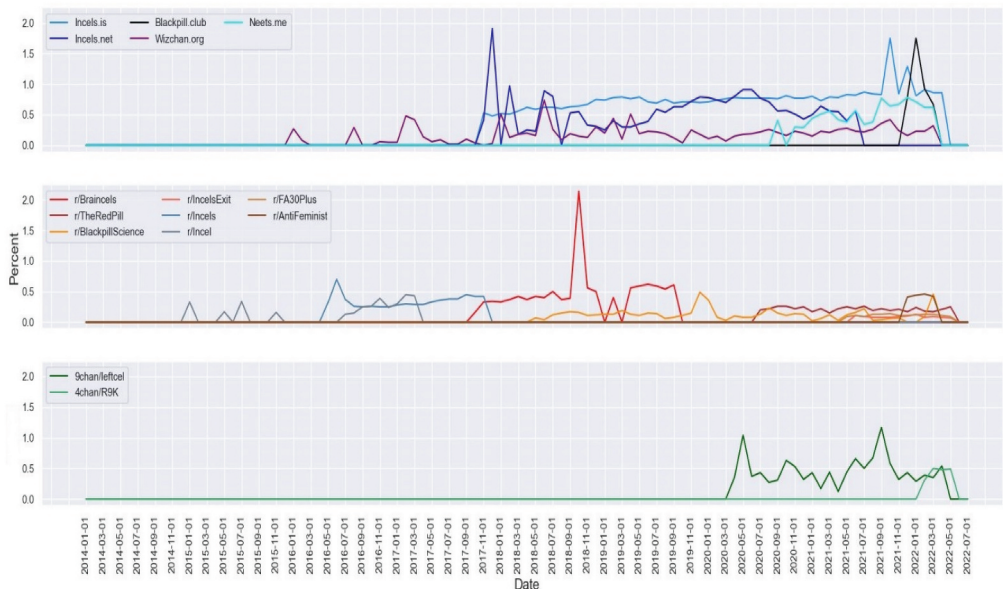
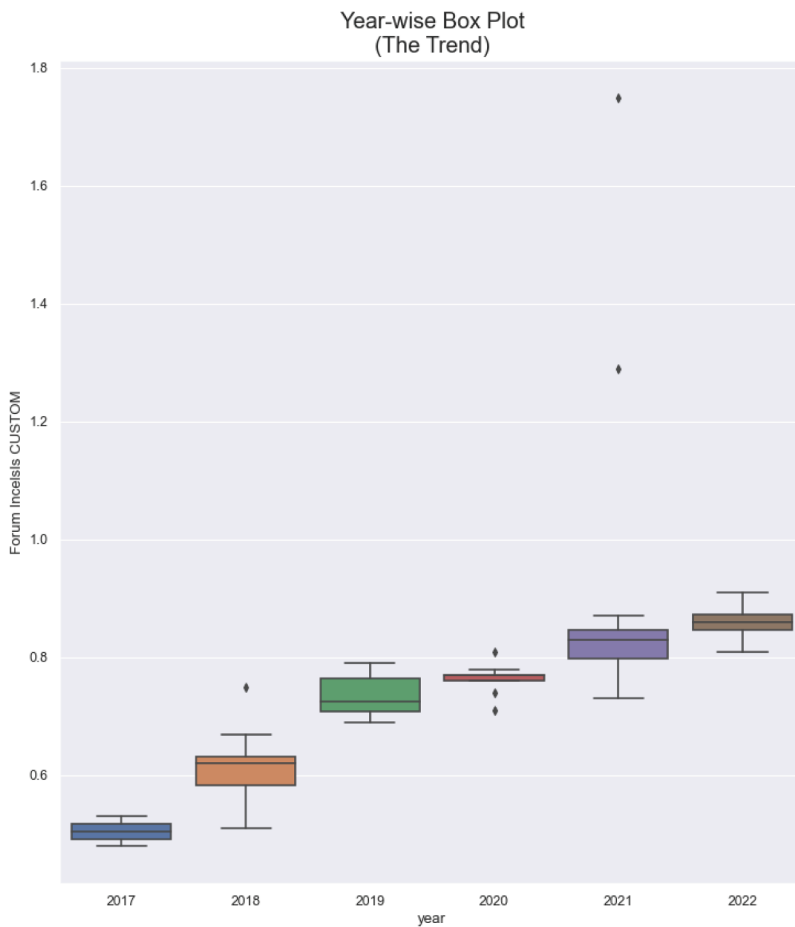


Figure 5. Ratio, per 100 words, of terms appearing in the IVED, for all the forums (top), sub-Reddits (middle), and chan image-boards (bottom).

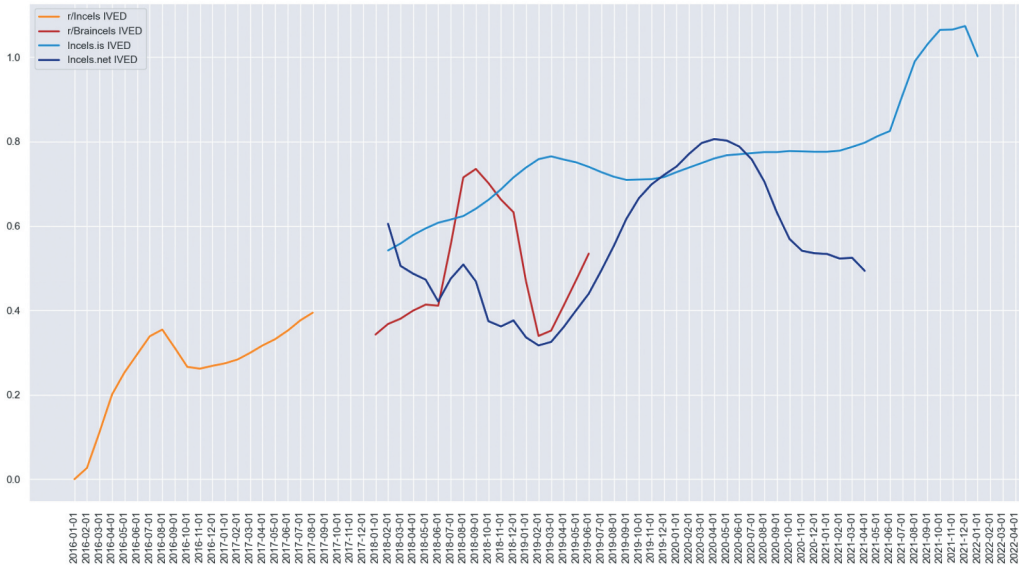
November 2019, which corresponds to the end of /r/Braincels, the average IVED score for subreddits (/r/TheRedPill, /r/BlackpillScience, /r/IncelExit, /r/FA30plus, /r/AntiFeminist) has been 0.16, against 0.84 for incels.is, 0.65 for incels.net, and 0.52 for Neets.me: forums now host significantly more violent extremist discussions than sub-Reddits.

To further confirm the above findings that the incelosphere, at the ecosystem-level, has become increasing extreme over time, the trend data for the four main platforms of /r/Incels, /r/Braincels, Incels.is, and Incels.net was extracted from the time series and plotted in [Figure 7](#) as a three-month rolling average. While there is variation with /r/Braincels due to Reddit's policies and Incels.net due to it being in competition with the larger Incels.is, [Figure 7](#) shows that when considering the genealogy of these platforms, there is a clear upward trend in the level of extremist discussions within the incelosphere between 2016 and 2022. From a starting point at an IVED score of 0 in January 2016, this graph ends with a score of 1 exactly six years later, a sharp increase denoting that at this state one word out of a hundred was either a dehumanizing label or a direct depiction of violence.

Third, the above seems to indicate an impact of external events on online engagement dynamics, particularly in regards to the initial COVID-19 lockdown measures and the attacks by Minnassian and Hernandez. Thus, we conducted a two-fold analysis of the impact of these events on the ratio of IVED terms being used in discussions on two of the four major online spaces that were active during these times: Incels.is and Incels.net. First, [Figure 8](#) depicts both the above IVED ratio score and the median



**Figure 6.** Year-on-year trend of IVED term ratios for Incels.is.



**Figure 7.** Time series trend data for /r/Incels, /r/Braincels, Incels.is, and Incels.net, plotted as a 3-month rolling average.

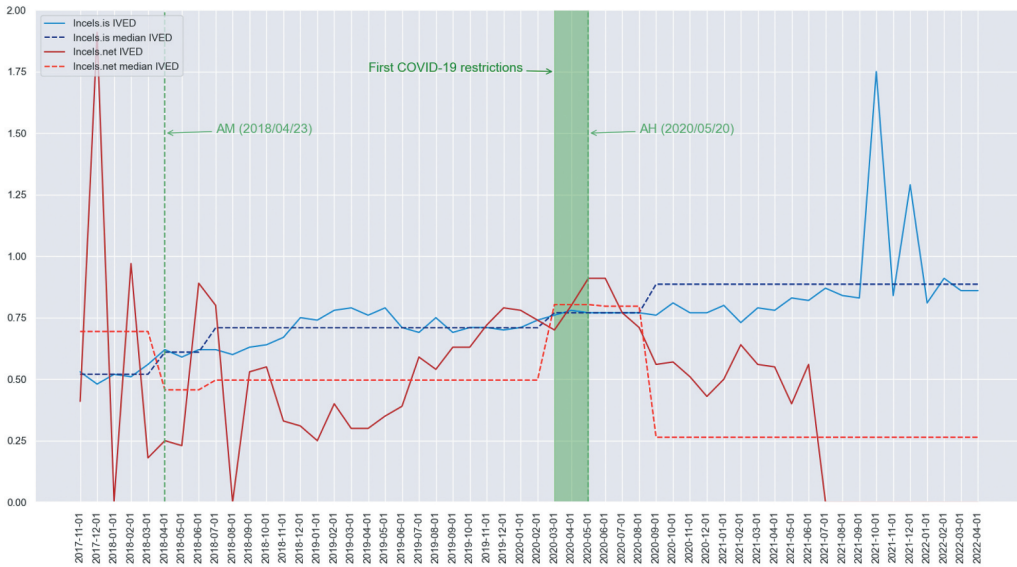
IVED ratio score for six distinct time periods; (1) before Minassian's attack, (2) the month of Minassian's attack and the subsequent 2 months, (3) the months from that point until the first COVID-19 restrictions, (4) the 3 months that these initial restrictions were in place, (5) the month of Hernandez's attack and the subsequent 2 months, and (6) the remaining time-span in our data. Second, to test for structural break points in the ratio of IVED term use, we utilised the Chow test, which is based on a structural break in the data being assumed *a priori* due to a specific and major event, in this case the initial COVID-19 lockdown or either of the two attacks, and determines whether the coefficients between the regression line before the event and the regression line after the event are equal. If they are not equal, then it concludes that there is a structural break in the data; in other words, the data pattern is different after the event. [Table 3](#) shows the results of three different and unconnected Chow tests for each of the three events in chronological order.

While the median use of IVED on Incels.net increases dramatically during the COVID-19 lockdown/Hernandez attack and actually decreases following Minassian's attack ([Figure 8](#)), the Chow test shows that the only event of these three that led to a statistically significant structural break in the use of IVED terms on Incels.net is Minassian's attack. This inherent contradiction between the descriptive statistics and the Chow test is likely due to the relatively large temporal fluctuations we see in the monthly IVED ratio score in [Figure 8](#) impacting the coefficients of the latter two tests with their identical statistical test scores being explained by the temporal proximity of the two events.

**Table 3.** Chow test for structural breaks in the IVED ratio data for Incels.is and Incels.net

Event	Platform	Chow test statistic and P-value ( $\alpha = 0.05$ )
Minassian attack	Incels.is	100.38, 0.00
	Incels.net	7.127, 0.0004
First COVID-19 lockdowns	Incels.is	8.366, 0.00006
	Incels.net	0.371, 0.34
Hernandez attack	Incels.is	10.6202, 0.00
	Incels.net	0.371, 0.34





**Figure 8.** IVED ratio and median IVED ratio for 6 time periods for Incels.is and Incels.net.

The results for Incels.is offer more insight due to its popularity. We see that, despite there being many more daily posts made to the forum around the time of the first COVID-19 lockdown (Figure 2), this did not result in a significant increase in the median use of IVED terms (Figure 8). Moreover, while the COVID-19 lockdown and Hernandez’s attack resulted in a statistically significant structural break in the data (Table 3), it was actually Minassian’s attack that led to the largest structural break in the IVED ratio data (Table 3) and increase in median use of IVED terms (Figure 8). This is interesting for two reasons. First, it shows that, as we hypothesised (H2b), the behaviour of these online spaces is responsive to real-world, offline, events. Second, it indicates that an increase in daily posts does not necessarily correlate with an increase in extremist discussions. This analysis complements Davies, Wu, and Frank’s above mentioned work in showing that there is an enhanced sense of violent extremist discussions during the three-month period of the first set of COVID-19 restrictions, more so for the smaller Incels.net.<sup>68</sup> Interestingly, while Hernandez’s attack has no noticeable impact, Minassian’s attack signals an increase in IVED term usage on Incels.is and a decrease on incels.net.

## Conclusions

Pressing debates about whether the incel worldview belongs to the realm of extremist ideologies—and thus whether acts of incel-inspired violence potentially fall into the “terrorist” category—have so far rested on somewhat monolithic appraisals of the incel online ecosystem. This paper sought to provide a richer, multi-dimensional basis for this important question by exploring the diachronic evolution of the linguistic markers of violent extremism across a range of platforms constitutive of the incelsphere.

Analysing the largest known linguistic corpus of incel online content (spanning all the major incel online spaces between 2014 and 2022) with a custom dictionary of incel violent extremist language (IVED), we showed that the main lineage of incel online discussion has worryingly hosted, over time, an increasing proportion of dehumanizing outgroups labels and words depicting violence. We also highlighted, however, the heterogeneity of the incelsphere when it comes to violent extremist expressions, with IVED language sometimes more than four times more salient in some online spaces compared to others. Overall, particular platforms tend to have their own specific linguistic

profile, with forums being more toxic than sub-Reddits (especially since the summer 2019 with the closure of /r/Braincels). When looking at the current major hub of the incelosphere, Incels.is, the COVID-19 lockdown and the two acts of incel-inspired violence associated with noticeable changes in posting activity (Minassian's Toronto van attack and Hernandez' Glendale shooting), were correlated with a statistically significant change in the pattern of data. However, this change was much larger for Minassian's attack than the latter two events, meaning that while one of our hypothesis holds, the dynamics between offline events and online behaviours are not uniform and a growth in the number of daily posts to an online space does not correlate with an increase in the amount of extremist content.

The nuanced, dynamic picture of the incelosphere rendered by the present study calls for further research on several fronts. First, the present analysis, which offered an evaluation of violent extremist ideation based on linguistic markers, might be enriched by a complementary study of visual tropes similarly reflecting an endorsement of violent extremism, such as avatar profiles containing pictures of killers or nazi iconography. Second, while offering a solid longitudinal study of the incelosphere, the present effort did not succeed in retrieving sufficient data from "historical" incel forums tracing further back, like Sluthate. Including them into the analysis would offer insights on the early development of aspects of incel violent extremist lingo such as dehumanizing labels. Third, this study calls for a detailed analysis of cross-platform migrations; our data points to probable migration dynamics between online spaces, especially for Incels.is, Incels.net and /r/Braincels, which is certainly an area worth exploring in more detail. Furthermore, the decrease in the daily number of posts for the platforms in our dataset, particularly Incels.is, starting in late 2020, combined with an increase in daily posts to other sites such Lookstheory.org and the emergence of sites such as Blackpill.club, offers anecdotal evidence that there might now be other prominent online incel spaces that do not feature in our dataset, suggesting that the incelosphere is not just a series of online spaces dedicated purely to incel ideology and discussions, but a dynamic and continually evolving ecosystem connected to neighbouring ones. Fourth, the present study misses an important dimension of incel violence: suicide and self-harm. These forms of violence, which are ubiquitous themes in online discussions, call for serious investigation from another angle than that of extremism; since our study came from that latter perspective, it was geared towards expressions of outgroup hate, but a complementary study aimed at investigating mental health issues would need to analyse linguistic and visual tropes reflecting ingroup depreciation and suicidal and self-harm ideations, to offer a truly nuanced account of violence in the incel worldview. Fifth, further studies should look beyond forums' IVED scores and examine whether these scores mask variation between particularly extreme contributors and less extreme individuals, in the vein of Scrivens and colleagues' (e.g., Scrivens et al.)<sup>69</sup> work on differences in terms of extremist views between types of posters in far-right forums. Additionally, further studies could analyse our data with alternative language analysis tools, as evoked already in the methods section. Finally, our study offered valuable insight into the development of an extremist ideology over time, calling for other cases to be studied in similar ways in order to gain data susceptible to strengthen existing attempts to theorize this important issue.

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## Notes on contributors

**Stephane Baele** is an Associate Professor in Security and Political Violence at the University of Exeter. His research spans the social sciences to analyse violent political actors' communications and to investigate the role of language in international conflict. As of 2020-2023, he is the project lead for the NORFACE-funded consortium "Extreme Identities" ("ExID"), which uses computational methods to map the far-right online ecosystem and analyse its visual and linguistic content.

**Lewys Brace** is a Senior Lecturer in Computational Social Science at the University of Exeter, where he specialises in data science, extremism, terrorism, and cybercrime. His work has appeared in journals such as *Terrorism* and *Political Violence, Behavioral Sciences of Terrorism and Political Aggression, Studies in Conflict & Terrorism*, and *Perspectives on Terrorism*.

**Debbie Ging** is Associate Professor of Digital Media and Gender at Dublin City University. Her research is concerned with gender and social media, focusing in particular on online misogyny, the manosphere, incels and the radicalization of young men into online male supremacy groups. She is a member of the Institute for Future Media Democracy and Society in DCU.

## ORCID

Stephane Baele  <http://orcid.org/0000-0002-3632-0888>

Lewys Brace  <http://orcid.org/0000-0002-7075-1243>

Debbie Ging  <http://orcid.org/0000-0002-6664-5560>

## Notes

1. Furthermore, older acts of violence such as the 1989 Montreal Polytechnic shooting and the 2014 serial stabbings in Portsmouth, U.K. were carried out by individuals who claimed grievances characteristic of the incel ideology, with the former being retrospectively adopted as a figurehead, or "saint" to use their terminology, by the incels.
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46. The sudden drop-off in activity on some platforms in 2022 is artificial; it corresponds to the last day the researchers extracted data from the sites.
47. While it looks like 4chan/R9K experiences many more daily posts than the 9chan/leftcel, this is actually due the impossibility of collecting a complete back-dated text corpus for these two chan boards because the sites only store ten pages’ worth of the most recent threads (original messages and replies) posted to the board. Thus, 4chan/R9K (red line) has a much shorter time span of posts accompanied by a much higher frequency than 9chan/leftcel (blue line) in our dataset because it has higher levels of traffic.
48. The almost perfect overlap between the data scraped independently from Incels.is and Incels.me in 2017–2018 demonstrates that the former is the direct continuation of the latter, with several months of content directly pulled by Incels.is administrators to create a back catalogue for their new forum when they launched it.
49. There are a number of such forums dedicated to discussions of individual aesthetics, with some of them again appearing to have a shared userbase with other prominent incel spaces. This is not surprising given the prominence of physical appearance in the incel worldview, but what is surprising is that, out of the three forums related to this subject in the dataset, Lookmaxxing.org appears to have more incel themes in its content than the others; with Lookstheory.org seemingly having the least.
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65. Based on posting volume, "historical" role in the incelosphere, and preliminary findings at the data-collection and descriptive analysis phases (see above).
66. Indeed *Wizchan.org* is a relatively niche board aimed at incels who are aged thirty years or older, and *Lookstheory.org* contains similar content pertaining to individual aesthetics as sites like *Looksmaxxing.com* and *Looksmax.org* but with little incel-specific terminology seen in the latter sites.
67. The distinctiveness of the other sub-Reddit's locations is better explained by their specific thematic focus, such as */r/FA30Plus* being dedicated to users over thirty years of age and */r/Anti-feminist* containing incel diatribe but extending to social issues beyond sexual relationships and individual physical appearance.
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## Appendices

### Appendix 1: The Incel Violent Extremism Dictionary (IVED)

foids	chad	whale	kill
foid	foids	stacey	rape
whore	normies	soyboy	hit
bitch	foid	normalfags	killed
nigger	normie	noodlewhores	attack
curry	whore	thots	killing
faggot	bitch	tallfags	raped
cunt	nigger	thot	slay
slut	curry	gook	destroy
nigga	subhuman	beast	destroyed
femoids	faggot	tallfag	murder
fag	cunt	bluepillers	shooting
roastie	slut	soyboys	shoot
roasties	stacy	wagecuck	kick
femoid	nigga	chink	pound
tranny	femoids	shitskin	torture
rice	alpha	gorilla	hitting
trannies	chadlite	normalfag	abused
creature	fag	parasite	punch
landwhale	roastie	dumpster	kicked
subhumans	roasties	noodlewhore	beaten
simps	femoid	numale	slaying
simp	stacies	numales	nuke
hoe	betabux	negro	cutting
scum	tranny	gigachads	
monster	rice	beckies	
landwhales	trannies	smash	
noodle	creature	raping	
monkey	landwhale	genocide	
pig	subhumans	attacked	
rat	simps	attacking	
kike	gigachad	slap	
whale	simp	murdered	
soyboy	hoe	uprising	
noodlewhores	scum	poison	
thots	monster	punching	
thot	npc	slays	
gook	betabuxx	wound	
beast	landwhales	tortured	
soyboys	ricecels	shove	
chink	noodle	gun	
shitskin	chadlites	acid	
gorilla	monkey	weapon	
parasite	pig	bullet	
dumpster	becky	knife	
noodlewhore	rat	bomb	
numale	kike	poison	
numales	tyrones	shotgun	
negro	stacys	assault	
foids	chad	grab	

### Appendix 2: Guide to Interpreting Incel Platforms' Correspondence Analysis

The key thing to remember when interpreting a correspondence analysis graph is that they do not depict frequencies, in this current paper that would mean the number of times a word appears on a platform. Instead they depict relatives. In other words, the graph below depicts the associations between platforms and dictionary terms by calculating residual differences. These residual differences ( $r$ ) are the frequency of a term for a specific platform ( $t$ ) minus the expected value for that platform-term combination, with the expected value being the result of multiplying the average frequency for the

row across all platforms ( $x$ ) by the average frequency for all terms within platforms ( $y$ ), divided by the average frequency for all term-platform combinations ( $a$ ):

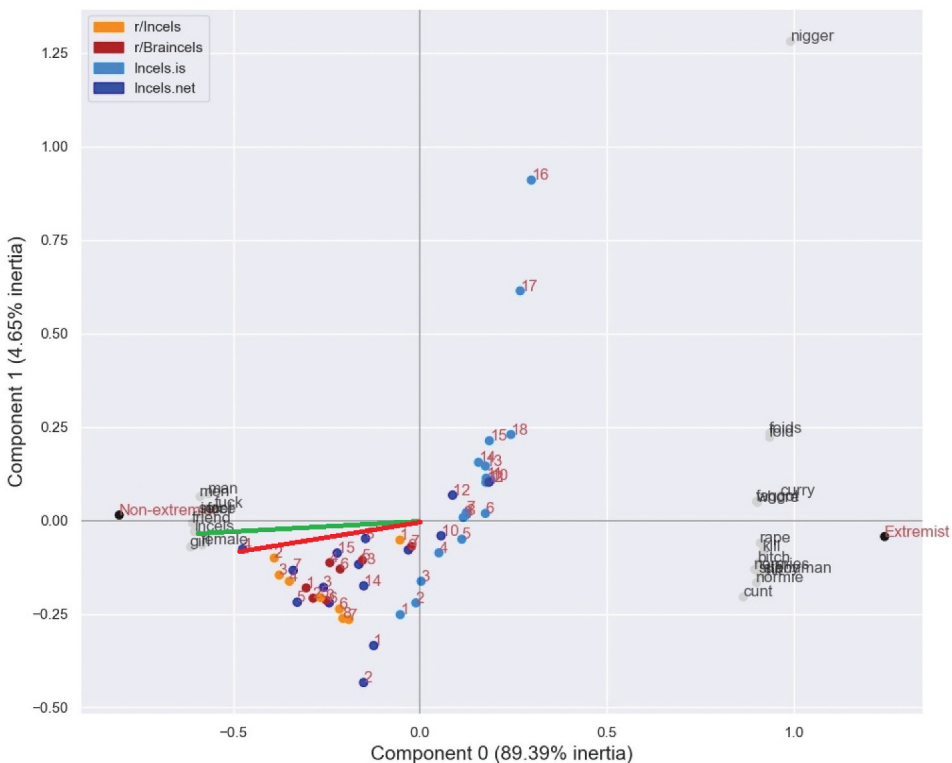
$$r = t - \left(\frac{x*y}{a}\right)$$

This means that in the figure below, a word that appears frequently in all platforms, such as “woman,” would have a low residual, whereas a word that is more unique to a specific platform, such as “anons” on the chan boards, would have a high residual. If the residual for a specific term-platform combination is a large positive one, this indicates a strong positive relationship between the two, with the opposite being true for negative valued residuals.

These residuals then determine the placement of the data points in our graph. However, these data point locations have to be evaluated in conjunction with the amount of variance accounted for in the graph, as depicted along the two axes. The graph below accounts for 94.04 percent of the variance, meaning that it represents a vast amount of the information contained within the residuals, with the majority of the relevance occurring along the x-axis (89.39 percent).

In the graph below, therefore, platforms with similar residuals have been placed closer together; the same applies to the terms shown in the graph. However, it is crucial to understand that the proximity of a platform data point to a term data point does not mean there is a higher residual association between the two, due the complexity of placing term data points in such a way that their location accurately reflects its residuals for various platforms. Instead, in a correspondence analysis, how unique a platform or term is depends on how far it is from the graph’s origin (point 0,0 on the graph where the vertical and horizontal lines meet), with data points that are further away from the origin being more differentiated. In contrast, platforms and terms that are closer to the origin are less distinct, with data points that are centred on the origin having a 89.39 percent chance of not having any distinguishing features.

Comparing associations between specific platforms and terms is a little trickier. Here, we need to look at the length of the line between the term data point and the graph origin, and do the same with the platform data point, with longer lines indicating a term having high association in both cases. In the graph below, we see that the line drawn between the graph origin and the term “incel” (green line) and the one between the graph origin and time point 4 for *Incels.net* (red line) are both relatively long, thus indicating a high association. However, to fully understand an association between a term and a platform, we also have to look at the angle between these two lines, with smaller angles indicating an association, ninety-degree angles indicating no association, and 180 degrees or near indicating a negative association. In the graph below, therefore, we see that the green line and red line form a very small angle, indicating that the two are strong and positively associated.



### Appendix 3: IVED Ratio Year-on-year Box Plots

Below are the box and whisker plots depicting the year-on-year changes in the Incel Violent Extremism Dictionary (IVED) ratios for the four main incel online spaces. The graphs are in chronological order of when the platform first emerged, beginning with the sub-Reddit /r/Incels, then /r/Braincels, Incels.is, and finally Incels.net (the latter three all emerged around the same time). Although the graph for Incels.is appears in the main paper, it is also included here for ease of comparison.

