Information Warfare: Memes and their Attack on the Most Valued Critical Infrastructure—the Democratic Institution Itself

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ABSTRACT

Social media has become a potent vector for the spread of disinformation. Content initially posted by bots, trolls, or malicious actors is often picked up and magnified by ordinary users, greatly extending its influence and reach. In order to combat disinformation online, it is important to understand how users interact with and spread this type of content, unwittingly or not. We studied patterns in the sharing of propaganda and disinformation on social media through political image-based memes. Initially, we began with a selection of 12 memes. In our first survey, we narrowed this down from 12 memes to six based on the responses received with respect to the message it was trying to convey and representation of varying viewpoints along the ideological spectrum. Ultimately, we chose a selection of six memes. Four of them involved climate-change with two considered left-leaning and the other two right-leaning, and the remaining two were focused on particular politicians and also split along ideological lines. Next, we conducted a second survey in order to better understand the behavior of ordinary users as they interact with propaganda and disinformation on social media. Particular attention was paid to differences based on political affiliation and psychological factors, including personality and trait affect. Negative types of affect appear to dominate the level of engagement Republicans and Independents have with memes, while positive types of affect and extraversion do the same for Democrats.

Keywords: integrity, disinformation, information warfare, trait affect, personality, memes, politics, cybersecurity, elections, national security

1. INTRODUCTION

A key aspect of cybersecurity is protecting the *integrity* of information [1]. This generally means ensuring that information is not altered, either accidentally or maliciously, between the receiver and the sender. But more broadly, it also means ensuring that the information has not been manipulated in unintended ways, that the information received is *trustworthy*. If a malicious user is able to manipulate a program to generate and send fraudulent results, then the integrity of that information has been compromised. Likewise, inferences drawn from data that is not trustworthy or otherwise lacks integrity is itself flawed [2]. While much focus is often placed on the availability of information [3], what good is having information available if it lacks integrity? Additionally, in the context of trying to alter the outcome of an election in republic that values democratic ideals, this amounts to information warfare on the most critical of all infrastructures—fair, free, and open elections, i.e., democracy itself.

This type of problem often occurs on social media, in which "undue manipulation of information" occurs well before the information is transmitted to the user's feed. Bots, trolls, foreign actors, even advertising companies work to manipulate the algorithms that populate our social media feeds. Some of this manipulation is facilitated and intended by the social media companies themselves—advertisers pay them for the privilege—but some is not.

Efforts to spread disinformation on social media garnered a lot of coverage and attention during and after the 2016 elections in the United States [4], [5]; these efforts have continued ever since. We are already seeing evidence of the same sort of disinformation campaigns ramping up for 2020 [6]. Coordinated political disinformation campaigns may also aptly be referred to as "covert information operations" [7].

But long-term election campaigns are not the only events whose coverage on social media is subject to this kind of manipulation. Shorter-term news events are fertile ground as well. After the Mueller Report was released, for example, a network of 5,000 Twitter bots tried to promote the hashtag #Russiagate and post messages to help discredit the Russia investigation [8]. After the fire at Notre Dame in April 2019, conspiracy theories spread quickly on social media through a variety of posts, ranging from conspiratorial to fear-mongering [9].

A range of technological solutions have been suggested to combat disinformation on social media platforms. These include more robust fact-checking [10], crowd signals [11], and using natural language processing [12] to detect questionable articles. The last suggestion would only be useful against articles, however. Much of the content most suited to go viral, such as image memes, would not be affected.

Technological solutions that can automatically flag such efforts may be an important piece of the puzzle, however, it is also important to consider the role that ordinary users play in the magnification and spread of disinformation. If an item is flagged as false in some way, will that deter ordinary users from interacting with it?

We conducted a two-part study to examine the use of political memes in the spread of disinformation on social media. The first survey was designed to identify a subset of content that represents a wide political and emotional spectrum. Information was collected on 12 memes from the first survey. Based on the

results from this survey, we conducted a second survey with a subset of six of the original 12 memes to identify how likely users are to share this content on social media, as well as examine how user perceptions of their platform, their audience, and their anonymity correlate to the willingness of users to share disinformation, either unwittingly or on purpose.

2. BACKGROUND AND RELATED WORK

Spreading Disinformation

Disinformation and propaganda have always helped shape the reporting of news and current events—disinformation might be spread by a party involved in the story, by the government, by third-party organizations or corporations, or even by the journalists themselves. As traditional sources of journalism (e.g., newspapers) have struggled, social media and other online platforms have opened up new avenues for disinformation, and new techniques for spreading it. News organizations, social media companies, and researchers are still grappling with these techniques and their ramifications. Social media, in particular, has been a fertile ground for malicious actors.

Marwick and Lewis present quite a few recent case studies in which malicious parties, such as hate groups, hostile governments, and even conspiracy theories, manipulate social media in order to amplify their message [13]. In one example from 2015, a white nationalist website coordinated its users on social media to spread a hoax regarding the creation of 'White Student Unions.' The hoax was picked up by traditional media outlets, such as USA Today [14], and thereby spread even further. The group had figured out, correctly, that traditional media now takes its cues from social media, and even if a story is a hoax (or insignificant), spreading inflammatory material on social media is a great way of getting that material picked up by the mainstream media.

Tactics like this have become increasingly potent and far-reaching. To understand the magnitude of their influence, we only need to look at the controversies surrounding two of the most consequential events of 2016, both of which have shaped the last several years of world politics: the Brexit referendum and the U.S. Presidential election [15]. The ramifications of the controversies surrounding those events is one reason why disinformation on the Internet, and social media in particular, has been cited as a real and growing threat to the functioning of democratic institutions around the world [16].

Social media gives users the ability to curate the viewpoints they are exposed to, and to isolate themselves from opposing viewpoints if they choose [17], [18]. Moreover, when people do interact with opposing viewpoints, they may react with hostility, and become more entrenched in their own worldview [19]. With these considerations, it is little surprise that ordinary users themselves play a big role in magnifying disinformation and 'fake news' [20].

If we want to improve the integrity of information on social media, we need to understand how ordinary users interact with disinformation. We need to understand how to distinguish the behavior of those ordinary users from malicious influence campaigns, and in many cases, how ordinary users are a critical part of those campaigns, either willingly or unwillingly.

First, we need to probe deeper into the nature of disinformation and 'fake news'. Since the 2016 election, 'fake news' has been the term of choice to describe news that pushes a misleading agenda. It is used by people and organizations on all sides of the political spectrum, sometimes seriously and sometimes in jest.

'Disinformation' is a more precise term, and suggests information which is *intentionally* incorrect, as opposed to misinformation, which is *unintentionally* incorrect [21]. Generally, when discussing malicious influence campaigns, *disinformation* is more accurate. However, it also refers to the intentions of the authors, rather than the intentions of the users who interact with it.

If users are unintentionally sharing false information, then additional education of users is one potential remedy. Using automated natural language processing to flag disinformation and alert users [12], [15], and incorporating fact-checking functionality into social media [10], are approaches that should be pursued for combating 'fake news'. On the other hand, if users are intentionally sharing information that they know is false, then additional educational resources would do little to help.

It might be worthwhile to examine the truth of an item on a two-dimensional graph, as proposed by Rashkin et al. [22]. One axis represents the Information Quality (ranging from Fake to Trustworthy), the other represents Authorial Intent (specifically, whether the author intends to deceive the reader or not). *Satire* sites, such as The Borowitz Report or The Onion, have low-quality information but their intention to deceive is also low. On the other hand, a *hoax* would rank similarly in information quality, but would rank much higher in terms of authorial intent to deceive.

Propaganda is a more problematic category and can occupy a wide range of values on the graph. However, it is almost always misleading to some degree, because the primary intention is to push a political message, not to tell the truth or relay facts. Rather than attempt to differentiate between different types of propaganda and hoaxes, through the rest of the paper we will use *disinformation* to refer to propaganda, hoaxes, and other false information which is pushed by malicious influence campaigns in a goal to manipulate users.

Suppose that we wanted to design content for such a campaign—false content designed to go viral. What kind of content would be most effective, and how would it look? What motivates users to share this type of content, and how can we target them?

It seems self-evident that sparking emotion in the user is necessary to get them to share content, but which emotions are most effective? A study by Berger (2011) suggests that more than any particular emotion, it was actually psychological arousal that made users more likely to share information [23]. When considering negative emotions, for example, evoking *anxiety* resulted in more willingness to share than evoking *sadness*. On the positive side, evoking *humor* or *amusement* produced better results than merely evoking *contentment*.

Studies have also found that ideologically extreme content is more likely to be shared than moderate content, because it arouses stronger emotions in users. A study by found that Twitter users with more extreme ideological positions shared

content more than moderate users [24]. Since user engagement is a major factor that social media algorithms use to determine an item's popularity, users may be more likely to see more extreme content in their feeds as a result.

Besides the emotion of the moment, another factor that may affect online behavior is a user's perception of their own anonymity. When considering cyberbullying and online harassment, for example, problematic behavior tends to increase when users believe their identity is hidden and that they are acting anonymously [25]. Similarly, studies have pointed to a relationship between users' anonymity and their sharing behavior, suggesting that user anonymity does have an effect on what users share online, and users may be more comfortable sharing items of negative valence if they feel safer in their anonymity [26]. A study from 2014 found that controversial content was over three times more likely to be shared anonymously than non-anonymously [27].

For this research, we focused on image memes because their nature allows for behavior to be studied in a more straightforward manner and on a large scale through surveys. Users can quickly view and digest the meaning of an image meme within a couple of seconds, without having to click on an external link or do additional reading.

Because memes are so well-suited for social media, they can potentially be a powerful way to influence opinion online [28], [29], despite often appearing silly at first glance. Memes were a frequent tool of disinformation campaigns during the 2016 election—one example, a 'Draft our Daughters' campaign targeted at Hillary Clinton's campaign [4], used memes as a way to inspire user revulsion and disgust—another emotion marked by high psychological arousal.

Memes provide one of the most potent weapons for disinformation campaigns. As mentioned above, they can be digested quickly and don't need to be clicked on in order to be viewed, unlike long-form news articles or even videos. Memes such as Pepe the Alt-Right Frog are widely used by the alt-right on social media [30], to the point that their association with the meme has overshadowed the creator's intent [31].

While a lot of work has been done in documenting how influence campaigns use memes, less work has been done in terms of studying their effectiveness, perhaps because most people think of memes as being primarily for humor or amusement.

One study that did look at this topic collected a series of feminist memes featuring Ryan Gosling, and found that exposure to the test meme did increase viewers' endorsement of specific feminist beliefs [32]. However, actual 'convincing' may not be the point so much as simply getting users to spread the information until it gets picked up in other venues. If a meme becomes widespread enough on social media, it will affect the national conversation, as its message gets picked up by politicians and traditional media. The questions that swirled around Hillary Clinton's health during the 2016 campaign is one example of this, in which memes and posts on social media fed stories in traditional media, which in turn fed social media, and so on [4], [13].

Our goal with this paper was to help study the reasons behind those effects, and to contribute to the understanding of how ordinary users interact with disinformation campaigns. We wanted to measure how user sharing behaviors changed based on the user's perception of the truthfulness of the meme, as well as their perceived audience and how they evaluated their own anonymity. Measures for personality and trait affect were also incorporated into this survey.

Affect
Affect is composed of three different types: trait affect, mood, and emotion. One of the challenges has been the lack of consistent use with respect to these terms [33]. As a result, challenges have ensued. For example, it has made it challenging for studies to be compared with one another; thus, the ability to validate prior research has been limited. Nonetheless, there is a general consensus that trait affect represents a long-term and generally stable type of affect. It changes little through time, which makes it similar to personality in some respects as they both represent psychological traits [34], [35].

Within one of the three different types of affect, there are also different ways to conceptualize the specific qualities of affect. One common approach has been to identify different dimensions of affect, such as higher order (i.e., negative and positive) and lower order (e.g., hostility, joviality), which has received support in both clinical and non-clinical settings [36], [37].

It is useful to understand affect and the many ways in which it is conceptualized since it impacts how individuals view the world around them and their place within it [38]; this includes information related to risk and how they may best cope with that risk [39]. Additionally, affect helps individuals in making decisions, especially when the cognitive load required to make a decision is high compared to the processing resources available [40]. Therefore, it is useful to examine trait affect in the context of better understanding the interpretation and dissemination of memes on social networking sites.

Personality
From the perspective of personality research, the five-factor model has been effective in the analysis of social media behavior. This model consists of the personality traits agreeableness, openness, neuroticism, conscientiousness, and extraversion [41]. Personality traits that generally cause individuals to be more inclined to use social media include openness and neuroticism. Not all individuals are comfortable engaging with others in social situations or necessarily feel comfortable in their own skin. Social media platforms, which provide interactions that are perhaps more comfortable than face-to-face interactions and provide greater levels of anonymity at times, may help these individuals find a venue to express themselves. Social media use may even provide some level of therapeutic benefit by helping individuals with feelings of low self-esteem or satisfaction [42].

Personality may also influence the content of what individuals post on social media, such as a greater frequency of intellectual posts by those with higher levels of openness [43]. Individuals with higher levels of openness generally have an interest in having new experiences; it is characterized by broad, novelty seeking interests [41]. It has been positively correlated with social media usage and a desire for trying new forms of communication [41], [44].

Neuroticism is related to the level of emotional control and affection individuals have; poor control over stability and emotions is associated with higher levels of neuroticism [41]. They also tend to show higher social media usage compared to those with lower levels of neuroticism [41], [42]. This may be done in part to reduce loneliness [44].

Extraversion is associated with being surrounded by large groups of individuals and high social skills. Individuals with higher levels of extraversion are more likely to use social media sites with a greater number of friends on Facebook than others [41]. These individuals feel that their 'real' self is what is seen online [44].

Agreeableness is generally related to how friendly people seem. Individuals that are less agreeable often have more social networking contacts [41]. This may be due to the difficulty these people have in making friends via face to face interactions. Instead, they may find interactions on social networking platforms more palatable.

Conscientiousness is associated with orderliness, thoroughness, and a person's work ethic. Individuals with higher levels of conscientiousness are more likely to avoid social networking platforms as they believe that they promote distraction and procrastination [41], [44].

3. METHODS

Survey 1
With this in mind, our first goal was to compile a set of image memes for testing, and measure user reaction to ensure that we had a set of memes that contained a variety of political content and provoked a range of reactions. Using Google image search, we compiled a set of memes that represented a variety of political content and addressed a variety of issues, which we ultimately narrowed down to 12 memes for testing in our first survey.

The memes included a mix of left-leaning and right-leaning memes, as well as memes that made fun of both parties. The memes included two that were circulated on Facebook by Russia during the 2016 election, as well as a mix of general memes on a range of issues. For example, we included memes that promoted both left- and right-leaning messages on issues such as climate change and gun control. We also included a Bernie Sanders meme with both a left-leaning message and a right-leaning message.

In the process of selecting memes for the study, as well as the survey questions themselves (i.e., what were going to measure), we employed the Delphi technique [45]–[47]. The Delphi technique is a method that is used to reach consensus on a matter. In the context of this study, we wanted to make sure there was appropriate coverage in what we were assessing for each meme and for the memes themselves. We employed three rounds of the Delphi technique to a small group of participants (N=10) which were knowledgeable with the use of political memes on social networking sites and how they may distort one position or another. Additionally, employing three rounds in the Delphi technique is considered a satisfactory number of rounds as it effectively balances robustness with fatigue that can set in from too many rounds. Additionally, we set a 75% threshold for consensus. In other words, if 75% of the participants involved

in the Delphi technique were in agreement, then consensus was considered achieved.

Ultimately, we decided that we would measure the following items for each meme:
- Ideological Agenda
- Political Party being Advanced
- Propaganda (Classification)
- Hoax (Classification)
- Satire (Classification)
- Truth (Classification)
- Funny (Is it?)
- Trying to be Funny (Is it?)
- True (Is it?)
- Underlying Message True (Is it?)

In order to obtain some baseline data on how political affiliation, political ideology, and various demographic factors influence one's judgment of a meme, a large-scale survey was employed. Amazon's Mechanical Turk (MTurk) was used to recruit survey participants. MTurk provides researchers with a relatively low-cost and quick turnaround platform for participant recruitment [48], [49]. Participants generally represent a broader cross-section of the population than other methods often employed, such as college sophomores in an introductory psychology class [50].

IRB approval was on file prior to collecting data and informed consent was obtained. Participants were compensated with $2 for their participation in the study. One quality control question was used. If participants failed the quality control question, the survey would conclude with an explanation of why it had ended.

We used the Qualtrics survey platform. A total of 203 responses were collected. Participants are asked at the end of the survey how the effort and time required to complete the survey compared to similar work offered through the MTurk platform. Most participants indicated that it was either easier (19.4%) or comparable (61.2%) to other projects with some indicating more effort was required (19.4%). Of note, a pilot study was employed beforehand to check for any issues with the survey, including survey logic and question wording problems, as well as the same question noted above. The compensation was subsequently adjusted from the pilot study to better reflect a comparable amount of time and effort for research participants. Thus, we believe we accomplished this given the above results from this question in the final survey.

The memes were presented in a random order to the participants with the same questions for each meme. The 12 memes used in this study can be found at: http://www.aristotle.cc/Memes.pdf

Results were obtained from those that classified themselves as Democrats (N=86), Republicans (N=58), and Independents (N=56). There was an equal split between males (49.3%) and females (50.2%) that completed the survey with one participant indicating other. Next, we discuss the second part of this study.

Survey 2
The second part of this study is concerned with developing a better understanding of how different people interact with memes compared to others. In particular, we are interested in determining how political affiliation, ideological leaning, personality, trait affect, and various demographic factors may

help explain the types of interactions individuals have with memes on social networking sites.

In this part of the study, we used the results from the first survey (also detailed in [51]) to help inform the selection of memes that would be used here. In particular, we chose six memes from the original 12 that represent a variety of ideological leanings (please see Appendix). This includes three memes that are left-leaning and three memes that are right-leaning ideologically. Four of these memes are related to climate change (two left-leaning and two right-leaning), one is related to Donald Trump (left-leaning), while the final one is related to socialism (right-leaning). The memes all represent propaganda, in that they push specific political messages; however, the memes have different levels of 'truth.' Memes 2 and 3 were used in the Russian disinformation campaign leading up to the 2016 election, however, they are not the only examples of disinformation on the list. The first four memes represent a variety of talking points on climate change, and the fifth and six memes were rated the highest by users for humor from the previous survey.

As before, we used Amazon's Mechanical Turk and Qualtrics to obtain participants and collect data, respectively. IRB approval was on file and informed consent was obtained. Participants were compensated $2 for their participation. There was a total of 201 completed surveys that passed all three of the quality control questions. A total of 10 participants failed one or more of these questions (4.7%). An additional 18 participants opened the survey, but did not progress to the point of either failing or passing a quality control question. Most participants (83.1%) thought the compensation received for completing the survey was either easier for the money (11.7%) or comparable to other projects (71.4%), while some participants indicated that more effort was required for the money when compared to other projects (16.8%).

We asked participants a series of questions for each of the six memes they were presented with. They included rating their likelihood of liking, commenting, sharing, or not performing any action for each of the six memes across four social networking platforms: Facebook, Twitter, Instagram, and Reddit. A nine-point Likert scale was used and ranged from 'very unlikely' to 'very likely'. The means for each of these four activities was calculated across the four different social networking platforms. We also asked them if they thought the meme was true, whether the underlying message was true, if it was funny, and if it was trying to be funny. A five-point Likert scale was used for these questions and ranged from 'strongly disagree' to 'strongly agree'.

Additionally, we also measured various psychological traits. This was done by using previously developed and validated instruments. We used the PANAS-X to measure both the higher and lower order dimensions of trait affect, which is an extended version of the original PANAS (positive affect negative affect schedule) [52], [53]. For personality, we employed the Big Five Inventory [54]–[56]. Results were obtained from those that classified themselves as Democrats (N=98), Republicans (N=44), and Independents (N=52). Next, we discuss some of the findings from this study.

4. RESULTS & DISCUSSION

This study provides insight on how political affiliation may be related to the views individuals have of certain political memes, including the truthfulness, ideological leaning, and humor value provided by the meme. Additionally, this study provides some insight on how political affiliation and psychological factors influence the types of interactions individuals have with memes on social networking platforms.

The results from the first survey may be found in the Appendix in Table 1. The first question related to the ideological leaning of the meme, a 7-point scale was used from "very liberal" to "very conservative". The results from the other questions presented in the table employed a 5-point Likert scale from "strongly disagree" to "strongly agree". In order to simplify the presentation of the results for the second survey, we calculated mean values for each meme across the four social networking platforms (i.e., Facebook, Twitter, Instagram, and Reddit) examined in the study and for the three primary activity types (i.e., liking, commenting, and sharing). We also calculated mean values for the different activity types across all memes and social networking platforms.

One-Way ANOVA Analysis
One of the first things we wanted to examine was whether there were differences between memes, primary activity types, and psychological factors based on political affiliation. Analysis included One-Way ANOVA with Tukey post hoc analysis included to help identify the specific political affiliations for which there was a significant difference.

We did identify some differences based on political affiliation. With respect to the psychological factors examined in this study, we found that Republicans ($M = 3.33$, $SD = 0.87$) had lower levels of openness than either Democrats ($M = 3.68$, $SD = 0.81$) or Independents ($M = 3.74$, $SD = 0.76$), $F(2, 197) = 3.85$, $p = .02$. There was not a significant difference between Democrats and Independents. Differences were not found for the other psychological factors examined in this study, nor for the activity types.

Moderation Analysis
Another statistical test we performed was the Pearson's r correlation coefficient. We wanted to assess how the psychological factors we examined in this study may be related to one's propensity to engage in various activity types across all memes and activity levels for each given meme. There were many significant relationships found, which ultimately did little to help with our understanding of how these psychological factors may be related to meme activity on social networking platforms. Therefore, we decided it would be fruitful to test for moderation based on political affiliation. This was done by performing the analysis for each of the political affiliations separately. Some interesting results were found.

The level of engagement based on either activity type or the overall activity level for a specific meme was not related to personality type for Republicans with one exception, individuals that were more agreeable were less likely to engage with meme 5 ($r(44) = -.35$, $p = .02$). However, a different picture comes to light when we examine Democrats. Democrats that have higher levels of extraversion are more likely to engage in commenting ($r(98) = -.36$, $p < .001$), sharing ($r(98) = -.34$, $p = .001$), or liking ($r(98) = -.38$, $p < .001$). They were also more

likely to engage in activity with all of the memes ($p < .001$ for each meme). Some of this was also observed for Independents for memes 1 ($r(52) = .35$, $p = .01$), 3 ($r(52) = .31$, $p = .03$), and 5 ($r(52) = .41$, p = .002).

Beyond personality, we also examined trait affect, including both the higher order and lower order dimensions. These results are presented in Table 2 in the Appendix. The only results omitted from this table were for attentiveness and serenity since the results were not significant for any of them.

There are a few interesting observations that can be made from these results. First, with the exception of meme 3, trait negative affect is positively related to Republicans activity levels based on both type and for each meme (8/9). In contrast, this was true for only three out of nine instances for Democrats (sharing, meme 1, and meme 3). Similar to Republicans, this was true in eight of nine instances for Independents with the one exception being meme 5.

For trait positive affect, the opposite is true for Democrats and Republicans. Higher levels of trait positive affect were associated with activity type and meme activity levels for all but meme 2 (8/9) for Democrats. This was true in only three instances for Republicans (liking, meme 4, and meme 6). A relationship was found in only one instance for Independents, meme 1.

The lower order dimensions of affect follow a similar pattern with fear, hostility, and guilt similar to what was observed for trait negative affect. Likewise, joviality and self-assurance followed a pattern similar to trait positive affect. This suggests that negative types of affect are much more prevalent in whether Republicans and Independents engage with memes on social networking sites, while positive types of affect have less of an influence. Likewise, positive types of affect appear to play a large role for Democrats in whether or not they will engage with memes on social networking sites, while the same is not true for negative types of affect. Psychologically, the willingness for individuals to engage with memes on social networking sites is quite different for Democrats when compared with Independents and Republicans. Please see Table 2 in the Appendix. Next, we examine some differences found based on political affiliation for each of the six memes included in this study.

Meme-level Analysis
The first and third memes are right-leaning climate change memes, while the second and fourth memes are left-leaning climate change memes. No significant differences were found for these memes with respect to activity type based on political affiliation.

The fifth meme is a right-leaning socialism meme, Figure 5. No significant differences were found for this meme with respect to the commenting or sharing activity types based on political affiliation. However, we did find a difference based on the liking activity type. We found a significant difference between Republicans ($M = 4.20$, $SD = 2.97$) and Democrats ($M = 2.49$, $SD = 2.58$) on the likelihood that they would like this meme across social networking platforms, but no significant difference with Independents ($M = 3.00$, $SD = 2.70$), $F(2, 193) = 6.07$, $p = .003$. This difference is not too surprising given the partisan nature of the meme that attempts humor at the expense of Bernie Sanders, an Independent that has ties to the Democrats.

The sixth meme is a left-leaning Donald Trump meme, Figure 6. No significant differences were found for this meme with respect to the commenting or sharing activity types based on political affiliation. However, we did find a difference based on the liking activity type. We found a significant difference between Republicans ($M = 2.89$, $SD = 2.96$) and Democrats ($M = 4.91$, $SD = 3.15$) on the likelihood that they would like this meme across social networking platforms, but no significant difference with Independents ($M = 3.86$, $SD = 2.71$), $F(2, 193) = 7.23$, $p < .001$. Again, this difference is not too surprising. This time the meme takes aim at Donald Trump and thus Republicans are less likely to like it across social networking platforms.

Anonymity Analysis
We asked participants a series of four questions for each of the four social networking platforms we examined in this study. The questions were designed to gauge the extent to which they try to remain anonymous on each of the platforms. For example, the extent to which the individual uses her real name on the social networking platform, as well as who they interact with on said platform.

Individuals who made more effort to remain anonymous on Facebook were related to reduced aggregate activity levels across the four social networking platforms, including commenting, sharing, and liking ($p < .001$). The same was not true for Twitter or Instagram. Thus, if part of the user's goal is to maintain a higher level of anonymity on Facebook then the user is simply less likely to engage in the three primary activity types examined in this study.

Interestingly, we found the same relationship for Reddit, but in the opposite direction of what it was for Facebook ($p < .001$). In other words, individuals that use Reddit and do not make efforts to retain a certain level of anonymity on the platform, are more likely to engage in commenting, sharing, and liking across the four social networking platforms. These differences may largely be a function of the differences in the social networking platforms. Nonetheless, they do deserve additional inquiry since perceived anonymity may be a driver in the spread of disinformation online.

5. CONCLUSION

The goal of this study was to better understand the nature of the spread of disinformation online through political memes. We did this by examining three activity types (liking, commenting, and sharing) across four social networking platforms (Facebook, Twitter, Instagram, and Reddit). We also incorporated personality and trait affect measures to better understand the differences between people with respect to activity type and political affiliation. Our findings suggest that the psychological underpinnings for the spread of disinformation varies based on political affiliation. In particular, the meme activity levels for Republicans and Independents appear to be related to negative types of affect. In contrast, positive types of affect help us better understand the level of engagement with memes by Democrats, as well as extraversion.

These findings are important since the spread of disinformation online through social networking sites poses a significant threat to information integrity, one of the three pillars of information

security (confidentiality, integrity, and availability) [57]. If this threat to integrity continues to proceed unchecked, it may alter the results of future elections as it may have done so for the 2016 U.S. presidential election. Disinformation campaigns, whether as a result of a foreign adversary or a political opponent, pose a clear and present danger to the democracy of the United States and other democracies throughout the world. We are often concerned with cyber-attacks on our critical infrastructure. There is not a critical infrastructure of greater importance to the United States than that of fair, free, and open elections. This research takes one step to helping us better understand the reasons why individuals may perpetuate the spread of disinformation online. Future studies should seek to determine how the efficacy of such disinformation campaigns may be neutralized.

6. REFERENCES

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Figure 1. Right-Leaning Climate Change Meme (Meme 1)

Figure 2. Left-Leaning Climate Change Meme (Meme 2)

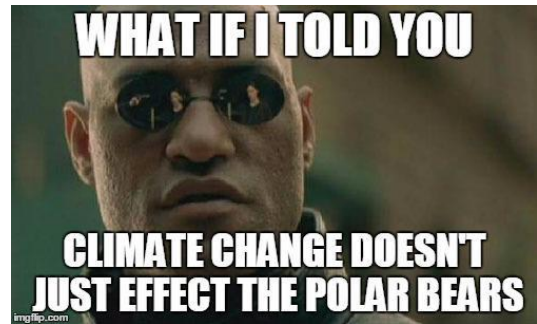Figure 3. Right-Leaning Climate Change Meme (Meme 3)

Figure 4. Left-Leaning Climate Change Meme (Meme 4)

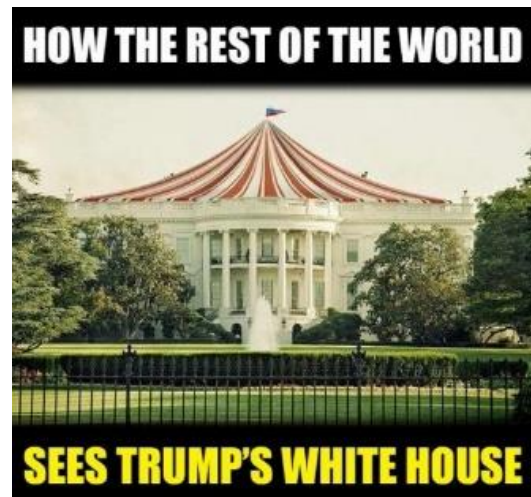Figure 5. Right-Leaning Socialism Meme (Meme 5)

Figure 6. Left-Leaning Donald Trump Meme (Meme 6)

Meme	Party Affiliation	Politics of Meme	This meme can be classified as…				Is the meme…			
			Propaganda	Hoax	Satire	Truth	Funny	Trying to be Funny	True	Underlying Message is True
A	R	5.52	2.19	2.09	2.41	3.88	2.79	2.95	3.84	3.98
	D	5.09	3.08	2.21	2.93	2.80	2.87	3.44	2.93	3.05
	I	5.38	2.64	1.95	3.09	3.18	2.82	3.29	3.13	3.29
B	R	3.88	2.83	2.54	2.38	3.14	2.14	2.34	3.16	3.48
	D	2.83	2.64	2.02	2.22	3.97	2.27	2.63	3.72	3.84
	I	2.25	3.21	2.11	2.07	3.36	1.96	2.38	3.18	3.16
C (1)	R	4.86	2.76	2.29	2.66	3.53	2.41	2.58	3.64	3.62
	D	5.44	3.65	2.79	2.56	2.20	2.00	2.79	1.99	2.08
	I	5.57	3.52	2.63	2.34	2.02	1.77	2.52	1.80	1.98
D (2)	R	4.07	2.48	2.49	2.14	3.69	2.16	2.19	3.69	3.72
	D	2.69	2.44	2.02	1.81	3.65	1.90	2.00	3.51	3.77
	I	2.52	2.86	2.29	1.75	3.23	1.86	1.88	3.18	3.25
E (3)	R	4.60	2.86	2.80	2.28	2.98	2.14	2.19	3.19	3.33
	D	5.69	4.03	3.10	2.10	1.87	1.86	2.26	1.69	1.79
	I	5.59	3.95	2.89	2.15	2.07	1.66	2.11	2.09	2.04
F	R	4.38	3.12	2.52	2.12	3.19	2.26	2.60	3.41	3.45
	D	2.78	2.70	2.02	2.88	3.48	2.58	3.01	3.38	3.51
	I	2.68	3.16	1.89	2.80	2.86	2.43	2.82	2.89	3.00
G	R	4.97	2.56	2.29	3.53	3.07	3.32	3.52	3.28	3.34
	D	4.15	3.13	2.16	3.44	2.81	3.15	4.09	2.85	2.92
	I	4.14	2.75	2.18	3.64	3.21	3.43	4.02	3.43	3.57
H	R	4.83	2.52	2.40	3.61	3.03	3.45	3.71	3.24	3.29
	D	3.83	2.56	2.10	3.79	2.87	3.15	4.13	3.05	3.13
	I	4.02	2.50	1.96	3.95	3.00	3.55	4.09	3.23	3.29
I (4)	R	3.41	2.91	2.93	2.40	2.91	2.30	2.64	3.07	3.14
	D	2.71	2.16	1.81	2.26	4.07	2.46	2.81	3.97	4.09
	I	2.45	2.43	1.80	2.25	3.88	2.54	3.13	3.68	3.88
J (5)	R	5.54	2.40	2.17	3.26	2.98	3.59	3.60	3.38	3.52
	D	5.53	2.90	2.20	3.62	2.19	2.97	4.09	2.17	2.29
	I	5.57	2.82	1.93	3.96	2.29	3.13	3.95	2.52	2.73
K (6)	R	4.33	2.91	2.45	2.96	3.09	2.66	3.28	3.22	3.41
	D	2.49	2.51	2.08	3.65	3.31	3.59	4.07	3.51	3.77
	I	2.64	2.89	1.95	3.70	2.79	3.21	3.93	2.95	3.07
L	R	4.72	2.95	2.55	2.81	3.42	2.81	3.33	3.66	3.69
	D	5.05	3.53	2.34	2.93	2.52	2.57	3.81	2.52	2.62
	I	4.79	3.57	2.39	3.05	2.64	2.63	3.68	2.80	2.77
(1=Very Liberal; 7=Very Conservative)			(1=Strong Disagree; 5=Strongly Agree)							

Table 1. Meme Classification, by Political Affiliation

		TNA	TPA	Fear	Hostility	Guilt	Sadness	Joviality	Self Ass.	Shyness	Fatigue	Surprise
Comment	R	.463**	.152	.541**	.451**	.415**	.550**	.146	.313*	.242	.285	.476**
	D	.165	.292**	.168	.174	.158	-.080	.290**	.332**	-.104	.026	.433**
	I	.426**	.231	.485**	.459**	.299*	.266	.277*	.337*	.301*	.200	.389**
Share	R	.487**	.192	.539**	.485**	.468**	.555**	.201	.334*	.325*	.308*	.497**
	D	.233*	.288**	.241*	.241*	.205*	-.018	.311**	.340**	-.053	.039	.478**
	I	.532**	.203	.606**	.548**	.398**	.390**	.235	.334*	.400**	.329*	.414**
Like	R	.435**	.308*	.494**	.440**	.408**	.472**	.319*	.444**	.333*	.273	.585**
	D	.173	.257*	.169	.185	.144	-.035	.266**	.328**	-.112	.063	.410**
	I	.469**	.144	.548**	.470**	.358**	.364**	.148	.239	.399**	.390**	.308*
Meme 1	R	.424**	.064	.504**	.374*	.352*	.514**	.104	.240	.217	.298*	.381*
	D	.233*	.254*	.246*	.266**	.186	.036	.230*	.316**	-.038	.078	.330**
	I	.410**	.332*	.462**	.443**	.270	.249	.340*	.479**	.306*	.220	.364**
Meme 2	R	.416**	.251	.401**	.492**	.397**	.470**	.218	.316*	.315*	.261	.483**
	D	.117	.180	.133	.102	.095	-.123	.223*	.250*	-.073	.055	.299**
	I	.414**	.076	.437**	.414**	.373**	.321*	.054	.116	.377**	.259	.320*
Meme 3	R	.212	-.009	.325*	.190	.178	.309*	.029	.159	.051	.107	.173
	D	.216*	.216*	.209*	.219*	.223*	.035	.200*	.230*	-.053	.062	.382**
	I	.480**	.225	.552**	.512**	.373**	.343*	.249	.334*	.301*	.256	.375**
Meme 4	R	.378*	.344*	.439**	.351*	.335*	.419**	.322*	.385**	.277	.225	.524**
	D	.132	.261**	.140	.140	.119	-.068	.276**	.263**	-.081	.047	.381**
	I	.352*	.051	.382**	.358**	.241	.257	.102	.133	.316*	.349*	.228
Meme 5	R	.432**	.033	.444**	.431**	.491**	.431**	.023	.177	.312*	.322*	.338*
	D	.153	.335**	.155	.172	.117	-.055	.338**	.427**	-.138	-.073	.513**
	I	.252	.253	.347*	.266	.170	.147	.286*	.330*	.109	.117	.324*
Meme 6	R	.457**	.347*	.534**	.455**	.403**	.506**	.368*	.515**	.306*	.239	.666**
	D	.159	.214*	.141	.165	.156	-.029	.233*	.256*	-.078	.047	.389**
	I	.533**	.064	.624**	.538**	.376**	.429**	.106	.180	.473**	.355**	.281*

Table 2. Social Media Activity Type and Meme Level Analysis with Affect (** $p < .01$; * $p < .05$; 2-tailed)