Virtual versus reality: how online communication has impacted the way Americans discuss politics

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Abstract

The ways in which people communicate about politics have been studied for years and examined through the lens of psychology, gender, and ideology. Political communication has become more prevalent on social media and a larger portion of the population can participate because of its rapid and instantaneous nature. This raises the question of whether the ways that people communicate about politics online is the same as the ways they communicate in person. This paper first reviews the current psychological literature about the different ways genders and people with different ideologies communicate. Then, 16.5 million tweets about the 2022 US Senate Election were collected and graded for sentiment and users were categorized by gender and ideology. By comparing the sentiments for each subgroup to their tendencies according to psychology, the degree to which the two environments for communication were similar could be measured. It was determined that while the majority of trends held true across the environment, there were examples where online communication differed. Specifically, Democrat females discussing republican candidates. This study concludes by calling for further research using more data from other sources in order to ensure that outside factors associated with this election did not skew the results.

Keywords: politics, gender studies, sentiment analysis, social network analysis

Introduction

For most of history, our world has been a dangerous and chaotic place. Despite the threats from not only the outside world, but from our own human nature and our tendency toward conflict and disagreement, humanity has survived and thrived. By creating hierarchies and government systems, people have fought off our world's default chaos. By implementing systems that organize societies and give the world order, people have found more comfort and security than once possible. The benefit of this order in society is apparent when one considers humanity's rapid expansion, advancement, and intellectual adventure. Humanity's ability to communicate, share ideas, and exchange information is what pushes the boundaries of our understanding and what improves society overall. Great thinkers have, specifically, pushed the political envelope, but without ways of informing others, their ideas would be in vain. Communication has been humanity's greatest asset towards political development.

Communication within the species has been analyzed and written about by scholars for a long time. By assessing the way that people interact with one another, some of the many gaps in communication can be fixed. One of the primary areas of study that analyzes communication is psychology. By measuring the personalities, tendencies, and motivations of people, a clearer picture of the nuances of their communication can be formed. Scholars have analyzed the relationship between political ideology and psychology

repeatedly. This is a natural step in the pursuit of this topic as political communication is one of the most important forms of interaction that has advanced societies. By looking at politics in a unidimensional way (plotting ideology from right to left), psychologists and political scientists have been able to determine which personality traits tend to translate to certain political ideologies (Gerber et al., 2010, Jiang et al., 2020).

Besides ideology, the differences between men and women have also been of particular interest within the field of psychology. This makes sense as men and women tend to communicate differently (Hyde, 2014), and by studying the reason behind these differences, the relationships between men and women can be strengthened. By analyzing their psychology and personalities, specifically by using the Big Five personality traits (The Psychology Today Staff, 2023), a greater insight into their political ideologies and tendencies can then be explored. By making the connection between the psychology of men and women and how their traits tend to lie politically, a picture of their political communication can be made.

Research that works to understand communication on a deeper level is more important and useful than ever before. As humanity has industrialized and advanced technologically, communication has become far easier and more widespread. This means that more groups of people with different personalities and communication styles are interacting than ever before. This is because social media has become increasingly popular. With its dominance over the past quarter century, it seems as though communication is no longer limited by time and space. This new form of communication is beginning to affect all facets of human life. Specifically, political discourse was once only performed by those in power and some highly educated individuals. Now the political occurrences of any country can be heard of by anyone with a social media account. This influx of people participating in political conversations is what makes further research important. By understanding the nuances and important aspects of online political communication, a greater understanding of the trends seen by participants can be gained. Then they can begin to use it to benefit themselves and society as a whole.

Social media is now the most convenient way for the average citizen to participate in political discussions. For this reason, there is a large percentage of the population, specifically in the United States, which participates in discussions and posts about political content on various platforms. Roughly a quarter of the United States adult population uses Twitter; of the tweets these users produce, 33% are political in nature (Bestvater et al., 2022). This includes both men and women. They utilize these sites to exchange ideas and opinions on current political issues and topics. As social media becomes one of the primary ways that people communicate their political ideas, this raises an important question: How does American political discourse online compare to current literature's consensus on face-to-face political communication? Furthermore, how are the ways that men and women interact online different from the ways that studies have shown they communicate in-person? By examining the ways psychology influences men and women and their political stances, and by tracking and comparing their online communication with one another, any differences between political communication done through a screen can be measured. Conclusions about any detected differences can then be drawn and their implications pertaining to future political communication can be inferred.

This subject of research is especially important not only during a time of high social media use, but high levels of polarization. Political gridlock has plagued the United States Congress for decades. Partisan polarization is one of the main reasons for this impasse (Jones, 2001). It is important to evaluate the causes of polarization, and to determine the sources of this turmoil. This paper will analyze the ideas and questions discussed above by examining a recent example of political communication: The 2022 United States Senate Elections. By examining the ways in which men and women discuss political issues and elections online, and by comparing their communication styles to those described by studies that examine in-person

discourse, the differences between these two avenues can be assessed. Based on prior research completed by this team of researchers and current psychological axioms, it can be inferred that men will tend to be more aggressive with their speech and therefore have sentiment scores that sway widely depending on the subject they are talking about or the party they are referencing. Women will most likely have more neutral or positive tweets as they are less aggressive and more "tender-minded" (Hyde, 2005). It can also be speculated that liberals will tend to be more positive with their sentiment as they tend to be more open-minded while conservatives will be more negative as they are more closed-minded. This means that the hypothesis of this study is that online political communication will follow the same trends and rules recorded in physical settings.

To answer the questions posed by this study, it is first important to define terms that will be used throughout. As mentioned, the primary focus of this paper is exploring political communication between men and women online in comparison with the in-person trends that have been recorded in psychological literature. To avoid any misrepresentation of verbiage, the term gender (Eagly & Revelle, 2022) will be used when describing or discussing men and women. This term is used to avoid prejudging causality since determining whether differences are biologically induced (nature) or socially constructed (nurture) is still widely questioned in the field of psychology (Eagly & Revelle, 2022).

When discussing psychological ideas and findings throughout this study, the Big Five Personality Traits will be referenced. This measurement of personality across five dimensions is widely accepted by psychologists and used in various studies to discuss the gender differences in personality (Hyde, 2005, 2014; Eagly & Revelle, 2022). The five dimensions, openness, conscientiousness, extraversion, agree-ableness, and neuroticism (The Psychology Today Staff, 2023), will be referenced throughout the study and are derived from the Big Five theory.

This paper will also analyze people based on their political leanings and affiliations. The underlying belief system that leads to people's political affiliation is ideology. Defined by John Jost as *(i)*, "any abstract or symbolic meaning system used to explain (or justify) social, economic, or political realities", and *(ii)*, "a web of ideas that are distorted, contrary to reality, and subject to 'false consciousness'", (Jost, 2006). Essentially, ideology, for the sake of this study, is a person's system of beliefs and that system's effect on their outlook and view of reality. This definition, although simplistic, is adequate for this study and can be used to define the terms that follow. This study, dealing with American politics, will be concerned with the two major political ideologies present in the country: conservatism and liberalism. Psychological literature deals in ideology, but it will be important to bridge the gap to political party for the sake of this study. The parties that spur from these ideologies are the Republican and Democratic parties. These terms will be used to describe candidates that are members of a party or Twitter users determined to be associated with a party.

Literature Review

Psychological Differences between Men and Women

There is a plethora of literature surrounding the psychological gender differences. Janet Shibley Hyde, a psychologist at the University of Wisconsin, has produced work throughout her career pertaining to these differences. She is most famous, however, for challenging the idea that there are many differences between genders with her "Gender Similarity Hypothesis" (Hyde, 2005). Before outlining the conclusions of that study, it will be beneficial to overview her summary of the major theories surrounding psychological gender differences (Hyde, 2014).

Since the idea of gender differences has been a topic of discussion for so long, there are several theories and studies that have formed the ideas that are widely accepted today. The evolutionary theories, which date to the time of Darwin, state that there are two main factors that have caused these differences to manifest: sexual selection and parental investment (Hyde, 2014). Sexual selection is comprised of two processes: "(a) Members of one gender (usually males) compete among themselves to gain mating privileges with members of the other gender (usually females), and (b) members of the other gender (usually females) have preferences for and exercise choice in mating with certain members of the first gender" (Hyde, 2014). Parental investment is said to cause differences in psychology, mainly in behavior, as the investment needed to raise offspring between the sexes is disproportionate. The theory further explains that females give more time and resources to a child in the womb, which correlates to their natural instincts toward caring for children once the baby is born (Hyde, 2014).

If the evolutionary theories outline nature's case for gender differences, another popular set of sociocultural theories outline nurture's case. This set of ideas rests on the fact that society treats men and women differently as children and adults, with different opportunities, cultural standards, and rules. These distinct treatments, over time, cause psychological differences to manifest. The theory states that the biological differences between genders have contributed to the division of labor seen in society. For males, "greater size and strength led them to pursue activities such as warfare, which gave them greater status and wealth, as well as power over women" (Hyde, 2014). Over time, this propelled men into a more dominant role that has manifested in the behavior patterns seen today. On the other hand, "Women's assignment to the role of childcare led them to develop qualities such as nurturance and a facility with relationships" (Hyde, 2014). Although this theory is far newer than others produced, such as the evolutionary theory, there has been a vast amount of research done to support it. Although there are other theories, these two dominate.

With most studies focusing on and arguing over the differences between genders, Hyde published "The Gender Similarities Hypothesis" to challenge the popular differences models. The thesis argues that "males and females are alike on most— but not all—psychological variables" (Hyde, 2005). Using meta-analyses conducted on psychological gender differences, Hyde determined that 78% of differences are small or close to zero. This not only supports her hypothesis but allows for researchers to focus more on the areas where sizeable differences have remained. The degree of difference is measured by the effect size, given in terms of d:

$$d = \frac{M_m - M_f}{s_w},$$

where M_m is the mean male score, M_f is the mean female score, s_w is the average standard deviation between the two, and negative effect sizes are associated with women while positive values are associated with men. The two areas with the largest effect sizes were motor performance (e.g., throwing velocity and distance) and measures of sexuality (e.g., sexual satisfaction and attitudes surrounding sex), and are unimportant to this study. Tendermindedness, which falls under the umbrella of agreeableness, was the next largest effect size of $d = -0.91$. Physical aggression was $d = +0.60$ to $+0.33$ depending on the meta-analysis. Verbal and psychological aggression was from $d = +0.43$ to $+0.18$ (Hyde, 2005).

Since Hyde finds tendermindedness and aggression to be the main traits with the largest effect sizes and therefore most different between genders, they can then be focused on as the remaining aspects are too similar to be important. This conclusion is still challenged by more traditional evolutionary and sociocultural theorists who assert that the genders are more different. A study by Eagly and Revelle examined this dispute further in 2022. They argue that depending on how the data and psychological attributes are combined can result in vastly different findings. When examining these differences at high resolution levels, more exact findings can be made. Many examples from past studies are given that

demonstrate this idea. For example, the data described from Gruber et al. (2010) shows that broad measures of traits (i.e., split into personality, cognition, and interests and activities) on a masculine and feminine scale produce results with a high effect size. When these traits are measured more specifically not only are the effect sizes lower, but the accuracy level increases.

This idea is expanded upon by Eagly and Revelle. They state, "differences are larger on assessments of the overall difference between women and men in multidimensional domains such as personality, in which they differ on the component dimensions" (2022). Based on this, the study asserts that by assessing these personality dimensions at a higher resolution more valuable and accurate results can be discovered. This supports the findings of Hyde, who extracted many different sub-traits from the Big Five Personalities to find the few categories where genders differ. She admits that the attributes that take exception to her gender similarities hypothesis include, "3D mental rotation, the personality dimension of agreeableness/tendermindedness, sensation seeking, interests in things versus people, physical aggression, some sexual behaviors (masturbation and pornography use), and attitudes about casual sex" (2014). The attributes that are relevant to this study, or those that can manifest themselves in online political discussion, are agreeableness/tendermindedness and aggression (physical and psychological/verbal).

Personality's Effect on Political Affiliation

With the psychological measures that substantially differ between genders established, the research's focus could be turned to political ideologies. Like the gender differences described above, there is great debate, and some consensus, surrounding psychological determinants of political leaning and affiliation. Jost, although not a psychologist but a political scientist at NYU, lays the foundation for this idea in an interesting way. Jost works to prove that the "end of ideology" prophesized about in the 1950's is not only wrong, but ideologies have become more popular and polarized in recent years (2006). This is fortunate for this study as political leaning can be measured on a unidimensional scale from conservative to liberal while still encompassing the vast majority of citizens.

With these two ideologies in mind researchers have worked to predict a person's proclivity towards either conservatism or liberalism based on the Big Five Personality traits. Gerber et al. attempted to do this in 2010 with great success. The study utilized the 2007–2008 Cooperative Campaign Analysis Project (CCAP), which is an online survey of registered voters. This study in particular uses, "a combination of sampling and matching techniques to account for the fact that opt-in Internet survey respondents may differ from the general population on factors such as political interest" (Gerber et al., 2010) and attempts to replicate a random digit dialing sample.

Their findings were quite definitive. Conscientiousness was linked to conservatism in self-placement (how the respondent self-identified), economic policy, and social policy opinions. Overall, conscientiousness is associated with an $s = .29$ standard deviation increase in self-described conservatism. The study also finds that conscientiousness is a better determinate of conservatism than income and education which had formerly been popularly used. Likewise, openness is a strong determinate for liberalism with a $s = .56$ standard deviation increase for ideological self-placement, $s = .48$ increase for economic liberalism, and a $s = .53$ increase in social liberalism. Like conscientiousness, this is a better way of determining liberalism than income and education (Gerber et al., 2010).

The study continues by addressing the remaining Big Five Personality traits. Although the study did not find a correlation between ideology and agreeableness when examining the trait broadly, specific qualities (economic and social) associated with ideology do produce results. It can be inferred that the reason for the differences detected on a higher resolution inspection of ideology are found because the agreeableness trait

itself is being expanded at a higher resolution. Keeping in mind conclusions from Eagly and Revelle, it seems that their ideas transcend psychological areas of study. Gerber et al. found that agreeableness is associated with liberal economic attitudes and conservative social attitudes (2010).

Emotional stability, the opposite of neuroticism, is linked to conservative self-placement and economic conservatism. The effect size for emotional stability's association with social conservatism is quite modest and difficult to give much weight. Finally, extraversion was measured and according to the study, "we find that those who are more Extraverted are somewhat more conservative on each of the outcomes we examine" (Gerber et al., 2010).

Important conclusions can be made from these findings which are important to the goals of this paper. This information can be utilized by this study by determining which of these attributes that relate to ideology correlate to communication styles on social media. Not every trait of the Big Five can translate to an online environment where posts are the only thing visible. Without demeanor and body language, it can be hard to judge all five based on how someone communicates. Aggression will most likely be seen in posts with very low sentiments, especially towards members of the opposing party. According to Jiang et al., aggression is highly associated with agreeableness ($d = -0.32$), extraversion ($d = 0.23$), and neuroticism ($d =.21$) (2022). From this, a connection between aggression, the Big Five Personality traits, and ideology can be made.

Based on the work of Gerber et al., extraversion is most associated with conservatism, agreeableness can skew toward either end of the ideological spectrum depending on context (economic: liberal; social: conservative), and conservatism is correlated with emotional stability. This means that Jiang et al.'s results argue that aggression tends to be associated with both conservatives and liberals. However, as disagreeableness and extraversion are the traits associated with aggression the most, it can be inferred that conservatives are overall more aggressive.

Openness and conscientiousness can also be observed in online conversation. Openness denotes, "receptivity to new ideas and new experiences" (The Psychology Today Staff, 2023). Based on information above, liberals tend to be more open-minded, and it can be inferred that this will lead to fewer negative conversations as they are more willing to see the other side's point of view. Conscientiousness, which is associated with conservatism, leads to higher levels of self-control and adherence to norms and rules (The Psychology Today Staff, 2023). These sub-traits may correlate to certain differences in method and style of conversation online and will be closely tracked in this study.

Methodology

Although political communication occurs on all major social media platforms, Twitter is the platform that this study will utilize. Due to its design and the ways in which users can voice their opinions, reply to, or retweet others, and speak directly with or towards political candidates and figures, it is the ideal platform to study. It is also the main social media platform for American political discussion (Bestvater et al., 2022). The opinion-based content and ability to post quickly attracts political figures and candidates to use the platform. Of the 70 candidates that were running during the senate elections, each had a Twitter account that was used in the data collection phase of this study. Consequently, because of these candidates' presence on the platform, their followers use Twitter to post their own responses and ideas. For this reason, and because studies conducted in the past that deal with current political conversations over social media have used Twitter, it is the precedent and obvious choice for this study.

Data Collection

This study uses data collected from the five weeks leading up to the election, beginning with September 5th and leading up to November 8th, 2022. By using the Twitter Listener API in the Twython library (McGrath, 2013), any tweets that discuss the candidates Twitter handles were collected. A total of 16,476,679 tweets were collected with 1,520,328 unique authors. Figure 1 shows the number of tweets collected each day throughout the collection period.
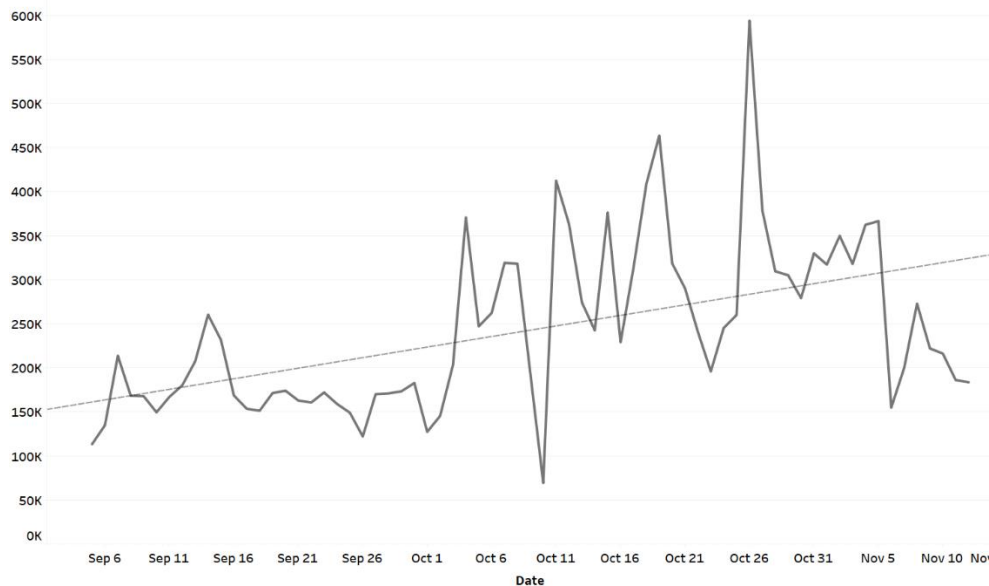
**Figure 1: Tweet Collection Labor Day through Election Day**

Gender Classification

Once the tweets and authors were obtained, four main steps were taken utilizing the data collected by the API. First, the gender of each author was determined. This was completed by utilizing the gender guesser (Pérez, 2015) package within Python which utilizes a lookup list based on the users first name. Of the 1.52 million authors, the gender for 43% of authors were determined. This includes 312,426 users classified as female, 481,876 classified as male, 15,888 classified as androgynous, and 931,285 classified as unknown. When users use screen names that do not contain their first name, the library is unable to confidently classify them, and they are put into the unknown category. This percentage of known genders is roughly equal from the last study conducted concerning the 2018 senate elections which had 46% of its authors classified as either male or female (Mentzer et al., 2020).

Sentiment Analysis

Next, each tweet was scored for sentiment. Valence Aware Dictionary for Sentiment Reasoning (VADER) analysis (Hutto, 2014) is a popular Python package that is used in several political studies that use Twitter data (Noor & Turetken, 2023; Mentzter et al. 2020, Dang-Xang, 2013), This package takes texts and scores its sentiment from -1.0 (extremely negative) to +1.0 (extremely positive) with a score of 0.0 being neutral. Each tweet's sentiment was scored using this scale. The average sentiment for all 16.48 million tweets is $s = 0.04158$, which means that overall, the tweets are classified as somewhat positive. This number being so

close to neutral is to be expected as the majority of tweets are neutral, and the positive and negative tweets balance out. The distribution of sentiment is shown in Figure 2.
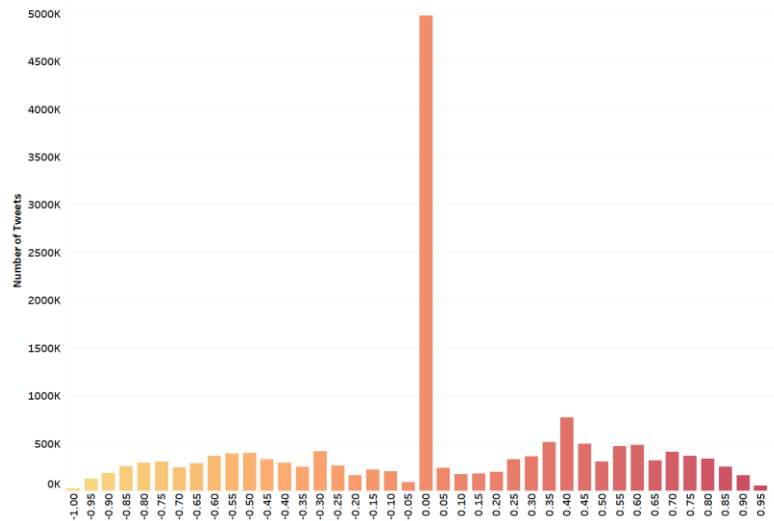
Figure 2: Distribution of Tweet Sentiment
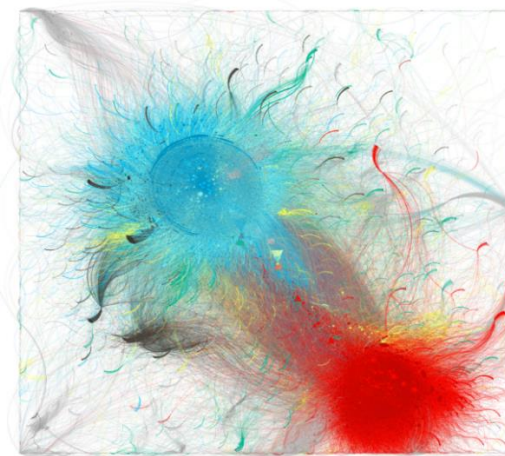
Figure 3: Retweet Social Network

Following the same process as Mentzer et al. (2020), the network is created by establishing communities within the set of tweet authors collected for this study. By utilizing the social network analysis tool Gephi (Gephi, 2023), the top ten communities can be determined. Table 1. Shows information associated with each community including the percentage of total users associated with the community, the top five accounts leading the community, and the political affiliations. From these communities each Twitter user could be classified by their party affiliations. Users who interact the most with communities of one-party affiliation are classified as a part of that party.

The retweet network (Figure 3) depicts the connection between all users based on other users they have retweeted. The colors shown in the network correspond to the political affiliation of the communities. The red cluster in the bottom right is comprised of the Republican community that makes up 31.62% of users.

The light blue cluster in the center consists of the seven Democratic communities that are associated with 61.97% of users. The yellow connections seen on the outskirts of both major clusters is the libertarian community. Finally, the black connections are associated with the Spanish media community.

Results

After all tweets were graded for sentiment, they were categorized by the candidate and the party they are discussing. Then all authors were classified by gender and ideology, so the nature of online political communication can be examined. By comparing the trends derived from the data collected from Twitter to the psychological axioms discussed in the Literature Review section, any possible correlation was measured. This section will cover the conclusions and visuals created based on the data analysis described above.

Sentiment by Gender

As previously mentioned, 43% of the Twitter author's genders could be determined. This distribution and average sentiment (s) by gender is shown in Figure 4. Women authors, on average, scored a sentiment of $s = 0.065541$, while men scored an average of $s = 0.042792$. The 57% of remaining authors are comprised of both men and women whose gender could not be determined with certainty. This group's sentiment averaged $s = 0.042971$. This value is very close the average male sentiment which may mean that most unknown genders are male. However, this is only a hypothesis and will not be explored further in this study.
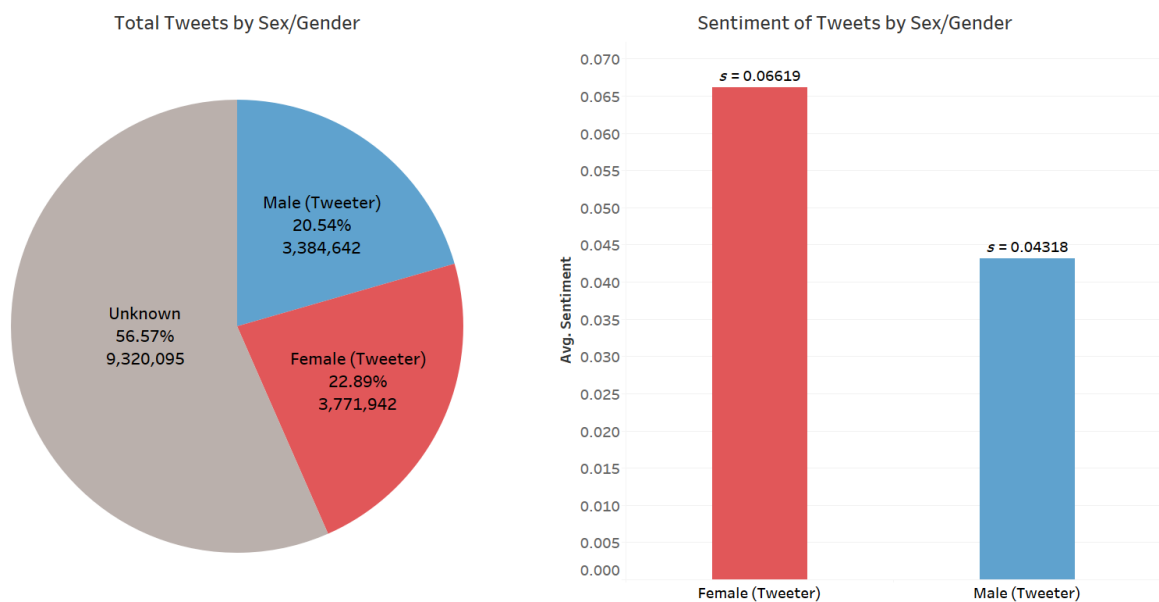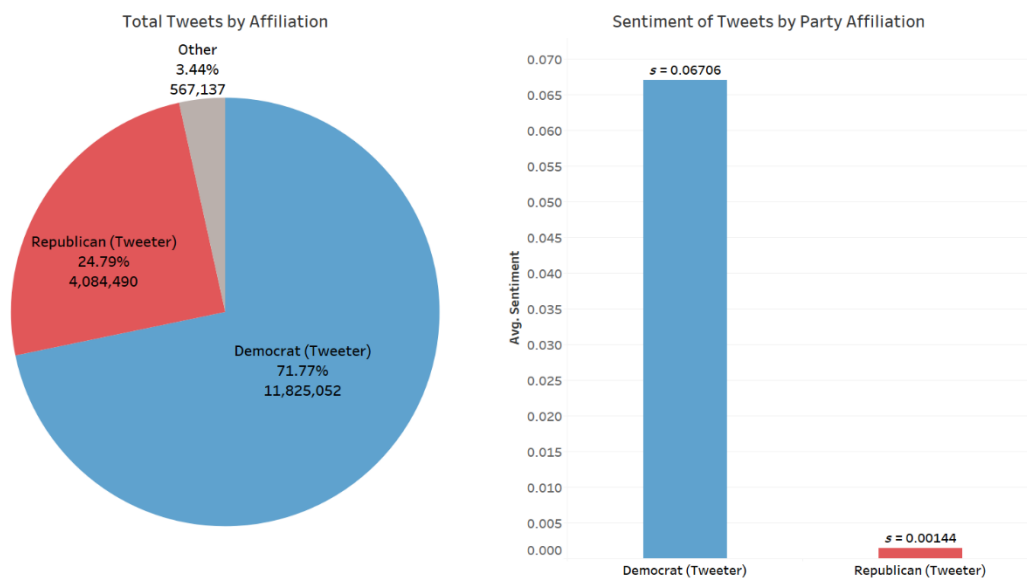

Figure 4: Political Affiliation Distribution and Average Sentiment

Sentiment by Ideology

By utilizing the retweet network and by assigning party affiliation to the communities with the highest level of following and interaction, the author's political party could be designated. Figure 5 shows the distribution of party affiliation among the authors collected this year as well as the average sentiments for each group. There were 11,825,052 tweets produced by authors with Democratic affiliation and 4,084,490 with

Republican affiliation. This 1:3 ratio is unprecedented as in years prior the split has been about 1:1 (Mentzer et al., 2020). Of the tweets from Democrat authors, the average sentiment was $s = 0.067064$. This was far higher than the average sentiment of Republican affiliated tweets which scored 0.001444.

These sentiments can further be broken down by splitting the tweets based on their subjects. A clearer and more detailed picture of the sentiments of each party can be seen by examining sentiments of tweets by party affiliation split by the party affiliation of the candidate(s) being discussed. When Democrat affiliated tweets are discussing Democrat candidates, the average sentiment is $s = 0.123195$. This average drops to $s = -0.048894$ when Democrat tweets discuss Republican candidates. A difference in these numbers is, of course, to be expected as political polarization in a political setting is driven by out-party hate (Rudolph & Hetherington, 2021). However, this gap is much smaller for Republicans. When discussing Republican candidates, Republican affiliated tweets have an average sentiment of $s = 0.029127$. The average sentiment towards Democrat candidates is $s = -0.036785$. It is important to note how much lower the average sentiment Republican tweeters have towards their own candidates in this election.

Figure 5: Political Affiliation Distribution and Average Sentiment

Sentiment Based on Tweet's Subject

By drilling down further and crossing the data above, the sentiment of a tweeter with a specific gender and party affiliation can be seen based on the gender and party of the candidate they are tweeting about. Democrat female tweeters, when compared with the three other groups of tweeters, are the most positive when discussing in-party candidates. Specifically, $s = 0.1267$ when mentioning female candidates and $s = 0.1304$ for male candidates. This sentiment drops to $s = 0.0307$ when discussing female Republican candidates and even further to $s = -0.0510$ for male Republican candidates. Male Democrat tweeters follow a very similar trend. For female and male in-party candidates, the sentiments are $s = 0.1197$ and $s = 0.1141$ respectively. The average sentiment towards male Republican candidates is also roughly the same as female Democratic tweeters at $s = -0.0491$. The main difference is found between the sentiment toward female Republican candidates. The male Democrat tweeters are far more negative towards them with an average sentiment of $s = -0.0023$.

The overall sentiments of male and female Republican tweeters are very similar across candidate groups. Both women and men were most positive towards in-party women candidates with sentiments of $s = 0.1221$ and $s = 0.1138$ respectively. When discussing male Republican candidates, women spoke with a sentiment of $s = 0.0326$ while men scored $s = 0.0297$. The overall sentiments dropped when discussing out-party candidates. Female Republican tweeters discussed female Democrat candidates with a sentiment of $s = -0.0160$, while male tweeters discussed the same group with a sentiment of $s = -0.0219$. Finally, male Democrat candidates scored the lowest with $s = -0.0359$ from female tweeters and $s = -0.0375$ from male tweeters. The data is depicted in Figure 6 where the Democrat tweeters are shown in blue and Republican tweeters in red.
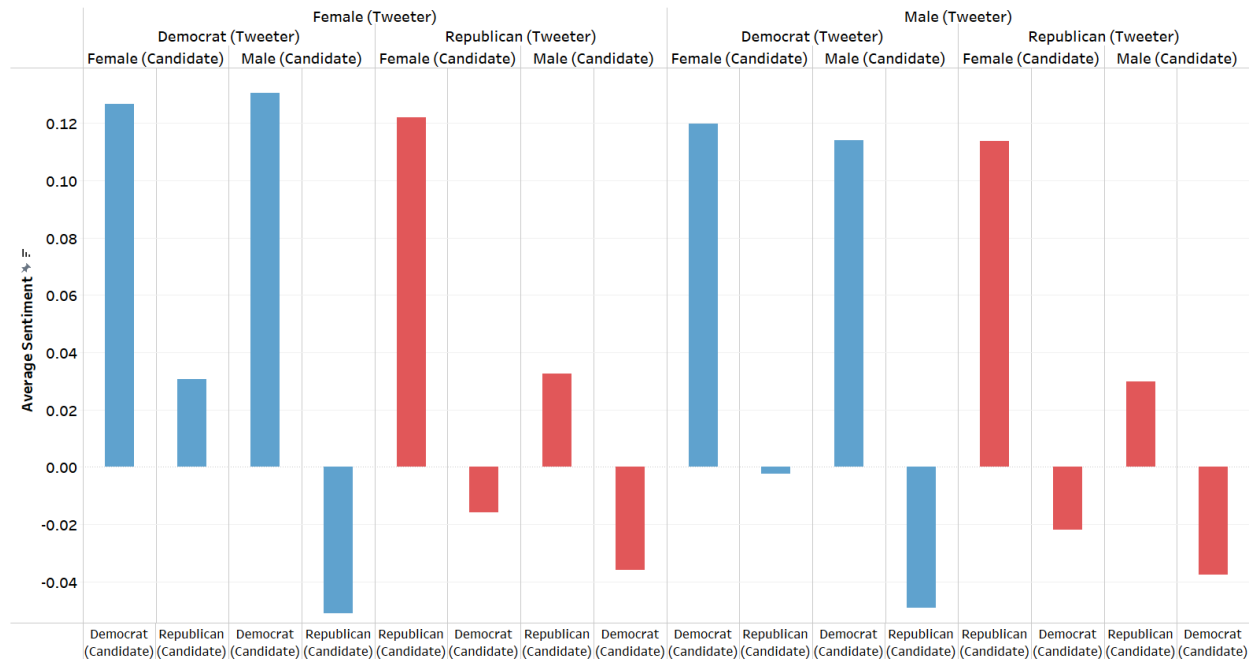

Figure 6: Sentiment of Tweeters towards Candidates by Gender and Party

Conclusions

This final section's goal is to not only discuss the findings described above, but to extrapolate any further information that can be drawn from these conclusions. Keeping the goal of this paper in mind, the conclusions from this data can be compared to the information collected in the literature review to compare in-person political communication to its online counterpart. This is only possible by considering personality's role in communication style and tendencies. By bridging this gap, a connection can be made between the conclusions of past psychological studies about the personality of genders and ideologies, and these attribute's impact on the way people communicate. With this connection in mind, trends seen particularly in sentiment of online communication can relate to certain psychological traits and tendencies. Whether or not the trends match the psychological consensus for each group's personality is what will determine if the two different types of political communication are alike or different.

The data collected from the graph, for the most part, can be explained by Rudolph and Hetherington's study in 2021. Out-party hate seems to be the most obvious trend that can be drawn from Figure 6. For both Republicans and Democrats, both female and male, the sentiments are much more negative for candidates of the opposing party than for candidates from their own party. However, further conclusions can be made in the less noticeable differences. Hyde finds that aggression, both physical and verbal, is associated more

with men than women (2005). Male tweeters, overall, have a lower sentiment than female tweeters with a difference of $s = |0.02301|$. Specifically, when discussing out-party candidates male tweeters scored a lower average sentiment than female tweeters at a rate of 3:1. The largest gap is found when comparing male and female Democrat Tweets when discussing female Republican candidates. Tweets from the men are more negative by a margin of $s = |.0330|$. Only female Democrat tweeters discussed male Republican candidates with a lower sentiment than male Democrat tweeters. This overall lower sentiment, and its concentration and higher intensity in discussion of out-party candidates, could be evidence for males' proclivity toward aggression manifesting itself in online political communication.

While male aggression could be the explanation for their overall lower sentiment, Hyde's other biggest difference between the genders, tendermindedness, could explain the higher overall sentiment for females. As tendermindedness relates to idealism and optimism (APA, 2023), it makes sense that overall, females would be more positive in their Tweets. The one area where this rule is broken, which has been described above, is when female Democrats discuss male Republicans. In order to explain this deviation from the rule, the next attribute to examine is their political affiliation and the traits associated with it. Based on the findings of Gerber et al. (2010) and Jiang et al. (2022), Democrats score higher in agreeableness, open-mindedness, and emotional instability. Based on the lattermost trait, this far lower sentiment towards out-party males could be explained. Emotional instability could make someone react in a rash or negative way towards candidates they disagree with and post negative Tweets about them online. However, the former two traits listed would seem to contradict the trend seen in female Democrat tweeters. Democrat's higher levels of open mindedness, in particular, would oppose the trend that is seen in the data.

Furthermore, open mindedness, which is characterized by a lack of dogmatism, makes people more open to change and opposing viewpoints (APA, 2023). Along with their higher levels of agreeableness and tendermindedness, based on prior research, it can be concluded that female Democrats possess the traits that would result in more accepting and kinder communication towards or about out-party groups. This could be evidence for a difference in the way this group communicates online. Of course, the gravity of neuroticism's effect needs to be considered. This trait may be more dominant over the others or more prominent in an online setting, which could lead to Tweets with lower sentiments for out-party male candidates and explain away this difference.

Members of the Republican Party are prone to higher levels of extraversion, aggression, conscientiousness, and emotional stability (Gerber et al., 2010; Jiang et al., 2022). Their overall lower sentiment when compared to Democrat tweeters could be explained by their aggression and extraversion. Like the reasons for lower sentiments from men, Republican tweeters sentiments could be lowered by their willingness to post aggressive and negative tweets. This could explain why sentiments towards out-party candidates are lowest on average for Republican tweeters at $s = -0.027825$.

This paper makes the following contributions:

1. It continues the work of Mentzer et al. (2020) giving researchers another voting cycle to understand the longitudinal changes occurring in the social media discourse on Twitter.
2. It highlights unique changes that occurred in the 2022 election from prior years.
3. It extends this domain by tying in personalities and gender characteristics that may be influencing the online discourse.

Areas for Future Research

The conclusions stated above are less definitive findings, but more descriptions of possibilities that require further research to fully understand. The question of whether political communication is consistent psychologically based on people's gender and ideology in-person or online, is a difficult question to answer just based on the data collected from one election. It is challenging, without this further research, to confidently assert that any of the evidence supporting or refuting differences between communication settings are legitimate. Therefore, the hypothesis of this study cannot be confirmed. Although some evidence from this study may support it, further research is needed to validate the findings.

One possible driving factor behind some of the trends is the context of the Senate Elections themselves. For instance, the lower sentiment of Democrat females toward Republican male candidates, which could be evidence for a difference in communication in an online setting, could also be explained by the overturning of Roe v. Wade. After the overturning of the case in June 2022, the percentage of Democrats who found the issue of abortion very important rose from 46% in March to 75% in October (Schaeffer & Green, 2022). As the majority of concern for this issue has been from women it could explain the trend described above. Democrat females could Tweet more negatively towards Republican males because of the Republican party's involvement in the overturning.

In order to combat this issue's possible effect on the data, future researchers could continue to collect Tweets from elections where the issue of abortion was not as important to voters and see if the same trend remains. If it does it would then be important to determine whether this lower sentiment was evidence for a difference in Democrat females personality online. Does Democrat neuroticism dominate when it comes to online communication? This could explain the lower sentiment for out-party male candidates. If their proclivity towards open mindedness and aggreeableness tends to dominate their personality in-person then perhaps this is evidence for a difference in online political communication. These sorts of questions should be analyzed further by researchers not only equipped with Twitter data from more elections, but meta-analyses that drill down deeper into personality traits and their dominance or recessiveness in political communication.

Further research should also be conducted into the use of sentiment analysis itself. The findings of this paper and many others (Noor & Turetken, 2023; Mentzer et al. 2020), use sentiment in order to derive trends from social media posts. For the purposes of studies, like this one, which attempt to draw psychological conclusions from these posts, it is important to confirm that sentiment is the most useful aspect of each post.

Limitations

There are some important limitations of this study that should be considered. The first being the skewed distribution of party affiliation in the data set. As previously mentioned, 71.77% of the Twitter users were found to be Democrats while 24.79% were found to be Republican. This slanted pool of users could impact the results of the study. When studying the senate election cycle in 2018, 50% of tweets were from Democrats and 50% were from Republicans (Mentzer et al., 2020). There seems to have been either a dip in Republican participation in political discourse on Twitter or a rise in Democratic participation which overwhelmed the Republican tweets.

This disproportionate distribution of users could also be a result of the platform choice of this study. Americans turn to many other social media platforms to discuss politics, and by examining posts across these platforms a better and more accurate sample of the population can be explored. The traffic of new

platforms, specifically ones that target a conservative audience should be examined. If there was an influx of new activity on these platforms before the start of the election, it could explain the lack of conservative voices collected by this study.

Finally, this study deals with the psychological study of men and women. The Twitter users are also classified as either male, female, or unknown. Any user who does not identify with either gender is not properly accounted for in this study. Their voices and sentiments are either lumped into those of males or females or left to the unknown category. Future research cound to be conducted in order to gain a better understanding of how this group communicates about politics online.

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