A computational linguistic analysis of the 2016 U.S. presidential candidates

Abstract

We like to think that voters base their decisions on the issues, have a rational state of mind, and

are not easily swayed when it comes to their decisions. Unfortunately, research has shown that

this is not the case. The current study sought to answer the following question: Is there

something unique about the way a candidate speaks that can potentially influence a voter's

behavior? Significant linguistic differences were discovered between political parties.

Furthermore, significant linguistic differences were discovered between Donald Trump and

Hillary Clinton. These findings suggest that under the right context, politicians are carefully and

methodically choosing what they say and how they say it.

Influences on voter behavior: A computational linguistic analysis of presidential candidates

Introduction

We like to think that when we walk into a voting booth, we are making a rational decision void of bias that is based on the facts and positions of a particular candidate. However, recent research shows that this might not be the case. Every time a candidate opens their mouth, they are trying to persuade potential voters. Because of this, language is a powerful tool used by politicians to deliver their message and to hopefully gain support.

Based on this information, our overarching research question for this current study was: Is there something unique about the way different members of political parties (i.e., Republicans and Democrats) speak that can potentially influence a voter's behavior?

Linguistic Characteristics

Language is a component of human cognitive processes that has been a focus of research for centuries. From the study of dead languages to the biological nature of language within the brain, researchers have sought to understand how it functions, why humans possess complex language abilities, the impact of language on humans, and countless other questions. Human language is undeniably expressive in content and dialect. Benefits to human health, achievement, and state of being were found when individuals were asked to simply write regularly about emotional content. These benefits that arose through this simple exercise are reflective of the deep relationship between health and language (Pennebaker, 1997). Though the deeply expressive nature of language is not strictly what we understand within conversation and reading, language is expressive through the particular words chosen by individuals and the frequency of their use (Groom & Pennebaker, 2002).

By exploring the habitual way that people explain causes (explanatory style), Zullow, Oettingen, Peterson, and Seligman (1988) were able to develop a blind, reliable content analysis of verbatim explanations from historical records. The researchers proposed that, "subjects who are famous, dead, uninterested, hostile, or otherwise unavailable can be studied as easily as students in introductory psychology classes or depressed patients completing the ASQ so long as they have left some verbatim record" (Zullow et al., 1988, p. 674). The first sample of text in their study utilized were ten press conference transcripts from Lyndon Johnson while he was president. These transcripts reflected four different points in Johnson's conduct of the Vietnam War. In regards to Lyndon Johnson, results revealed that shifts to a more optimistic style in his speeches predicted bold, risky action during the Vietnam War. Conversely, shifts to pessimism in the speeches predicted passivity.

A second sample consisted of 20 nomination acceptance speeches from the Democratic and Republican conventions of 1948 to 1984. Results revealed the speeches containing pessimistic rumination predicted who lost and by how much. For example, in 90% of the elections, the candidate that had a higher degree of pessimistic rumination lost the election.

A third and final sample "observed the frequency of behavior consistent with depression in comparable public social settings in East and West Berlin" (Zullow et al., 1988, p. 680). Initial ratings were made using behavioral observation techniques: facial expression, posture, number of smiles, and number of laughs. Behavioral observations revealed more consistent depression in East Berlin compared to West Berlin. Using the CAVE (content analysis of verbatim explanations) technique, Oettingen et al. (1988) analyzed the reports of the 1984 Winter Olympics from the sports pages of East and West Berlin newspapers. Analysis showed that East and West Berlin reports differed strongly in explanatory style (i.e., their use of language). More

specifically, the language used in the West Berlin newspapers during the Olympics tended to be more optimistic compared to East Berlin. The authors point out that this finding is counterintuitive given that East Berlin actually won more medals than West Berlin. This study suggests that historical documents can generate meaningful patterns of explanatory style and behavior related to pessimism and optimism. In other words, language (both written and spoken) can give potentially powerful insight into thought processes and behavior.

Other research has explored the speech of presidential candidates through the use of computational linguistic analyses. Research conducted by Dowell, Myers, and Graesser (2012) argues that candidates take one of two different approaches when trying to gain the support of a potential voter. The first route of persuasion is known as the central route. According to Dowell et al. (2012) the central route is characterized by "coherent, logical, expository language, resulting in a formal complicated message." The benefit of approaching persuasion from a central route is that the changes made in the mind of the voter tend to be more stable and long-lasting. The second route of persuasion, known as the peripheral route is characterized by "entertaining, narrative discourse that is more informal and easier to comprehend" (Dowell et al., 2012). Unlike the central route, changes in behavior as a result of the peripheral route of persuasion tend to be temporary and unstable.

In order to determine which candidates used the central route versus the peripheral route of persuasion in the 2012 presidential election, Dowell et al., (2012) utilized an automated linguistic analysis tool called Coh-Metrix (Graesser, McNamara, & Louwerse, 2004). Most of the variability in text complexity across the dimensions of text characteristics were Narrativity, Deep Cohesion, Referential Cohesion, Syntactic Ease, and Word Concreteness (more will be said about these different dimensions in the Methods and Procedures section). Using these

different textual dimensions, Dowell et al. were able to compute a measure of formality, defined as "informational (rather than narrative) with high cohesion, complex syntax, and abstract words. Information text is more narrative, with lower cohesion, simple syntax, and concrete words." Results revealed that during the 2012 presidential campaign, Democrats had more formal language which appealed to voters who were attracted to the central route of persuasion.

Also using computational linguistic analyses, Slatcher, Chung, Pennebaker, and Stone (2007) examined personalities and psychological states of the 2004 president and vice president through their use of words. Using a computerized text analysis program called Linguistic Inquiry and Word Count (LIWC), the authors explored transcripts of televised interviews, press conferences, town hall meetings, and debates. Results revealed: 1) Candidates used language more like that of a depressed person in interviews when compared to press conferences and town hall meetings 2) Candidates used language that was more similar to an older person in press conferences as compared to interviews and debates 3) Candidate language was less presidential in interviews when compared to press conferences and town hall meetings 4) Out of the four candidates, Dick Cheney's language was the most cognitively complex and the most presidential of the four candidates 5) In regards to femininity, John Edwards's language was the most feminine 6) John Kerry's language was most similar to that of a depressed person 7) George W. Bush's language was most similar to that of an older person 8) Both vice presidential candidates (Cheney and Edwards) use of words suggested greater honesty than both presidential candidates.

Using speech characteristics to give insight into an otherwise black box has been around for decades. For example:

- Senatorial and presidential outcomes were predicted by comparing the levels of optimism in their speeches (Zullow et al., 1988).

- Depressed individuals and those with low self-acceptance tend to use more first person singular pronouns (Rude, Gortner, & Pennebaker, 2004).

- The use of insightful ("think," "understand," "realize") and causal words ("because," "cause," "effect") has been shown to be related to higher grades among college students (Pennebaker & Francis, 1996).

These results suggest that the way in which we speak can potentially influence how others perceive us across many different dimensions. Furthermore, research has shown that the impression of a candidate's personality can be a robust and powerful predictor of a voter's choice (Klein, 1996; Pillai & Williams, 1998; Pillai, Williams, Lowe, & Jung, 2003). The argument can be made that a candidate's use of words can serve as a guide to the potential voter into a candidate's way of thinking, acting, and feeling (i.e., their personality).

Current Study

Is there something unique about the way candidates of different political parties (i.e., Republicans and Democrats) speak that can potentially influence voter behavior? The current study applies to the 2016 U.S. Presidential election.

Materials and Procedure

U.S. Presidential announcement speeches were obtained from 22 candidates. In addition to announcement speeches, debate transcripts from four Republican debates (August 6, September 16, October 28, and November 10) and three Democratic debates (October 14, November 14, December 20) were obtained. All speeches were then analyzed by Coh-Metrix. As mentioned previously, Coh-Metrix is an automated linguistic analysis tool used for computing computational cohesion and coherence metrics for written and spoken texts. Coh-Metrix allows readers, writers, educators, and researchers to instantly gauge the difficulty of written text for the

target audience. Because previous research has shown that the majority of variability in text complexity is accounted for by Narrativity, Deep Cohesion, Referential Cohesion, Syntactic Ease, and Word Concreteness, these are the text dimensions used for the current analyses.

Narrativity: Narrative text tells a story with characters, events, places, and things that are familiar to the reader. Narrative is closely affiliated with everyday, oral conversation. This is highly affiliated with word familiarity, world knowledge, and oral language.

Syntactic Complexity: This component reflects the degree to which the sentences in the text contain fewer words and use simpler, familiar syntactic structures, which are less challenging to process.

Word Concreteness: Texts that contain content words that are concrete, meaningful, and evoke mental images are easier to process and understand.

Referential Cohesion: A text with high referential cohesion contains words and ideas that overlap across sentences and the entire text, forming explicit threads that connect the text for the readers.

Deep Cohesion: This dimension reflects the degree to which the text contains causal and intentional connectives when there are causal and logical relationships within the text. These connectives help the reader to form a more coherent and deeper understanding of the causal events, processes, and actions within the text.

Results

Results showed a significant difference between Republicans and Democrats in Narrativity, t (20) = -2.792, p = .01, d = .64; Syntactic Simplicity, t (20) = -2. 128, p = .04, d = .49; Word Concreteness, t (20) = 2.11, p = .04, d = .49; and Flesch Kincaid Grade Level, t (20) = 2.788, p = .01, d = .64. Please see Figure 1 for a complete list of the means.
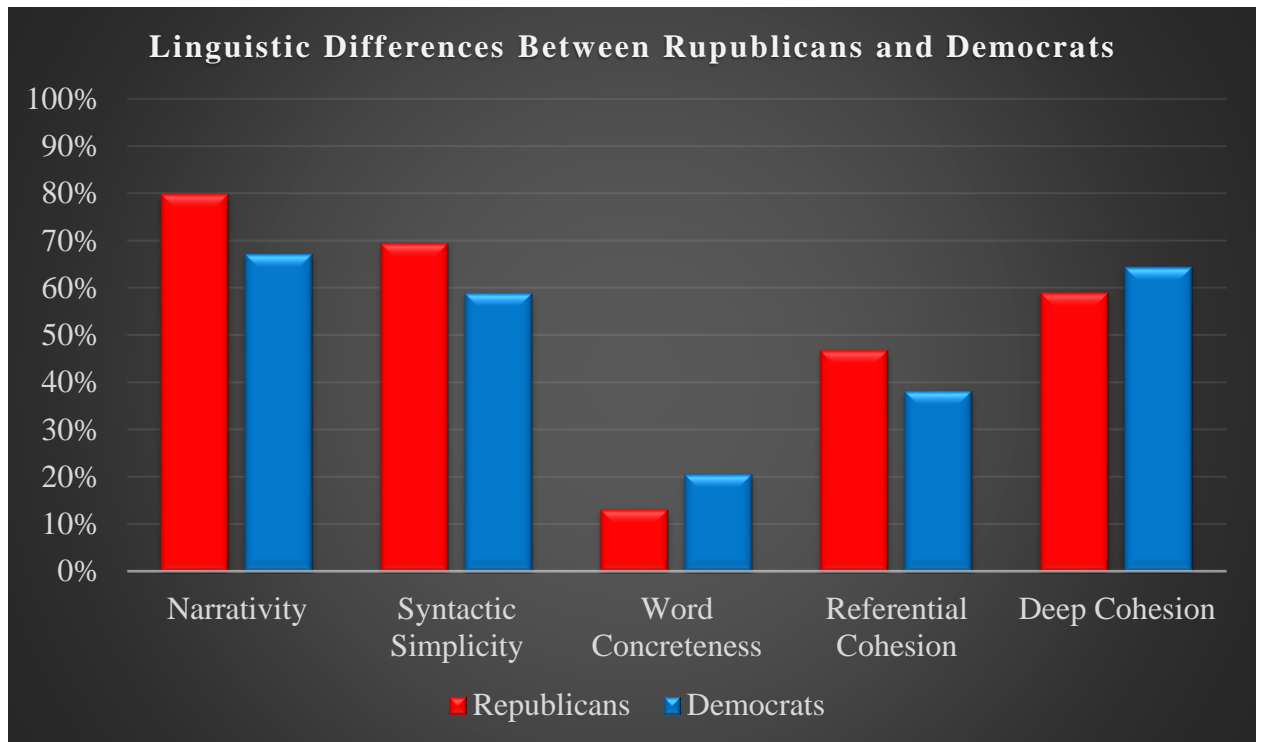
Figure 1. Comparison of means across the five indices.

As can be seen from Figure 1, Republicans tend to use more Narrativity in their speaking. In other words, their speeches and debates have a more story-like quality that is affiliated with everyday, oral conversation. Republicans also tend to have higher levels of syntactic simplicity which translates into fewer words and simpler, familiar syntactic structures, which are less challenging to process. However, Democrats tend to have higher scores in Word Concreteness meaning the words they use are more concrete, meaningful, and evoke mental images which are easier to process and understand. Although not present in Figure 1, Democrats also tended to have higher Flesch Kincaid Grade Level scores which rates texts on a U.S. school grade level. Democrats' debates and speeches were equivalent to somewhere between eighth and ninth grade level whereas Republicans' speeches and debates tended to fall somewhere between seventh and eighth grade level.

Trump versus Clinton

An independent samples t test revealed several significant differences in the way that Clinton and Trump speak. More specifically, as can be seen from Figure 2, Donald Trump uses significantly simpler syntax, $t(10) = -3.205$, $p = .009$, $d = 1.85$. Additionally, Donald Trump had significantly higher amounts of referential cohesion, $t(10) = -2.488$, $p = .032$, $d = 1.43$. Lastly, it was discovered that Hillary Clinton uses a significantly higher amount of concrete words, $t(10) = 3.999$, $p = .003$, $d = 2.30$. Finally, as can be seen from Figure 3, Donald Trump speaks at a lower grade level estimate compared to Hillary Clinton.
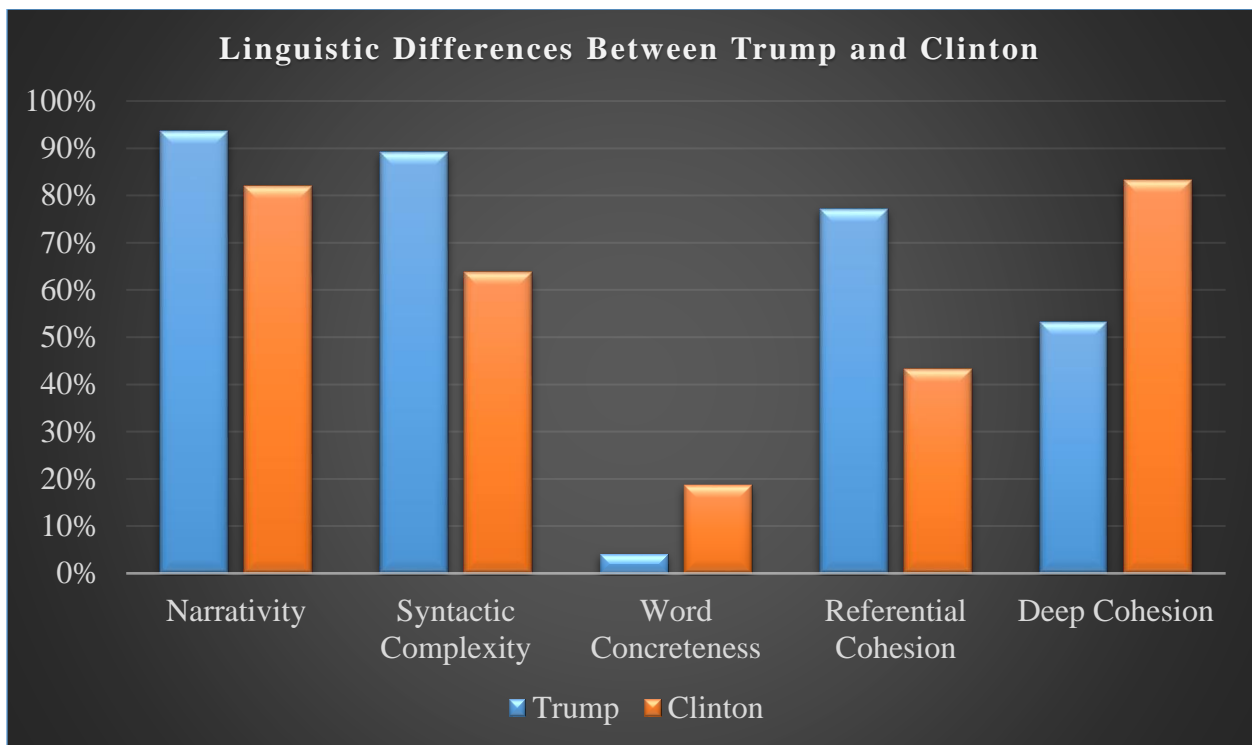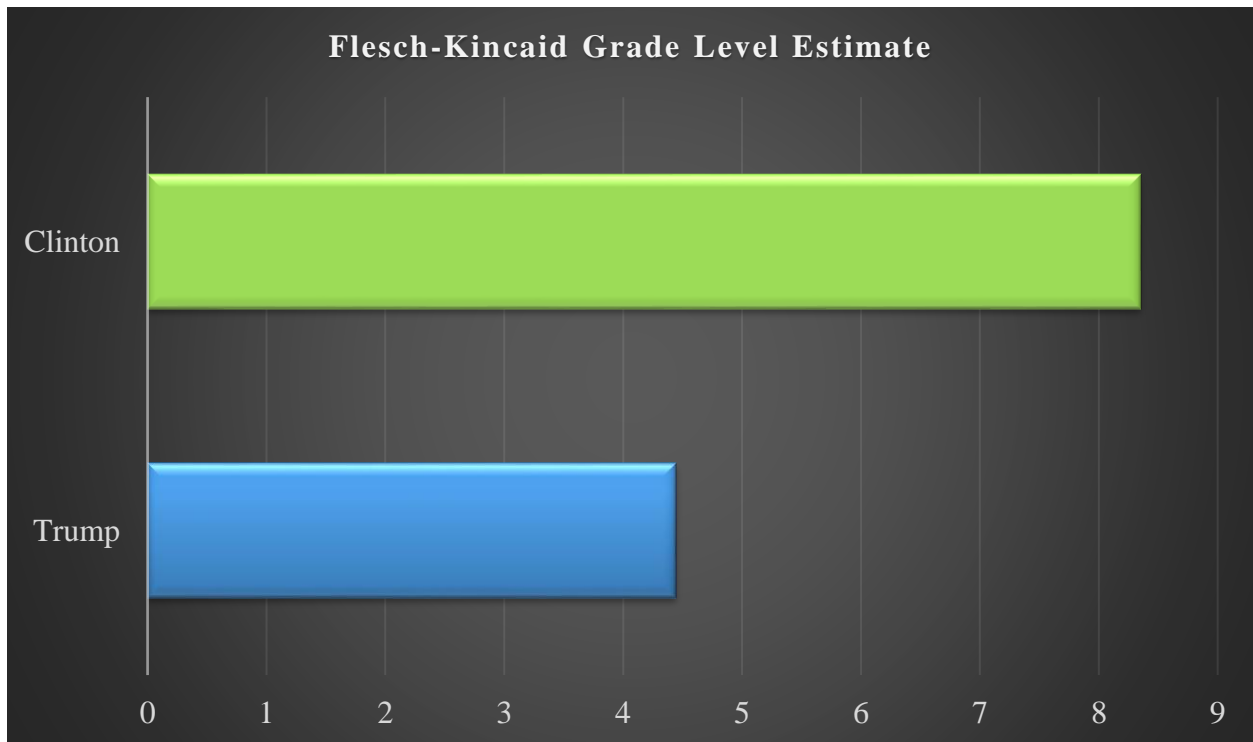

Figure 2. Linguistic differences between Trump and Clinton across the five Coh-Metrix indices.

Figure 3. Discourse grade level estimate between Donald Trump and Hillary Clinton.

Discussion

The current study sought to explore any linguistic differences that exist between Republicans and Democrats in the 2016 U.S. Presidential election. Several significant differences were discovered: Republicans used significantly higher levels of narrativity and syntactic simplicity in their language. However, Democrats used significantly more concrete words and were speaking at a significantly higher grade level estimate.

Research has shown educational differences between those who identify themselves as either Republicans or Democrats. Democrats lead by 22 points among adults with post-graduate degrees (57%-35%). Democrats lead by 7 points among those with college degrees or some post-graduate experience (49%-42%). The GOP has a 21 point advantage among Caucasian men who have not completed college (54%-33%). Related to education, there are also some interesting

gender differences. Democrats have a 35 point advantage (64%-29%) among women with postgraduate degrees, but only 8 points among postgraduate men (50%-42%).

Based on this information, the argument can be made that the differences that we are observing are systematic and calculated. For example, if potential Caucasian male voters with less education tend to lean Republican, it stands to reason that a Republican candidate in certain contexts would want to use language that is more story-like in quality and use less complex sentence structure. This idea is also consistent with the fact that the results revealed that Democratic candidates' language was at a significantly higher grade level compared to the language of the Republican candidates.

Regarding the Word Concreteness differences between Hillary Clinton and Donald Trump, these can be observed by viewing an excerpt from their discourse. Hillary Clinton*: "As a young girl, I signed up at my Methodist Church to babysit the children of Mexican farmworkers, while their parents worked in the fields on the weekends."* While reading this, it is easy to visualize things like "young girl," "Methodist Church," and "farmworker" which in turn would yield scores that are higher in Word Concreteness.

Donald Trump: *"When do we beat Mexico at the border? They're laughing at us, at our stupidity. And now they are beating us economically. They are not our friend, believe me. But they're killing us economically. The U.S. has become a dumping ground for everybody else's problems."* Words like "stupidity", "economically," and "problems" are much more abstract and not easily visualized and therefore would yield scores that are lower in Word Concreteness.

Given the success of Donald Trump both in the primaries and general election, the fact that Trump scored significantly higher in abstract language initially seems counterintuitive. However, in the current political cycle, this lack of word concreteness worked to his advantage.

For example, Trump spoke a tremendous amount about topics such as "jobs," "immigration," "businesses," and "ISIS." The words by themselves are extremely abstract and not easily visualized. However, by remaining abstract and not providing concrete examples of what exactly was meant by these terms, voters were able to draw their own conclusions about what exactly Trump meant and what his solution might be.

The same excerpt from the two candidates can also be used to observe the differences related to syntactic simplicity. Graesser, McNamara, and Kulikowich (2011) posit that sentences with simple syntax are shorter, have fewer words before the main verb of the main clause, and have fewer logic-based words. This definition fits more closely the discourse style of Donald Trump. However, sentences with complex syntax contain dense noun phrases with many modifiers, have a high number of words before the main verb of the main clause, and require a reader to keep track of many combinations of meaning with logic-based words (e.g., "and," "or," and "not"). This definition fits more closely the discourse style of Hillary Clinton.

As mentioned earlier, Donald Trump uses significantly higher levels of referential cohesion in his speech compared to Hillary Clinton. Referential cohesion in part refers to the amount of word and idea overlap that exists between sentences and paragraphs. Take for example another excerpt from Donald Trump's discourse: *"So now ISIS has the oil, and what they don't have, Iran has. And in 19— and I will tell you this, and I said it very strongly, years ago, I said— and I love the military, and I want to have the strongest military that we've ever had, and we need it more now than ever. But I said, "Don't hit Iraq," because you're going to totally destabilize the Middle East. Iran is going to take over the Middle East, Iran and somebody else will get the oil, and it turned out that Iran is now taking over Iraq. Think of it. Iran is taking over Iraq, and they're taking it over big league."* In this particular paragraph,

Trump uses the word "oil" twice, "Iraq" twice, "military" twice, "Middle East" twice, and

"Iran" five times. This repetition (which is characteristic of most of Trump's speeches) explains

why he scores significantly higher in referential cohesion.

It is the belief of the authors that these observed differences between Trump and Clinton

explain (in part) the success of Donald Trump in the 2016 U.S. Presidential election. More

specifically, the right combination of 1) high narrativity 2) low syntactic complexity 3) higher

use of abstract speech 4) higher referential cohesion and 5) low grade level estimate yields what

the authors refer to as the *discourse inclusivity hypothesis*. In other words, this combination of

discourse patterns can be processed by a wider audience therefore increasing the likelihood of

garnering votes. There is no point in delivering a message if the audience is not able to

comprehend exactly what is being stated (even if they initial agree with your platform).

Taken all together, the results from the current study reveal interesting differences in

discourse patterns across the two primary political parties along with the two 2016 U.S.

Presidential candidates. More specifically, these results suggest that in the right context,

politicians are carefully and methodically choosing what they say and how they say it.

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