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Meredith A. Repke

The University of Montana, Missoula

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POLITICIZED CLIMATE CHANGE COMMUNICATION: AN INTEGRATIVE
COMPLEXITY ANALYSIS

By

MEREDITH ANN REPKE

Bachelor of Science, Northern Illinois University, DeKalb, Illinois, 2009
Master of Human Resources and Industrial Relations, University of Illinois, Champaign, Illinois,
2011

Thesis

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Approved by:

Sandy Ross, Dean of The Graduate School
Graduate School

Lucian Conway, Chair
Psychology

Allen Szalda-Petree
Psychology

Stephen Yoshimura
Communications

Abstract

Chairperson: Lucian Conway

The vast majority of scientists agree that anthropogenic activities have caused the level of CO₂ in the atmosphere to rise at an unprecedented rate, and that the consequences of such a rise may very well be extreme. Despite these warnings, the American people do not possess, on average, the same level of concern towards climate change as scientists. The polarization of media in recent decades, the prevalence of selective exposure, and the general position on climate change of the two major political parties have led to liberals and conservatives consuming different information relevant to climate science. While evidence exists that there are accuracy differences in the information consumed by these two groups, there is also reason to suspect that linguistic differences are also present. This investigation sought to understand whether the dissemination of climate science information contained different types of complexity across conservative and liberal media. Because complexity has important attitudinal consequences, scientifically investigating whether the climate science information being dispersed by the leading conservative (FOX) and liberal (MSNBC) media outlets differs in its integrative complexity is a critical step in understanding the current attitudinal divide. Trained complexity coders scored 30 articles published on the websites of FOX and MSNBC for the two levels of Integrative Complexity: dialectical and elaborative. It was expected that FOX articles would contain higher levels of dialectical complexity than MSNBC, and that MSNBC articles would contain higher levels of elaborative complexity than FOX. Results revealed evidence consistent with the hypothesized pattern of complexity use; however, these differences between media outlets' use of integrative complexity did not attain conventional levels of statistical significance. I discuss possible reasons for this failure to find statistical significance and future directions.

Many have argued that climate change is the most critical challenge facing society today (Berry et al., in press). The vast majority of scientists agree that anthropogenic activities have caused the level of CO₂ in the atmosphere to rise at an unprecedented rate, and that the consequences of such a rise may very well be extreme. Despite this message being communicated by the scientific community, much of the American public holds attitudes that are inconsistent with what scientists are saying. The aim of this paper is to analyze this divergence through understanding possible Integrative Complexity differences in conservative and liberal media reporting on climate-science issues.

Scientific Consensus

Attempts to quantify the level of consensus amongst the scientific community regarding interpretation of climate science information have been met with criticism over recent decades. Four large-scale efforts to achieve such a quantification (Bray & von Storch, 1997, 2003; Oreskes, 2004; Milloy, 2007) each arrived at different conclusions, and were heavily critiqued. However, more recent findings suggest that expert scientists acquiesce with the findings outlined in the Intergovernmental Panel on Climate Change (IPCC) reports (2001; 2007; 2014), which state that human activity is pumping CO₂ into the atmosphere at a rate and volume that is causing drastic changes to the earth and its atmosphere. Researchers have found that about 97 percent of climatologists who are active publishers on climate change agree with this interpretation of the facts (Doran & Zimmerman, 2009). Further, the majority of scientists agree that this damage is likely irreversible if radical changes to human CO₂ output are not made. D. James Baker, administrator of the US National Oceanic and Atmospheric Administration, and Harvard professor James McCarthy, former co-chair of the IPCC, among others, have argued that a 97

percent scientific consensus is staggeringly high for the scientific community, with no or few other theories possessing such strong levels of consensus (Warrick, 1997).

This scientific consensus has been arrived at after decades of accumulated research and has highlighted not only the role humans have played in bringing about climate change, but also the importance of a human intervention to attenuate the effects. In 1990, the IPCC released its first series of reports on climate science. The first report released that year included a summary of where climate scientists were deriving their confidence for the stated predictions, and details of both natural factors impacting the global climate, as well as an explanation of how byproducts of human activities impact global climate issues (IPCC, 1990a). Further, the third report released later that year specified the importance of a well-informed public in making the changes that scientists saw as necessary (IPCC, 1990b). Five years later the IPCC released its Second Assessment Report, stating that strong evidence existed for anthropogenic causes of climate change (IPCC, 1995). A recent report by the IPCC speaks unambiguously, “Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased” (IPCC, 2013).

Americans' Attitudes Towards Climate Change

Despite these decades' worth of warnings and high levels of agreement within the scientific community regarding the contributors to and consequences of climate change, attitude surveys of the American people indicate the average public perception of the issue has far from reflected the expert opinion of scientists.

In 1998, the nation was split nearly equally between people thinking that the seriousness of global warming was generally exaggerated, correct, and underestimated. However, despite increasingly ominous reports from the IPCC, the American public has not reacted with increased concern on the issue. In fact, the opposite has occurred. In 2014, 42% of Americans now feel the seriousness of global warming is generally exaggerated, while 33% believe it is generally underestimated, and 23% believe it is generally correct (Dugan, 2014). To understand this observed divergence between the message the scientific community is sending and the opinion of the American people, it is prudent to consider the trends of relevant subgroups of Americans.

Arguably one of the most critical group differences exists between the attitudes of conservatives/Republicans and liberals/Democrats. While meaningful divisions exist between various subsets of the populace (socioeconomic status, age, gender, and more), experts in climate science have made clear the importance of governmental regulations to curb climate change threats, and thus the positions of those who identify with the major political parties on issues related to climate change are of the utmost importance. While the broader goal of protecting the environment has not always divided liberals and conservatives, climate change has long been a more divisive issue for the American people.

Political Split

Since the climate change phenomenon was first brought to mainstream public attention decades ago, liberals have consistently demonstrated a higher degree of concern over global warming than conservatives, and liberals have been more likely to hold beliefs that are consistent with the scientific consensus. This divide has become more drastic in recent years (e.g., Dunlap, Chenyang Xiao, & McCright, 2001; McCright & Dunlap, 2011). Some have noted that conservative values such as individual freedom, private property rights, limited government, and

the promotion of free markets (Meyer, 1964) can easily be painted as incompatible with the pro-environmental movement that calls for more collective effort and regulation. On the other hand, the liberal values of collective rights, public protection through market regulation, and government intervention (Domhoff, 2003) fit more comfortably with the solutions that many environmental experts say must occur to attenuate the impact of climate change.

Prior to issues of global warming receiving mainstream attention, pro-environmental attitudes have not always been a partisan issue. Early strides towards environmental protection resulted from efforts on both the Right and the Left. Legislation under Theodore Roosevelt, Franklin Delano Roosevelt, Richard Nixon, and Gerald Ford demonstrated how the environment was once seen as a resource to be protected by both parties. The ideological split witnessed today originated around the time of Ronald Reagan, when environmental regulations were cast as economic burdens (Dunlap and McCright, 2008). In the following decades, the divide would become more pronounced. Gallup poll trends (Gallup, 2013) show that the percent of Republicans and Democrats believing the effects of global warming have already begun were nearly identical in 1998 (47% and 46%, respectively), but dramatically diverged over the next ten years. By 2008, 41% of Republicans reported to believe the same statement, in contrast with 76% of Democrats (Dunlap, 2008). Further, in 1998 34% of Republicans reportedly felt the seriousness of global warming was generally exaggerated in the news, compared to 23% of Democrats. Over the next ten years the opinions had diverged much further; in 2008 the percent of Republicans feeling that the seriousness of global warming was generally exaggerated in the news increased to 59%, while the percent of Democrats dropped to 18%. This drastic divergence is cause for concern in a nation where a majority vote is required to achieve most political action, therefore it is critical to understand the roots of the divergence.

To explain how Republicans have become increasingly more skeptical of the global warming phenomenon and its seriousness, Dunlap (2008) points to conservative Americans following the leadership of conservative political elites and pundits. Recent years have seen a period of polarization amongst political elites, as well as within the population in general. Researchers have pointed to this general polarization observed in the current political environment as an explanation for the dramatic divide of climate change attitudes between liberals and conservatives.

A number of studies have identified a period of overall political polarization beginning in the late 1990s and early 2000s (e.g., Evans, 2003; Brewer, 2005; Jacobson, 2005; Abramowitz and Saunders, 2008; Baldassarri and Gelman, 2008). McCright and Dunlap (2011) provide evidence that polarization relative to climate change between Republicans and Democrats occurred within this timeframe, specifically between 2001 and 2010. More recently, McCright, Dunlap and Xiao (2014) report that increased partisanship related to climate change occurred between 2006 and 2012, and party identification became a stronger predictor of perceived scientific agreement on global warming in 2012 than it was in 2006. Further, Allen, Seaman, and DeLascio (2009) suggest that climate change is not simply a topic which the American people have differing attitudes, but that it is a polarizing topic, often eliciting heated political, societal, and economic debate. Given the paramount role played by government and politics in the global warming crisis, an understanding of the rapid growth of this divide is critical. To do this, it is pragmatic to understand the content of the environment-related information the American public is consuming.

Mass Media and Selective Exposure

Mass media has been identified as the source from which most people ascertain scientific knowledge (Nelkin, 1987; Wilson, 1995). Similarly, Stroud (2010) explains that the media is also the primary source from which the public learn the positions of the political elites, which have become very polarized over recent decades (Fiorina, Abrams, & Pope, 2005; Jacobson, 2003). As a primary source of information, the media's reach has become greater given the U.S. has experienced an exponential increase in available media content over the last two decades (de Zúñiga, Correa, and Valenzuela, 2012). This is of particular importance when considered in conjunction with selective exposure to media. Selective exposure gives credence to the popular adage, 'tell me what I want to hear,' as the concept suggests that people seek confirmatory information when choosing their desired media outlet (e.g., Garrett, 2009a, 2009b; Iyengar & Hahn, 2009; Knobloch-Westerwick & Meng, 2009; Stroud, 2008). Specifically related to political ideology, Iyengar and Hahn (2009) found that when presented with news stories from liberal and conservative networks, people opted to consume news (across a variety of topics) from the network that they perceived to be in alignment with their ideological beliefs (liberals preferred CNN and NPR; conservatives preferred FOX). Further, Knobloch-Westerwick (2012) found that exposure to attitude-consistent information increases the accessibility of relevant attitudes, likely further contributing to the cycle.

Ironically, another way which media bias has been shown to impact attitudes towards climate change has been through an apparent attempt to eradicate bias in reporting. Boykoff (2005) found that when media outlets provided more 'balanced' reporting on global warming by including arguments both for and against the existence of global warming, it created a false sense of disagreement amongst the scientific community when communicated to the public. This is

linked to decreased concern and belief in global warming, despite this disagreement among the scientific community being widely untrue.

An analysis conducted by the Union of Concerned Scientists (2014) considered the three most widely watched cable news networks in an assessment of the accuracy with which they reported on climate science issues. CNN, FOX News Channel, and MSNBC were each considered. MSNBC's climate-science-related segments were found to be accurate 92 percent of the time, compared to 70 percent for CNN, and 28 percent of the time for FOX News Channel.

Due to the flood of media availability (including liberal and conservative-focused programming), people's propensity to seek confirmatory news sources, frequent misrepresentations of climate change research by the media, and large differences in the accuracy of information included in climate science segments across conservative and liberal media outlets, it is reasonable to conclude that liberals and conservatives are acquiring different information related to climate-science topics.

Some evidence suggests that differences in the information presented by conservative and liberal media extends beyond the accuracy of the content to the linguistic properties of the reports. As suggested by the Union of Concerned Scientists (2014), liberal media reports are more likely to include detail and thorough explanation of one perspective towards climate change (that of the scientific consensus), whereas conservative media reports are more likely to include discussion and debate involving multiple points of view towards climate change (that of the scientific consensus, as well as dissenting opinions). This potential difference is critical beyond the obvious issue of information accuracy. It is also important because it suggests the messages conservatives and liberals receive may differ on a linguistic level, and that purely linguistic difference may be important in understanding the current divide in the country over

climate change. Specifically, linguistic complexity – more commonly called *cognitive complexity* – may provide a framework for considering the difference between the messages, as well as the implications for the differing attitudes between groups.

It should be noted that while an argument can be made that the complexity of one's written thoughts may not be a perfect reflection of the complexity of one's cognitions, the idea that the complexity of expressed thoughts is at least informative of the level of complexity of cognitions is at the foundation of cognitive complexity research. Additionally, research has shown that private and public complexity levels are correlated. An investigation by Tetlock and Tyler (1996) compared complexity levels of private and public statements from Winston Churchill, Neville Chamberlain and Stanley Baldwin on the issue of Nazi Germany, as well as statements from Churchill, Baldwin, and Samuel Hoare regarding self-government for India. In each of these instances (with the exception of Baldwin on India), there were no significant differences between complexity levels of private and public statements. This suggests that the complexity of a given thought is consistent, regardless of whether one is keeping the thought private, or sharing it with others, therefore providing evidence that the complexity of a thought is not likely to be intentionally modified by the individual as the thought is translated to words.

Cognitive Complexity

Cognitive complexity is the degree to which one considers different aspects of a given issue. Integrative Complexity is the most commonly used and widely validated measurement of cognitive complexity (see, e.g., Conway, Conway, Gornick, & Houck, 2014; Houck, Conway, & Gornick, 2014). Developed by Suedfeld and Tetlock (1977), this scoring system is applied to open-ended statements and measures the levels of differentiation (one's ability to distinguish between different dimensions of an issue) and integration (the degree to which differentiated

dimensions are connected into a larger framework) present in the passage (e.g., Suedfeld & Bluck, 1988; Suedfeld & Leighton, 2002; Suedfeld & Piedrahita, 1984).

Complexity itself is multi-dimensional; a person can be complex in different ways (see Houck et al., 2014, for discussion). To capture two different dimensions of complexity, Conway et al. (2008, 2011) also offers an additional supplement to the Integrative Complexity system with the partitioning of elaborative and dialectical complexity. Elaborative complexity reflects the quantity of arguments of a similar valence, whereas dialectical complexity involves the recognition of different perspectives that are in tension with each other. Understanding potential differences in the complexity of climate science related articles across liberal and conservative media and the implications for attitude strength towards climate issues is the primary interest of the present study.

The Present Study

The message from scientists is that climate change is real, and the consequences of the destructive human practices prevalent around the world are likely to be severe. Despite these warnings, the American people do not possess, on average, the same level of concern towards climate change as scientists. The polarization of media in recent decades and the prevalence of selective exposure have led to liberals and conservatives consuming different information relevant to climate science. It is thus important to understand how the information consumed by each group is itself different. As previously discussed, evidence exists that the information consumed by these two groups differs in accuracy, however many factors go into attitude formation and attitude strength besides the accuracy of information. Cognitive complexity offers one known set of additional factors (e.g., Conway et al., 2008). Because cognitive complexity is known to have important implications for attitudes, the present investigation attempts to better

understand the current attitudinal divide by first seeking to understand whether the climate science information being disseminated by the leading conservative (FOX) and liberal (MSNBC) media outlets¹ differs in its cognitive complexity.

To evaluate whether such differences exist, the current investigation will assess articles published on the FOX News and MSNBC websites. Articles covering climate science issues will be selected from each outlet, with the objective of the selection process to arrive at a sample of articles that can be reasonably compared based on subject content and publication date. Articles will then be scored for integrative complexity, elaborative complexity, and dialectical complexity. Elaborative complexity and dialectical complexity are of primary relevance to the present study in light of the potential differences between the climate science coverage by FOX and MSNBC. Offering more explanatory detail in defense of a particular position on a topic is characteristic of higher elaborative complexity scores and lower dialectical scores (see, e.g. Conway et al., 2008, 2011).

Such differences may have important attitudinal consequences relevant to the debate on climate change. Conway et al. (2008) found that attitude strength was related to higher levels of elaborative complexity, and lower levels of dialectical complexity. Further, attitudes towards controversial topics (e.g., the death penalty and prisoners' rehabilitation) have been found to become more neutral with increased complex thinking (Sotirovic, 2001), suggesting that when

¹ The Pew Research Center American Trends Panel conducted March 19 - April 29, 2014 found that audiences described as consistently liberal and consistently conservative (consistency defined as the ideological placement on a 10-point scale of ideological consistency, with the mid-point being the score of the average survey respondent) preferred MSNBC and FOX, respectively. While some news sources' audiences were rated as more consistently liberal or conservative than those of MSNBC and FOX (e.g., New Yorker and Slate audiences for liberals, and the Rush Limbaugh Show and Glenn Beck Program audiences for conservatives), this study sought to focus on mainstream media outlets with a large viewership for liberals and conservatives, which is why MSNBC and FOX were selected.

one considers various dimensions of an idea (a characteristic of dialectical complexity), attitude strength weakens.

Therefore, if the liberal and conservative media presentation of climate change information includes differing degrees of elaboration and dialectical complexity, it may shed light on the currently observed differences in liberal and conservative attitudes regarding climate change and the environment. If complexity is playing an important role in the current divide, we would expect MSNBC segments on climate change to show this high elaborative/low dialectical pattern. On the other hand, offering more diverse information that represents different arguments both for and against a topic is characteristic of higher dialectical complexity scores and lower elaborative complexity scores (Conway et al., 2008, Conway, et al., 2011). So if complexity is playing an important role in the current divide, it is expected that FOX coverage of climate change stories would conform to this low elaborative/high dialectical pattern.

Hypotheses

For the purpose of this study, the following hypotheses were investigated:

Hypothesis 1: On average, conservative media articles related to climate science will possess greater dialectical complexity than liberal media articles related to climate science.

Hypothesis 2: On average, liberal media articles related to climate science will possess greater elaborative complexity than conservative media articles related to climate science.

Methods

Design Overview

Using a 2 groups (Media outlet: FOX versus MSNBC) design, potential differences in the levels of dialectical and elaborative complexity contained in climate science related articles were explored.

Selection of Documents and Paragraphs for Scoring

30 articles total (15 from each source) were selected from the FOX News and MSNBC websites, with the selection criteria including topic relevancy (climate science related) and publication date (most recent articles will be selected first). Research assistants blind to the research hypotheses were trained to retrieve articles from the websites to help reduce possible selection bias. From each of the 30 articles, the five longest paragraphs from each article were selected for inclusion in the coded sample (three articles only contained four paragraphs, so the final sample included 147 paragraphs).

The final sample of paragraphs was then randomly ordered. This random order was achieved through assigning a random number to each paragraph, and then sorting the list numerically. This list of randomly sorted paragraphs was then presented to the 6 trained coders to score (see below for more details of the coding system). All coders had previously passed the integrative coding test with at least a .85 reliability score and received subsequent training in both elaborative and dialectical complexity. All paragraphs were then scored by each coder independently, and inter-rater reliability was calculated on each complexity dimension separately.

Complexity Scoring

Integrative Complexity is measured on a 1 (simplistic thinking) to 7 (highly complex thinking) scale. Simple thinking involves no differentiation of different perspectives or dimensions of an issue. As thinking becomes more complex, multiple dimensions are

recognized. A score of 3 would indicate clear differentiation of different dimensions of an issue. Advancing beyond a score of 3 requires some degree of integration of these differentiated dimensions into a broader, cohesive framework. Scores range from 4 to 7 as the degree of integration increases.

Further, the Integrative Complexity score was broken down into the two subtypes: elaborative and dialectical. Elaborative complexity acknowledges the degree of elaboration of a given perspective (e.g., Kale is a good choice for snacking because it is both high in nutrients and also is easy to prepare), while dialectical represents the degree to which different perspectives are present (e.g. Brussels sprouts have great flavor, but an unpleasant texture). Elaborative and dialectical complexity are both measured on the same 1 – 7 scale as overall integrative complexity. The scoring of elaborative and dialectical complexity aids in determining which type of complexity is driving the overall integrative complexity score. While the sum of the dialectical and elaborative scores will not be equivalent to the overall integrative complexity score, one (or in some cases, both) of the subtypes must be equal to the overall score. Please see the Appendix for further examples of elaborative and dialectical complexity.

The scoring procedure included all coders assigning an overall integrative complexity score to each statement, along with elaborative and dialectical scores. In keeping with prior complexity research (Conway et al., 2011), any score that was an outlier when compared to the average coders' score (a difference >2) was removed and replaced with the mean paragraph score. The resulting summary scores showed satisfactory inter-rater agreement for all three variables (integrative complexity $\alpha = .82$, dialectical complexity $\alpha = .78$, elaborative complexity $\alpha = .73$).

Results

Primary analyses

Primary analyses of interest compared levels of dialectical complexity and elaborative complexity across each of the media outlets. Two independent samples *t*-tests revealed non-significant differences between media outlets on both dimensions of complexity. Inconsistent with Hypothesis 1, the average level of dialectical complexity present within FOX news articles ($M = 1.48, SD = .49$) did not differ significantly from the average level of dialectical complexity of MSNBC news articles ($M = 1.39, SD = .50$), $t(145) = 1.12, p = .264$, partial eta squared = .009. Similarly, in assessing Hypothesis 2, the average level of elaborative complexity present within FOX news articles ($M = 1.55, SD = .49$) did not differ significantly from the average level of elaborative complexity of MSNBC news articles ($M = 1.64, SD = .47$), $t(145) = -1.16, p = .249$, partial eta squared = .009. While these results do not lend strong inferential support to the present hypotheses, the mean pattern of results does follow the predicted pattern, with FOX news utilizing relatively more dialectical complexity, and MSNBC utilizing relatively more elaborative complexity (please see Figure 1).

Additional analysis was conducted to evaluate the presence of a possible interaction between complexity type and media outlet. A 2 (media outlet: FOX versus MSNBC) X 2 (complexity type: dialectical versus elaborative) mixed model ANOVA, with media outlet as the between-subjects variable and complexity type as the within-subjects variable revealed that the complexity type by media outlet interaction was non-significant, $F(1,145) = 2.11, p = .149$, partial eta squared = .014 (see Figure 1). Across all analyses, in accord with standard practice for complexity research (e.g., Conway et al., 2012; Thoemmes & Conway, 2007) the paragraph served as the unit of analysis.

Additional analyses

Further analysis was conducted to consider the possibility that findings may be driven by differences in article complexity across time, author, or differences in paragraph length (as measured by word count).

Publication date. First, a possible impact of publication date was taken into account by considering the date range from which articles were selected from each news outlet. MSNBC articles ranged in date from July 25th, 2014 to February 2nd, 2015, while FOX articles ranged in date from November 14th, 2013 to December 18th, 2014. To explore differing date ranges as an explanation for the present findings, two ANOVAs were conducted comparing the three groups of articles: (1) articles from MSNBC, (2) articles from FOX published within the date range of MSNBC articles (more recent FOX articles), and (3) articles from FOX published prior to July 25th, 2014 (older FOX articles) on the two dimensions of complexity under investigation (dialectical and elaborative complexity). The results of the first ANOVA comparing the three groups of articles on dialectical complexity indicated there were no significant differences between complexity levels of the articles, $F(2,144) = .761, p = .469$, partial eta squared = .010 (a Tukey post hoc test also revealed no significant differences between the dialectical complexity levels of the three groups of articles). Further, the mean pattern revealed that while the level of dialectical complexity in newer FOX articles was lower than the level of older FOX articles, the overall mean pattern was still consistent with the hypothesis that MSNBC articles would utilize less dialectical complexity than FOX articles (MSNBC $M = 1.39, SD = .50$; newer FOX $M = 1.44, SD = .46$; older FOX $M = 1.51, SD = .52$; see Table 1).

An ANOVA comparing the three groups of articles on elaborative complexity also indicated there were no significant differences between elaborative complexity levels of the articles, $F(2,144) = .889, p = .413$, partial eta squared = .012 (again, Tukey's post hoc test found no significant differences between groups of articles on elaborative complexity levels). Further, the mean pattern revealed that while the level of elaborative complexity in newer FOX articles was higher than the level of older FOX articles, the overall mean pattern was still consistent with the hypothesis that MSNBC articles would utilize more elaborative complexity than FOX articles (MSNBC $M = 1.64, SD = .47$; newer FOX $M = 1.60, SD = .59$; older FOX $M = 1.52, SD = .42$).

Author. While the present investigation was focused on understanding complexity differences in articles put forward by FOX and MSNBC, not specific persons affiliated with those organizations, it is nonetheless meaningful to understand whether significant differences exist between the authors whose articles are under evaluation in this study. A series of one-way ANOVAs were conducted to determine the presence of such differences. First, the eight authors of FOX articles were compared with one another on their use of dialectical complexity. The ANOVA revealed that the authors differed significantly in their use of dialectical complexity, $F(7,64) = 5.43, p < .001$, partial eta squared = .373. Another ANOVA evaluating potential differences across authors' use of elaborative complexity also revealed significant differences, $F(7,64) = 2.79, p = .013$, partial eta squared = .234. These tests were then repeated with the seven authors of the MSNBC articles. The ANOVA revealed that the authors did not differ significantly in their use of dialectical complexity, $F(6,68) = 1.31, p = .264$, partial eta squared = .104. Further, another ANOVA evaluating potential differences across authors' use of elaborative complexity also found that the authors did not differ significantly, $F(6,68) = .485, p = .817$, partial eta squared = .041.

Finally, to explore the possibility that an individual author or authors were responsible for driving the pattern of results found in this study, the mean of each author was compared to their respective group mean (the overall average for FOX or MSNBC). Particular interest was paid to the authors whom contributed more paragraphs to the sample. This cursory analysis demonstrates that authors with the most potential to sway the results (those who authored more than one article in the sample) are not responsible for the observed pattern of findings being consistent with the hypothesized pattern. This is evidenced by the mean dialectical complexity of FOX articles being higher (1.48) than any of the means for the three authors who wrote multiple articles in the sample (1.29, 1.31, 1.35) – so in other words, the overrepresented authors were dragging the group mean down, which was the opposite of what the alternative hypothesis predicted. Further, the mean for MSNBC articles was lower (1.39) than the mean of the author who wrote multiple articles (1.41) – so here the overrepresented author was pulling the group mean up, which was also the opposite of what the alternative hypothesis predicted (see Tables 2 and 3).

Results of the comparison relative to elaborative complexity were similar. The mean elaborative complexity of FOX articles was lower (1.55) than two of the three means for authors who wrote multiple articles in the sample, and higher than one (1.59, 1.66, 1.37). As for the use of elaborative complexity by the only MSNBC author who wrote more than one article in the sample, the mean for the author's articles was similar (1.69) to that of all MSNBC articles (1.64) (see Tables 4 and 5). Given it was hypothesized that MSNBC would employ lower levels of dialectical complexity relative to FOX, and MSNBC would employ higher levels of elaborative complexity relative to FOX, these comparisons lend further credence to the notion that the

observed pattern is due to systematic differences between MSNBC and FOX, rather than overrepresentation of outlier authors.

Paragraph length. Finally, to consider the possible impact of paragraph length on the present findings, two ANCOVAs were conducted to test the effect of news outlet on each of the two measures of complexity, while controlling for paragraph word count. An ANCOVA testing the effect of news outlet on dialectical complexity, while controlling for word count, yielded results consistent with analysis not accounting for word count in examination of Hypothesis 1; the average level of dialectical complexity present within FOX news articles did not differ significantly from the average level of dialectical complexity of MSNBC news articles, $F(1,144) = .746$, $p = .389$, partial eta squared = .005, when controlling for word count. Results were similar when considering Hypothesis 2. An ANCOVA testing the effect of news outlet on elaborative complexity, while controlling for word count, yielded results consistent with analysis when not accounting for word count; the average level of elaborative complexity present within FOX news articles did not differ significantly from the average level of elaborative complexity of MSNBC news articles, $F(1,144) = 2.20$, $p = .140$, partial eta squared = .015, when controlling for word count. Lastly, Hypothesis 3 was considered using a 2 (media outlet: FOX versus MSNBC) X 2 (complexity type: dialectical versus elaborative) mixed model ANCOVA, with media outlet as the between-subjects variable, complexity type as the within-subjects variable, and word count as the covariate. Results revealed that the complexity type by media outlet interaction remained non-significant with the addition of the covariate, $F(1,144) = 2.10$, $p = .150$, partial eta squared = .014. In addition to these effects remaining non-significant with the inclusion of the word count covariate, further evidence that paragraph length did not make a meaningful impact on complexity score is that the effect sizes and p values for these covariate

analyses closely resembled the effect sizes and p values for analyses prior to including word count as a covariate.

Discussion

These results offer mixed support for the theory under investigation. While, consistent with hypotheses, (1) conservative media outlet FOX News utilized more dialectical complexity than liberal media outlet MSNBC, and (2) MSNBC utilized more elaborative complexity than FOX, these differences were not statistically significant. Further, while the mean pattern lent support for the present hypotheses, the consideration of article publication date and article author highlighted that the pattern may not be stable across all relevant variables. All in all, while the results are encouraging in their suggestion that FOX tends to use less elaborative and more dialectical complexity than MSNBC when reporting on climate science articles, additional data would be needed to assess the extent to which this difference is statistically significant and stable over time. Below, I discuss: (1) why statistically significant results were not found, (2) possible alternative explanations for the observed results, (3) how the observed results fit with the hypothesized theory of attitude divergence and media coverage, and (4) future directions for subsequent research.

Explaining Null Findings

The lack of statistically significant results may be attributable to at least three possible issues: (1) the experiment may have been underpowered, (2) the hypothesized pattern may not represent a real effect, or (3) this pattern may have been true in the past, but is changing such that these differences may no longer be meaningful.

Power. The first possible explanation for the null findings of this study is that the hypothesized pattern of results does indeed represent a real effect, but the sample size did not

provide the requisite power to register the effect. Given that the sample size for this study was developed based on an estimated moderate to large effect size, this may have led to the selection of a sample that was somewhat underpowered. While I cannot say for certain, in retrospect, it may have been more accurate to consider a small effect size in estimating the necessary sample.

The Reality of the Hypothesized Effect. Further, it should be considered that the reason for not achieving a statistically significant result may be that the hypothesized effect does not exist in reality. While the introduction of this manuscript explained why the hypothesized pattern may be reasonable to expect, the underlying reasoning was built upon ideas that are difficult to know for certain. For example, while poll data shows that liberal and conservative opinions about climate change have diverged over recent decades, and along the same timeline an explosion of available media to suit any political appetite has become available, it is difficult to know for certain which way the causal arrow points, or if there is a causal arrow at all.

Consequently, results such as those found in the present inquiry may simply indicate that there is not an effect of media outlet on complexity. While this non-effect could indeed be an accurate reflection of reality, this seems unlikely given the pattern of results directly map onto the hypothesized pattern of media influence. Therefore, before considering the lack of significant results to be an indicator of a lack of an effect more broadly, additional data should be collected to account for the present investigation only assessing a relatively small date range, and relying on a sample size that may have been underpowered to register small effects.

Temporal Trends. Finally, the inclusion of publication data in the analyses suggests that while the hypothesized pattern of results has remained true over the entirety of the date range in question, that the magnitude of the difference between each news source's use of the various complexity types may be decreasing over time. Without data from older MSNBC articles to see

the trend as it compares to FOX articles from that timeframe, it is hard to know whether the observed differences were once meaningful and becoming less so, or if there is simply an effect of time rather than media outlet. Consequently, additional data from a wider date range (ideally from both outlets, but especially from MSNBC) would be important to better understand these results.

Alternative Explanations

While, based on inferential statistics, we cannot confidently rule out sampling error as an explanation for the present pattern, the descriptive pattern is nonetheless consistent with hypotheses. Thus, it is prudent to consider possible alternative explanations for this pattern besides the hypothesized influence of the differing media outlets.

Specific Authors. One possible explanation could be that the differences underlying the pattern found in this study are best attributed to the specific authors of the selected articles than the news agencies they work for. The evidence partially supports this alternative explanation. While MSNBC authors did not differ significantly from one another in their use of dialectical and elaborative complexity, FOX authors did differ significantly, which allows for the possibility that certain authors may have skewed the data, creating an inaccurate view of FOX articles overall. However, when authors contributing more than one article to the sample were assessed relative to the MSNBC or FOX group means, it did not appear that these authors (who would be particularly capable of distorting the results) had swayed the results in a meaningful way.

Regardless of the results of these analyses on the differences between authors, the possibility that certain specific authors are driving the pattern would not nullify the importance of the present findings in a broader sense. Even given their status as outliers, these deviant authors in question are nonetheless acting as representatives of FOX in the eyes of consumers,

and thus this information remains of interest to researchers in the pursuit of understanding what causes FOX and MSNBC to differ (whether it is something systematic about the media outlets, or it is the deviance of a few individuals). Further, it should be noted that the deviant authors from each network actually deviated, for the most part, in the opposite of the hypothesized direction. Therefore, rather than viewing deviance from apparent network norms as pulling the network towards further towards ideological extremity (to the degree that can be measured by complexity), it seems the deviant authors may be more accurately described as acting as ‘balancing points’ for their respective networks.

Time Frames. In addition to being a possible explanation for the lack of statistically significant findings, the non-overlapping nature of the time frames from which these articles were pulled should also be considered as an alternative explanation for the observed pattern of results (a pattern that was descriptively consistent with hypotheses). As was stated above, given that the analysis of older FOX articles compared to more recent articles from FOX and MSNBC revealed that complexity use by these media outlets may be changing over time, it should be considered that time frame might be responsible for the results found along the hypothesized pattern, rather than the theorized differences between media outlets. While there is some support for this alternative explanation due to the hypothesized pattern found in the present study being weaker when the comparison of FOX and MSNBC focused on more recent articles from the same date range rather than older FOX articles, this might merely suggest that the strength of the effect may not be weaker (as opposed to becoming non-existent). Therefore, since it is true that the pattern of results held regardless of whether MSNBC was compared to older or newer FOX articles, this issue of time frame does not likely invalidate the importance of the present findings as evidence that media outlet may have an effect on complexity.

Political Divergence of Climate Change Attitudes

To consider the findings from this study in the context of the present theory, these data offer weak support for the broader picture of political divergence of climate change attitudes over the course of time as a consequence of selective exposure. To be able to study the impact selective exposure may be having on attitudes as a result of cognitive complexity differences, it is first necessary to establish that different media outlets do actually differ in their use of complexity. Therefore, the present study was designed to serve as a launching point from which the impact of repeated exposure to messages differing in cognitive complexity could be assessed once a difference in complexity usage by outlets was established.

Cognitive complexity was selected due to its known relationship to attitude strength, with dialectical complexity representing the recognition of multiple points of view related to climate change and elaborative complexity representing the degree to which explanatory detail was used to expound on a given point of view. Given that high levels of elaborative complexity are related to increased attitude strength, and high levels of dialectical complexity are related to decreased attitude strength, it was expected that FOX articles would present readers with higher levels of dialectical complexity than MSNBC articles, and that MSNBC articles would present readers with higher levels of elaborative complexity. Indeed, the present investigation found this pattern of results to exist in reality. However, given these differences were not found to be statistically significant, future investigations should remain open to the possibility that the assumption that complexity levels differ may not be accurate, and should seek to use additional data to continue to establish this difference is reliable.

Future Directions

Building on the present study, more data should be collected to address the aforementioned issues. Beyond focusing on the opportunities highlighted by the present investigation, additional inquiry into the drivers and consequences of diverging climate change attitudes will be important. For example, future investigations could use a different method for analyzing the role of media in shaping public opinion. Perhaps television or radio news shows have more influence, or reach more people, than online articles. It would be interesting to conduct a replication of this study with transcribed television shows or radio talk shows in place of published articles. Future research may also benefit from considering other linguistic markers of attitude strength beyond Integrative Complexity. There are a multitude of other mechanisms for linguistic analysis that could shed light on attitude changes over time which may be of interest to researchers in the future.

Concluding Thoughts

Many would argue climate change is the most critical issue of our time, as climate change has the capacity to impact every aspect of life as humans have come to know it. While many tend to view climate change as a technological problem, those closest to the problem understand it to be a human problem. Human behavior change has the power to change the course of climate change on this planet. While attitudes are not a perfect predictor of behavior, they are a meaningful one (Hines, Hungerford & Tomera, 1987). Therefore, fostering an effective solution to climate change will have to come from an understanding of the drivers of human behavior, including attitudes.

To the degree that selective exposure to media influences attitude accessibility and strength (Knobloch-Westerwick, 2012), it is important to understand differences between media

presentations in helping understand the attitudinal divide. As such, this study offers a narrow glimpse into one possible way which attitudes may be influenced and changed. However, the solution to climate change will not come from any one field or investigation into any single construct, instead it will be revealed through researchers from all fields approaching the problem with their own unique methodologies and perspectives, working collaboratively in a way that exhibits the very cooperation all citizens will have to embrace if we are to address climate change in time.

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Figure 1

Dialectical and Elaborative Complexity Means for FOX and MSNBC

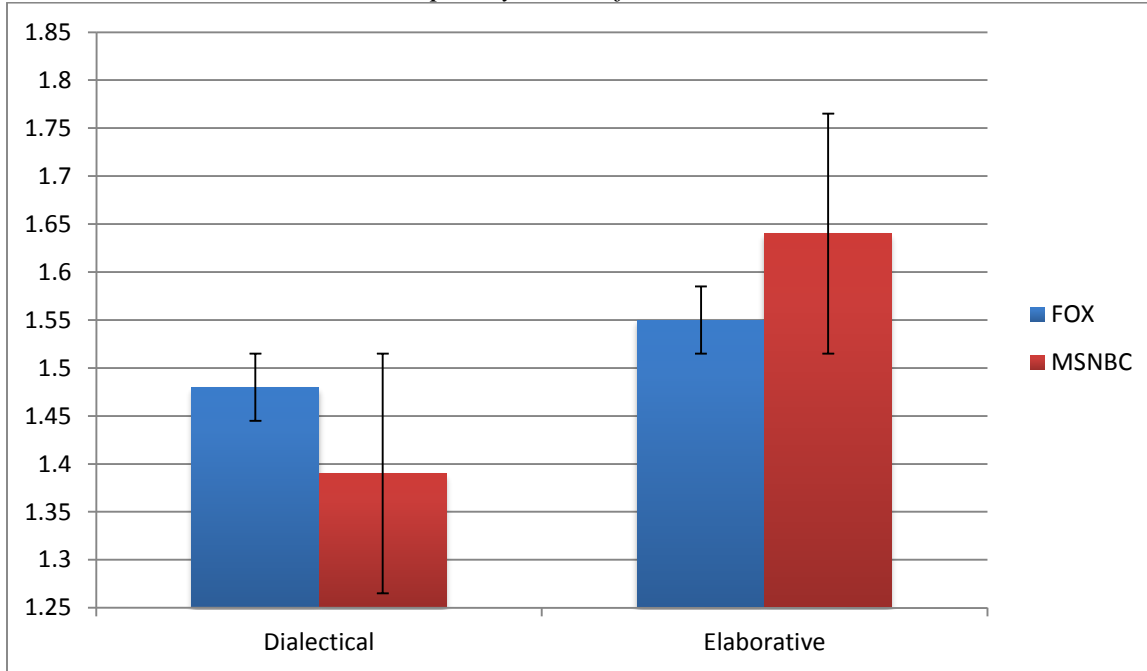


Table 1

Dialectical and Elaborative Complexity Means for MSNBC, New FOX, and Old FOX

Complexity Type	MSNBC ^a	New FOX ^b	Older FOX ^c
Dialectical Complexity	1.39 (<i>SD</i> = .50)	1.44 (<i>SD</i> = .46)	1.51 (<i>SD</i> = .52)
Elaborative Complexity	1.64 (<i>SD</i> = .47)	1.60 (<i>SD</i> = .59)	1.52 (<i>SD</i> = .42)

^aMSNBC, n = 75.

^bNew FOX = Present to July 24, 2014 , n = 29.

^cOld FOX = July 25, 2014 – November 14, 2013, n = 43.

Table 2

Mean Dialectical Complexity Score by Author

<u>FOX News Authors</u>		
	<u>Number of Paragraphs</u>	<u>Dialectical Complexity Mean</u>
Author 1	20	1.29 (<i>SD</i> = .30)
Author 2	12	1.31 (<i>SD</i> = .36)
Author 3	5	1.78 (<i>SD</i> = .79)
Author 4	5	1.43 (<i>SD</i> = .40)
Author 5	15	1.35 (<i>SD</i> = .26)
Author 6	5	1.73 (<i>SD</i> = .38)
Author 7	5	2.40 (<i>SD</i> = .68)
Author 8	5	1.60 (<i>SD</i> = .51)

Note. Weighted mean = 1.48

Table 3

Mean Dialectical Complexity Score by Author

<u>MSNBC Authors</u>		
	<u>Number of Paragraphs</u>	<u>Dialectical Complexity Mean</u>
Author 1	45	1.41 (<i>SD</i> = .47)
Author 2	5	1.30 (<i>SD</i> = .67)
Author 3	5	1.72 (<i>SD</i> = .76)
Author 4	5	1.27 (<i>SD</i> = .38)
Author 5	5	1.67 (<i>SD</i> = .73)
Author 6	5	1.03 (<i>SD</i> = .07)
Author 7	5	1.17 (<i>SD</i> = .20)

Note. Weighted mean = 1.39

Table 4

Mean Elaborative Complexity Score by Author

<u>FOX News Authors</u>		
	<u>Number of Paragraphs</u>	<u>Elaborative Complexity Mean</u>
Author 1	20	1.59 (<i>SD</i> = .32)
Author 2	12	1.37 (<i>SD</i> = .31)
Author 3	5	2.25 (<i>SD</i> = 1.08)
Author 4	5	1.47 (<i>SD</i> = .32)
Author 5	15	1.66 (<i>SD</i> = .54)
Author 6	5	1.27 (<i>SD</i> = .28)
Author 7	5	1.23 (<i>SD</i> = .25)
Author 8	5	1.49 (<i>SD</i> = .31)

Note. Weighted mean = 1.55

Table 5

Mean Elaborative Complexity Score by Author

<u>MSNBC Authors</u>		
	<u>Number of Paragraphs</u>	<u>Elaborative Complexity Mean</u>
Author 1	45	1.69 (<i>SD</i> = .49)
Author 2	5	1.57 (<i>SD</i> = .19)
Author 3	5	1.45 (<i>SD</i> = .30)
Author 4	5	1.70 (<i>SD</i> = .67)
Author 5	5	1.40 (<i>SD</i> = .32)
Author 6	5	1.70 (<i>SD</i> = .48)
Author 7	5	1.58 (<i>SD</i> = .63)

Note. Weighted mean = 1.64

Appendix

Dialectical Complexity Examples

The following paragraphs were attributed the level of differentiation (at least a score of 3) on integrative complexity in the manual/practice materials (Baker-Brown et al., 1992) or by way of example in other researchers' papers. They are clear instances of dialectical complexity:

Paragraph 1. "Proposals to limit hospital costs provoke much anger and concern. On the one hand, most people are unwilling to settle for anything less than 'state-of-the-art' medical care. On the other hand, there are limits on the amount of money that people can or are willing to spend" (*Integrative Complexity Coding Manual*, Baker-Brown et al., 1992, p. 20).

Paragraph 2. "Busing students from deprived school districts into richer ones may be great for the deprived, but it usually brings down the quality of the better school. Choosing which way to vote requires deciding whether equality or excellence is a more important goal" (Gruenfeld, Thomas-Hunt, & Kim, 1998, pp. 211–212).

Paragraph 3. "Rules have both positive and negative features. On the positive side, rules are critical for maintaining social order and cohesion. On the negative side, rules can prevent people from thinking for themselves" (Tetlock, 1988, p. 104).

Elaborative Complexity Examples

The following paragraphs were also attributed the level of differentiation (a score of 3) on integrative complexity in the manual/practice materials (Baker-Brown et al., 1992) or by other researchers. They are clear examples of elaborative complexity:

Paragraph 1. "Do I encourage doves rather than hawks in Israel? There are no doves or hawks on the other side, only Israelis. They have convinced themselves that they are quite happy where they are. It is hopeless to change it. Everything we have offered hasn't made the slightest difference in their outlook. And when the Libyan airliner was shot down with 108 civilians killed, every paper in Israel praised this barbarian act. So, how can I change their thinking? The situation is hopeless and—make no mistakes—highly explosive" (*Integrative Complexity Coding Manual*, Baker- Brown et al., 1992; practice set 3, number 8).

Paragraph 2. "Handcrafted furniture is expensive in part because there are few skilled artisans and in part because most people do not have the good taste to appreciate high quality work" (*Integrative Complexity Coding Manual*, Baker-Brown et al., 1992, p. 1).

Paragraph 3. "I do not agree with this thesis. Solidarity among Flemish and Walloon people, as well as with immigrants living here, makes us stronger and enriches our culture. Independency is only advantageous to those in power and divides the people. Independency also opens the road to fascism (see Yugoslavia) and civil war" (Van Heil & Mervielde, 2003, p. 798).