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EXAMINING PUBLIC ATTITUDES AND IDEOLOGICAL DIVIDES THROUGH MEDIA ENGAGEMENT: AN EMPIRICAL ANALYSIS OF MORAL FOUNDATIONS THEORY AMIDST THE COVID-19 PANDEMIC

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ABSTRACT

The COVID-19 pandemic has highlighted societal values and beliefs, with U.S. news media playing a key role in shaping public attitudes. Our research, based on Moral Foundations Theory and analyzing 53,358 Facebook posts from U.S. news outlets, reveals distinct moral frameworks in media coverage. Liberal outlets focus on care, fairness, and liberty, while conservative outlets emphasize authority and loyalty. Audience engagement reflects these divides, indicating the significant impact of moral values in public communication and responses to science issues like COVID-19.

INTRODUCTION

Existing studies demonstrate that media outlets' portrayal of the pandemic varies with their political leanings (Gadarian et al., 2020). For example, conservative media, including figures like former President Trump, often downplay the virus, in contrast to liberal media's focus on protective measures for vulnerable groups (Jiang et al., 2021; Amin et al., 2017). Public reactions to scientific issues, including COVID-19, are ideologically divided, and influenced by moral commitments and political ideologies (Gauchat, 2012; Graham et al., 2009; Peng, 2022).

Moral Foundations Theory provides insights into public responses to COVID-19 measures like social distancing and mask-wearing (Chan, 2021; Tarry et al., 2022). However, findings are mixed, and further investigation using big data is warranted. Our research, grounded in moral foundations theory, examines the use of specific moral values in liberal and conservative media and their impact on audience engagement with COVID-19-related issues.

This study contributes to understanding the politicization of science through morality, the influence of moral values on audience engagement with science news, and advances computational methods in Moral Foundation Theory by introducing a liberty dimension.

MORAL FOUNDATIONS THEORY AND IDEOLOGICAL DIVIDE

Political Divide in Media Coverage of COVID-19

Moral Foundations Theory categorizes human values into dimensions such as care/harm, fairness/cheating, loyalty/betrayal, authority/subversion, and sanctity/purity (Graham et al., 2009). Liberals and conservatives differ in valuing these dimensions: liberal media focus on care and fairness, while conservative media emphasize loyalty, authority, and sanctity (Graham et al., 2009). The recently proposed liberty/oppression dimension addresses reactions to perceived dominance (Iyer et al., 2012).

The polarization between liberals and conservatives is evident in the spread of online messages, often confined within ideological boundaries (Brady et al., 2017). Liberal outlets, viewing hardships as externally caused, emphasize protective measures (Hasson et al., 2018; Araque et al., 2021; Bolsen et al., 2022), whereas conservative outlets, attributing hardships to internal factors, focus on personal responsibility (Caprara, 2006; Araque et al., 2021). Media coverage of COVID-19 is likely to reflect such ideological divides. We propose:

Hypothesis: Liberal media are more likely to use the moral value of care (1a) and fairness (1b) than conservative news media.

Hypothesis 1c: Conservative media are more likely to use the moral value of loyalty in their posts than liberal media.

Hypothesis 1d: Conservative media are more likely to use the moral value of authority in their posts than liberal media.

Hypothesis 1e: Conservative media are more likely to use the moral value of sanctity in their posts than liberal media.

RQ1: How is the liberty/oppression moral foundation used in liberal and conservative media?

Moral Foundations and Social Media Engagement

Public engagement is crucial for media outlets to disseminate and persuade with their messages (Dubovi & Tabak, 2021). Research indicates that individuals engage more with ideologically aligned content. For example, higher Fox News viewership is linked to lower compliance with stay-at-home guidelines (Simonov et al., 2020), and Trump supporters show less engagement with virus-related information and social distancing (Barrios & Hochberg, 2020). Such engagement patterns highlight and exacerbate media polarization. Based on these insights, we propose the following hypotheses and research questions:

Hypothesis 2a: News coverage that uses moral values of care is more effective (or less ineffective) in driving audience engagement for liberal media outlets than for conservative news media.

Hypothesis 2b: News coverage that uses moral values of fairness is more effective (or less ineffective) in driving audience engagement for liberal media outlets than for conservative news media.

Hypothesis 2c: News coverage that uses moral values of loyalty is more effective (or less ineffective) in driving audience engagement for conservative media outlets than for liberal news media.

Hypothesis 2d: News coverage that uses moral values of authority is more effective (or less ineffective) in driving audience engagement for conservative media outlets than for liberal news media.

Hypothesis 2e: News coverage that uses moral values of sanctity is more effective (or less ineffective) in driving audience engagement for conservative media outlets than for liberal news media.

RQ2: How does the liberty/oppression moral foundation drive audience engagement for liberal and conservative media?

DATA

The study sample was downloaded from major U.S. news media’s Facebook public pages using Crowd Tangle. Following the methodology of a previous study (Peng, 2020), we categorized the news media into two groups based on their audience's ideology: liberal and conservative, encompassing a total of 14 news media outlets.

Table 1. News Media Types.

Liberal Media	Conservative Media
Buzzfeed	Breitbart News Network
CNN	Daily Caller
Daily Kos	Fox News
Huffington Post	TheBlaze
MSNBC	Washington Examiner
NPR	
The New York Times	
The Washington Post	
Vox	

We extracted these downloaded media postings from January 1, 2020, to June 30, 2021, considering that topics on COVID-19 were the most predominant during this time. Next, following previous studies (Lopez et al., 2020), we used COVID-19-related keywords (e.g., see Table 2) to identify COVID-related posts for further analysis. For each post, we performed the following pre-processing steps: 1) tokenization; 2) converting all words to lowercase; 3) removing stop words; 4) part-of-speech tagging; and finally, 5) removing any tokens that included numbers, punctuation, or entities. After these steps, the data was ready for the next stage of analysis.

Table 2. COVID-19 Related Keywords.

Keywords
Covid19; Covid; Corona; Coronavirus; 2019ncov; Ncov; Pandemic; Social distancing; Lockdown; Quarantine; SARS-CoV-2; N95

Measurement of Moral Scores

Moral Foundations Theory provides a taxonomy of values and a term dictionary (Hopp et al., 2021). Building on a dictionary-based approach introduced by Graham et al. (2009), Hopp et al. (2021) developed the Extended Moral Foundations Dictionary (eMFD), leveraging text annotations from a large group of human coders. The eMFD assigns each of its 3020 words a foundation probability across five moral dimensions, allowing for a nuanced "mapping" of documents to generate an overall moral score.

Construction of Liberty Moral Dictionary

Moral Foundations Theory offers a value taxonomy and term dictionary (Hopp et al., 2021). Building on Graham et al.'s (2009) dictionary-based approach, Hopp et al. (2021) developed the Extended Moral Foundations Dictionary (eMFD), utilizing text annotations from numerous human coders. The eMFD assigns each of its 3,020 words a foundation probability across five moral dimensions, enabling nuanced document "mapping" to calculate an overall moral score.

Step 1: Identify Seed Words for Liberty

We reviewed the literature and identified potential seed words for the liberty dimension (Iyer et al., 2012; Araque et al., 2021). To ensure the quality of our seed word selection, we undertook steps including expert validation, establishing these initial seed words for the liberty dimension:

Freedom: Freedom free choice liberty private right allow

Oppression: Oppression restrict interfere force limit

Step 2: Expand Candidate Words via Synonyms and Antonyms

We obtained all derivatives of each word by searching on Thesaurus.com, a leading website for identifying synonyms and antonyms.

Step 3: Expand Candidate Words via Word Embeddings

Utilizing expanded seed words, we applied word embedding with pre-trained models (Glove and Google word2vec) to identify similar terms. Through iteration, Glove word embedding proved more effective than Google word2vec in finding relevant seed terms, leading to its selection for our model. We organized the results into a dictionary, with each seed word as a key linked to a list of related words. For efficient storage, we used a JSON file format, avoiding repetition of seed words. This method produced a key for each seed term associated with the top 20 semantically closest terms, yielding 633 synonym words and 118 antonym candidates.

Step 4: Human Validation of Liberty Dictionary

Following Hofmann et al.'s (2014) approach, we recruited five college students as human coders and provided them with basic training on Moral Foundations Theory. The coders were given a questionnaire to score candidate words of liberty on a scale of 0-7, where 0 indicates "not at all relevant" and 7 "very relevant", for each moral dimension and sentiment. This process yielded the initial scoring for the candidate words.

Step 5: Adjust Scores Before Proceeding

We utilized the Min-Max Scaler function, which subtracts the minimum value in the feature and then divides it by the range, defined as the difference between the original maximum and minimum (Max = 5.454, Min = 0). Applying this formula, we normalized the original coding to a 0-1 scale for further analysis, with a mean of 0.524 and a standard deviation of 0.152.

Step 6: Generate Moral Scores for Posts

We adopted the approach used by Hopp et al. (2021) to generate moral scores. This involves averaging the annotations for words in a sentence, skipping words not found in our lexicon. For instance, consider the sentence: “I am feeling exhausted.” This sentence is transformed into tokens like [“I”, “am”, “feeling”, “exhausted”], and for each token, we obtain its lemmatized form, resulting in [“I”, “be”, “feel”, “exhaust”]. We then attempt to retrieve the Liberty score for each word from our liberty dictionary. If a word exists in the dictionary, its score is added to a sum variable, initially set to 0. Words not found in the Liberty dictionary are ignored. This method was applied to generate scores for the other five moral dimensions, assessing the closeness of a post to a certain moral dimension using a pre-trained eMFD score (Hopp et al., 2021). We obtained six moral dimensional scores for an analytical sample of 53,358 posts from both liberal and conservative media. Only 5.5% of the postings received null scores.

Table 3. Examples of COVID-19 Messages that Reflect Different Moral Foundations.

Moral Dimension	Examples of COVID-19 Messages
Care/harm	<p>The pandemic is making a vicious cycle even worse for low-income students.</p> <p>Low pay and “toxic” workplaces are driving workers away from restaurants during Covid</p>
Fairness/reciprocity	<p>Economist Betsey Stevenson discusses why women have been disproportionately impacted by unemployment amid the coronavirus pandemic.</p> <p>Who gets the Covid-19 vaccine next? Older adults and frontline essential workers CDC advisers recommend</p>
Loyalty/ingroup	<p>Married couple, both teachers, die of Covid-19 while holding hands with their children.</p> <p>The US is relying on rubber glove imports from mostly Malaysia and Thailand in the midst of the Chinese coronavirus</p>
Liberty/Oppression	<p>Listen to Billie Eilis’s new song “My Future" Written and recorded in Los Angeles during lockdown, I’s a dreamy ode to freedom.</p> <p>At this stage in the novel coronavirus pandemic, masks are a fact of life.</p>

Authority/respect	Encouraging data from Covid-19 vaccines won't prevent a dangerous stretch of rising cases, experts warn. CDC now says masks protect both the wearer and those around them from Covid-19
Sanctity/purity	Two Sikh doctors shaved their beards, a pillar of their religion, to continue treating Covid-19 patients. There's something spreading faster than the coronavirus: Racism and microaggressions

Measures of Audience Engagement

On Facebook, the "like" reaction is the most used indicator of users' affinity or agreement with content. Following Peng's (2018) methodology, we measured audience engagement by the number of likes a Facebook post received. The distribution of likes is right-skewed (skewness = 15), but it approximates a normal distribution after applying a log transformation (Radecic, 2020). Therefore, the log-transformed number of likes serves as our dependent variable, while the six moral dimensional scores developed earlier are the independent variables.

Control Variables

We included several control variables in our study, with a particular focus on sentiment, as previous research indicates its impact on audience engagement (Hopp et al., 2021). Unlike Hopp et al. (2021), who used the vice-virtue of each dimension to indicate sentiment, we employed a pre-trained sentiment analysis function from the Python NLTK library. This function generates a singular sentiment index, reflecting the polarity and strength of the sentiment (Araque et al., 2021). It identifies positive or negative sentiments by comparing the text to K-mean clusters, resulting in a sentiment score for each posting, where 1 indicates positive sentiment and 0 indicates negative sentiment.

Additionally, our control variables include media type, word count, the month of the post's creation date, the number of followers, and the month of the page's creation.

ANALYTICAL APPROACH

To examine the differences in how news media display moral content, we conducted a descriptive analysis, followed by a one-way ANOVA test to determine if the differences in means are statistically significant (Girden, 1992).

For audience engagement questions, we employed regression models, specifically a random intercept model with Facebook ID as the group cluster to adjust for variance across groups (Ma et al., 2021). Variables such as followers, posting frequency, page category, and page creation date are Facebook account-based and vary only by Facebook ID, making a random intercept model appropriate for this analysis. We initially used the full sample, followed by a sub-sample analysis to investigate variations by media type. The results are presented in the subsequent section.

RESULTS

Differences in Morality between Liberal and Conservative Media

Table 4 presents the variables used in our analysis (N = 53,358). On average, a post garnered 1,638 likes, with liberal media posts receiving slightly more likes compared to those from other media types. The six moral scores range between 0 and 1, where a higher score indicates a greater likelihood of a post aligning with a specific moral dimension.

For the care score, liberal media posts averaged 0.108, significantly higher than those from conservative media ($p < .05$). Similarly, liberal media exhibited a higher fairness score (0.100) compared to conservative media (0.098), again significant at the $p < .05$ level. These findings support Hypothesis 1a, which posited that liberal media are more inclined to employ the moral value of care than conservative news media, and Hypothesis 1b, which suggested a similar trend for the value of fairness.

As anticipated, conservative media posts were associated with higher loyalty and authority scores, both significant at the $p < .05$ level. While conservative media also had a higher sanctity score, the difference was not statistically significant. These results corroborate Hypothesis 1c, which proposed that conservative media are more likely to emphasize the moral value of loyalty than liberal media, and Hypothesis 1d, which made a similar claim for the value of authority. However, our data did not provide sufficient evidence to support Hypothesis 1e, which posited greater use of the sanctity value in conservative media posts compared to liberal ones.

Regarding the liberty score, liberal media posts were slightly but significantly higher than those of conservative media ($p < .01$). This answers our exploratory question 1a, suggesting that liberal media posts are more closely associated with the liberty/oppression moral dimension.

Table 4. Descriptive Table of All Variables.

	Full sample	Liberty media	Conservative media	
Number of Like	1,638	1,788	1,545	
Care score	0.107	0.108	0.104	*
Fairness score	0.099	0.100	0.099	*
Liberty score	0.495	0.490	0.488	**
Loyalty score	0.089	0.090	0.092	*
Authority score	0.092	0.092	0.097	*
Sanctity score	0.080	0.079	0.081	
N	53,385	36,436	16,949	

Note: *, **, and *** indicate statistically significant differences at the alpha levels of 0.05, 0.01, and 0.001, respectively.

Main Effects of Morality on Audience Engagement

First, examining the main effects on audience engagement (Table 5). The estimated mean for the full sample is 5.509, significant at $p < .001$. The variance of random news media effects is 0.661.

A unit increase in the care score corresponds to a decrease of 3.724 likes ($p < .001$). In contrast, a unit increase in the authority score increases 2.672 likes, significant at $p < .01$. Similarly, a unit increase in the loyalty score leads to an increase of 3.341 likes, significant at $p < .001$. Liberty and sanctity scores show no significant effects. Positive sentiment, newer posts, and increased word count are all significantly associated with higher likes ($p < .01$).

Differences in Audience Engagement between Liberal and Conservative Media

Next, let's examine the interaction effects between audience engagement and media types (Table 5). Posts in liberal media are 0.127 times more likely to receive likes compared to those in conservative media, significant at $p < .001$. For liberal media, a unit increase in the care score leads to an increase of 1.351 likes, significant at $p < .05$; a unit increase in the authority score results in an increase of 2.027 likes, significant at $p < .01$; and a unit increase in the loyalty score corresponds to a decrease of 3.72 likes, significant at $p < .001$. Other interactions between liberal media and moral dimensions do not yield significant results. Our findings support Hypothesis 2a: News coverage using moral values of care is more effective in driving audience engagement for liberal media outlets than for conservative media. They also support Hypothesis 2c: News coverage using moral values of loyalty is more effective for conservative media outlets than for liberal media. However, our findings reject Hypothesis 2d: News coverage using moral values of authority is more effective for conservative media outlets than for liberal media. Finally, the liberty moral dimension does not show significant differences in driving audience engagement between conservative and liberal media.

Table 5. Regression Results on Audience Engagement.

Variables	Coefficient Number
Intercept	5.509*** (0.717)
Care score	-3.724*** (0.678)
Fairness score	-0.740 (0.368)
Liberty score	0.105 (0.088)
Loyalty score	3.341*** (0.936)
Authority score	2.672** (0.790)
Sanctity score	1.210 (0.156)
Liberal media	0.127*** (0.013)
Liberal media * Care score	1.351* (0.753)
Liberal media * Fairness score	0.483 (0.917)
Liberal media * Liberty score	0.096

Variables	Coefficient Number
	(0.098)
Liberal media * Loyalty score	-3.72*** (1.052)
Liberal media * Authority score	2.027** (0.890)
Liberal media * Sanctity score	-0.109 (0.953)
Sentiment	0.127*** (0.013)
Word count	0.004*** (0.000)
Month of post created	-0.005*** (0.001)
Month of page created	-0.0232 (0.059)
Follower at the post	0.000*** (0.000)
Variance (Facebook Id)	0.661 (0.279)
N	53,385

Standard errors in parentheses.

* p<.1, ** p<.05, ***p<.01

DISCUSSION

Incorporating Moral Foundations Theory, we analyze Facebook posts from major U.S. news media to investigate how these outlets leverage morality and how audiences engage with their content across ideological lines.

Moral Messages in Partisan Media

Our research provides nuanced insights into public health messaging, particularly for COVID-19. We found that liberal media predominantly used moral values of care, fairness, and liberty, aligning with our hypotheses. Conversely, conservative media focused more on loyalty and authority. This difference in moral messaging aligns with Moral Foundations Theory, indicating that liberals and conservatives may prioritize different moral values.

Implications for Public Messaging

Building on Gauchat's (2012) findings, our study demonstrates how liberals' and conservatives' reactions are shaped by distinct moral values. Our analysis showed that news coverage focusing on fairness and liberty did not necessarily enhance audience engagement for liberal media more than conservative media. Surprisingly, coverage using the moral value of authority was more effective for liberal media. This counterintuitive result indicates that public reactions to moral messages are nuanced and topic-specific. It implies that policymakers and media outlets aiming to reach a broader audience might benefit from integrating a variety of moral values, even those

not typically associated with their ideologies, though this approach could potentially weaken their appeal to their primary audience.

Methodology Contribution

Building on previous work that quantified five dimensions of moral foundation theory (Hopps et al., 2020), we advanced this approach by quantifying the sixth dimension, liberty, and developing a liberty dictionary for analysis. This enhances resources for researchers to assess the moral value of liberty and contributes to computational linguistic resources for analyzing moral values in the text.

Limitations and Future Research

Future research, building on our call for a deeper understanding of public reactions, might explore specific topics within the COVID-19 discourse, employ advanced semantic methods, and incorporate individual-level characteristics. This would provide a more nuanced understanding of how topic, sentiment, and moral value interplay in shaping public responses.

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