What Can Fake News, Politics, and Religion Tell Us About Pseudoscience?

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Abstract

News consumption and the media landscape have fundamentally changed over the last decade. These changes exacerbate concerns surrounding the proliferation of misinformation, particularly fake news. Most researchers consider fake news misinformation that disguises itself as legitimate news, which we liken to another form of misinformation, pseudoscience, that spreads falsehoods by appropriating the legitimacy of science. We investigated the influence of religious identity, political ideology, and open-mindedness on pseudoscientific and paranormal beliefs. We predicted that increased belief in religiosity and political identity would contribute to stronger beliefs in pseudoscience and the paranormal. Results revealed that belief in the paranormal was significantly higher for religious undergraduates compared to their non-religious peers, but that the relationships between political ideology and pseudoscience are much more complex. In sum, our results support further exploring changing risk factors based upon individual differences and the type of misinformation to aid in combating both fake news and pseudoscience.

Keywords**:** Fake news, pseudoscience, politics, religion, cognition, individual differences.

I maintain there is much more wonder in science than in pseudoscience. And in addition, to whatever measure this term has any meaning, science has the additional virtue, and it is not an inconsiderable one, of being true (Sagan, 1987, p. 46).

1. Introduction and the state of fake news

How we consume news and the landscape of that media space have fundamentally changed over the last decade. Information is increasingly consumed digitally, and social media platforms now dominate news spheres (López-García et al., 2021; Twenge et al., 2019; Wagner & Boczkowski, 2019).These changes have exacerbated concerns surrounding the proliferation of misinformation and disinformation in the public's understanding of science. Waisbord (2018) argues that one of the consequences of the rise of social media has been the "speed, scale and massive proliferation and consumption of false information"(p. 1887).Dimensions of misinformation, including fake news, have quickly become a global issue that researchers from across the intellectual landscape—including psychology, journalism, education, and linguistics—are grappling to understand (López-García et al., 2021).

We define fake news as any information that mimics real news (Duffy et al., 2020). While taxonomies and conceptualizations of fake news are still evolving (see Wardle, 2017), the damage caused by fake news is pernicious, persistent, and difficult to ignore. In 2020 the World Health Organization's concern was so great for the spread of disinformation about COVID-19 that it formally identified a modern "infodemic": a deluge of information on social media that made it difficult to discern trustworthy sources from fake news, preventing people from accessing reliable health guidance and luring them into believing falsehoods (WHO, 2020a).Such examples are easy to find: injecting oneself with bleach (WHO, 2020b), drinking acutely poisonous industrial methanol (WHO, 2020b), embracing refuted virus treatments (e.g., Ivermectin; FDA, 2021), or using a 5G USB device to shield one from phone transmission of the virus (Koetsier, 2020). Other disinformation claims are associated with health choices and vaccine hesitancy, such as: Wearing a mask activates the virus (see research on the Plandemicconspiracy: Cook, et al., 2020; Prasad, 2021, vander Linden et al., 2020) or that Bill Gates is planning to use the COVID-19 vaccine to implant microchips in people (Goodman & Carmichael, 2020).

While many researchers are concerned about the deleterious effects of fake news, there have been few studies quantifying the behavioral effects of disinformation. Greene and Murphy (2021) reported that half of their fake news conditions yielded an effect and that exposure to a single fake news story decreased the adoption of a beneficial health application by 5%.Pennycook et al. (2018) found similar effects from the perceived accuracy of a single exposure to a fake-news headline (d = .20). Although we might take solace in the small effect sizesafter a single exposure, fake news is often repeated and shared across multiple websites/media platforms, and there is evidence for a *compounding* effect of encountering the same misinformation over time (Lewandowsky et al., 2012; Swire et al., 2017; Pennycook et al., 2018).

Of note, fake news does not affect everyone equally. Christians, particularly in the United States (U.S.) Republican party, are susceptible to fake news with religious content regarding the COVID-19 pandemic (Calvillo et al., 2020; Douglas, 2018; Guess et al., 2019).Political polarization is so strong in the U.S. that researchers have suggested that it is the primary force behind fake news adoption (Osmundsen et al., 2020), overcoming seemingly sensible preventative measures (e.g., Twitter warning tags; Lees et al., 2021). Evidence also reveals that Facebook users over the age of 65 are prone to sharing more fake news than their younger counterparts (Guess et al., 2019).Thus, as a type of disinformation, the adoption of fake news can be politically motivated, driven strongly by one's political, and sometimes religious, identity.

1.1.*Fake news and pseudoscience*

When considered "information that astutely mimics news and taps into existing public beliefs" (Waisbord, 2018, p.1886), fake news has an uncanny resemblance to pseudoscience, which appropriates scientific (rather than media) legitimacy to "create the impression that it represents the most reliable knowledge on its subject matter" (Hansson, 2013, p. 71).Like fake news, pseudoscience increases belief in misinformation while diminishing scientific literacy (Boudry et al., 2015).One example, Freudian Psychoanalysis, has been branded as pseudoscientific for its ad hoc revisionism, convenient explanation for non-believers, and imperviousness to disconfirmation (Boudry & Braeckman, 2011). Its proponents have argued against randomized clinical trials as a legitimate method for studying its efficacy (Leichsenring, 2005), while simultaneously lamenting (Dauphin, 2020) that evidence-based psychological practice has moved on due to the absence of such evidence (Zaboski et al., 2021).

Pseudoscientific beliefs can afflict anyone, even professionals (Lynn et al., 2015), and may or may not be fake news. For example, the fake news that 2016 presidential candidate Hillary Clinton ran a pizza restaurant child-sex ring (Robb, 2017) is not pseudoscience, but the viral fake news story about the health dangers of eating Reese's peanut butter cups (Wolfe, n.d.) is (see Schmaltz & Lilienfeld, 2014 for pseudoscience warning signs). The adoption of pseudoscience mirrors fake news in that it leads to general harm, including the promotion of dangerous assessment practices, misinformed psychological practice, life-threatening medical decisions, and questionable legal decisions (Jupe & Denault, 2019, Kranzler et al., 2016; Rovira & Raffio, 2017; Zaboski et al., 2017).

1.2. A cognitive individual-differences approach

Understanding fake news and pseudoscience requires a closer examination of individual beliefs and the demographics of the individual who believes the claim. More nascent research in individual differences in fake news susceptibility suggests that it appeals most to political or religious identity and is often shared within the context of one's social relationships (Duffy et al., 2020; Spohr, 2017). Individuals may be less receptive to information that runs counter to their political ideology (Tappin et al., 2021), and increased domain knowledge of a topic, higher levels of analytical thinking, and greater open-mindedness are associated with improved fake-news detection. Comprehension and reasoning mechanisms might differ in important ways with respect to an individual's beliefs and the type of misinformation processed (Rapp et al., 2019). Perhaps paradoxically, increased trust in science also increases one's propensity for believing in and propagating pseudoscience (O'Brien et al., 2021). Rapp et al., (2019) suggest that future research may benefit from considering how individual factors interact with politically laden content, folk theories, and mixtures of accurate and inaccurate information.

Consequently, the goal of the current study was to use the fake news literature as a guide to conduct an exploratory analysis to investigate which demographic variables contributed to pseudoscientific beliefs. Using two measures of pseudoscience, one obtained from online websites and a measure of paranormal beliefs, we sought to explore the impact of political identity and religiosity on such beliefs when controlling for open-mindedness. We predicted that when controlling for open-mindedness, our results would mirror that from the fake-news literature; namely, religiosity and political identity would contribute to stronger beliefs in pseudoscience.

2. Methods

This exploratory analysis follows up on the procedures described in Zaboski and Therriault (2020). All analyses are new. The original sample (N = 85 participants) was collected in 2016 – 2017 through a research pool in the U.S. All procedures were approved by an Institutional Review Board. All participants were 18 or older and participated to fulfill a course research requirement. Numerous religious affiliations were reported in the original study; these were condensed for this analysis into three categories: Catholic, Christian (non-Catholic), and Non-religious for use as an independent variable. Participants reported the following political affiliations: Republican (n = 32), Democrat (n = 23), and Independent (n = 22). Table 1 summarizes and supplements the participant demographics from the original study.

Table 1
Demographics

	n	%
Gender		
Male	14	16
Female	71	84
Political Affiliation		
Republican	32	38
Democrat	23	27
Independent	22	26
Prefer not to say	8	9
Religion		
Christian	36	42
Catholic	29	34
Non-religious	14	16
Prefer not to say	6	7

2.1. Measures

2.1.1. Pseudoscience belief

As described in Zaboski and Therriault (2020), all participants read 10 pseudoscientific texts. Topics were diverse, ranging from learning styles (Macdonald et al., 2017; Pashler et al., 2008) and graphology (Ben-Shakhar & Barr, 2018) to creationism (Law, 2021). Participants rated each text on a Likert scale from 1 (strongly disagree) to 7 (strongly agree) with the following prompt: 'Do you personally believe that [insert central claim of the text].' We then computed a composite Pseudoscience Belief Score for each participant by taking an average rating over each of the 10 texts.

2.1.2. Revised Paranormal Belief Scale

Along with our pseudoscientific text judgments, all participants were asked to complete the 26-item Revised Paranormal Belief Scale (Tobacyk, 2004). This scale, created to assess one's degree of belief in paranormal phenomena, has a 7-point rating scale including subscales of Traditional Religious Belief, Psi, Witchcraft, Superstition, Spiritualism, Extraordinary Life Forms, and Precognition. Participants rated each text on a Likert scale from 1 (strongly disagree) to 7 (strongly agree) with a possible range of 26 - 182. The scale's authors report earlier reliability and validity studies (see Tobacyk, 2004), with a large confirmatory factor analytic study (N = 3,764) supporting the construct validity of the instrument's total score as a measure of a general factor of paranormal belief (Drinkwater et al., 2017).

2.1.3. Actively Open-Minded Thinking Scale

The Actively Open-Minded Thinking Scale (AOT) is one of many versions used to measure cognitive style towards rational thinking (Janssen et al., 2020). The version used in this study contains 7 items that quantify one's tendency to weigh new evidence against a favored belief (Haran et al., 2013), with a possible range for the total score of 7 - 49. A higher AOT score is linked to greater persistence in the search for information along with higher accuracy of estimates and lower overconfidence (Haran et al., 2013). Researchers have used this version of the scale to demonstrate meaningful relationships to probabilistic forecasting (Mellers et al., 2015), correlates with scientific reasoning (r = .41; Drummond &Fischhoff, 2017), and positive associations with climate change acceptance (r = .24), and negative associations with right-leaning political beliefs (r = -.24; Kahan & Corbin, 2016).

2.2. Data Analysis

All analyses were conducted in R (R Core Team, 2021) with data manipulation done with the Tidyverse (Wickham et al., 2019). Regressions were run with R's "lm" function; descriptive statistics and alpha coefficients were calculated with the psych package (Revelle, 2021). All plots were programmed in ggplot2 (Wickham, 2016).

First, summed scores were computed for the Revised Paranormal Belief Scale and the Actively Open-Minded Thinking Scale. A trichotomous variable was created for religious identification containing Catholics, Non-Catholic Christians (Protestant, Mormons, and non-denominational Christians), and Non-Religious individuals (Agnostics, individuals not identifying with a religion, and individuals with no religion).

Statistics were then obtained for the study's continuous measures including means and standard deviations. For visualizing the relationship between the dependent variables and categorical variables (i.e., religious identification and political affiliation), we utilized a modified boxplot that displays all the data.

We ran four main regression models. The eight participants preferring not to report a political affiliation and the six participants who chose not to report a religious identification were removed from the regression analyses. The first two analyses used our Pseudoscience Belief score as a dependent variable. This was predicted by religious identification and the Active Open-Minded Thinking total score in one model, and by political affiliation and the Active Open-Minded Thinking total score in another model. The third and fourth models used the total score from the Revised Paranormal Belief Scale as the DV, with identical independent variables as the first two models. After running our models, we visualized QQ plots to check model assumptions and identify outliers (Cohen et al., 2003). Deviations were deemed acceptable; no outliers were removed.

All alpha levels were set to .05; however, as this was an exploratory analysis, we recognized that the p-values (and our conclusions) are at best tentative (Ioannidis, 2005); we thus report the *p*-values and significance levels so that other researchers can infer their own conclusions from the data. Consistent with current statistical recommendations we de-emphasize statistical significance in favor of discussing model effects and confidence intervals (McShane & Gal, 2017; Wasserstein & Lazar, 2016). We selectively display least square mean plots for model results with the emmeans package in R (Lenth, 2021) that we believe to be most worthy of follow-up.

3. Results

3.1. Descriptive Statistics

Descriptive statistics for the study measures are contained in Table 2.

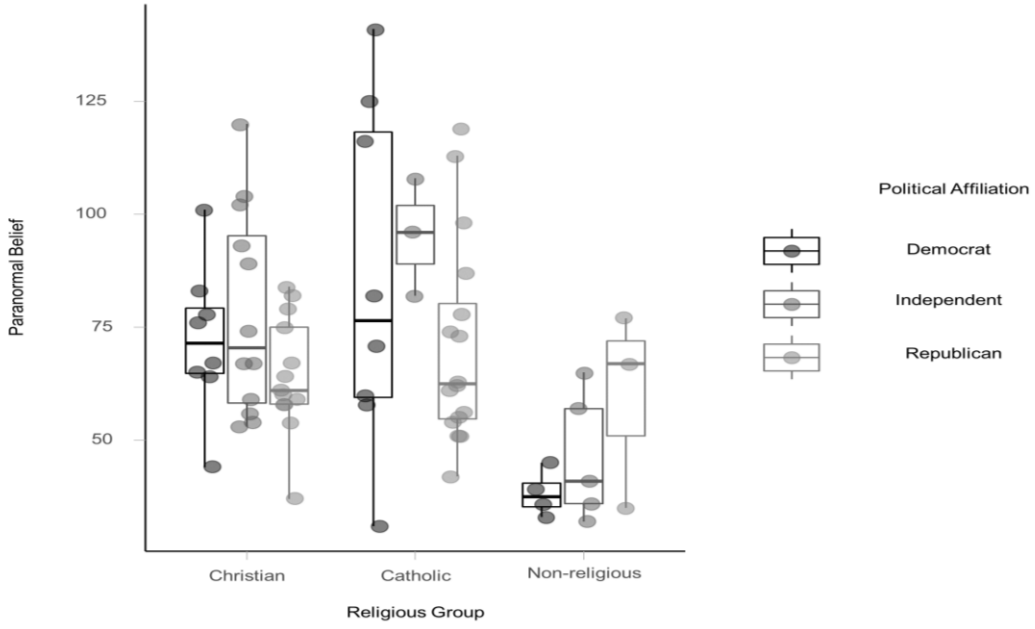
Table 2
Descriptive Statistics

Measure	*N*	*M*	*SD*	Cronbach's α
Pseudoscience Belief	85	3.69	0.64	-
Paranormal Belief	85	71.68	24.09	0.90
Actively Open-minded Thinking	85	35.00	5.14	0.51

Descriptive statistics revealed valid measurements on 85 participants with no missing data. When examining data across all participants and across all groups on the Pseudoscience Belief score, mean scores were *M* = 3.69 (*SD* = 0.64), indicating middle-range belief in the pseudoscientific texts. Participants reported a mean on the Revised Paranormal Belief Scale of *M* = 71.68 (*SD* = 24.09), indicating relatively high levels of paranormal belief in this sample. The scale had good internal consistency reliability (α = .90). Most participants rated themselves highly on the Actively Open-Minded Thinking Scale: *M* = 35.00; *SD* = 5.14 yielding a negative skew. This scale had lower internal consistency reliability compared to the Revised Paranormal Belief Scale (α = .51),but it was not unacceptably low for exploratory purposes.

Figure 1 displays a boxplot of paranormal beliefby religious identification on the x-axis and grouped by political affiliation. Non-religious Democrats appeared to have the lowest levels of paranormal belief, followed by independents, then republicans. Of note, a smaller sample size precluded us from analyzing the non-religious group further. Indeed, the small sample appeared to yield a great deal of variability for Catholic Democrats, though we note that the few Catholic Independents clustered together more tightly. The sample was larger in the Catholic Republican group, but still this plot shows high variability in paranormal belief; indeed, this variability was more pronounced than the Christian religious group which contains more heterogeneity among its religious composition.

Figure 1*Box Plot of Paranormal Belief by Politics and Religion*



3.2. Regression Analyses

3.2.1. Religious Identification

The first model used religious identification and Active Open-Minded Thinking to predictPseudoscienceBelief. Table three displays all of the results:

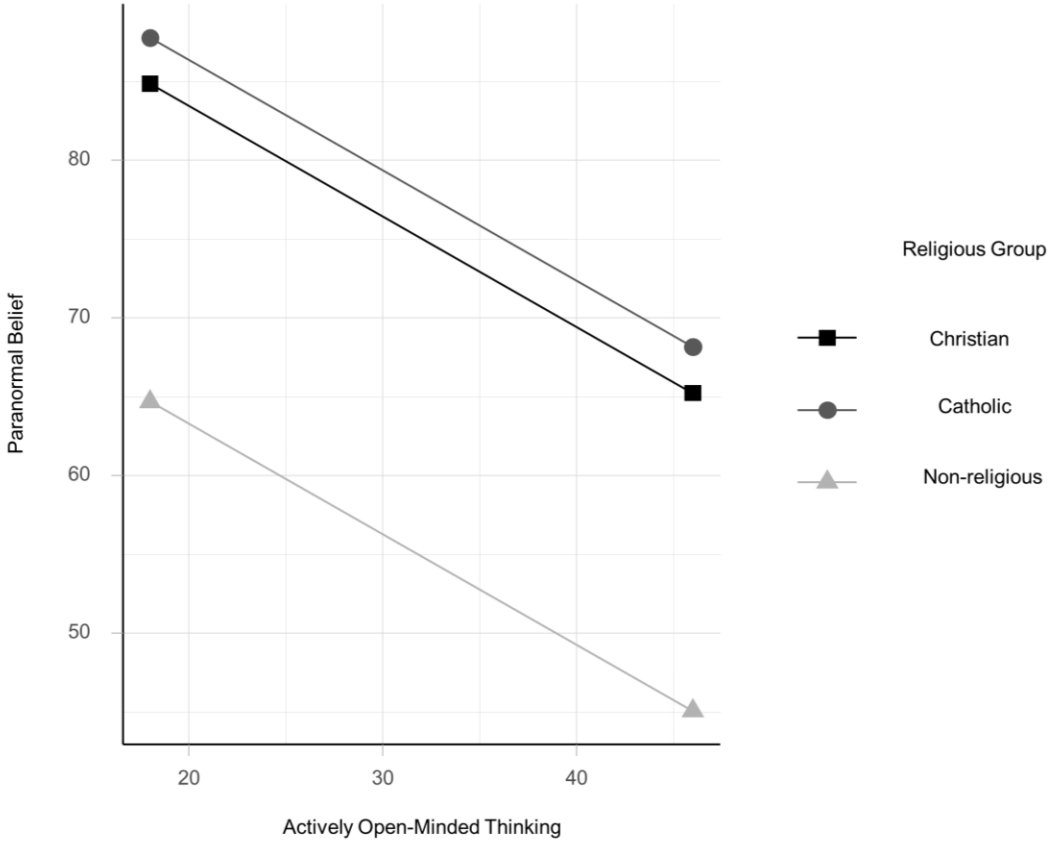
Table 3 ***Regression Models - Religion***

Variable	b	95% CI LL	95% CI UL	*t*	*SE*	*p*
Pseudoscience Belief[a]						
Intercept	3.66	2.60	4.72	0.53	6.88	$p < 0.01$
Actively Open-Minded Thinking	0.00	-0.03	0.03	0.02	0.04	$p = 0.97$
Religion (Catholic)	0.01	-0.31	0.33	0.16	0.07	$p = 0.95$
Religion (Non-Religious)	-0.04	-0.46	0.38	0.21	-0.18	$p = 0.86$
Paranormal Belief[b]						
Intercept	97.40	60.52	134.37	18.50	5.26	$p < 0.01$
Actively Open-Minded Thinking	-0.70	-1.74	0.34	0.52	-1.34	$p = 0.19$
Religion (Catholic)	2.93	-8.27	14.13	5.62	0.52	$p = 0.60$
Religion (Non-Religious)	-20.20	-34.72	-5.60	7.31	-2.76	$p < 0.01$

[a] $R^2_{adj} = 0.00$, $F(3, 75) = .02$, $p = .99$
[b] $R^2_{adj} = .14$, $F(3, 75) = 5.14$, $p < .01$

Results indicated a poor overall model fit $R^2_{adj} = 0.00$, $F(3, 75) = .02$, $p = .99$, with no scientifically important or statistically significant main effects. By contrast, the second model with the Revised Paranormal Belief Scale generated a better (and statistically significant) model fit: $R^2_{adj} = .14$, $F(3, 75) = 5.14$, $p < .01$. Examining the beta coefficients, the main effect for Actively Open-Minded Thinking contributed only slightly to paranormal belief (b = -0.70, 95% CI [-1.74, 0.34], $p = .19$) controlling for the other variables. Identifying as Catholic also contributed a small amount to paranormal belief, controlling for Open-Minded Thinking (b = 2.93, [-8.27, 14.13], $p = .60$). We found a large effect—almost a standard deviation's difference—between individuals identifying as non-religious and not, while controlling for Open-Minded Thinking (b = -20.20, [-34.72, -5.60], $p < .01$). Figure 2 illustrates the expected means across the range of Open-Minded Thinking Score generated from the paranormal belief model.

Figure 2*Paranormal Belief, Religious Group, and Open-Minded Thinking*



3.2.2. Political Affiliation

Our third model used political affiliation and Active Open-Minded Thinking to predict PseudoscienceBelief, the results of which are in Table 4:

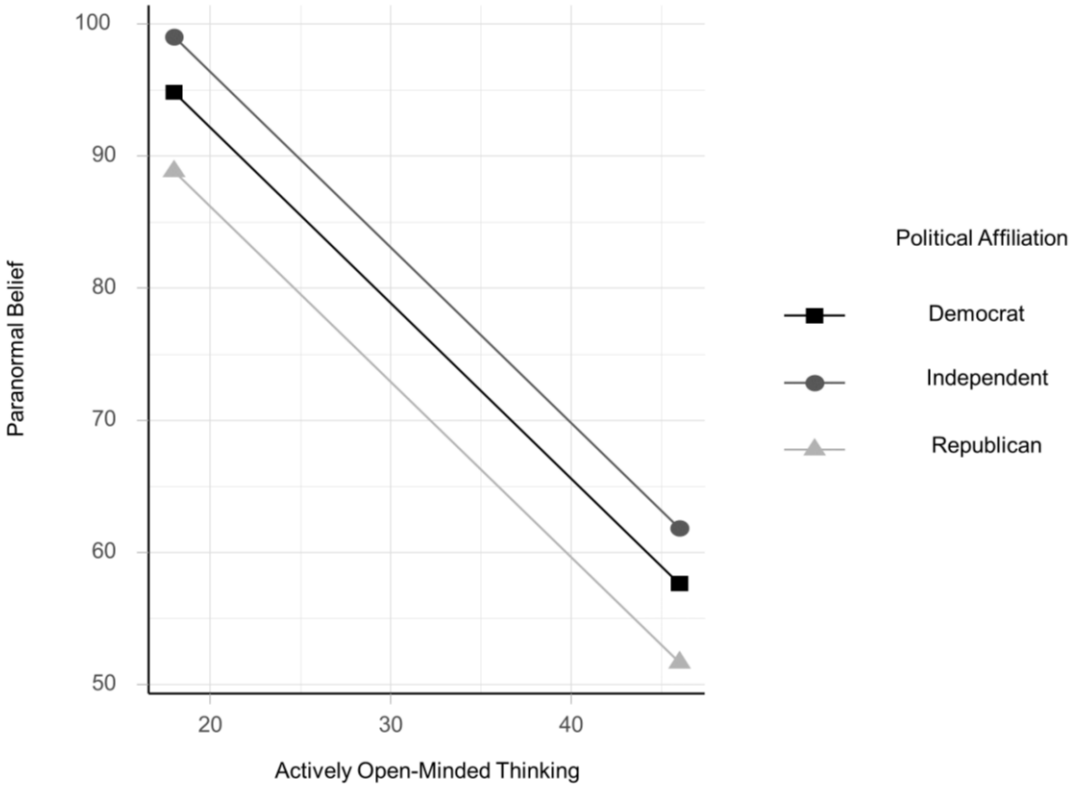
Table 4*Regression Models - Politics*

		95% CI				
Variable	b	LL	UL	*t*	*SE*	*p*
Pseudoscience Belief[a]						
Intercept	3.60	2.52	4.68	0.54	6.65	$p < 0.01$
Actively Open-Minded Thinking	0.00	-0.03	0.03	0.01	0.04	$p = 0.96$
Independent	0.03	-0.37	0.43	0.20	0.14	$p = 0.89$
Republican	0.07	-0.29	0.44	0.18	0.41	$p = 0.69$
Paranormal Belief[b]						
Intercept	119.00	80.70	156.75	19.10	6.22	$p < 0.01$
Actively Open-Minded Thinking	-1.33	-2.38	-0.28	0.53	-2.53	$p < 0.01$
Independent	4.20	-9.83	18.23	7.04	0.60	$p = 0.55$
Republican	-5.97	-18.83	6.89	6.45	-0.93	$p = 0.36$

[a] $R^2_{adj} = 0.00$, $F(3, 73) = .06$, $p = .98$
[b] $R^2_{adj} = .06$, $F(3, 73) = 2.62$, $p = .06$

As with the religious identification results, we found a poor overall model fit $R^2_{adj} = 0.00$, $F(3, 73) = .06$, $p = .98$; main effects were small and non-significant. The Revised Paranormal Belief Scale again generated a better model fit as a dependent variable: $R^2_{adj} = .06$, $F(3, 73) = 2.62$, $p = .06$. The Actively Open-Minded Thinking scale contributed a small effect to paranormal beliefs (b = -1.33, 95% CI [-2.38, -0.28]) that was statistically significant when controlling for political affiliation ($p < .01$). Identifying as an Independent was associated with increased paranormal belief scores (b = 4.20, [-9.83, 18.23], $p = .55$) controlling for Open-Minded Thinking, and identifying as a Republican appeared to have the opposite effect: b = -5.97, [-18.83, 6.89], $p = .36$. Figure 3 shows the expected means across the range of Open-Minded Thinking Score generated from the paranormal belief model for political affiliation.

Figure 3*Paranormal Belief, Political Affiliation, and Open-Minded Thinking*



4. Discussion

The purpose of this exploratory analysis was to investigate demographic variables associated with belief in pseudoscience and the paranormal, which we hypothesized would parallel those associated with fake news. Our sample had a relatively high level of paranormal belief, with a mean score of 71.68 (max possible: 182). Our participants were also reportedly opened-minded, with a mean score of 35.00 (max possible: 49). The largest effect in our analysis was a 20-point difference for non-religious individuals on the paranormal belief scale controlling for open-minded thinking. This was consistent with Wilson (2018), who found that belief in the paranormal is lower for non-religious students compared to their religious peers.

Visualizing our data, we saw some effects by religion and political group that were not amenable to a conclusive interpretation due to sample size constraints. For instance, among the non-religious group, there were noticeable differences among the different political identities, with Democrats reporting the lowest paranormal beliefs and Republicans reporting the highest. Our model without this religion by politics interaction, but controlling for open-minded thinking, revealed different effects for political affiliation, with Republicans having the lowest scores on paranormal thinking followed by Democrats and Independents.

Thus, while larger studies have shown that political ideation does impact factual reasoning (Tappin et al., 2021),and other researchers have concluded that politics can have predictable effects on whether certain scientific theories will be accepted or rejected (e.g., climate change; Ballew et al., 2019), it remains unclear whether the pseudoscience of paranormal activity is politically charged or politically neutral.

Researchers identified a narrow set of successful approaches to combating fake news, ranging from narrative corrections and refutational texts to classroom-based interventions to increase critical thinking (Adam & Manson, 2014; Donovan et al., 2018; Lewandowsky, et al., 2012; Rapp &Kendeou, 2007; Sangalang et al., 2019). Unfortunately, common media practices such as providing general warnings about the dangers of fake news or simply labeling media as inaccurate after the fact (e.g., retractions) are not effective in changing misinformed beliefs (Ecker et al., 2011; Greene& Murphy, 2021). In our prior study (Zaboski & Therriault, 2020), pseudoscientific beliefs were not amenable to change, at least not by the manipulations we attempted, such as by adding credentialed names, scientific citations, or hedging language. One reason for this challenge might be due tothe combined strength of several fake educational concepts being coupled together. Sinatra and Jacobson (2019) have described this phenomenon as "zombie herds": Myths that travel together and are difficult to kill. Evidence for the herds comes from factor analyses in which twenty-two fake educational claims were reduced to three conceptual areas: neuroscience, learning, and motor coordination (Macdonald et al., 2017). These "zombie herds" gain strength from their interconnections with each other, allowing new myths to arise, which are difficult to snuff out in isolation (Sinatra & Jacobson, 2019). We found clear herding instances in our pseudoscience stimuli. For example, one of our stimulus texts describes the power of water-dowsers, (those who intuit the location of water). Inspection of that website now provides links to false COVID claims through a medical intuitive, a "virus whisperer" who can intuit the location of afflictions related to COVID-19 and heal them. It may be that pseudoscience and fake news overlap in some areas such as how they spread and maintain themselves but not in others, such as individual differences in belief structures and the type of persuasion mechanisms (i.e., appealing to science vs. media credibility).

Most of the current research has settled upon correcting misinformation through remedial and/or reactive tools, but these are also limited by the compounding effects of fake news that arise when it is repeated without specific refutation. Not surprisingly, a review of refutational approaches reveals that they are also not particularly effective at fully reversing misapprehensions, and in some cases further concretizes the belief through increased familiarity (Schwarz et al., 2016, van der Linder et al., 2017; Skurnik et al., 2005; Zengilowski et al., 2021). Yet one commonality of the above approaches is that they are all one-size-fits-all. But why assume that all forms of misinformation are managed equally well by the same interventions? Our data suggest that there may be additional benefit in exploring individual differences and different types of pseudoscience; and that these may contribute differentially to fake news susceptibility.

Thus, we suggest that a first step is to determine what type of misinformation is involved. Our exploratory analysis provides preliminary evidence that when it comes to the paranormal—one of psychology's most famous and enduring examples of pseudoscience (Hines, 2010)—belief is high and not easily predictable along demographic lines. Thus, despite differences among political affiliations fake news belief (Calvillo et al., 2020; Guess et al., 2019), it may have been erroneous for us to hypothesize similarly homogenous group effects across political or religious groups for our pseudoscience dependent variable, which yielded no effects.

If people believe pseudoscience for different reasons, it follows that researchers need to be more proactive when it comes to understanding the function of belief. By understanding this, one can more easily address misapprehensions. For example, research suggests that conservatives are more open to the science of climate change when framed in terms of free-market solutions (Campbell, 2014; Dixon et al., 2017). Applied to our study, one of our pseudoscience texts promotes the power of water dowsing, or the ability to use a simple device (like a stick) to detect water deep underground. Such pseudoscience might be neutral with respect to religion or politics and more amenable to a refutational-like solution, whereas our text on creationism requires a broader intervention that requires an understanding of the function of one's beliefs within a religious context.

5. Conclusion

We found that when controlling for actively open-minded thinking, religious identity predicted scores on paranormal belief, but not on a simple composite measure of pseudoscience. We also found small and null results for political affiliation, despite a strong literature base in fake news suggesting these models were reasonable. Taken together, our exploratory data suggest that managing fake news and pseudoscience means having a better understanding of the changing risk factors based upon the group and type of misinformation involved—whether fake news, pseudoscience, or pseudoscientific content.

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