



# Beliefs influence argumentative essay writing

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## Abstract

The content of argumentative essays is determined by multiple factors, but belief influences are understudied compared to topic knowledge and argument schema. We investigate how beliefs influence the inclusion of basic components in argumentative writing. A pre-screening survey identified believers and disbelievers in gun control effectiveness. In a subsequent laboratory session, subjects ( $N=324$ ) read a one-sided text that was either consistent or inconsistent with their beliefs. Subjects then reported their beliefs and wrote a 250-word argumentative essay explaining them. These essays were coded for the presence or absence of a claim, the number of reasons supporting the claim, the presence of a counterargument, text content, and other factors. 682 supplementary subjects provided approximately 10 ratings for each essay on several factors, including position, clarity, and consideration of both sides. Subjects who read a belief consistent text wrote essays that were more likely to contain a claim, more reasons, and text content. Subjects who read a belief inconsistent text were more likely to include an evaluative statement about the text and to consider both sides of the issue. Individual differences in belief change were related to the likelihood of stating a claim, the number of reasons, and likelihood of mentioning text content. Results suggest that beliefs influence the basic components of argumentation that are included in argumentative essays. Theoretical and practical implications of these findings are discussed.

**Keywords** Beliefs · Belief change · Argumentative discourse · Essay writing

In discussing contentious topics, people need to critically comprehend argumentative texts and integrate arguments into their own persuasive communication. In many cases, this communication needs to take the form of an argumentative essay. Beliefs and argumentation are inexorably linked, as beliefs are often, but not always, the basis for an argumentative essay. Skilled argumentative writing is critical to success in educational and professional contexts

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(Graham & Perin, 2007). Thus, it is important to understand both how information that reinforces or conflicts with individuals' beliefs affects their argument construction, and how beliefs themselves may influence argumentative writing.

A sound argument is comprised of a claim with supporting reasons (Voss & Means, 1991). High-quality arguments also contain a warrant, and potential counterarguments with rebuttals (Toulmin, 1958). To comprehend information from diverging perspectives and produce a compelling argumentative essay, people need to separate their personal beliefs from the position of an essay (Fulkerson, 1996). Arguments are judged to be of higher quality when they consider multiple perspectives related to the topic (Allen, 1991). However, beliefs may lead people to write about a claim without considering alternatives or the strength of the evidence supporting their claim (Ellis, 2015). In argumentative essay writing, the author generally states a claim and provides supporting reasons consistent with their beliefs (Wolfe et al., 2009). Regardless of a position taken, beliefs should not influence the inclusion or exclusion of the components of an argument that make it sound and persuasive. In the current research, we examine two questions related to how argumentative essay writing may be influenced by beliefs. First, how does reading a one-sided text that is either consistent or inconsistent with one's beliefs influence the components that are included in a subsequent argumentative essay? Second, what relationship (if any) does belief change, that results from reading, have with the inclusion of the components of an argumentative essay?

## **Other influences on essay content: Argument schema, knowledge, and comprehension**

Existing lines of research have established that multiple factors influence the content and components of argumentative essays. Wolfe, Britt, and colleagues (Britt et al., 2008; Wolfe, 2012; Wolfe et al., 2009) contend that the inclusion of basic components in argumentative essays is primarily determined by an argument schema. Each person's schema contains "slots" for a claim, warrant, reasons, and counterarguments along with rebuttals. Each claim consists of a theme (or topic), side, and claim predicate. The claim predicate refers to the specific position advocated for. For example, "gun control is effective at reducing crime" vs. "gun control laws should be expanded" are claims that have the same theme and side but differ in claim predicate. In either a comprehension or writing task, an argument schema is activated and indicates the types of information and structure that should be used.

Individual differences are important in understanding the use of argument schema because people's argument schemas vary in complexity. Numerous studies demonstrate that people often fail to clearly state a claim or include counterarguments in their argumentative essays (Anmarkrud et al., 2013; Nussbaum & Kardash, 2005; Tarchi & Villalón, 2021; Villarroel et al., 2019; Wolfe, 2012; Wolfe & Britt, 2008; Wolfe et al., 2009). Wolfe and Britt (2008) found that fact-based schemas are associated with a "myside bias" in which students only mention arguments consistent with their side. Students vary in the number of reasons they provide as well. Britt et al. (2008) tested students' memory for components of simple argument statements and found that many were unable to accurately recall the claim predicate of the arguments. Dandotkar et al. (2016) found that only skilled reasoners were proficient at both identifying claim predicates and assessing argument quality. Overall, we

expect variation across essays in the extent to which they include these important components of argumentation.

Topic knowledge also determines argumentative essay content, and can include factual knowledge and evidence, as well as anecdotes, news stories, and policy opinions (McCarthy & McNamara, 2021). Knowledge also includes attitudes, beliefs, feelings, and experiences, which are likely organized in a network through which spreading activation occurs (Dalege et al., 2016). The amount of topic knowledge may also influence informal reasoning ability; Sadler and Zaidler (2005) found that flawed reasoning was less common among individuals who were knowledgeable about a particular topic.

Recently learned information can be integrated with prior knowledge and serve as another important source of information that can be included in an argumentative essay. We presume people will construct a mental representation of what they read (Kintsch, 1998) and that salient information from this representation is available for use in argumentative essays. Anmarkrud et al. (2014) found subjects who engaged in higher levels of strategic processing while reading multiple texts wrote essays that had better argumentative reasoning scores. Some studies use argumentative essay writing to assess comprehension of source texts (Braasch et al., 2022; Tarchi & Villalón, 2021). However, an argumentative essay can only be considered a valid measure of comprehension if subjects are explicitly instructed to include information from the source texts in their essay. For example, subjects' argument schema may dictate that they selectively omit information that weakens or contradicts their argument position (Bolz, 2022). There is mixed evidence regarding the possibility that beliefs influence comprehension of information. Some studies suggest belief consistent information is better comprehended in the absence of specific processing strategies that favor belief inconsistent information (Maier & Richter, 2013; Richter & Maier, 2017). Other studies failed to find any relationship between the belief consistency of a text and comprehension (Wolfe et al., 2013; Wolfe & Williams, 2018). While this study examines belief influences on argumentative writing, we assume that argument schema, topic knowledge, and comprehension processes also influence argumentative writing.

## Influence of beliefs on essay content

The extent to which beliefs influence argumentative essay content is the focus of the current study. Beliefs are defined as a statement about the truth value of a proposition (Wolfe & Griffin, 2018). Prior research provides some evidence suggesting that beliefs influence essay content. Arguments may be chosen for inclusion in essays based on the perceived strength of the arguments as support for the claim. People rate belief consistent arguments to be higher quality (Ditto et al., 2019; Kahne & Bowyer, 2017; Kobayashi, 2010, 2014; McCrudden et al., 2017) and more sound (Wolfe & Kurby, 2017) than belief inconsistent arguments. Research shows that people with polarized attitudes evaluate attitude consistent information as high quality and convincing; the opposite is true for attitude inconsistent information (Lord et al., 1979; Taber & Lodge, 2006). These biases in argument evaluation are consistent with findings that people include more attitude or belief consistent versus inconsistent information when writing argumentative essays (Nussbaum & Kardash, 2005; Wolfe & Britt, 2008). Furthermore, belief-based argument evaluation biases change dynamically following changes in beliefs (Wolfe & Williams, 2017).

A limited number of studies directly investigate the influence of beliefs on argumentative essay content (van Strien et al., 2014; van Strien et al., 2016; Nussbaum & Kardash, 2005; Wolfe & Britt, 2008). In this literature, the clearest finding is that beliefs influence the *side* of the argument claim. When tasked with writing an essay on a contentious topic using source texts with conflicting information, people with strong prior beliefs write essays that are biased towards their initial beliefs (Braasch et al., 2022; Kobayashi, 2014; van Strien et al., 2014). van Strien et al. (2014) also found that neutral essays contained the highest proportion of information from source texts, whereas biased essays contained a greater proportion of information from prior knowledge. Another study by van Strien et al. (2016) found that argumentative essays written by students with strong initial attitudes contained more attitude consistent arguments relative to essays written by students with weak initial attitudes.

Evidence regarding the influence of beliefs on the inclusion of counterarguments in argumentative essays is mixed. Nussbaum and Kardash (2005) found that counterarguments are less likely to be included in argumentative essays if subjects' initial beliefs are polarized. However, Wolfe and Britt (2008) found that assigning students to write either a belief consistent or belief inconsistent essay did not predict counterargument inclusion. Wolfe (2012) found no significant relationship between opinion polarization and the inclusion of counterarguments in essays. These results raise a question about whether counterargument inclusion stems from the author's argument schema rather than a bias originating from beliefs. Including more arguments than counterarguments is not necessarily considered an error (Mercier & Sperber, 2011). However, failing to include any counterarguments in an essay is interpreted by Wolfe and colleagues as a "myside bias" error in argumentative reasoning (Wolfe, 2012; Wolfe & Britt, 2008).

## Current research

The current research is grounded in a claim about belief construction that we refer to as the belief fluency hypothesis (Wolfe et al., [under review](#)). Beliefs are viewed as being constructed in context based on salient information at the time of belief generation, in a manner similar to attitude construction (Blair, 2002; Schwarz, 2007; Vuletich & Payne, 2019). Salient information will include prior knowledge, beliefs, and attitudes related to the belief topic, as well as recently comprehended information that is easily accessible. Consistent with this hypothesis, belief change is not necessarily a deliberate process in which new evidence is weighed against previous beliefs. If a person has recently consumed belief-relevant information that they found persuasive, then the belief they generate may differ from their previous belief. Our general claim, as it pertains to argumentative essay writing, is that beliefs at the time of writing will influence not just the side of the claim, but inclusion of the components of argumentative essays. This general claim leads to two more specific claims: first, reading a belief consistent or belief inconsistent text before writing an argumentative essay will influence the components of the essay. Second, belief change as a result of reading will influence the components of the essay. The difference between these two claims is one of text information being available for use in the first claim, and the interpretation of that text information in terms of beliefs in the second claim. In the case of belief change, the influence would not come from a deliberate awareness of the change, but rather because

the belief influence will manifest at the time of writing based on the belief that is generated at that moment.

The data reported here are part of a larger study containing data unrelated to the current research questions (Wolfe et al., [under review](#)). We sampled subjects whose beliefs about gun control effectiveness in the United States were polarized. After reading a belief consistent or inconsistent text, subjects reported their beliefs. Following the belief inconsistent text, subjects' beliefs changed in the direction of the text position. Next, they wrote a 250-word argumentative essay explaining their beliefs on gun control effectiveness, which constitute the primary data reported here. We coded essays for the presence of basic components of argumentation, including a claim, supporting reasons, a counterargument, and a claim with a predicate other than effectiveness. Other essay characteristics related to beliefs and argumentation were also coded, such as information borrowed from the text, statements about belief change, and evaluative statements about the text. Following the experiment, a sample of supplementary online subjects rated the position of the essays and the extent to which they stated a clear position, considered both sides, were supported by facts, personal experiences or stories, and were based on emotion.

We have a few specific hypotheses regarding the content of the argumentative essays. Hypothesis 1: Compared to reading a belief inconsistent text, subjects who read a belief consistent text will be more likely to write essays that contain a claim, have more reasons, mention specific text content, and are more one-sided. Hypothesis 2: Compared to reading a belief consistent text, subjects who read a belief inconsistent text will be more likely to include specific counterarguments and write essays that are more balanced across positions. Hypothesis 3: Belief change towards the text position following reading will be associated with the inclusion of more supporting reasons, and greater likelihood of mentioning text content.

In addition to these confirmatory hypotheses, we have several exploratory questions with outcomes that are not clearly specified by prior research. We assessed explicit statements about belief change as an indicator of subjects' awareness of their change when it occurred. However, we expect the frequency of these comments to be low for two reasons. First, commenting on one's own belief change is not part of the instructions. Second, previous research indicates generally poor awareness of such change (Ross, 1989; Wolfe & Williams, 2018). We coded whether essays contain evaluative comments about text content or personal anecdotes, although it is unclear to what extent these comments will be included since they are not part of the task instructions. Some exploratory variables were collected that did not come from the argumentative essays. The importance, relevance, and emotionality of gun control as a topic were assessed in the prescreening. Positive and negative affective reactions after reading were assessed with the PANAS (Watson et al., 1988). We were interested in potential relationships between affective reactions to the text and essay content. However, as reported in Wolfe et al., ([under review](#)), these variables were not related to variables of interest in the current study and will not be discussed further.

## Method

Materials, data, and analyses for this study are available in the Open Science Framework repository (<https://osf.io/rh2mg/>). This study and analysis plan were not preregistered.

All data processing, cleaning, scoring, and analyses were conducted in R statistical software (R Core Team, 2022). The tidyverse (v1.3.2; Wickham et al., 2019) package was used for data processing and cleaning. For data analysis, the emmeans (Lenth, 2022) package was used to conduct main effect and interaction contrasts, the lmerTest (v3.1.3; Kuznetsova et al., 2017) was used for multi-level modeling, and the ggeffects (Lüdtke, 2018) and ggplot2 (Wickham, 2016) packages were used to plot model results.

## Subjects

Undergraduate students participated for partial course credit in Introductory Psychology at a large Midwestern United States university. Subjects were invited to participate based on their beliefs about gun control effectiveness, which were assessed with an online pre-screening at the beginning of each semester. Subjects reported their agreement with the item “To what extent do you believe that increased gun control will reduce gun violence in the United States? Gun control is defined as strengthening laws or policies that regulate the manufacture, sale, transfer, possession, modification, or use of firearms by civilians.” They responded on a nine-point scale: 1 = “completely disbelieve”, 5 = “unsure whether I believe this”, and 9 = “completely believe”. During four semesters of data collection, 1,176 students responded with either 1–3 (believers) or 7–9 (believers), which resulted in a sample of 324 subjects. The mean age was 18.8, with 16.7% declining to respond. The sample was 53.1% female, 19.4% male, 0.9% other, and 26.5% did not answer. The racial composition was 60.2% European American, 15.4% Other, 4.3% Hispanic American, 3.1% Multi-Racial, 2.8% Asian American, 2.2% African American, 0.3% Native American, and 11.7% did not respond.

## Materials

A Pro and a Con text each present one-sided evidence and arguments about gun control. Both texts present accurate information and were created by gathering evidence and arguments from internet sources. Sources are linked in the OSF version of the texts but were not visible to subjects. The Pro text is 2,252 words and 23 paragraphs, with a Flesch-Kincaid grade level score of 14.1. The Con text is 2,223 words and 21 paragraphs with a Flesch-Kincaid grade level score of 15.2. Both texts state the main proposition, that gun control is or is not effective at reducing gun violence, in the title and first paragraph and have a similar structure. The texts discuss the same primary topics including gun control in other countries, the correlation between guns and crime, stand your ground laws, high-capacity magazine clips, and suicide. Both texts also include counterarguments with rebuttals.

## Design

The experiment was a  $2 \times 2 \times 3$  between-subjects design. Within each belief group (believers or disbelievers), subjects were randomly assigned to read either the Pro or Con text. As part of a manipulation outside the scope of this manuscript, subjects were also randomly assigned to one of three conditions to verify the initial beliefs that they had reported in the prescreen prior to reporting their current beliefs. In the “true” condition, subjects verified their initial gun control belief. In the “false” condition, they verified a gun control belief

that was the opposite of their initial belief. In the control condition, they did not verify their initial gun control belief. This manipulation did not influence any results presented in the current manuscript and will not be discussed further.

## Procedure

During the first two weeks of each semester subjects completed an online prescreening questionnaire. In addition to their beliefs about gun control, subjects reported their beliefs on the same 9-point scale about genetically modified food safety, spanking effectiveness, whether homosexuality is a choice, government health care effectiveness, the relationship between immigrants and terrorism, and cell phone danger. For gun control, subjects reported its associated importance, relevance, and emotionality, which were also rated on a nine-point scale. Believers and disbelievers were invited via email to participate in the experiment 2–11 weeks after the prescreening.

The experiment was administered using Qualtrics software. During the sessions, subjects sat at individual cubicles in a room with up to five other subjects. Prior to their arrival, the experimenter entered their prescreen responses and demographic information using a coding system to ensure the experimenter was blind to each subject's beliefs. After completing the informed consent process, subjects read the Pro or Con text at their own pace. Instructions directed them to read carefully and that they would respond to questions about the text after reading. The text was presented on a single screen that subjects scrolled through. After they finished reading, the program required subjects to reflect on the content of the text for one minute before moving on. Subjects then completed the PANAS (Watson et al., 1988) and the belief verification manipulation.

Next, subjects reported their current beliefs about the control topics, as well as gun control, which was always the second topic presented. The wording and scaling of these questions were identical to the prescreening. Subjects were then instructed to "please write an argumentative essay in which you describe and explain your beliefs about the effectiveness of gun control." The instructions stated that they could include information and/or opinions that were in the text they read, or that were not in the text. Subjects were required to type between 240 and 270 words before proceeding. Next, subjects completed a questionnaire that measured their experience of the study. Finally, a short answer question asked participants to explain what they thought was the purpose of the experiment. The experiment took between 25 and 50 min.

## Essay coding

Each essay was coded for the presence/absence of several elements of theoretical interest. First, we coded for a specific claim about the effectiveness of gun control. If a claim was present, then supporting reasons and counterarguments could be coded. In the absence of a claim, reasons and counterarguments were not counted because their existence is interpreted in relation to a claim (Voss & Means, 1991). When an essay contained a neutral or undecided claim, a reason could have supported either side while a counterargument had to be in opposition to an argument or reason that was presented in the essay. We did not code for rebuttals to counterarguments because they could also be considered reasons supporting the claim. Any mention of content from the Pro or Con text was coded, along with evaluative

statements about text content. The text content coding category was orthogonal to other categories, so text content codes could coincide with any other code. Gun control claims with a different predicate than “effectiveness” were coded as an “other claim”. The vast majority of “other claims” were policy claims (e.g. “gun control *should not* be implemented”). Finally, we coded for specific comments related to belief change on the part of the subject. Each coding category is binary except for reasons, which is continuous. The coding categories with examples are shown in Table 1.

Three coders independently coded sets of 10 essays in pairs. Each essay was scored by two coders, with disagreements resolved through discussion. Reliability was calculated based on their initial coding. Overall interrater reliability was calculated as the mean reliability of the three pairs of coders (96% agreement, Cohen’s  $\kappa=0.92$ ,  $p < .01$ ).

## Essay ratings

Subject essays were rated by a separate sample of 682 subjects from the Prolific research subject platform (<https://www.prolific.co/>). The “standard sample” was used because rating the essays did not require specialized knowledge. We did not collect gun control beliefs from the raters because we did not want to prime their own beliefs before rating the essays. Each supplementary subject rated 5 essays on the following items, resulting in each essay being rated about 10 times on a 9-point scale, with 9 = “Completely agree”, 5 = “Neutral”, and 1 = “Completely disagree”:

1. The arguments in the essay claim that increased gun control will reduce gun violence.
2. The author of this essay believes that increased gun control will reduce gun violence.
3. The author considers both sides of the issue.
4. The claims made in this essay are supported by factual evidence.
5. The claims made in this essay are supported by personal experiences, anecdotes, or stories.
6. The author arrives at their conclusion based on emotion.
7. The author clearly articulates their position.

## Results

The results address two primary research questions that align with our three confirmatory hypotheses. First, what is the influence of reading a belief consistent vs. belief inconsistent text on argumentative essay content? Second, what is the association between belief change following reading, and argumentative essay content? Both questions were addressed with the hand-coded data and the essay ratings provided by the supplementary subjects. For each set of data, we first analyzed each dependent variable for an interaction between initial belief (believer vs. disbeliever) and text read (Pro vs. Con) to determine if those conditions can be combined into belief consistent and belief inconsistent conditions. Supplemental Table S1 presents all grand means and descriptive data separated by initial belief and text read. For all analyses, believers’ responses were reverse-scored. The effect of this reverse scoring is that all subjects begin with initial belief ratings that are low, and higher post-



**Table 1** Essay coding system with descriptions and examples

Coding category	Description	Example
Claim	Statement that gun control is/is not effective.	“The more we increase the amount of gun control within the United States, the safer everyone will be” “I strongly believe gun control is effective in decreasing gun-related violence.”
# Reasons	Statement that supports a claim.	“Gun control is not an effective form of lowering the amount of gun deaths in the United States. <b>Many possible mass shootings have been prevented through the use of a responsible gun owner, including two potential mass shootings Texas churches where a gunman opens fire but is quickly wounded or killed by a citizen who uses their gun responsibly.</b> ” “Gun control is completely necessary to effectively lower suicide rates, mass shootings, and other negative gun based crimes/events... <b>Other countries like the United Nations, Australia, and Japan are providing their people with more stability and safety by instating more in depth background checks, user safety classes, and stricter laws to begin with. The effects of the cautions they’ve taken are seen in the lower statistics of mass shootings and homicides[sic].</b> ”
Counterargument	Reason or data mentioned that is counter to stated claim about gun control effectiveness.	“I believe that some type of gun control will reduce the amount of gun related crimes. <b>I understand that many criminals will still find back channels to acquire guns...</b> ” “Gun control is an effective way to aid putting an end to the continuous mass shootings, gun related homicides, and suicides ... <b>The saying “guns don’t kill people. People kill people,”</b> should not be a reason to give citizens easy access to firearms if people are still continuing to die.
Text content	Specific content from text is mentioned	“Nations such as Japan and Australia saw a dramatic decline in their violent crime rates when they implemented strict gun control policies.” “The article makes mention to the fact that some countries who already have gun control have decreased levels of violence and yearly deaths by firearms.”
Other claim	States claim that gun control policy should/should not be implemented (note this was not the task)	“There should be a way longer processes when trying to get a gun. Instead of just being able to go and sign a few papers” “There should be more laws and restrictions but certainly not bans”
Statement about belief change	Statement that beliefs changed during experiment	“From the article, I’ve discovered that Gun Control isn’t as effective as I once thought it to be” “Before reading this essay I thought my viewpoint on this topic was secure, but after reading the article that provided evidence and support for their argument my beliefs have slightly changed”
Evaluative	Positive or negative evaluation statement about text	“While the essay just read for this survey had some strong points, I do not believe it addressed all areas of the topic. As a biased essay, it failed to address any success that gun control has had within foreign countries.” “After reading the article in this study, I was very pleased with what I was reading, it was almost like after every paragraph, in my head, I was just saying “yes! amen”

*Note.* Counterarguments and reasons are in bold

reading beliefs represent movement towards more moderate beliefs. In the case of subjects who read a belief inconsistent text, more moderate beliefs represent change in the direction of the text position. For the supplementary subjects, the first two ratings of author beliefs and essay arguments were highly correlated ( $r=.79, p<.001$ ) and were combined to form a measure of subject beliefs.

### Initial beliefs, text read, and belief change

For the hand-coded data, we conducted a linear regression with initial belief (believer vs. disbeliever) and text read (Pro vs. Con) as predictors of the number of reasons and a binomial logistic regression with the same predictors of the binary coding categories. The interaction of initial belief x text read was significant for claim,  $Z(1, 320) = -3.40, p<.001, OR=0.13, 95\% CI [0.04, 0.41]$ , number of reasons,  $F(1, 320) = -5.04, \beta = -1.39, p<.001, 95\% CI [-1.94, -0.85], R^2=0.08$ , text content,  $Z(1, 320) = -2.99, p<.01, OR=2.42, 95\% CI [0.93, 6.41]$ , and evaluative statements about the text,  $Z(1, 320)=3.57, p<.001, OR=15.8, 95\% CI [3.73, 80.30]$ . The interaction was not significant for counterargument,  $p=.962$ , other claim,  $p=.073$ , or statement about belief change,  $p=.068$ . For each variable with a significant interaction, post hoc comparisons of Pro vs. Con text within each belief group revealed opposite effects for Pro and Con texts among believers and disbelievers respectively,  $p$  - values  $<0.035$ . One exception was among disbelievers for text content statements. While this comparison failed to reach significance,  $p=.35$ , the frequencies occurring with the Pro, 51%, CI [0.39, 0.63], and Con text, 59%, CI [0.46, 0.70], were in the expected directions. In light of this pattern of results and for the sake of conceptual clarity, we combined the initial belief and text read variables into belief consistent and belief inconsistent conditions.

For the supplemental ratings, we conducted a multi-level model with initial belief (believer vs. disbeliever) and text read (Pro vs. Con) as fixed effect predictors of the supplementary rating items. The interaction of initial belief x text read was significant for belief rating,  $\beta=3.86, t(313)=9.75, p<.001$ , consideration of both sides,  $\beta=1.05, t(312)=4.25, p<.001$ , supported by facts,  $\beta=-0.73, t(312)=-2.91, p=.004$ , and clear position,  $\beta=1.96, t(311)=-3.80, p<.001$ . The initial belief x text read interaction was not significant for experiences / stories,  $p=.402$ , or emotion,  $p=.916$ . For each variable with a significant interaction, planned comparisons of Pro vs. Con text within each belief group again revealed opposite effects for Pro and Con texts among believers and disbelievers respectively,  $p$  - values  $<0.032$ . Comparisons were not significant among disbelievers for the supported by facts and clear position ratings,  $p=.50$  and  $p=.43$ , respectively. However, the ratings for supported by facts, Pro, 4.58, CI [4.31, 4.85], and Con, 4.42, CI [4.15, 4.70] texts, were in the expected direction. This was also the case with the ratings for clear position for the Pro 6.32, CI [6.11, 6.52] and 6.42, CI [6.21, 6.64] for the Con text. Following the previous analyses, we combined the initial belief and text read variables into belief consistent and belief inconsistent conditions.

### Belief consistency and essay content

For the hand-coded data, essay content was analyzed with separate binomial logistic regressions for each outcome variable as a function of belief consistency. The number of reasons ( $M=1.44, SD=1.27$ ) were predicted with a linear regression as a function of belief consis-

tency. As shown in Table 2, subjects who read a belief consistent text wrote essays that were more likely to include a claim, a higher number of reasons, and to mention text content. Subjects who read a belief inconsistent text wrote essays that were more likely to include statements about belief change and evaluative statements, which were mostly negative (74%).

Essay ratings by the supplementary subjects were analyzed using a multi-level model, examining the relationships between belief consistency of the text read and the ratings by supplementary subjects. Argumentative essays were entered as a random effects variable, with belief consistency as a fixed effects variable. Results from this model are also presented in Table 2. Subjects who read a belief inconsistent text wrote essays that contained arguments about gun control effectiveness that were more moderate in belief rating and considered both sides more than subjects who read a belief consistent text. Subjects who read a belief consistent text wrote essays that were rated as higher in supported by facts and as espousing a clear position compared to those who read a belief inconsistent text.

### Belief change relationship with essay content

The amount of belief change experienced by each subject was calculated as the difference between their post-reading and initial belief. For both initial believers and disbelievers, larger positive numbers indicate change towards a more moderate stance, while negative numbers indicate change towards a more polarized stance. To analyze each coding category as the outcome variable, with the exception of reasons, we conducted a binomial logistic regression with belief consistency as a between-subjects variable and belief change as a continuous variable. For number of reasons, we conducted a linear regression with belief consistency as a between-subjects variable and belief change as a continuous variable. Results are shown in Table 3.

The significance of the interactions suggests that subjects who changed beliefs in the direction of the text position (more polarized for belief consistent and more moderate for belief inconsistent) were more likely to state a claim, mention text content, and state more reasons (see Figs. 1, 2 and 3). Subjects whose beliefs changed less in response to reading the text were less likely to include all of these components in their essays. For the simple effects test of subjects who read a belief consistent text, the probability of a claim being included in essays increased as beliefs became more polarized in the direction of the text position (see Fig. 1). For subjects who read a belief inconsistent text, the probability of text content (see Fig. 2) and a statement about belief change being included in essays increased as beliefs changed in the direction of the text position. Conversely, the probability of an evaluative statement about the text decreased as beliefs changed in the direction of the text position.

For the supplementary subject ratings, a linear mixed-effects model was conducted for each rating question with argumentative essays as a random effects variable, and belief change and belief consistency as fixed effects variables. Results are shown in Table 3. The significant interaction for factual support indicates that the relationship between belief change and essay content being supported by facts differs as a function of text-belief consistency. As subjects' beliefs moved towards the position of the text they read, they wrote essays that were rated as supported by facts more. For belief consistent subjects, as beliefs changed in the direction of the text position (more polarized), they wrote essays that considered both sides less, were supported by facts more, and had a clearer position. For belief inconsistent subjects, belief change was not significantly related to essay ratings.

**Table 2** Frequencies and means of essay components as a function of belief consistency

	Grand Mean/Frequency		Belief Consistent		Belief Inconsistent		Z/t	p	R <sup>2</sup>
	Mean/Frequency	95% CI	Mean/Frequency	95% CI	Mean/Frequency	95% CI			
Claim	78%	[80%, 91%]	86%	[80%, 91%]	71%	[63%, 77%]	-3.33	<0.001	0.036
# Reasons	1.44	[1.59, 1.97]	1.78	[1.59, 1.97]	1.10	[0.92, 1.29]	-5.04	<0.001	0.072
Text Content	59%	[61%, 75%]	68%	[61%, 75%]	50%	[42%, 58%]	-3.29	<0.001	0.034
Statement About Belief Change	7%	[2%, 8%]	4%	[2%, 8%]	10%	[7%, 16%]	2.23	0.026	0.016
Evaluative	14%	[3%, 11%]	6%	[3%, 11%]	21%	[16%, 28%]	3.71	<0.001	0.048
Positive	5%	[53%, 99%]	(90%)	[53%, 99%]	(20%)	[10%, 36%]			
Negative	8%	[1%, 47%]	(10%)	[1%, 47%]	(74%)	[58%, 86%]			
Belief rating	3.59	[2.34, 2.88]	2.61	[2.34, 2.88]	4.51	[4.25, 4.78]	9.78	<0.001	0.145
Consider both sides	4.85	[4.43, 4.76]	4.60	[4.43, 4.76]	5.08	[4.92, 5.25]	4.03	<0.001	0.011
Supported by facts	4.71	[4.77, 5.13]	4.95	[4.77, 5.13]	4.47	[4.29, 4.65]	-3.72	<0.001	0.011
Clear position	6.48	[6.57, 6.84]	6.70	[6.57, 6.84]	6.27	[6.14, 6.41]	-4.39	<0.001	0.011

**Table 3** Regression slopes of belief change predicting essay components as a function of belief consistency

	Belief Consistent				Belief Inconsistent				Belief Consistency*Belief Change				<i>R</i> <sup>2</sup>
	Estimate	95% CI	Z/t	<i>p</i>	Estimate	95% CI	Z/t	<i>p</i>	Estimate	95% CI	Z/t	<i>p</i>	
Claim	-0.34	[-0.65, -0.03]	-2.20	0.03	0.07	[-0.09, 0.23]	0.80	0.42	0.40	[0.06, 0.75]	2.32	0.02	0.054
# Reasons	-0.13	[-0.28, 0.02]	-1.76	0.08	0.09	[0, 0.17]	1.96	0.052	0.22	[0.05, 0.39]	2.52	<0.01	0.091
Text Content	-0.22	[-0.49, 0.03]	-1.70	0.09	0.20	[0.05, 0.36]	2.61	<0.01	0.42	[0.13, 0.73]	2.79	<0.01	0.065
Statement About Belief Change	-0.11	[-0.92, 0.46]	-0.30	0.77	0.31	[0.09, 0.55]	2.66	0.008	0.42	[-0.20, 1.26]	1.11	0.27	0.043
Evaluative	-0.01	[-0.59, 0.42]	-0.05	0.96	-0.23	[-0.44, -0.04]	-2.22	0.03	-0.21	[-0.70, 0.40]	-0.77	0.44	0.070
Consider both sides	0.15	[0.02, 0.27]	2.26	0.03	0.06	[-0.03, 0.14]	1.36	0.17	-0.09	[-0.25, 0.06]	-1.17	0.24	0.016
Supported by facts	-0.20	[-0.35, -0.05]	-2.58	0.01	0.07	[-0.01, 0.14]	1.68	0.09	0.26	[0.10, -0.42]	3.17	<0.01	0.019
Clear position	-0.14	[-0.24, -0.03]	-2.59	0.01	-0.03	[-0.10, 0.03]	-1.05	0.29	0.10	[-0.02, 0.23]	1.65	0.10	0.015

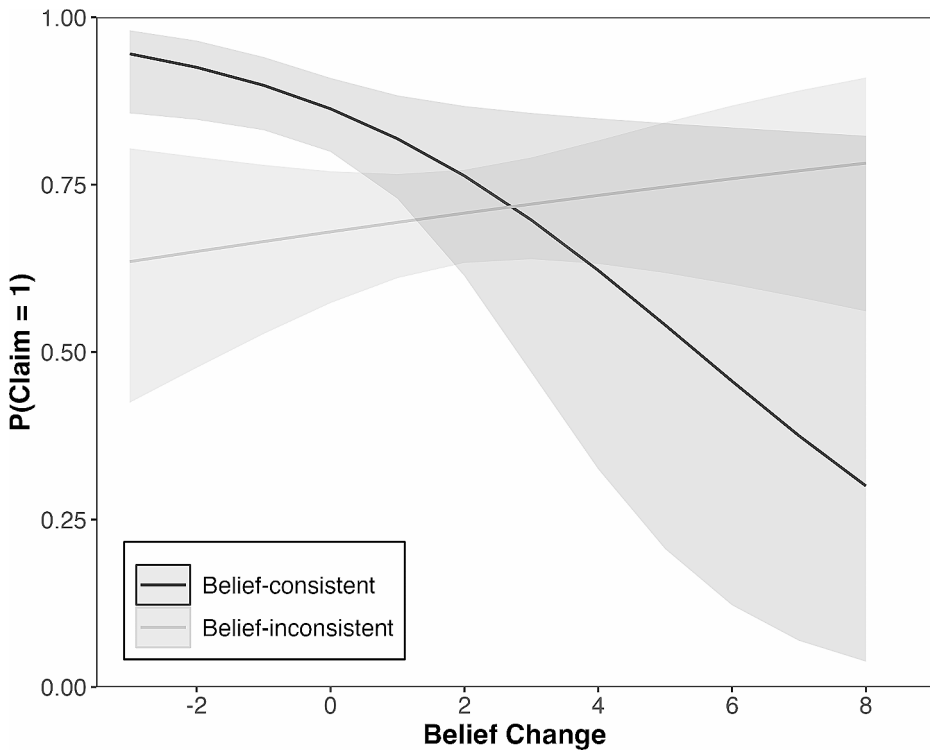
## Discussion

The current findings lead to the conclusion that beliefs influence argumentative essay writing. The likelihood that people included important components in their argumentative essays varied with the belief consistency of the text read. The predictions for our first hypothesis were confirmed: Subjects who read a belief consistent text wrote essays that were more likely to contain a claim, more reasons, mention text content, and were considered more one-sided by the supplemental subjects. Consistent with our second hypothesis, subjects wrote essays that were more balanced after reading a belief inconsistent text. However, contrary to this hypothesis, there was no effect of belief consistency of the text on the inclusion of counterarguments. Another important finding is that the extent and direction of belief change after reading predicted several aspects of the argumentative essays. Consistent with hypothesis 3, greater belief change in the direction of the text position was associated with a greater likelihood of stating a claim, including more reasons, and mentioning text content. Contrary to hypothesis 3, belief change was not associated with consideration of both sides after reading a belief inconsistent text. Overall, these findings add to the literature on argumentative essay writing by suggesting that two general factors related to beliefs can influence the components of argumentative essay writing: the mental representation of belief consistent or inconsistent information after reading, and the persuasive effect that information has in terms of belief change. Results are interpreted within a framework in which beliefs are constructed from salient information at the time of belief generation.

### Text-belief consistency and argumentative essay content

Prior research demonstrates that multiple factors influence the components and content of argumentative essays. Individual differences in argument schema are a primary factor in determining the inclusion of a claim, supporting reasons, and counterarguments (Wolfe, 2012; Wolfe et al., 2009). Comprehension strategies while reading relevant information also influence argumentative essays (Anmarkrud et al., 2014; Wiley & Voss, 1999), as does the mental representation of the text(s) (Anmarkrud et al., 2013; Mason et al., 2023; Tarchi & Villalón, 2021). It is also well established that beliefs influence the side of the topic that people argue for in essays (Braasch et al., 2022; Kobayashi, 2014; van Strien et al., 2014; Strien et al., 2016). The current findings add to this literature by showing that the belief consistency of a text influences the inclusion of important components of the essay such as a claim and supporting reasons. We presume that people are motivated to use accessible information to generate belief consistent or 'myside' reasons (Wolfe & Britt, 2008). When the text content is consistent with initial beliefs, claims and reasons are made salient and easier to relate to the argument schema components (Wolfe, 2012; Wolfe et al., 2009). When text content is belief inconsistent (in the absence of belief change), that content is less able to facilitate the schema goal of including a claim and reasons.

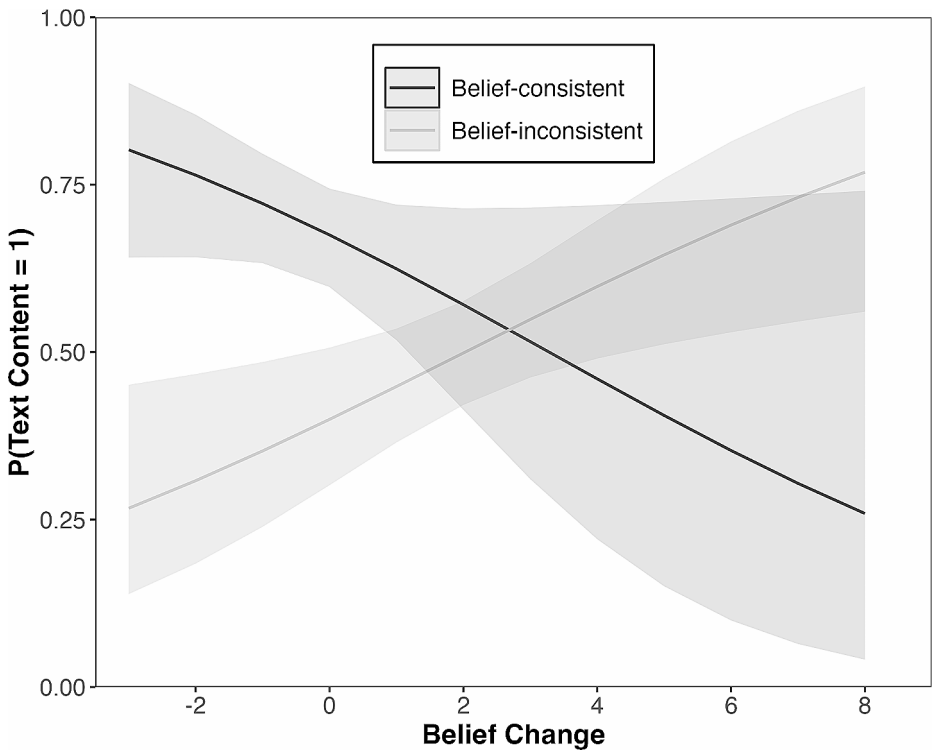
Although essays written by subjects that read a belief consistent text were more one-sided and essays by belief inconsistent subjects considered both sides more, there were no differences in counterargument inclusion as a function of belief consistency or belief change. Nussbaum and Kardash (2005) found that subjects with less extreme beliefs generated more counterarguments, however we did not find this effect. Overall, 37% of subjects included a counterargument in their essay, which is roughly comparable to other studies in



**Fig. 1** Relationship between belief change and probability of claim being included in essay. Mean logistic regression slopes are shown for the belief consistency conditions. Error ribbons represent 95% confidence intervals

which people include counterarguments in an argumentative essay without being instructed to do so (Anmarkrud et al., 2013; Wolfe & Britt, 2008; Nussbaum & Kardash, 2005; Tarchi & Villalón, 2021; Wolfe, 2012). These findings suggest that in the case of counterarguments, even when people are presented with only belief inconsistent information, the myside bias still dictates that counterarguments do not need to be included in an argumentative essay (Kobayashi, 2010; Wolfe & Britt, 2008; Wolfe et al., 2009). The task instructions may also orient subjects to focus on myside information in this task. In particular, subjects were instructed to “describe and explain their own beliefs.” Instructions that place less emphasis on the beliefs of the writer and more emphasis on balance across sides may have different effects on the inclusion of counterarguments in argumentative essays.

Some of the exploratory variables were influenced by text-belief consistency and others were not. While infrequent, the evaluative statements were 90% positive after reading a belief consistent text and 74% negative following a belief inconsistent text. These results are generally consistent with previous research suggesting that people’s evaluation of content is biased by their initial beliefs (Diakidoy et al., 2015; Ditto et al., 2019; Lord et al., 1979; Taber & Lodge, 2006). Subjects drew upon personal experiences, stories, and/or anecdotes and emotion in their essays, however these characteristics were not affected by text-belief consistency. A substantial portion (64%) of the essays contained a claim that was not about gun control effectiveness, but these instances were unrelated to our manipulation.



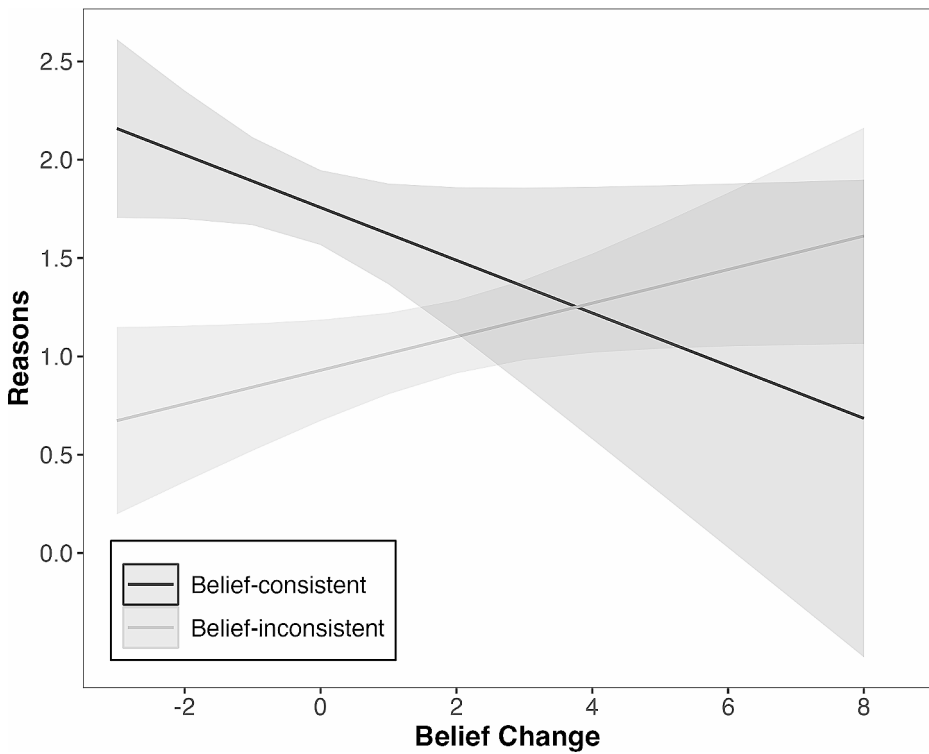
**Fig. 2** Relationship between belief change and probability of text content being included in essay. Mean logistic regression slopes are shown for the belief consistency conditions. Error ribbons represent 95% confidence intervals

Still, this frequency is consistent with other findings indicating that people have a difficult time remembering and focusing on a particular claim predicate while using or generating arguments (Britt et al., 2008).

### Belief change and argumentative essay content

A central finding in the current study is that the components of argumentative essays were associated not just with the belief consistency of the text read, but with the persuasive impact of the text as indicated by belief change. This pattern of results is the most direct indicator that argument essay content is influenced by the interaction of argument schema, the mental representation of the text information, and the *interpretation* of that text information in terms of beliefs. The likelihood of including a claim, more reasons, mentioning text content, and the essay being rated as supported by facts all increased as beliefs shifted toward the position of the text. These results are noteworthy for the belief consistent subjects because experiments in which people read a belief consistent text do not tend to show belief change on average, both in the current experiment and in others (Andiliou et al., 2012; Anglin, 2019; Kobayashi, 2018; Murphy et al., 2003; Wolfe & Williams, 2018). As a result, belief change after reading a belief consistent text is not typically discussed and can be overlooked as a source of influence. Finally, while not instructed to include statements about





**Fig. 3** Relationship between belief change and number of reasons included in essay. Mean linear regression slopes are shown for the belief consistency conditions. Error ribbons represent 95% confidence intervals

belief change or evaluative statements, they were both more likely among subjects who read a belief inconsistent text. For those subjects, belief change statements were also more likely as beliefs changed towards the inconsistent text position. Evaluation statements about the text were less likely as beliefs changed, suggesting people who were not persuaded were more inclined to criticize the text.

The results are consistent with the belief fluency hypothesis (Wolfe et al., [under review](#)), in which beliefs are generated in context from salient information at the time of generation. Salient information in this situation includes prior knowledge and beliefs, and the mental representation of the text content. Our claim about belief construction matches research and theorizing suggesting that attitudes are not stable properties of long-term memory, but are context sensitive and constructed from available information (Blair, 2002; Schwarz, 2007; Vuletic & Payne, 2019). Other support for the belief fluency hypothesis comes from evidence that people typically have poor awareness of changes to beliefs and to other aspects of themselves (Prati & Senik, 2022; Safer & Kueler, 2002; Wolfe & Williams, 2018). In the current study, even though belief change statements were more likely for belief inconsistent subjects who changed beliefs, only 10% made such comments. We suggest that essay content decisions are not driven by belief change per se, meaning subjects do not base decisions on an awareness of their beliefs being updated by new information (Sharot et al., 2023). Rather, essay content is simply influenced by the beliefs that are constructed at the time of

writing. This point is particularly relevant after reading a belief inconsistent text; the more beliefs are constructed that are in line with the arguments of the text, the more these arguments become belief consistent and therefore relevant to the task. Indeed, people who read a belief inconsistent text and do not change beliefs are less likely to find the evidence and arguments in their mental representation of the text useful to their task.

## Practical implications

The current findings have practical implications because the components of argumentative essays are essential elements of informal arguments (Voss & Means, 1991). The finding that their inclusion can be related to beliefs suggests that beliefs can influence the quality of these arguments and may have consequences in some important circumstances (Graham & Perin, 2007). Within education, argumentative writing is a critical skill for students to learn in secondary and post-secondary school. The writing section of the National Assessment of Educational Progress (NAEP) for grade 12 requires students to compose argumentative essays. To achieve the maximum score, students are required to write an essay with a clear claim supported by multiple reasons that may integrate content from potentially conflicting information sources (NAGB, 2017). In legal and political contexts, people come across conflicting information and have to reason in the moment and produce an argument in response. If people are less inclined to include information that is counter to an argument, or make a clear claim in the first place, arguments could present as weaker than they should be. Ideally, being convinced or unconvinced by otherside information should not weaken the basic structure of one's argument.

## Future research, generalizability, and limitations

There are still several aspects of how beliefs influence argumentative writing that should be explored in future research. It is not clear whether the argument schema itself is influenced by beliefs, or whether beliefs and argument schema act somewhat independently. Relatedly, the temporal nature of beliefs, argument schema, and knowledge is unclear. Wolfe (2012) suggests that argument schema activate knowledge, attitudes, and beliefs that may be included in essays. Beliefs may also activate knowledge or serve as organizing concepts in long-term memory (Richter & Maier, 2017). In either case, knowledge activated by both beliefs and argument schema may be most likely to be included. Another possibility is that knowledge relevant to the topic is activated largely independent of beliefs. In this case, beliefs would play a role in determining what is deemed worthy of inclusion among activated knowledge. In terms of comprehension, we suggest that these belief change results are most likely orthogonal to comprehension success. In other studies with similar topics and texts of similar length, comprehension differences did not emerge as a function of belief consistency (Wolfe et al., 2013; Wolfe & Williams, 2018) or in relation to belief change (Wolfe et al., [under review](#)). However, other research suggests comprehension of the gist of a text is better for belief consistent versus belief inconsistent texts (Maier & Richter, 2013; Richter & Maier, 2017). Future research should examine this issue. It should also be determined if these findings extend into verbal argumentation, and whether they are still present when people read multiple texts or a text that presents balanced information.

The topic of the current study, gun control, is controversial in the United States. We expect that our findings regarding belief influences on argumentative essay writing will generalize to beliefs about other contentious social topics. With less contentious topics, it is unclear if beliefs would have the same influence. In terms of the population, we see no reason to conclude that the belief influences would fail to generalize to other adult populations, given that students write argumentative essays as a standard part of their education. One limitation of the findings is that the experimental procedure may emphasize the influence of the text content relative to other circumstances in which arguments are generated. Specifically, subjects did not engage in a general review of the topic, and only read one-sided information. Furthermore, even though it was explicitly stated that subjects did not need to use the text information in their essay, the experimental context may have created a demand among some that they should. Finally, we did not collect information about the beliefs of the Prolific subjects who provided supplementary essay ratings. It is possible that the beliefs of those subjects could moderate the ratings they provided, although we do not have reason to suspect they would influence the overall findings of the current study.

## Conclusions

The current findings suggest that inclusion of the component parts of an argumentative essay are influenced by both the belief consistency of information read beforehand, and by the degree to which beliefs change as a result of reading. These results suggest that when creating persuasive communication, beliefs about the topic may influence not just the position argued for, but the quality of the communication in terms of the components of arguments that are included. Furthermore, the belief change results suggest that belief influences follow from beliefs that are constructed at the time of the writing task, and that these influences may shift as the beliefs themselves shift. Future research will determine how beliefs interact with argument schema and prior knowledge, and the extent to which training can lessen these belief bias effects.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s11251-024-09663-x>.

## Declarations

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