



# Reducing COVID-19 vaccine hesitancy among African Americans: the effects of narratives, character's self-persuasion, and trust in science

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**Abstract** This research examines the efficacy of self-persuasion narratives (i.e., narratives that describe how a character has changed their mind about the COVID-19 vaccines) in encouraging vaccine uptake among unvaccinated African Americans. A five-condition experiment ( $N=394$ ) was conducted in June 2021. Participants viewed one of the three pro-vaccine messages (a self-persuasion narrative, a narrative without self-persuasion, or a non-narrative message) or an irrelevant message or completed a self-persuasion task. Findings supported the persuasive benefits of the self-persuasion narrative compared to the narrative without self-persuasion, actual self-persuasion, and the irrelevant message. Its advantage over the narrative without self-persuasion was mediated by increased self-referencing, affective empathy, and perceived similarity with the character. Moreover, its psychological effects were moderated by participants' trust in science. Unexpectedly, the non-narrative showed persuasive benefits compared to other intervention strategies. The theoretical implications for narrative persuasion and practical implications for vaccine promotion were discussed.

**Keywords** Narrative persuasion · Self-persuasion · Vaccine hesitancy · COVID-19 vaccination · Trust in science

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## Introduction

The COVID-19 pandemic has disproportionately affected communities of color and widened pre-existing health disparities (Razai et al., 2021). A report of the mass vaccination efforts in the U.S. revealed that, as of August 2021, African Americans remained the ethnic group that was least likely to have received a COVID-19 vaccine (Ndugga et al., 2021). There has been growing concern that the unequal vaccination rates may further exacerbate the disparities in COVID-19 outcomes. Vaccine hesitancy among African Americans is deeply rooted in the legacies of past abuses in medical research (Strully et al., 2021). Therefore, it is imperative to explore effective strategies for campaign messaging that may reduce vaccine hesitancy among African Americans linked to historically shaped mistrust of science and medical systems.

The current study examines health narratives as a potential intervention. Narratives are defined as a story containing an identifiable beginning, middle, and end that illustrates how characters overcome unresolved questions, conflicts, or crisis (Green & Brock, 2000). The accumulated empirical evidence has demonstrated the efficacy of narrative messages in health communication in general (Shen et al., 2015) and vaccine promotion in particular (Lazić & Žeželj, 2021). A challenge for using narratives to address vaccine hesitancy, however, is associated with individuals' tendency to discredit counter-attitudinal information (Kunda, 1990). For instance, when individuals who are skeptical about science and vaccine safety encounter a campaign promoting COVID-19 vaccination, they tend to engage in motivated reasoning to dismiss the campaign effort. This may be especially true for narrative messages as they are often criticized as being anecdotal and less objective (Huang & Wang, 2020).

Social psychological research on self-persuasion suggests a possible direction for assuaging audience resistance. Self-persuasion refers to the process of making one's own arguments for taking a recommended position (Aronson, 1999). The literature has demonstrated that engaging in self-persuasion through writing tasks or role-playing games can effectively change attitudes and behaviors, especially when individuals hold strong opposing opinions (Briñol et al., 2012). Narrative exposure may provide a vicarious experience of self-persuasion by eliciting empathetic responses toward a character who has engaged in self-persuasion on the advocated issue (Shen, 2010), thereby enhancing narrative effects among audiences who already hold opposite viewpoints.

Bridging the research streams on narrative persuasion and self-persuasion, the goal of the current study is three-fold. First, it empirically examines the effectiveness of self-persuasion narratives (i.e., narratives that describe how a character has changed their mind about an issue) in reducing COVID-19 vaccine hesitancy among African Americans through a five-condition experiment, which compared it with actual self-persuasion, a non-narrative message, a narrative without self-persuasion, and a baseline control condition. Second, it investigates the psychological mechanisms that may explain the persuasive advantage of self-persuasion narratives over narratives without self-persuasion. Third, as the self-persuasion narrative specifically addresses mistrust of science and medical systems, we explore whether its psychological appeal would be qualified by individual differences in trust in science.

### Narrative persuasion and vaccine promotion

A substantial body of research suggests that narratives can affect health related beliefs, attitudes, and behaviors (de Graaf et al., 2016; Shen et al., 2015). Storytelling is a fundamental means of human communication, and narrative exposure is engaging and affect-laden (Green & Brock, 2000). By transporting individuals into the story world, narratives enable individuals to put themselves in the shoes of a character, experience their life events, and identify with their emotions (Cohen, 2001). Attitude change occurs when individuals understand and adopt the character's perspectives, instead of being directly lectured about what should be done. As a result, narratives may decrease resistance to persuasive messages and increase the likelihood of attitude change (Moyer-Gusé & Nabi, 2010). Several studies have examined vaccination attitudes specifically, and a review of this work concluded that pro-vaccine narratives generally have a small positive effect on vaccination attitudes (Lazić & Žeželj, 2021).

Despite the potential of narrative persuasion, research comparing narratives to non-narratives shows mixed results.

Some work has shown that narratives are more effective than non-narratives in increasing beneficial health attitudes and behaviors (e.g., Lemal & Van den Bulck, 2010). However, other studies found that non-narratives had stronger effects than narratives (e.g., Greene & Brinn, 2003), or found no difference (Steinhardt & Shapiro, 2015). An increasing number of studies have focused on identifying the boundary conditions of narrative persuasion (Huang & Wang, 2020). Particularly, some research has shown that narrative effects are often contingent on individuals' pre-existing position on the advocated issue (Walter et al., 2020; Wang & Huang, 2021). If their position contradicts the campaign narrative, persuasion may be limited or even counterproductive. Given the mixed findings, the current study extends the testing of narrative and non-narrative effects to promoting COVID-19 vaccination. Moreover, the study determines if featuring a character's self-persuasion might enhance the effectiveness of campaign narratives in promoting vaccination among African Americans who already have reservations about COVID-19 vaccines. The rationale for integrating narratives and self-persuasion research is explained below.

### Effects of self-persuasion narratives

The notion of self-persuasion has received a great deal of scholarly attention in social psychology (e.g. Aronson, 1999; King & Janis, 1956). By asking individuals to express beliefs or arguments for taking a particular position, self-persuasion has been found to be more effective in eliciting attitude change than direct persuasion received from others, especially when the advocated position is incompatible with individuals' pre-existing attitudes (Briñol et al., 2012; Gordijn et al., 2001). Empirical research has supported the efficacy of self-persuasion as a health intervention strategy, such as reducing alcohol consumption (Loman et al., 2018), promoting AIDS prevention (Aronson, 1999), and encouraging HPV vaccination (Baldwin et al., 2017).

Several explanations have been proposed to account for the psychological appeal of self-persuasion among change-resistant individuals. First, it is often linked to cognitive dissonance (Festinger, 1962), which suggests that individuals experience discomfort when inconsistency exists in their beliefs and behaviors. In self-persuasion interventions, individuals may experience cognitive dissonance when they state opinions that are inconsistent with their pre-existing beliefs. Depending on how much effort individuals have made to generate self-persuasion arguments (Zimbardo, 1965) and how committed they are to their original beliefs (Carpenter, 2019), they may be motivated to reconcile conflicting ideas by changing their original beliefs (Aronson, 1999). Second, self-persuasion interventions may better suit the cognitive needs of change-resistant individuals. According to the transtheoretical

model of change (Prochaska & Velicer, 1997), change-resistant individuals are typically in the precontemplation or contemplation stage. During the precontemplation stage, individuals are often certain about their unhealthy behavior and do not plan to change. They resist suggestions for immediate change but may be receptive to interventions encouraging self-evaluation. By asking individuals to reflect on the issue, self-persuasion tasks may reduce their resistance to intervention efforts (Greenberg et al., 2018). Contemplators, in particular, may feel ambivalent toward changing due to their awareness of both the pros and cons (Prochaska et al., 2015). Providing opportunities for them to persuade themselves about how the pros outweigh the cons may help move them forward to the next stage of change.

Given the advantage of self-persuasion, incorporating a similar experience into narratives may enhance campaign effectiveness among individuals who hold opposite viewpoints. Particularly, pro-vaccine narratives may illustrate the self-persuasion process through which a vaccine-hesitant character changes their mind about vaccination. By identifying with the character and generating empathetic responses, individuals may vicariously experience self-persuasion, thereby changing their vaccine-related beliefs and behavioral intentions.

Although entertainment-education researchers have used principles of social cognitive theory to develop narratives with transitional characters who convert to a healthier path (e.g. Singhal & Rogers, 2012), the potential of self-persuasion narratives has rarely been tested in empirical research. In fact, the origin of self-persuasion interventions can be traced back to role-playing tasks (King & Janis, 1956), where individuals were asked to enact a role in which they express opinions to support certain positions. Identification, as a form of involvement with a story character (Cohen, 2001), is essentially conceptualized as a message-induced experience of role playing. When individuals identify with a character, they imagine themselves to be that character, and, thus, adopt their perspectives, and share their feelings and goals (Tal-Or & Cohen, 2016). As the character engages in self-persuasion, individuals will likely experience a similar process through empathic responses elicited by identification (Shen, 2010).

Another rationale that narratives may elicit a vicarious experience of self-persuasion is associated with self-referencing, the idea that individuals process incoming information by relating it to their own perspectives or experiences (Dunlop et al., 2010). As individuals mentally simulate the life experiences of a story character, they tend to consider their actual or potential behaviors in similar scenarios, in which they are the main character (Escalas, 2007). Through self-referencing, individuals may undergo

self-persuasion when reading a story about how a character changes their mind on an advocated issue.

Although the literature does not provide direct evidence of narrative-induced self-persuasion, it has demonstrated that the life experiences of a story character have profound effects on audiences' self-perceptions and cognitions. A recent experiment, for example, revealed that reading about a character's achievements increased participants' self-affirmation, which was comparable to the effect of instructing participants to reflect on their own achievements (Walter et al., 2019). When it comes to health issues, Moyer-Gusé and Nabi (2010) found that identification with a character involved in unexpected pregnancy increased perceived personal risk of having sex without birth control. Similarly, reading about a character who discussed sexual health led to greater perceived self-efficacy of engaging in similar conversations (Moyer-Gusé et al., 2011). These findings suggest that it is common for individuals to generate parallel responses as they read about a character's experiences. And this type of engagement may be likely when a character engages in self-persuasion.

Providing a vicarious experience of self-persuasion through narratives may help address several limitations of implementing self-persuasion interventions via mass media campaigns. In particular, attitude change through self-persuasion may hinge on the amount of cognitive effort involved in the process (Zimbardo, 1965). To ensure sufficient engagement, self-persuasion has often been manipulated in laboratory settings through administered writing tasks or role-playing games with the assistance of trained experimenters (e.g., Briñol et al., 2012; Gordijn et al., 2001). It may be challenging to successfully implement these tasks via public campaigns among a broader audience. In contrast, narrative processing may effectively engage audiences through its vivid portrayal of the character and story events (Green & Brock, 2000). Moreover, sufficient involvement in the self-persuasion task may demand a relatively high level of knowledge on the topic (Bernritter et al., 2017), which may not necessarily be the case in reality. Self-persuasion narratives can prepare individuals with relevant arguments through the character's thoughts and experiences. Given these possible advantages of a self-persuasion narrative, it is worthwhile to explore whether it would provide persuasive benefits compared to actual self-persuasion. In addition, considering the mixed findings in prior narrative research, we will explore the extent to which a self-persuasion narrative can trigger change in vaccine beliefs and vaccination intention among vaccine-hesitant individuals compared to a non-narrative or a baseline control group:

RQ1: Will a self-persuasion narrative be more effective than an actual self-persuasion task, a non-narrative message, or a control group in eliciting positive vaccine beliefs and the intention to get vaccinated?

Including the character's self-persuasion in a pro-vaccine narrative may also make it more psychologically appealing than narratives without self-persuasion among vaccine-hesitant individuals. To some extent, self-persuasion narratives could be considered as a form of two-sided narratives (Cohen et al., 2015). As a character describes how they changed opinions about COVID-19 vaccination, they also acknowledge their concerns and present possible negatives associated with the vaccines. As opposed to a one-sided narrative in which the character shares all the benefits of vaccines without addressing concerns, self-persuasion narratives may pose less of a threat to individuals' freedom, especially if they are hesitant about the vaccines. Individuals are often motivated to resist persuasive efforts if they feel their freedom to choose is threatened or restricted (Brehm, 1966). This is especially true when the persuasive message is obviously incompatible with their viewpoints. Empirical research has supported that two-sided messages are often less likely to elicit resistance than one-sided messages among individuals who hold negative attitudes (Eisend, 2006). And this pattern holds true for two-sided narratives (Wang & Huang, 2021). Given the above reasoning, we ask:

RQ2: Will a self-persuasion narrative elicit less perceived threat to freedom than a narrative without self-persuasion?

More importantly, self-persuasion narratives may be more persuasive among vaccine-hesitant individuals than narratives without self-persuasion by increasing perceived similarity with the character, empathetic responses, and self-referencing. Perceived similarity refers to individuals' perception that they share commonalities with a character in characteristics, beliefs, or values (Moyer-Gusé & Nabi, 2010). It might be improved by describing the real similarity between the character and the target audience, such as demographic traits, living situations, and pre-existing health beliefs (de Graaf et al., 2016). Although evidence for the similarity effects on persuasion is mixed, a systematic review suggests that perceived similarity in attitudes has a relatively robust effect on persuasion (Tal-Or & Cohen, 2016). As a self-persuasion narrative presents the character's initial concerns about COVID-19 vaccination, vaccine-hesitant individuals may generate a greater perception of similarity with the character in their vaccine attitudes, thus being more subject to narrative effects.

Furthermore, similarity with a character can strengthen empathy and self-referencing during narrative exposure. Individuals often have a stronger desire to identify with, emulate, and act like characters with similar attitudes (Hoffner & Buchanan, 2005). Cohen et al. (2015), for instance, found that participants generated greater empathy toward a character when the character's position was aligned with their pre-existing attitudes. The empathetic responses

include both cognitive understanding of the character's perspective and the sharing of their emotions and feelings. In addition, similarity with a character may prompt individuals to process the narratives in relation to their own experiences (Tal-Or & Cohen, 2016). For example, participants generated more self-referencing thoughts when the character's attitude toward smoking cessation matched their own stages of change, leading to greater quit intentions (Kim & Lee, 2017). Given the above reasoning and empirical evidence, we propose:

H1: The self-persuasion narrative will elicit (a) more positive vaccine beliefs and (b) a greater intention to get vaccinated than the narrative without self-persuasion.

H2: The self-persuasion narrative will elicit greater levels of (a) cognitive empathy, (b) affective empathy, (c) perceived similarity with the character, and (d) self-referencing than the narrative without self-persuasion.

H3: The effect of self-persuasion narrative (vs. narrative without self-persuasion) on vaccine beliefs will be mediated by (a) cognitive empathy, (b) affective empathy, (c) perceived similarity with the character, and (d) self-referencing.

H4: The effect of self-persuasion narrative (vs. narrative without self-persuasion) on vaccination intention will be mediated by (a) cognitive empathy, (b) affective empathy, (c) perceived similarity with the character, and (d) self-referencing.

### Moderating effect of trust in science

Individual differences in trust in science may present a boundary condition for the effects of self-persuasion narratives. Trust in science reflects one's confidence in and appreciation of scientific research, knowledge, and institutions (Hilgard & Jamieson, 2017). The rising resistance to public immunization programs has been linked to the declining public trust in science (Goldenberg, 2016). Recent research found that trust in science is a key psychological factor underlying vaccine acceptance (Sturgis et al., 2021). During the pandemic, scientific mistrust has prevailed across the globe, leading to significant hesitancy toward COVID-19 vaccination, particularly among African Americans due to the legacies of past medical abuses and unethical research practices (Strully et al., 2021).

Given the previously discussed advantages of self-persuasion narratives (vs. narratives without self-persuasion) among individuals who hold negative pre-existing attitudes, the influence of self-persuasion narratives may be more pronounced among individuals with lower levels of trust in science. These individuals may hold more negative attitudes toward COVID-19 vaccination, thus perceiving the character



who initially has concerns about the vaccines as being more similar to themselves and generating more empathic responses and self-referencing thoughts. As trust in science grows, these differences made by presenting a character's self-persuasion may likely diminish. Therefore, we propose:

H5: Trust in science will moderate the effect of self-persuasion narrative (vs. narrative without self-persuasion) on (a) vaccine beliefs and (b) vaccination intention.

H6: The interaction between self-persuasion narrative and trust in science on vaccine beliefs will be mediated by (a) cognitive empathy, (b) affective empathy, (c) perceived similarity with character, and (d) self-referencing.

H7: The interaction between self-persuasion narrative and trust in science on vaccination intention will be mediated by (a) cognitive empathy, (b) affective empathy, (c) perceived similarity with character, and (d) self-referencing.

## Method

### Study design and participants

A five-condition between-subjects experiment was conducted in June 2021. Prospective participants were recruited from Qualtrics panels and answered two screening questions, with one asking about their ethnic identification and the other asking whether they had received at least one shot of the COVID-19 vaccine. Only those who self-identified as African Americans and were unvaccinated against COVID-19 were eligible for participation. Two attention check questions were embedded in the questionnaire asking participants to select a specific option (e.g., “please select ‘strongly agree’ for this question to show your attention”). Participation of those who failed any of the checks was terminated. A total of 425 participants completed the experiment.

In the experiment, participants either viewed one of three messages promoting COVID-19 vaccines (i.e., a narrative describing the character's self-persuasion process, a narrative without the character's self-persuasion, or a non-narrative CDC message) or completed a traditional essay task for self-persuasion. A no-treatment control condition was included for baseline measures.

Seven participants who completed the self-persuasion task but did not follow the instructions (e.g., responded “none” or “I don't know”) were removed. To ensure data quality, participants who took less than 4 min to complete the study were also removed. The final sample included 394 participants ( $M_{\text{age}} = 37.5$ ,  $SD_{\text{age}} = 14.50$ ; 67.3% females): 24.6% had received a Bachelor's degree

or beyond; 37.3% had some college education or received associate degrees; 33.5% graduated from high school; and 4.6% did not complete high school. Participants also reported their political orientation (from 1 = extremely liberal to 7 = extremely conservative) and the mean was slightly toward the liberal end ( $M = 3.62$ ,  $SD = 1.56$ ). About 89.3% of the participants indicated that they had not contracted COVID-19 before; 3.3% had been diagnosed with it; 4.8% had not been officially diagnosed but thought they got it; 2.3% were waiting for their results; and 0.3% did not provide a response.

### Stimuli and manipulations

For greater ecological validity, all message stimuli were developed based on existing materials or news stories found online (see supplemental materials). The two *narratives* featured a story character who discussed their personal experiences, thoughts, and beliefs about COVID-19 vaccines, whereas the *non-narrative* message discussed the benefits, safety, and possible side effects of COVID-19 vaccines directly using bullet-pointed information found on CDC's website. The *self-persuasion* narrative explained how the character was initially hesitant but changed her mind about the vaccine after careful consideration. The narrative *without self-persuasion* featured a character who had a strong positive attitude from the beginning and did not struggle with the vaccine decision. Both narratives were written in the first-person point of view and came from a physician. The decision was made as the narratives featured the character's extensive reflection on the science, research, and clinical trial results related to the mRNA vaccines. To make the narratives realistic and believable (and not to introduce message believability as a possible confound), the character should have commensurate expertise. All messages were about 1000–1030 words. Analyses indicated that the three messages did not differ in terms of perceived message believability, informativeness, lengthiness, and ease of processing. For better equivalence, the *control* group was asked to view a message of the same length discussing artificial intelligence instead of COVID-19 vaccines.

Participants in the *actual self-persuasion* condition were asked to complete an essay task. Following prior research (Briñol et al., 2012), participants were instructed to imagine that they were having a conversation with themselves about the COVID-19 vaccine and write down some arguments they might use to convince themselves to get vaccinated regardless of their actual feelings. Most participants were able to follow the instructions. For example, a participant wrote, “If I were to get the vaccine, I would be able to travel around the world and get back to normal. I would also be able to see my family and friends.”

### Experimental procedure

After participants indicated their consent, they were randomly assigned to one of the five experimental conditions and received the corresponding treatment. Then, participants completed a questionnaire measuring outcome variables of interest (i.e., vaccine-related beliefs and the intention to get vaccinated) and the psychological variables related to message processing and their viewing experience. Participants in the actual self-persuasion condition did not respond to measures of these message-related variables, but they indicated their perceived threat to freedom during the essay task. Then, moderating and demographic variables were measured.

### Measures

**Dependent variables** *Vaccine Beliefs* were measured using seven items adapted from Sarathchandra et al. (2018) on a seven-point Likert Scale. Participants indicated their agreement with statements such as “the COVID-19 vaccines are effective in protecting against the virus,” “the COVID-19 vaccines are safe,” and “the COVID-19 vaccines contain dangerous ingredients (reverse coded)” (Cronbach’s  $\alpha = .80$ ,  $M = 4.28$ ,  $SD = 1.36$ ). *Vaccination Intention* was measured by asking participants how likely they were to get vaccinated against COVID-19 in the near future on a seven-point Likert-type scale ( $M = 3.77$ ,  $SD = 2.29$ ). *Perceived threat to freedom* was measured using four items on a seven-point Likert scale (Dillard & Shen, 2005). Participants responded how much they agreed that the message threatened their freedom to choose, tried to make a decision for them, tried to manipulate them, and pressured them (Cronbach’s  $\alpha = .90$ ,  $M = 3.11$ ,  $SD = 1.82$ ).

**Mediators** *Empathy* was operationalized in terms of both affective empathy and cognitive empathy. They were measured using eight items on a seven-point Likert scale (Shen, 2010). Participants indicated levels of affective empathy by responding to statements such as “I experienced the same emotions as the person mentioned in the message when reading the message” (Cronbach’s  $\alpha = .84$ ,  $M = 4.57$ ,  $SD = 1.55$ ). For cognitive empathy, participants responded to items such as “I can see the point of view of the person mentioned in the message” (Cronbach’s  $\alpha = .91$ ,  $M = 5.34$ ,  $SD = 1.50$ ). *Self-referencing* was assessed using four items on a seven-point Likert-type scale (Dunlop et al., 2010). Participants responded to questions such as how much the message made them “think about their own decision to get the COVID-19 vaccine” (Cronbach’s  $\alpha = .91$ ,  $M = 4.47$ ,  $SD = 1.80$ ). *Perceived similarity with the character* was measured using four seven-point semantic differential items assessing attitude similarity (McCroskey et al., 1975). Par-

ticipants responded to items such as the story character “doesn’t think like me/thinks like me.” (Cronbach’s  $\alpha = .94$ ,  $M = 4.31$ ,  $SD = 1.86$ ).

**Moderator** *Trust in science* was measured using four items adapted from Huang and Sundar (2020). Participants indicated how much they considered science to be “dependable,” “honest,” “trustworthy,” and “reliable” (Cronbach’s  $\alpha = .93$ ,  $M = 4.74$ ,  $SD = 1.51$ ).

## Results

### Preliminary analyses

Preliminary analyses ensured that demographic distribution and prior COVID-19 infections did not significantly differ by experimental conditions. The reasons participants indicated for why they had not gotten the COVID-19 vaccine were analyzed to better understand the sample: 58.9% of the participants indicated that “I don’t think the vaccine is safe”; 14.7% indicated “difficulties getting appointments”; 11.7% mentioned “no transportation”; 9.6% chose “work shifts/hours”; 8.9% chose “cost for vaccination”; 8.1% indicated “I don’t think COVID is serious”; 6.1% chose “lack of paid leave to deal with possible side-effects”; and 5.8% chose “lack of child care”. Of the sample, 32.0% ( $n = 126$ ) selected more than one reason. In addition, 15.7% of the participants ( $n = 62$ ) selected “other reasons” and were given a textbox to enter their own reasons, among which 42 participants indicated reasons related to concerns about vaccine safety (e.g., “Long term side effects are not without precedent”; “The product was rushed to the marketplace.”) or mistrust of the government/medicine in general (e.g., “I don’t do drugs of any kind”; “I don’t trust the government or the cdc.”), 10 participants did not provide a reason and the rest indicated reasons related to pregnancy, health conditions, or religious beliefs.

The “3 Cs” model (MacDonald & SAGE Working Group on Vaccine Hesitancy, 2015) highlights the complexity of vaccine hesitancy and three different categories, particularly the lack of *confidence* (i.e., trust in vaccine safety and effectiveness, health systems, and the motivations of policy makers), *complacency* (i.e., low perceived risks of the disease and the necessity of vaccination), and *convenience* (i.e., physical availability, geographical accessibility, affordability and willingness-to-pay, etc.). Notably, individuals may fall into two or more categories at the same time. Based on the reasons participants selected and their open-ended responses (if provided), about 65.7% of the sample indicated lack of confidence; 33.0% indicated lack of convenience; and 8.1% indicated complacency.

**Table 1** Means of vaccine beliefs, vaccination intention, and perceived threat to freedom by experimental conditions

		Experimental treatment				
		Control (n = 59)	Actual self-persuasion (n = 62)	Non-narrative CDC message (n = 57)	Narrative without character's self-persuasion (n = 112)	Narrative with character's self-persuasion (n = 104)
Vaccine beliefs	<i>M</i>	3.92 <sub>ab</sub>	3.84 <sub>a</sub>	4.88 <sub>c</sub>	4.27 <sub>bd</sub>	4.42 <sub>d</sub>
	<i>SD</i>	1.30	1.34	1.28	1.44	1.24
Vaccination intention	<i>M</i>	3.34 <sub>a</sub>	3.18 <sub>a</sub>	4.63 <sub>b</sub>	3.53 <sub>a</sub>	4.17 <sub>b</sub>
	<i>SD</i>	2.20	2.08	2.23	2.28	2.32
Perceived threat to freedom	<i>M</i>	3.27 <sub>ab</sub>	2.77 <sub>a</sub>	3.39 <sub>b</sub>	3.30 <sub>b</sub>	2.86 <sub>a</sub>
	<i>SD</i>	1.84	1.58	1.96	1.80	1.83

Values in the same row not sharing the same subscript are significantly different at  $p < .05$

On average, the sample spent about 7 min to complete the whole study. We also analyzed if the time participants spent on the treatment tasks differed by conditions and the analysis was significant,  $F(4, 389) = 4.74, p < .001, \eta_p^2 = .05$ . As the variable was positively skewed, it was transformed by taking the square roots in analyses but we reported the original mean values below for easy interpretation. Overall, participants spent significantly less time completing the actual self-persuasion task ( $M = 131.82$  s) or reading the CDC message ( $M = 173.78$  s) than reading the control message ( $M = 240.41$  s) or the narrative with ( $M = 249.93$ ) or without the character's self-persuasion ( $M = 243.79$  s). The time spent on reading the two narratives was not significantly different. Therefore, time spent on treatment tasks was statistically controlled in analyses involving the actual self-persuasion and the CDC-message condition.<sup>1</sup>

We also compared participants' perceptions of the message stimuli to rule out possible confounds. Analyses revealed that participants did not perceive the messages significantly different in terms of how "believable" ( $F(3, 328) = 1.34, p = .26$ ) or "informative" ( $F(3, 328) = 0.09, p = .96$ ) they were. No group comparisons were significant.

Moreover, preliminary analyses with the demographics revealed that only political orientation was significantly related to the outcome variables of interest. Therefore, political orientation was controlled in hypothesis testing.

### Effectiveness of message manipulation

The manipulation of *narrative format* was assessed by asking participants the extent to which they agreed that the message includes "a story character," "a storyline," and "is about personal experiences" (Cronbach's  $\alpha = .78, M = 4.96,$

$SD = 1.70$ ). One-way ANOVA revealed that the manipulation was effective,  $F(2, 270) = 55.31, p < .001, \eta_p^2 = .29$ . Participants who read the self-persuasion narrative ( $M = 5.71, SD = 1.30$ ) and the narrative without self-persuasion ( $M = 5.46, SD = 1.35$ ) indicated greater agreement with the statements than those who read the non-narrative message ( $M = 3.44, SD = 1.62$ ). The difference between the two narrative conditions was nonsignificant ( $p = .44$ ). The manipulation of *self-persuasion narratives* was assessed by asking participants how much they agreed that the author "talked about how she changed her attitude toward the COVID-19 vaccine," "was initially hesitant about the COVID-19 vaccine," and "did not struggle at all with her decision to get the COVID-19 vaccine (reverse coded)" (Cronbach's  $\alpha = .72, M = 5.03, SD = 1.86$ ). An independent-samples t-test revealed that the manipulation was successful,  $t(214) = 9.91, p < .001$ . Participants who read the self-persuasion narrative indicated greater agreement with the statements ( $M = 6.11, SD = 1.16$ ) than those who read the narrative without self-persuasion ( $M = 4.03, SD = 1.82$ ).

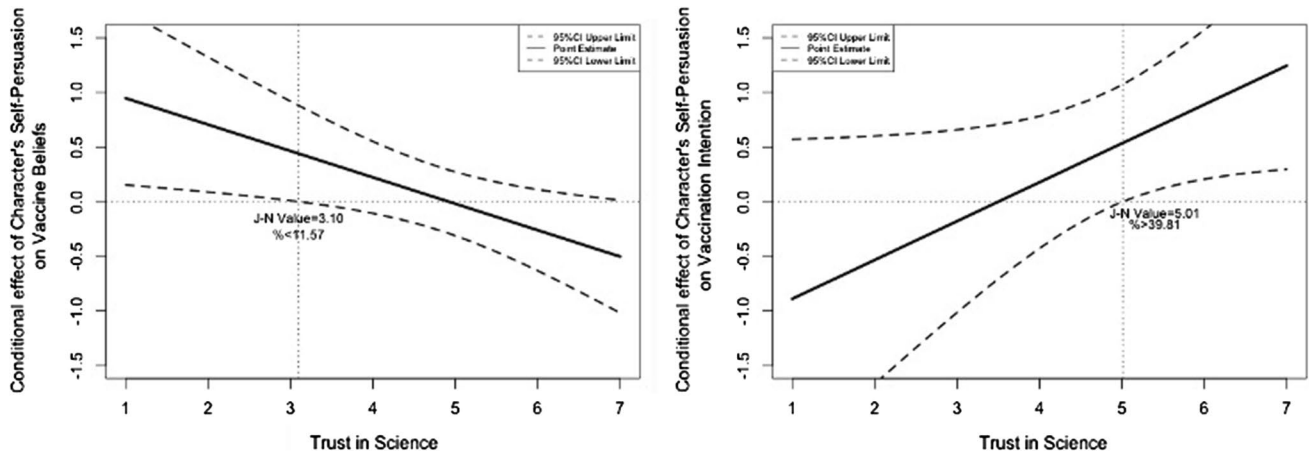
### Hypothesis testing

To test RQ1 and H1a-b, ANCOVAs revealed a significant main effect of the experimental treatment on vaccine-related beliefs,  $F(4, 387) = 6.83, p < .001, \eta_p^2 = .07$ , and the intention to get vaccinated,  $F(4, 387) = 5.28, p < .001, \eta_p^2 = .05$ . As Table 1 shows, participants who read the self-persuasion narrative indicated more positive vaccine beliefs and a greater vaccination intention than participants who completed the actual self-persuasion task and the control group. It also elicited a greater vaccination intention than the narrative without self-persuasion. However, the two narratives did not lead to a significant difference in vaccine-related beliefs. Therefore, H1b was supported, whereas H1a was not. Moreover, the non-narrative elicited significantly more positive vaccine beliefs than other experimental treatments.

<sup>1</sup> The pattern of results did not differ depending on whether the time spent on treatment tasks was statistically controlled.

**Table 2** Mean differences between the two narrative conditions

	Narrative without character's self-persuasion	Narrative with character's self-persuasion	Test statistics	<i>p</i> value	$\eta_p^2$
	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )			
Affective empathy	4.41 (1.62)	4.97 (1.52)	<i>F</i> (1,213)=6.79	.01	.03
Cognitive empathy	5.49 (1.58)	5.73 (1.25)	<i>F</i> (1,213)=1.36	.24	.01
Perceived similarity	3.96 (1.99)	4.67 (1.79)	<i>F</i> (1,213)=7.01	.01	.03
Self-referencing	4.29 (1.99)	4.85 (1.90)	<i>F</i> (1,213)=4.06	.05	.02



**Fig. 1** Conditional effects of character's self-persuasion on vaccine beliefs and vaccination intention at values of trust in science

Notably, there was no significant difference in vaccine beliefs between the control and the actual self-persuasion group. For vaccination intention, the difference between the non-narrative message and the self-persuasion narrative was nonsignificant. They both led to significantly greater vaccination intention than the other three conditions.

To test RQ2, ANCOVA results suggested that the three vaccine messages and actual self-persuasion led to varied levels of perceived threat to freedom,  $F(3, 329) = 2.60$ ,  $p = .05$ ,  $\eta_p^2 = .05$ . As Table 1 shows, participants who read the self-persuasion narrative or completed the actual self-persuasion task indicated lower levels of perceived threat to freedom than those who viewed the narrative without self-persuasion or the non-narrative message.

A series of ANCOVAs supported H2b-d but not H2a. As Table 2 shows, except for cognitive empathy, the self-persuasion narrative elicited greater levels of affective empathy, perceived similarity, and self-referencing than the narrative without self-persuasion.

For H3a-d, indirect-effect analyses using Hayes' (2018) PROCESS Macro with 5000 bootstrap samples and 95% confidence intervals revealed that the indirect path was significant through affective empathy,  $B = .21$ ,  $SE = .09$ , 95% CI [.048, .390], perceived similarity with the character,  $B = .26$ ,  $SE = .11$ , 95% CI [.067, .470], and self-referencing,

$B = .19$ ,  $SE = .10$ , 95% CI [.009, .395]. However, the indirect effect through cognitive empathy was nonsignificant,  $B = .07$ ,  $SE = .06$ , 95% CI [−.047, .194]. Therefore, H3b-d were supported whereas H3a was not.

For H4a-d, similarly, the indirect path was significant through affective empathy,  $B = .39$ ,  $SE = .15$ , 95% CI [.092, .689], perceived similarity with the character,  $B = .39$ ,  $SE = .16$ , 95% CI [.106, .711], and self-referencing,  $B = .34$ ,  $SE = .18$ , 95% CI [.004, .683]. However, the indirect effect through cognitive empathy was nonsignificant,  $B = .10$ ,  $SE = .09$ , 95% CI [−.066, .289]. Therefore, H4b-d were supported whereas H4a was not.

To test H5a-b, PROCESS Macro (Model 1) was used. Results suggested that the proposed interaction effect was significant on vaccine beliefs,  $F(1, 211) = 5.99$ ,  $p = .02$ . The Johnson-Neyman technique revealed that the self-persuasion narrative had a positive impact on vaccine beliefs among participants with relatively lower levels of trust in science (J-N value = 3.10; 11.57% below); for participants scored above 3.10, the effect was inconsequential. Moreover, the interaction effect was significant on vaccination intention,  $F(1, 211) = 3.84$ ,  $p = .05$ . The character's self-persuasion had a positive impact on vaccination intention among participants with relatively higher levels of trust in science (J-N value = 5.01; 39.81% above). For participants who scored



**Table 3** Conditional indirect effects of character's self-persuasion at values of trust in science

Trust in science	Mediators								
	Perceived similarity			Cognitive empathy			Self-referencing		
	<i>B</i>	<i>SE</i>	95%CI	<i>B</i>	<i>SE</i>	90%CI	<i>B</i>	<i>SE</i>	90%CI
<i>Conditional indirect effects of character's self-persuasion on vaccine beliefs</i>									
3.27 (−1SD)	.26	.08	[.110, .434]	.08	.05	[.001, .172]	.18	.08	[.048, .322]
4.80 (Mean)	.14	.06	[.033, .267]	.03	.03	[−.019, .076]	.09	.05	[.011, .188]
6.33 (+1SD)	.02	.08	[−.129, .182]	−.03	.04	[−.091, .029]	.00	.07	[−.094, .122]
<i>Conditional indirect effects of character's self-persuasion on vaccination intention</i>									
3.27 (−1SD)	.47	.17	[.189, .840]	.15	.10	[.002, .308]	.41	.19	[.117, .739]
4.80 (Mean)	.25	.11	[.059, .484]	.05	.05	[−.034, .138]	.21	.12	[.021, .427]
6.33 (+1SD)	.03	.14	[−.247, .305]	−.05	.07	[−.159, .053]	.01	.15	[−.224, .278]

below 5.01, the effect was inconsequential. Therefore, the findings were consistent with H5a but not with what H5b predicted (Fig. 1).

For H6a-d and H7a-d, indirect-effect analyses (Model 8) revealed that perceived similarity with the character was a significant mediator for the interaction effect on vaccine beliefs,  $B = -.08$ ,  $SE = .04$ , 95% CI  $[-.156, -.013]$ , and vaccination intention,  $B = -.14$ ,  $SE = .07$ , 95% CI  $[-.302, -.019]$ . The mediating effects of cognitive empathy (on vaccine beliefs,  $B = -.04$ ,  $SE = .02$ , 90% CI  $[-.074, -.001]$ ; on vaccination intention,  $B = -.07$ ,  $SE = .04$ , 90% CI  $[-.131, -.002]$ ) and self-referencing (on vaccine beliefs,  $B = -.06$ ,  $SE = .03$ , 90% CI  $[-.114, -.001]$ ; on vaccination intention,  $B = -.13$ ,  $SE = .08$ , 90% CI  $[-.263, -.002]$ ) were marginally significant (tested using 90% confidence intervals). However, the mediating effect of affective empathy was nonsignificant on vaccine beliefs,  $B = -.02$ ,  $SE = .03$ , 95% CI  $[-.075, .031]$ , or vaccination intention,  $B = -.05$ ,  $SE = .08$ , 95% CI  $[-.176, .081]$ . Table 3 reported the conditional indirect effects at  $-1 SD$ , mean, and  $+1 SD$  of trust in science. The general patterns are that the self-persuasion narrative had positive indirect effects on vaccine beliefs and intention by raising perceived similarity, cognitive empathy, and self-referencing among participants with lower levels of trust in science. The indirect effects became nonsignificant as participants' trust in science increased. Therefore, H6c and H7c were supported; H6a, H6d, H7a, H7d received partial support; H6b and H7b were not supported.

## Discussion

This experimental study examines the efficacy of self-persuasion narratives in reducing vaccine hesitancy and encouraging COVID-19 vaccine uptake among African Americans. The findings suggest that a narrative that contains a

character's self-persuasion is more effective among vaccine-hesitant individuals than a similar narrative that does not describe the character's process of changing their opinion. Reading the self-persuasion story can also elicit greater change in vaccine beliefs and vaccination intention than completing a writing task involving actual self-persuasion. Furthermore, we have identified important mediators of this effect; illustrating self-persuasion within a story appears to increase self-referencing, perceived similarity with, and empathy toward the story character. These effects were particularly evident among participants who had a low trust in science, suggesting that the self-persuasion story may have helped establish a connection between the reader and the character due to initial attitude similarity. Unexpectedly, the data also revealed the persuasive benefits of a non-narrative campaign message among vaccine-hesitant individuals.

This study contributes to literature by integrating the idea of self-persuasion into narrative persuasion to enhance its effectiveness among individuals who hold negative pre-existing attitudes. Aligned with entertainment-education researchers' interest in transitional characters (Singhal & Rogers, 2012), this study is among the first to empirically show the persuasive benefits of presenting how characters change their opinions on health issues in campaign narratives. Consistent with the literature on message sidedness (Eisend, 2006; Wang & Huang, 2021), self-persuasion narratives acknowledge a character's initial concerns about COVID-19 vaccination, therefore decreasing perceived threat to freedom among vaccine-hesitant individuals. This may inhibit their resistance to persuasion. More importantly, reading about a character's self-persuasion may allow individuals to vicariously experience the conversion process and facilitate change in their own beliefs and behavioral intentions.

Past self-persuasion interventions typically rely on writing tasks or role-playing games in laboratory settings (Briñol et al., 2012; Gordijn et al., 2001). These methods may be

difficult to implement among a mass audience as they demand careful monitoring of task completion. Moreover, a relatively high level of prior knowledge may be required so that individuals are able to generate sufficient arguments by themselves during the interventions. Our findings raise the possibility of employing the appeal of self-persuasion through campaign narratives. Involvement with and generating empathetic responses toward a character who engages in self-persuasion may induce a similar role-playing experience (Cohen, 2001; Shen, 2010). By reading through the character's thoughts, beliefs, and experiences, one may become more prepared for compelling arguments regarding similar situations in real life, regardless of one's background knowledge. This suggests a potential benefit of narrative-induced experience. It may also explain why our findings showed that the self-persuasion narrative was more effective than the actual self-persuasion task among vaccine-hesitant individuals. It is important to note that different levels of engagement between the two conditions may present an alternative explanation for the pattern. Our preliminary analyses did suggest that participants spent significantly less time on the actual self-persuasion task than reading the messages. We tried to minimize the influence of engagement by statistically controlling task length in analyses. However, this might not fully account for different levels of cognitive attention involved. To some degree, the difference in task length, and by extension, engagement reveals a limitation of implementing the self-persuasion intervention in non-laboratory settings. It also suggests the need to devise other methods for generating self-persuasion that may better elicit engagement in real-world applications.

Our findings also provide preliminary evidence of the vicarious experience by demonstrating that the persuasiveness of self-persuasion narratives is associated with psychological involvement with the character. The character's self-persuasion affects persuasion outcomes because readers feel empathetic toward the character, think about their commonalities, and relate the story to their life experiences. Moreover, these effects are more pronounced among individuals with lower levels of trust in science, who likely feel more negative toward COVID-19 vaccination prior to narrative exposure. Despite these findings, it should be noted that this study is just a first step toward understanding narratives' potential in eliciting vicarious self-persuasion. As this line of research is nascent, there is no established measure designed particularly for the psychological process. We employed established mechanisms underlying narrative involvement as proxies. However, future efforts are needed to formally theorize how this process may uniquely contribute to narrative persuasion and how its uniqueness can be captured through validated operationalization.

In addition, the study revealed several unexpected findings worth discussing. Interestingly, affective and cognitive

empathy showed inconsistent patterns as mediators. A character's self-persuasion has a main effect on affective empathy, whereas the adoption of the character's point of view depends on individuals' trust in science. While past research has focused on the convergence of affective and cognitive empathy (Cohen et al., 2015; Shen, 2010), this finding likely points to different conditions of the two psychological processes. Featuring a character's process of conversion may promote sharing of the emotional shift (Nabi & Green, 2015) regardless of individuals' prior stance. Perspective taking, however, may be influenced by character similarity. Individuals are more likely to experience cognitive empathy toward a transitional character if they identify with the character's initial attitude.

Furthermore, the findings showed that the non-narrative message was most effective in affecting vaccine beliefs and equally effective with the self-persuasion narrative in enhancing vaccination intention. This was unexpected as meta-analytic evidence has generally supported the persuasive advantage of narratives over non-narratives (Shen et al., 2015). There are two possible explanations. First, for ecological validity, we directly used information from the CDC website as the non-narrative message. As public health departments have served as important sources of information for individuals during the pandemic (Pew Research Center, 2020), participants in the study may have already been exposed to the information. Differently, the two narratives were from small local news sites and might be new to most participants. As a result, repeated exposure to the CDC information might have enhanced its effectiveness (Cacioppo & Petty, 1989). This explanation may be supported by the finding from preliminary analyses that participants spent significantly less time reading the CDC message than reading the two narratives despite similar message lengths. As the self-persuasion narrative was equally effective in affecting vaccination intention without repeated exposure, it may provide greater benefits when it is incorporated into campaign message design in the first place. Moreover, the findings demonstrate that participants perceived a greater threat to freedom when they read the non-narrative than when they read the self-persuasion narrative. However, this reactive response did not translate into disadvantages of the non-narrative in downstream persuasion outcomes. There is a possibility that participants' responses to the questions about vaccine beliefs and vaccination intention were affected by social desirability when they recognized the non-narrative as CDC information. We could not rule out this possibility with self-report data. But the findings related to perceived threat to freedom may reveal the merits of the self-persuasion narrative in this sample. Second, there may have been a general lack of accurate vaccine information among participants. Under these conditions, simply giving the facts in a bullet-pointed format may be a valuable approach. Future

research may examine how prior knowledge or perceived information insufficiency qualifies the efficacy of narrative and non-narrative messages.

This study provides helpful suggestions for designing campaign messages for the ongoing COVID-19 vaccination efforts, particularly among communities of color. As vaccine hesitancy linked to mistrust of science and medical systems becomes significant barriers to vaccine and health equality, it is beneficial for mass media campaigns to include stories about how characters change their minds about COVID-19 vaccines from acknowledged concerns. Compared to a story with characters who feel completely positive about the vaccines, self-persuasion narratives may present less of a threat to freedom to vaccine-hesitant individuals and help them better relate to the information emotionally and cognitively, leading to better intervention outcomes. Moreover, the findings also support the merit of non-narrative CDC messages in promoting vaccine uptake among African Americans. If vaccine hesitancy is related to limited access to accurate information, directly providing facts through didactic communication may be an efficient way to facilitate informed decisions.

It is important to note the limitations of this research and possible future directions. While our results showed promising effects for vaccine-related beliefs and intentions, we did not measure actual vaccination behavior. Demonstrating which messages would lead people to actually get vaccinated through longitudinal studies would be a valuable future step. Moreover, the study recruited participants through opt-in paid online panels. This allowed us to effectively reach eligible participants. However, the sample may not be representative of the population at large. This may not necessarily affect our testing of the relationships between variables but any estimates of the population means of these variables would suffer from this limitation. Furthermore, vaccine narratives are likely to be most effective when they target the source of hesitancy. The self-persuasion narratives in the study addressed doubts about science and medical systems, and the resulting safety concerns. Indeed, safety concerns and the lack of confidence in health systems were the most common barriers mentioned by participants. However, it remains unknown if the appeal of self-persuasion narratives holds for individuals who have other reasons for not wanting to be vaccinated. Future research should test with a different source of hesitancy. It is also intriguing to explore how the match of concerns addressed in self-persuasion narratives affects psychological responses and campaign effectiveness. In addition, vaccine hesitancy is multilayered and may represent strong negative, indifferent, or ambivalent attitudes toward vaccines (Shapiro et al., 2018). To avoid sensitizing participants prior to experimental treatments, we did not assess the types or strength of their pre-existing

attitudes. Future investigations may examine how different types of vaccine attitudes affect the effectiveness of the self-persuasion narrative and its underlying mechanisms. For example, individuals who hold strong negative attitudes toward vaccines may be less likely to find commonality with a character who changes opinions, thus reducing the effects of self-persuasion narratives. Finally, both narratives used in the study were drafted from the perspective of a physician for realism and message believability. This character choice may not influence the comparison of the two narratives. However, we acknowledge that it might potentially affect the results when comparing the narratives to the other three conditions due to the perceived expertise associated with this profession.

While prior research has provided advances in understanding the psychological processes underlying narrative effects (Cohen, 2001; Green & Brock, 2000), a “second-generation” of narrative research is needed to determine which types of stories might be more effective under particular circumstances. This research presents a step forward by documenting how including a character’s self-persuasion may enhance narrative effects among vaccine-hesitant individuals. To optimize the utility of narratives in health campaigns, further understanding of the boundary conditions calls for attention to the effects of different narrative components and/or production features. Such knowledge will offer valuable tools for message design and campaign planning.

**Authors contribution** Both authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by YH and MCG. The first draft of the manuscript was written by YH and MCG and both authors commented on previous versions of the manuscript. Both authors read and approved the final manuscript.

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#### Declarations

**Conflict of interest** Each author individually by name must declare any potential COI or state that she or he does not have any COI.

**Consent to participate** Informed consent was obtained from all individual participants included in the study.

**Ethical approval** The study was approved by the IRB at the University of Houston.

**Human and animal rights and Informed Consent** All procedures followed were in accordance with ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants for being included in the study.

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