ORIGINAL ARTICLE

The Potential for Narrative Correctives to Combat Misinformation[†]

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Misinformation can influence personal and societal decisions in detrimental ways. Not only is misinformation challenging to correct, but even when individuals accept corrective information, misinformation can continue to influence attitudes: a phenomenon known as belief echoes, affective perseverance, or the continued influence effect. Two controlled experiments tested the efficacy of narrative-based correctives to reduce this affective residual in the context of misinformation about organic tobacco. Study 1 (N = 385) tested within-narrative corrective endings, embedded in four discrete emotions (happiness, anger, sadness, and fear). Study 2 (N = 586) tested the utility of a narrative with a negative, emotional corrective ending (fear and anger). Results provide some evidence that narrative correctives, with or without emotional endings, can be effective at reducing misinformed beliefs and intentions, but narratives consisting of emotional corrective endings are better at correcting attitudes than a simple corrective. Implications for misinformation scholarship and corrective message design are discussed.

The prevalence of misinformation in communication environments has the potential to influence beliefs and behaviors (Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012). The phenomenon is widespread in various contexts, including health (Andrade-Rivas & Romero, 2017) and politics (Thorson, 2016), among others. Although at times spread unintentionally, at other times misinformation is used strategically to gain advantages (Southwell, Thorson, & Sheble, 2018). An example of the intentional spread of misinformation is the tobacco industry's advertisements containing misleading claims about deleterious health effects (Smith et al., 2011).

The problem with misinformation is two-fold: (a) the relative ease of encoding information and (b) the difficult, resource-intense endeavors required to correct it (Southwell et al., 2018). Once accepted, misperceptions are difficult to correct and, in some cases, even in the face of accepted correction, misinformation can continue to have effects. This phenomenon was dubbed belief echoes (Thorson, 2016). With the increased attention to misinformation and its correction, scholars have acknowledged the need to develop theoretical approaches to corrective messages (Swire & Ecker, 2018; Walter & Murphy, 2018) including the exploration of "enhanced correctives," such as emotional, narrative messages (Cappella, Maloney, Ophir, & Brennan, 2015; Lewandowsky et al., 2012). In this study, we conducted two randomized, controlled experiments to examine the potential of narrative messages to correct misinformed beliefs, attitudes, and behavioral intentions in the context of organic tobacco products. The investigation provides theoretical and practical information that could advance our understanding of and ability to prevent future belief echoes.

The challenge of misinformation

Misinformation can encompass both factually incorrect information and misleading information that leads the public to form incorrect perceptions (Southwell et al., 2018). Misinformation can have pernicious effects, from shifting individual beliefs, attitudes, and behaviors to influencing decisions that impact public policy. Human cognition possesses an inclination to accept novel information as true, particularly when compatible with one's existing knowledge and worldview, or when the source is perceived as reliable (Lewandowsky et al., 2012). Once formed, these misperceptions are often resilient to change (Southwell et al., 2018; Swire & Ecker, 2018). Several attempts at corrective messages have had weak and even counterproductive effects on the endorsements of the incorrect information. For example, in one study, exposure to corrective messages about smoking resulted in only small and temporary changes in knowledge and beliefs (Smith et al., 2011). At times, corrections may even backfire, and increase beliefs in misinformation (Nyhan & Reifler, 2010). Therefore, scholars have looked for enhanced corrective strategies, such as the use of emotional, narrative messages (Moyer-Gusé, 2008; Oatley, 2002) that may counter the emotional component of belief echoes (Cappella, Maloney, et al., 2015). In this investigation, we tested the potential of narrative correctives to combat misinformation and its emotional residuals.

The case for narrative correctives

Narratives are stories "with an identifiable beginning, middle, and end that provides information about scene, characters, and conflict" (Hinyard & Kreuter, 2007, p. 778). Narratives can be more effective on beliefs, attitudes, and, particularly, behavioral intentions than expository information (Braddock & Dillard, 2016;

Murphy et al., 2015). These effects are attributed largely due to the differential experience that a narrative message provides (Busselle & Bilandzic, 2012). Individuals become "swept up" in the story events (Green & Brock, 2000) and adopt the perspective of its characters (Cohen, 2001), thus minimizing selective avoidance and reactance (Moyer-Gusé, 2008).

The bulk of the studies demonstrating the effectiveness of narrative messages evoked positions that were clear and not controversial, such as by conveying generally accepted health practices (Igartua & Barrios, 2012), and even those that have tested narratives in controversial contexts conveyed clear positions (Slater, Rouner, & Long, 2006). In contrast, coupling narrative correctives with misinformation requires incorporating multiple sides, often for audiences who would not readily accept the correct information. While it was argued that two-sided messages that refute an opposing viewpoint are more effective than single-sided messages (O'Keefe, 1999), only a handful of studies have explored the intersection between sidedness and narrative persuasion to provide insight into two-sided narratives (Cohen, Tal-Or, & Mazor-Tregerman, 2015).

Narratives consist of many features (e.g., plot, genre, tone, character likeability; see Green, 2008) that could interact with sidedness to impact processing and persuasion. For example, sidedness was found to interact with focus (individual vs. community) to impact policy support to reduce obesity (Niederdeppe, Kim, Lundell, Fazili, & Frazier, 2012). Studies have suggested that story perspective can impact the adoption of specific viewpoints when ambiguous or multiple sides are presented (Cohen et al., 2015; de Graaf, Hoeken, Sanders, & Beentjes, 2012). We sought to build upon previous propositions that suggest narratives can be effective correctives by testing the hypotheses empirically. We further expanded on this work by considering and investigating the complex role of emotional engagement in narrative correctives.

Misinformation, mental models, and emotions

Misinformation is often embedded in story formats (Green & Donahue, 2011; Lewandowsky et al., 2012). Misbeliefs are integrated, stored, and retained as causal models that are resistant to change (Johnson & Seifart, 1994). For example, the incorrect belief that the measles-mumps-rubella vaccine causes autism provides a causal explanation for the appearance of autism in seemingly healthy children (i.e., the child was healthy, got vaccinated, and then started showing symptoms of autism). When misinformation is embedded in a mental model, simply tagging it as false does not adequately integrate changes to the erroneous situation model. In order for corrections to remove the continued effect of misbeliefs, an alternative should be provided. Thus, despite failures to replicate the since-retracted finding and paper (Taylor, Swerdfeger, & Eslick, 2014) and because the cause for autism is still not completely understood by scientists, many avoid a mental gap (Johnson &

Seifart, 1994) and still rely on the refuted misperception when deciding whether or not to vaccinate their children (Li, Stroud, & Jamieson, 2017).

Narrative correctives could, therefore, be effective if they provide causal, alternative explanations to story events that were previously explained by the misinformation (Cappella, Maloney, et al., 2015; Dahlstrom, 2012). While following the plot of a narrative, recipients construct a situation model, synthesizing the details about the events and characters into a coherent cause-and-effect structure; as new information is encountered throughout the story, the recipient updates his or her situation model accordingly (Zwaan, 1999; Zwaan, Langston, & Graesser, 1995). This hypothesis is further supported by a recent meta-analysis by Walter and Murphy (2018), which found that correctives that successfully address coherence are more effective than simple, fact-checking correctives.

Emotional reactions can also increase the salience of misinformation during encoding and retrieval (Van Damme & Smets, 2014). The emotional residual of corrected misinformation, or belief echoes, is distinct from belief persistence (Davies, 1982) or perseverance (Anderson, Lepper, & Ross, 1980), which is the cognitive bias resulting in continuing to believe incorrect information that could result from motivated reasoning and resistance to change (Nyhan & Reifler, 2010). In contrast, belief echoes can occur unconsciously and occur even in the face of successful corrections to beliefs (Thorson, 2016). Narratives could provide a solution to this challenge due to the emotional engagement audiences experience with them. Emotional responses are central to the narrative experience and result from characters' reactions to plot events (Oatley, 2002). Studies have found that emotional reactions amplify the effects of narratives on audiences (Dunlop, Wakefield, & Kashima, 2008; Mazzocco, Green, Sasota, & Jones, 2010).

Emotional messages receive more audience attention and are more easily stored in and retrieved from memory (Lang, Dhillon, & Dong, 1995); they are, therefore, popular in persuasive messages (Frosch, Krueger, Hornik, Cronholm, & Barg, 2007). Emotions can also be used to promote and make misinformation salient, such as by embedding fear into misleading claims. Though some work has documented that making persuasive information more central to the story increases its effectiveness (Quintero Johnson, Harrison, & Quick, 2013), little is known about whether one can link corrective information to emotion to make it more memorable. Understanding how to inspire emotions in advantageous ways in correctives is necessary and could increase correctives' effectiveness.

To test the effectiveness of narrative correctives, we employed two controlled experiments in the context of misinformation about "organic" tobacco products. Tobacco companies have a long history of propagating misinformation through both explicit denials of the deleterious health effects and addictive nature of smoking (Jarvis & Bates, 1999; Ong & Glantz, 2000) and through implicit deception in the form of labeling similarly-dangerous products as "light" or "low-tar" (Shiffman, Pillitteri, Burton, Rohay, & Gitchell, 2001). Recently, new types of tobacco-related misinformation have emerged: the promotion and advertising of certain cigarette

products as "natural," "organic," and "additive-free" (Pearson et al., 2017, 2016). Studies have documented that labelling tobacco products as organic or natural could lead to inaccurate perceptions of reduced harm and health risks (Byron, Baig, Moracco, & Brewer, 2016; Czoli & Hammond, 2014; Kelly & Manning, 2014). In the following studies, we tested narrative correctives in this emerging context.

Study 1

Though the story format is an appealing choice for corrective messages, to our knowledge, no previous study has attempted to test such a corrective format and, therefore, there is limited practical guidance for designing such messages. The purpose of Study 1 was to explore the efficacy of two story features to correct misinformed beliefs about organic tobacco: (a) within-narrative corrections and (b) story endings designed to inspire discrete, emotional responses. An immediate message design consideration and challenge was how to integrate both the misinformation and correction into one story. Fact-checkers often correct misinformation some time after it was distributed and, therefore, often need to repeat or acknowledge the misinformation before correcting it (Thorson, 2016). This repetition inadvertently may draw attention to the misinformation and could, thus, crystalize the incorrect information (see Allport & Lepkin, 1945).

We theorized that a within-narrative correction could minimize the effects of acknowledging or repeating misinformation. An initial story event could present the misinformation and, because narrative processing includes the continual updating of mental models as events unfold, corrected information could be placed as a subsequent event in the story. The corrected facts thus would replace any incorrect conclusions that would be drawn from exposure to the misinformation alone, leaving no gaps in the mental model. In order to examine the efficacy of the within-narrative correction, we opted to test it against two types of controls: a narrative without a corrective ending and a no-exposure condition (to gain baseline belief levels). If a within-narrative correction were successful, it would indicate that misinformation could be presented without the detrimental effects of repeating or acknowledging that information:

> H1: Exposure to a within-narrative corrective message will lead to lower endorsements of misinformed beliefs than a no-correction narrative and no-exposure control.

Given the central role of emotional responses in both learning and accepting misinformation, as well its centrality to the narrative experience, a greater understanding of the intersection between information and emotional engagement in narratives is needed. Emotions encompass an assessment of a target (positive or negative), as well as a corresponding arousal that may vary in intensity (Nabi, 1999) and can frame information in distinct ways (Nabi, 2003). In our case, misinformation about organic tobacco could inspire (false) hope in smokers who wished to

identify healthier alternatives to "regular" cigarettes (Popova, So, Sangalang, Neilands, & Ling, 2017). Conversely, a correction could employ emotional language (expressed by a narrator) to inspire emotional responses to counter the false hope garnered by the organic tobacco misinformation. We formally tested that hypothesis in Study 1.

> H2: Exposure to emotion-inducing language through corrective information will lead participants to report experiencing the emotion used in the correction after exposure to the narrative.

Successful messages are often designed to inspire discrete emotions, such as fear and anger, in order to facilitate persuasion (Dillard & Peck, 2001). Discrete emotional responses have distinct and predictable behavioral patterns (Nabi, 2003). For example, fear appeals draw attention to the need to minimize a specific threat (Tanner, Hunt, & Eppright, 1991). We therefore examined whether an emotional correction could counter an emotional misinformation, and whether specific, discrete emotions would be more effective than others in countering hopeful misinformation (e.g., hopeful correctives vs. angry corrections). While all our conditions were expected to induce hope in smokers at first, we developed four different story endings based upon discrete emotions (i.e., fear, anger, sadness, and happiness). Each ending had similar corrective information, but differed in the emotion expressed by the protagonist when considering the corrective information. Due to the lack of previous knowledge about the relative effectiveness of different emotional corrections, we suggested the following research question:

> RQ1: Is emotional language in corrective information more effective at promoting lower endorsements of misinformed beliefs than a simple (no-emotion) correction?
> RQ2: Are some discrete emotional corrective endings more effective at promoting lower endorsements of misinformed beliefs than others?

Participants

A sample of 385 current smokers (daily and intermittent) were recruited from Survey Sampling International, an online opt-in survey panel provider. Characteristics of the sample are provided in Table 1.

Procedure and materials

The study was approved by the University of Pennsylvania Institutional Review Board. Participants were randomly assigned to view one of the narrative conditions or a no-exposure control before completing a series of belief items about natural tobacco products. All messages in the study were narratives that contained the same sequence of events: the narrator (an unnamed woman detailing the story in a first-person perspective) agrees to meet an online contact, Eric, on a face-to-face date at a bar one evening. Their meeting is going well as they find common interests about community art. Eric decides to go outside to smoke a cigarette and suggests the

Table 1 Study 1 and Study 2 Participant Characteristics

	Study 1	Study 2
N	385	586
Age	*M* = 36.7	*M* = 46
	SD = 11.18	*SD* = 12.38
Sex	Male: 215 (56%)	Male: 347 (59%)
	Female: 169 (44%)	Female: 237 (41%)
Race/ethnicity	White (Non-Hispanic): 309	White (Non-Hispanic): 476
	Black/African-American	Black/African-American
	(Non-Hispanic): 35	(Non-Hispanic): 45
	Hispanic: 30	Hispanic: 24
	Other/more than 1: 10	Other/more than 1: 39
Smoking frequency	Every day: 299 (77.6%)	Every day: 526 (89.8%)
	Some days: 86 (22.34%)	Some days: 60 (10.2%)
Quit attempts	0 times: 163 (42.34%)	0 times: 293 (50%)
	1–2 times: 127 (33.00%)	1–2 times: 210 (36%)
	3–5 times: 5 (13.77%)	3–5 times: 9 (%)
	More than 5 times: 42 (10.91%)	More than 5 times: 31 (%)

narrator joins him. The narrator, who explains she is a former smoker, initially resists. Eric provides several misinformed beliefs about natural tobacco (e.g., healthier, includes straight tobacco without added chemicals, etc.), leading the narrator to decide to try the cigarette and reiterate Eric's inaccurate comments through the dialogue and her internal thoughts (misinformation manipulation). The date ends and the narrator, despite her enjoyment of the evening, is concerned about her return to smoking, deciding to look up information on her phone while walking home. It was at this point that the conditions differed. In the no-correction condition, she looks up information about community-based art discussed on the date and on display in the restaurant. In the simple correction (no emotion) ending, she simply states Eric's inaccurate claims. In the four emotion conditions, additional commentary about her feelings is reflected. The full stimuli for all conditions of Study 1 are reported in the Supporting Information.

Measures

Emotional response

Emotional responses were measured with the items: "Thinking again about your own experience, how did you feel at the end of the story? [happy, angry, sad, fearful]." The Likert-type items were on a 5-point scale, anchored by strongly disagree to (1) strongly agree (5). The means and standard deviations of all emotional responses are reported in the Supporting Information.

Misinformed beliefs

Beliefs were measured with eight Likert-type items on a 8-point scale, anchored by strongly disagree to strongly agree ($M = 4.34$, $SD = 1.49$, $\alpha = .94$), that was validated by a previous study (Gratale, Maloney, Sangalang, & Cappella, 2018). Items were averaged. Some example items included: "There is a lower chance of becoming addicted to organic cigarettes than traditional cigarettes" and "Secondhand smoke from organic cigarettes is less harmful to friends and family, compared to traditional cigarettes." The full list of items is reported in the Supporting Information.

Results

In order to test the hypotheses, a series of one-way analyses of variance (ANOVAs) were conducted between conditions. Post hoc analyses were conducted using the Bonferroni correction.

In order to examine the utility of within-narrative corrections (H1), a one-way ANOVA was conducted between the no-exposure, no-correction, and within-narrative correction conditions (collapsed) on the endorsements of misinformed beliefs. The test was not significant (see Table 2): therefore, H1 was not supported.

To test the ability of emotional endings to inspire desired emotions (H2), four one-way ANOVA tests were conducted: one for each manipulated emotion (Table 3). Specifically, we examined the differences between participants exposed to different conditions on their expressions of each of the following emotions: happiness, anger, sadness, and fear. For example, we tested whether those who were exposed to angry endings expressed more anger than those exposed to other conditions (including to other emotions). All global F-tests indicated significant differences ($p < .05$), so Bonferroni post hoc analyses were conducted to probe all differences. In no instance did an emotional ending inspire its individual, congruent emotion significantly higher than all conditions ($p > .05$), providing no robust support for an effect on discrete emotions. Rather, the results pointed to a valence effect: reading a sad story increased feelings of anger and fear (though less than sadness), but not positive emotions such as happiness.

Though the results from H2 indicated that different emotional endings did not lead participants to report experiencing congruent, discrete emotional responses, it could be possible that the emotional correctives were more effective than simple (no

Table 2 Study 1: Differences Between Conditions on Misinformed Beliefs

	Misinformed Beliefs Range: 1–7	N
No exposure: control	4.63 (1.62)	57
No correction: control	4.48 (1.61)	75
Within-narrative corrections, collapsed	4.22 (1.50)	253
F	2.68	…
Significance, p	.07	…
η^2 95% confidence interval	.01–.04	…

Table 3 Study 1: Differences Between Conditions on Experienced Emotions

	Experienced Emotional Response Means (SDs)				
	Happiness	*Anger*	*Sadness*	*Fear*	*N*
No correction: control	4.07 (1.05)	2.37 (1.52)	2.56 (1.52)	2.52 (1.50)	57
Simple correction ending: no emotion	3.71 (1.06)	2.76 (1.21)	2.74 (1.29)	2.88 (1.17)	50
Anger ending	3.44 (1.18)	3.32 (1.18)	3.15 (1.02)	3.29 (1.09)	52
Happy ending	3.84 (.98)	2.29 (1.27)	2.58 (1.16)	2.64 (1.27)	52
Sad ending	3.44 (1.12)	3.00 (1.25)	3.40 (1.16)	3.27 (1.20)	48
Fear ending	3.54 (1.03)	3.13 (1.18)	3.00 (1.05)	3.17 (1.08)	48
F	2.88	5.57	3.87	3.77	…
Significance, *p*	.01	<.01	<.01	<.01	…
η^2 95% confidence interval	.00–.08	.02–.14	.01–.10	.01–.10	
Condition differences, Bonferroni	No correction > Anger ending, *p* = .04	Anger ending > No correction, *p* < .01	Sad ending > No correction, *p* = .01	Anger ending > No correction, *p* = .02	…
	No correction > Sad ending, *p* = .05	Anger ending > Happy ending, *p* < .01	Sad ending > Happy ending, *p* = .01	Sad ending > No correction, *p* = .03	
	…	Sad ending > Happy end, *p* = .08	…	…	
		Fear ending > No Correction, *p* = .04			
		Fear ending > Happy ending, *p* = .02			

emotion) corrections (RQ1) or that specific, discrete emotions were more effective than others (RQ2). The results of two ANOVAs are reported in Table 4. The first ANOVA explored differences between the no-exposure (control), no-correction (control), simple correction (no emotion), and emotional corrections (collapsed) conditions. There were no significant differences ($p > .05$). The second ANOVA examined the differences between within-narrative corrections only, specifically looking at differences between the simple correction (no emotion), happiness, anger, sadness, and fear corrections. No significant differences were found ($p > .05$). In sum, there was no robust evidence indicating the utility of emotions or of specific discrete emotions.

Study 1 discussion

Study 1 did not provide substantial evidence that a within-narrative correction is effective at correcting misinformation. The results did not did link emotional corrective information and emotional responses, nor did they support the relative advantage of a single emotion over others. Nonetheless, these ideas have been explored by other scholars in recent works. It is important to note that Study 1 was part of a larger series of studies we have conducted that explored the impact of

Table 4 Study 1: Differences Between Emotional Endings on Misinformed Beliefs

	Simple vs. Emotional Correctives on Misinformed Beliefs Range: 1–7	Simple vs. Discrete Emotional Endings on Misinformed Beliefs Range: 1–7	N
No exposure: control	4.64 (1.28)	–	75
No correction: control	4.48 (1.62)	–	57
Simple within-narrative correction: no emotion	4.21 (1.45)	4.21 (1.45)	51
Emotional within-narrative corrections: collapsed	4.21 (1.52)	–	202
Anger ending	–	4.08 (1.53)	54
Happy ending	–	4.22 (1.54)	52
Sad ending	–	4.45 (1.51)	48
Fear ending	–	4.14 (1.51)	48
F	1.78	.44	–
Significance, p	.15	.79	–
η^2 95% confidence interval	.01–.04	.01–.02	–

Note: Means (SDs) are reported for misinformed beliefs.

messages about natural tobacco and was, therefore, more exploratory in nature, and its ability to detect effects was also affected by compromises made for other studies in the series. First, the stories were brief and, in an effort to keep the texts consistent across all conditions, emotional manipulations were limited to a few sentences. It is also possible that the manipulations used in Study 1 were not strong enough to prompt meaningful reactions to influence beliefs, nor meaningful emotional responses. Second, the established eight-item belief scale was employed because it was previously validated as a misinformation measure in this specific context (Gratale et al., 2018). However, only some of the specific belief items within this scale were directly related to the messages explicitly appearing in the stories. As a post hoc analysis, a series of contrast tests were conducted between the conditions versus no-message control for each of the individual belief items that were specifically endorsed in the misinformation manipulation. These ancillary analyses provided some support for the advantageous effectiveness of anger and fear appeals in narrative endings. The anger condition led to lower endorsements of the following beliefs: "organic cigarettes are a more responsible choice" ($F[1,378] = 6.25$, $p = .02$) and lead to a "lower chance of becoming addicted" ($F[1,378] = 4.0$, $p = .05$). The fear condition led to lower endorsements of the following beliefs: "secondhand smoke from organic cigarettes is less harmful" ($F[1,378] = 4.37$, $p = .04$) and "inhaling smoke from organic cigarettes is no worse" ($F([1,378] = 5.92$, $p = .02$). To further explore these effects and improve upon the limitations of Study 1, we conducted a follow-up study.

Study 2

In Study 1, the emotional language did not prompt robust emotional reactions, and we aimed to strengthen emotional responses in Study 2. We attempted to address this by combining fear and anger emotional language into an enhanced, negative-emotion condition. The evidence from Study 1 indicated that some negative conditions (anger, sadness, and fear endings) prompted some significant variations in anger. Past work employing both self-reported and physiological measures indicated that messages containing multiple emotions might have stronger emotional impacts (Lee & Lang, 2009). Perhaps, then, a more appropriate approach to designing emotional narrative endings is to bolster the emotional component of stories:

> H3: A bolstered negative emotional corrective ending will produce lower endorsements of misinformed beliefs about natural tobacco products than a simple corrective ending (no emotion) condition or a no-correction condition.

There were no differences in Study 1 between the emotion and no-emotion (simple) corrective endings. It may be possible that emotional endings have no advantage over simple corrections when correcting facts and beliefs, but the utility of narrative correctives could manifest in other persuasive outcomes: notably, affective ones (attitudes) or intentions. Attitudinal and intentional responses are also

carriers of residual effects over and above acceptance of the veracity of beliefs (Thorson, 2016), and we hypothesized that:

> H4: A negative emotional corrective ending will produce (a) less favorable attitudes toward and (b) less favorable intentions to use natural tobacco products than a simple corrective (no emotion) ending condition or a no-correction condition.

Participants

A sample of 586 current (daily and intermittent) smokers completed the study. In an identical recruitment procedure to Study 1, participants were recruited from an online survey panel provider (Survey Sampling International). Characteristics of the sample are reported in Table 1.

Procedure and materials

The study was approved by the University of Pennsylvania Institutional Review Board. Participants were randomly assigned to view one of three narrative stimuli before responding to items related to beliefs, attitudes, and intentions related to natural tobacco products. The sequence of events in the narrative stimuli remained largely unchanged from Study 1. Three narrative ending conditions were developed. In the no-correction (control) condition, the narrator searches the art displayed in the restaurant online on her phone as she walks home. In the simple correction (no emotion) condition, the narrator acknowledges the inaccuracy of the information Eric provided. In the negative-emotion condition, she acknowledges the inaccuracy of the natural tobacco information and includes both fear- and anger-related thoughts (e.g., "The more I read, the more the information both infuriated me and scared me. I should have been skeptical about claims that advertisers make about tobacco before thinking I can smoke again and not be fooled into putting myself at risk like that."). The stimuli for the Study 2 conditions can be found in the Supporting Information. A manipulation check indicated the negative emotional ending inspired significantly higher levels of anger and fear, as expected (see Supporting Information for the manipulation check).

It is important to note that two sets of these conditions were initially developed: a modeled behavior set and a non-modeled behavior set. The modeling conditions were consistent with Study 1 (the narrator tries the natural cigarette and repeats the misinformation Eric presents to her). In the no-modeling conditions, she resists trying the cigarettes but still reiterates the misinformation as she considers. Comparisons between the modeling and no-modeling conditions yielded no significant differences on beliefs ($t[584] = -.31$, $p = .75$), attitudes ($t[584] = -.81$, $p = .42$), or intentions ($t[584] = -1.22$, $p = .22$). Therefore, the conditions were collapsed and no differences between modeling and no-modeling conditions are reported in this analysis.

Measures

The full list of items for the belief, attitude, and intention scales can be found in the Supporting Information. Examples of items for each scale are listed below.

Misinformed beliefs

Ten Likert-type items were averaged to assess misinformed beliefs related to natural tobacco products, anchored by strongly agree (7) and strongly disagree (1), such that higher values indicated more endorsements of misinformation (i.e., beliefs in favor of natural tobacco product use, with no robust factual bases; $M = 3.78$, $SD = 1.35$, $\alpha = .92$). The items were previously validated in two pilot studies (Gratale et al., 2018). The items included statements such as: "organic cigarettes are not as bad for your lungs as regular cigarettes," "there is a lower chance of becoming addicted to organic cigarettes than traditional cigarettes," and "organic cigarettes contain no chemicals or additives."

Attitudes

Five semantic differential scales were averaged to assess attitudes toward natural tobacco products, with response options ranging from 10 (positive word) to -10 (negative word). The five scales included: good to bad, enjoyable to unenjoyable, pleasant to unpleasant, wise to foolish, and beneficial to harmful. All five items were collapsed into a single attitude measure ($M = .22$, $SD = 4.74$, $\alpha = .89$).

Intentions

Eight items were averaged to assess intentions to use natural tobacco products, anchored by definitely will (4) to definitely will not, and were collapsed into a single measure of intentions ($M = 2.71$, $SD = .82$, $\alpha = .89$). Five items included the prompt: "In the next year, how likely is it that you will do each of the following?": "Try to use [organic / natural] tobacco cigarette if offered by someone else," "Buy [organic / natural] tobacco cigarettes," "Talk to friends or family about natural cigarettes in the near future." Three items included the prompt: "Would you ever consider switching to natural cigarettes for any of these reasons?": "To reduce your health," "To cut down on the number of traditional cigarettes you smoke," "To quit smoking."

Results

To examine the hypotheses, a series of one-way ANOVAs were conducted between the no-correction control, simple correction (no emotion), and negative-emotion correction conditions on beliefs, attitudes, and behavioral intentions. Pairwise differences between conditions were examined using the Bonferroni correction. Complete descriptive (i.e., means, standard deviations) statistics for the outcome variables between conditions can be found in Table 5.

There was a significant difference between conditions on misinformed beliefs (H3; $F[2,583] = 12.48$, $p < .001$). Post hoc analyses (Bonferroni) revealed both the simple ($M_{\text{diff}} = -.48$, $p < .01$) and negative-emotion correctives ($M_{\text{diff}} = -.62$,

Table 5 Study 2: Differences Between Conditions on Misinformation Outcomes

	Misinformed Beliefs Range: 1–7	Attitudes Range: −10 to 10	Intentions Range: 1–4	N
No correction: control	4.10 (1.35)	1.13 (4.67)	2.86 (.80)	215
Simple correction: no emotion	3.62 (1.31)	.31 (4.65)	2.65 (.83)	185
Negative emotion correction	3.48 (1.28)	−.87 (4.66)	2.50 (.81)	187
F	12.48	9.41	10.04	–
Significance, p	<.01	<.01	<.01	–
η^2 95% confidence interval	.01–.07	.01–.06	.01–.06	–

Note: Means (SDs) are reported for misinformation outcomes.

$p < .001$) produced significantly lower levels of endorsing misinformed beliefs than the no-correction control ($M_{\text{diff}} = −.14$, $p = .92$). There were no significant differences between the simple and negative-emotion corrections. Though both correctives were successful in reducing misinformed beliefs, the negative-emotion corrective did not perform better than the simple corrective: therefore, H3 was not supported.

There was a significant difference between conditions on attitudes toward natural tobacco (H4; $F[2,583] = 9.41$, $p < .001$). Post hoc analyses (Bonferroni) indicated only the negative-emotion corrective ($M_{\text{diff}} −2.02$, $p < .001$) had significantly lower attitudes toward natural tobacco than the control condition. The negative-emotion corrective also produced significantly less-positive attitudes toward organic tobacco products than the simple corrective ($M_{\text{dif}} = −1.20$, $p < .05$). Both corrections produced significantly less-positive attitudes than the control condition, and the negative-emotion corrective was more effective than the simple one. H4 was supported.

There was a significant difference between conditions on intentions to use organic tobacco (H$_3$; $F[2,583] = 10.04$, $p < .001$). Post hoc analyses (Bonferroni) revealed that both simple ($M_{\text{diff}} = −.21$, $p = .03$) and emotional ($M_{\text{diff}} = −.36$, $p < .001$) corrections produced significantly lower intentions than the no-correction condition, but there were no differences between the simple and emotional corrections ($M_{\text{diff}} = −.15$, $p = .25$). H3 was not supported.

General discussion

The purpose of the present investigation was to test the utility of narrative-based messages to correct misinformation in the context of natural, organic tobacco products. Scholars had previously pointed to the potential for narrative corrective

messages (e.g., Cappella, Kim, & Albarracín, 2015; Lewandowsky et al., 2012), though this had not been previously tested empirically. Evidence from Study 2 indicated that narrative correctives can reduce misinformed beliefs, attitudes, and intentions, and both Study 1 and Study 2 point to areas of further inquiry to augment our understanding of corrective message design.

Emotions and misinformation

Study 2 found that both narrative corrective conditions (simple and enhanced emotional) reduced all three misinformation outcomes relative to the no-correction control condition, though it is particularly noteworthy that the enhanced emotional corrective narrative ending produced less favorable attitudes toward natural tobacco products than the simple corrective narrative and that the difference was statistically significant. Previous work demonstrated that affective aspects of misinformation, which in turn impact intentions and behaviors, can remain uncorrected even when corrective information is accepted (e.g., Sherman & Kim, 2002; Thorson, 2016). The findings from Study 2 indicate emotional language in corrective messages might have some degree of success at combating this affective perserverence, or belief echoes. This is also consistent with other work that suggests rationally-based attitudes must be addressed with rational messages, while emotionally-based attitudes should be countered with emotional messages (See, Petty, & Fabrigar, 2008; Shavitt & Nelson, 2002).

Results from Study 1 and Study 2 also provided some guidance for embedding emotion to enhance corrective messages: namely, regarding the (a) placement, (b) intensity, and (c) valence of emotion. First, we followed previous research by connecting emotion to the corrective information. Research has indicated that the placement of persuasive information at causal points in a story could enhance narrative effectiveness (Dahlstrom, 2012; Quintero Johnson et al., 2013). We attempted to employ a similar approach by linking emotion (the character's emotional response) to the corrective information. Processing the emotional response was central to the conclusion of the story and the reader's understanding of the story. This approach—following both the Dahlstrom (2012) and Quintero Johnson and colleagues (2013) studies—differs from simply including an emotional component and the corrective information in the same message. It is the direct linking of the two that we believe is crucial. However, our tests could not support this notion empirically, as we did not compare the effectiveness of positioning emotions at different points in the story; future studies should look more closely at the potential effects of positioning.

Second, our findings indicate that incorporating multiple emotions may be more successful than single, discrete emotions. Study 1 tested four discrete, emotional corrective endings (i.e., happiness, sadness, fear, and anger). These endings did not consistently inspire their respective emotions, though they did indicate these narratives inspired valence-consistent responses. Further probing indicated the potential in fear- and anger-based language for correcting specific beliefs, which was

then combined into the Study 2 design. It was this enhanced, combined fear and anger emotional language that reduced all misinformation outcomes, including attitudes, against the no-correction control in Study 2. Future work should continue to examine different ways to incorporate enhanced emotions in corrective messages. Nabi and Green (2015) propose that there is a natural transition of emotional responses due to story events, known as emotional flow, which helps maintain narrative engagement. Longer narratives also have the potential (and requirement) for multiple emotional shifts (Reagan, Mitchell, Kiley, Danforth, & Dodds, 2016) and should be an area of future exploration. It should be noted that we did not compare the effectiveness of emotional narratives to the use of emotional appeals in other message formats. Some work in the area of tobacco communication has pointed to the importance of emotional appeals in non-narrative formats, such as warning labels (Ophir, Brennan, Maloney, & Cappella, 2017). Future work should also explore the role of multiple, enhanced emotions in several corrective types, such as rhetorical, statistical, or other non-narrative messages, to test whether our findings generalize to corrective messages broadly or are limited to the narrative context.

Third, our work can also only highlight the role of negative emotions for correction. Both studies pointed to the effectiveness of negative emotions. Although limited only to impact on specific beliefs in Study 1, negative emotions impacted beliefs, attitudes, and intentions in Study 2. This is consistent with past research that suggests negative information is more attended to and, potentially, more memorable (Cappella, Kim, & Albarracín, 2015; Meffert, Chung, Joiner, Waks, & Garst, 2006; Rozin & Royzman, 2001). It is still unclear whether the combined negative-emotion corrective ending in Study 2 was effective because negative emotions are best for corrective messages or whether it was because negative emotions were countering the misinformation valence of this context, which was positive for the target audience (as allegedly, healthier cigarettes may induce hope for current smokers). If a negativity bias is persistent, perhaps a positive correction might not be sufficient to reduce belief echoes for negative misinformation, which might be harder to correct. Future research should explore differences between positive versus negative misinformation and positive versus negative corrections and their interactions, to examine whether the efficacy of emotions in correction has a negativity bias or whether counter-emotional appeals would be sufficient.

Limitations and future directions

Though the enhanced emotional corrective ending was no better than the simple corrective ending on intentions, the finding that both correctives significantly reduced behavioral intentions to use and to try natural tobacco products relative to the no-correction control is meaningful. It is difficult to change intentions with a single message exposure, particularly if one's processing involves motivated reasoning (Knobloch-Westerwick, 2014). Our findings are limited to one context (i.e., misinformation regarding natural tobacco) and to a specific population (i.e., daily and intermittent smokers). It is worth noting that smokers are particularly resistant to

adjusting smoking behavior due to motivated reasoning (Keller & Block, 1999), and the potential ability for a single message and subtle manipulation to reduce affective misinformation responses among this extremely resistant population offers a difficult, conservative testing context. However, we make no claim that the findings are generalizable across contexts, as we have only worked on the construction of a single narrative in a specific context. The case-category confound (Jackson, 1992) looms large, but any evidence indicating that impacts on affective outcomes can be silenced with brief interventions must be noted favorably.

Finally, previous work on belief echoes (Thorson, 2016) used a slightly different design, where acceptance of misinformation preceded exposure to corrections. In our study, due to the use of one narrative text for both misinformation and its correction, participants' beliefs, attitudes, and intentions were measured only after being exposed to both the misinformation and correction. Thus, although our findings of enhanced emotional corrective endings on attitudes indicate the potential to correct this affective residual, our study did not follow the Thorson (2016) design, which directly measured changes in beliefs and attitudes on the same participants. Future inquiries testing belief echoes across corrective formats may directly measure changes in beliefs, attitudes, and intentions using multiple measurements.

Supporting Information

Additional Supporting Information may be found in the online version of this article.

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