BRAIN MECHANISMS FOR THE COGNITIVE EFFECTS OF NARRATIVE PERSUASION

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BRAIN MECHANISMS FOR THE COGNITIVE EFFECTS OF NARRATIVE PERSUASION

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ABSTRACT

The ability of a narrative to transport individuals, or converge focus of attentional, emotional, and sensory resources to events in the narrative world, has been shown to lead to attitude and behavior changes. Proposed cognitive mechanisms behind narrative's effect on persuasion include recollective detail, retrieval fluency, and inhibition of counter-arguing that are encouraged during transportation. Though past research has begun to demonstrate that activation in brain regions responsible for both emotional arousal and executive control lead to subsequent attitude and behavioral changes there have been no neuroimaging studies on narrative persuasion. In our study two participant samples were exposed to 24 text-based messages, either all with or without a narrative context. The behavioral sample read and rated the messages on their persuasive strength, emotional appeal, and logical appeal; while the fMRI sample listened only rated persuasive strength. We observed strong (vs. weak) persuasive messages evoke significantly more activity in the precuneus and middle frontal gyrus bilaterally. Greater activity was exhibited in the precuneus, medial frontal gyrus, anterior cingulate cortex, and right supramarginal gyrus for high (vs. low) emotional appeal messages. The overlap of activation in the middle frontal regions may imply that past research has confounded emotional appeal and persuasive strength, especially considering emotional appeal was normalized between strong vs. weak persuasive messages, but weak messages were perceived as more persuasive when enfolded in a narrative context. Further research to distinguish narrative features will help contribute to the understanding of persuasion and the role of affective reactions in influencing attitudes.

CHAPTER 1

INTRODUCTION

As you have likely personally experienced, engaging narratives have an uncanny ability to make us forget about the real world. The experience is commonly described as "getting lost" in the narrative. This feeling of becoming lost is the process in which narratives transport the audience into the narrative world and persuade them to at least momentarily inhibit mental counter-arguing, or suspend disbelief, when aspects of the narrative world are incongruent with reality. Green and Brock (2000) have theorized that during this process you are more open to having your attitudes and even behaviors changed to be more narrative-consistent. In a study where participants read an emotional story of a mental institute patient killing a young girl in a shopping mall, those who felt more "transported" into the narrative world showed greater agreement with a statement that mentally ill individuals are dangerous (Green & Brock, 2000). This effect of engaging narratives swaying an audience's attitudes has been replicated in several follow-up experiments (Green, 2004; Green, Brock, & Kaufman, 2004) and show narratives to be a highly capable persuasive medium.

However as consistent as this effect is, behavioral studies have made up nearly all of the research so far on narrative persuasion with no neuroimaging studies on the specific subject as distinct from rhetorical persuasion. Functional magnetic resonance imaging (fMRI) allows neuroscientists to research the underlying processes and brain regions associated with narrative persuasion instead of solely relying on behavioral data that may yield similar results on the surface to rhetorical persuasion. Multiple

neuroimaging studies on persuasive communication and social influence have been able to identify specific set of brain systems associated with the feeling of persuasion (Falk et al., 2010a; Cassio, Scholz, & Falk, 2015). Activation in brain regions within the network has even been shown capable of predicting the extent of participants' behavioral changes, such as a reduction in smoking (Falk et al., 2010a; Falk et al., 2010b).

Persuasion and the Brain

Persuasion requires the complex cooperation of multiple brain regions, such as the social cognition network (ventromedial prefrontal cortex and dorsal anterior cingulate cortex) and particularly the mentalizing network (medial prefronal cortex, dorsomedial prefrontal cortex, and temporoparietal junction); regardless of culture, language, or media presentation (Falk et al., 2010a; Cassio, Scholz, & Falk, 2015). Given that these networks are known to be also active for processes other than as components of persuasion (e.g. encoding of memory, affect, and mentalizing among others; Cascio, Scholz, & Falk, 2015). We can then infer that persuasion is broadly an adoption of ideas from the message source and integration into the individual's mental state. It is a form of social learning where the norms from others' perspectives are absorbed into self-identity to lead to changes in attitudes and behaviors (Falk et al., 2010a). Importantly, the persuasiveness of a message is modulated by the message source's mentalizing ability and consideration of others' mental states and possible uses of information (Cascio, Scholz, & Falk, 2015). Persuasion therefore requires the tuned ability to understand and empathize with the other's perspective, and be reciprocated by the other towards the message source.

Persuasion Regions of Interest (ROIs)

The regions that have been most robustly identified in persuasion and a resulting

change in attitude or behavior are centered in the prefrontal cortex. The dorsomedial prefrontal cortex (DMPFC), known to be active for social cognitive and mentalizing tasks, and ventromedial prefrontal cortex (VMPFC), a region that assigns a value to a message based on an individual's motivations and goals, have both been shown to both be more active during persuasive message presentation than during unpersuasive (Falk et al., 2010). Increased activity in the VMPFC when participants were presented with anti-smoking advertisements predicted smoking reduction one month after (Cascio, Scholz, & Falk, 2015). Individual differences in VMPFC activation successfully predicted participants' application of sunscreen and were a better predictor than self-reported attitudes of sunscreen use and intentions to change behavior (Falk, Berkman, Mann, Harrison, & Lieberman, 2010). The medial prefrontal cortex (MPFC), a region anterior to DMPFC was also able to predict participant behavior. The co-activation of this region with the precuneus suggests that participants engage in self-identity processes when listening to and processing persuasive messages (Falk et al., 2010b). In Falk and colleagues' (2010b) experiment MPFC activation was able to predict an average of 23% more of the variance in behavioral change than self-reported attitudes did. These findings demonstrate the ability of neuroimaging studies to predict changes in behavior from neural activity (Falk et al., 2010a), and highlights the importance of moving from behavioral studies to neuroimaging to observe the complex brain networks at play in narrative persuasion.

To date, neuroimaging studies have only incidentally incorporated narratives in conditions of "strong" persuasion; one example is the use of negatively-valenced, highly arousing narratives in anti-drug public service announcement videos (Ramsay, 2013).

The lack of studies is disappointing, given that the most effective persuasive messages seem to be those that draw on affective reactions as well as engagement of executive functions (Ramsay, 2013). Instead, the literature has focused on rhetorical messages as the defining form of persuasion.

Narrative vs. Rhetorical Persuasion

Narratives have been identified as "stor[ies] that raise unanswered questions, unresolved conflicts, and/or depicts not yet completed action", but the key difference for its persuasive potential lies in individuals' approach to narratives in comparison to rhetorical arguments—narratives, be they fictional or non-fictional, are often approached more emotionally (Green & Brock, 2002). Many people have shared the sensation of becoming "lost in a book" and being emotionally involved with the characters' in the narrative, even when narrative aspects are incongruent with reality (Green & Brock, 2000). Experiences such as these suggest that the cognitive processes underlying narrative persuasion differ from the persuasive techniques of rhetorical arguments. This alone suggests that more research is necessary to fully to understand these differences.

Narratives are potentially even superior to arguments, as they have been found to lead to attitude changes that are more persistent and more resistant to interference or counterinfluence (Green & Brock, 2002; Green & Clark, 2013). One theory to explain this persistence is Green and Brock's Transportation-Imagery Model, which stresses retrieval fluency and recollective detail. The model states that this persistence is built on narratives' ability to tie abstract arguments to concrete narrative events and transport individuals through these memories of the narrative alone. Through repeated transportation the narrative's mental images have multiple opportunities to influence

attitudes. The source's persuasive content also becomes more strongly enmeshed with the memory of the narrative itself through repeated transportation, encouraging retrieval fluency. This enmeshment is even stronger when the psychologically intense narrative images are encoded into memory and therefore more easily retrievable in rich recollective detail. It is comparatively more difficult to recall a rhetorical argument's original logic or related points without such events as cues. For arguments, presentation of conflicting evidence is often enough to weaken belief in the argument while transportation compels readers to inhibit mental counter-arguing and distance themselves from real-world facts that could potentially discredit the persuasive content in the narrative. Narratives do not lose its persuasiveness if the narrative source is less trustworthy. Rather people are compelled to suspend their disbelief to immerse themselves into the narrative for enjoyment (Green & Brock, 2000).

Given that narratives have shown at the very least to exhibit a different behavioral mechanism of persuasion (Green & Brock, 2000; Green & Brock, 2002), it is all the more perplexing that research on the subject of persuasion has hardly been focused on narratives, instead looking at rhetorical messages presented through various forms of other media that may have employed narratives themselves (Falk et al., 2010a; Green & Clark, 2013; Ramsay, Yzer, Lucian, Vohs, & MacDonald, 2013).

Although Falk's (2010a, 2010b) work provides us with insights into the neural correlates of general persuasion, there is no research on the neural correlates of narratives as a persuasive medium. In order to understand how persuasive narratives influence behavior, we need to know its neural correlates.

Current Research

Our research investigated (1) the perceived persuasiveness of strong and weak persuasive messages and (2) neural activation differences underlying the cognitive processing of these messages when presented either embedded in a narrative context or as a standalone rhetorical argument. We included a non-narrative control condition to calculate the power of narrative context on persuasion of attitudes as none of the experiments that have used persuasive narratives previously contained a condition that served as a baseline. Our study's manipulation of the persuasive strength of messages only also allows direct comparison between narratives and arguments.

CHAPTER 2

METHODS

The present research combines the behavioral body of literature on narrative persuasion and the developing field of neural mechanisms of persuasion. We aim to understand the cognitive effects specific to narratives as a persuasive medium compared to rhetorical arguments, and identify the neural correlates underlying theses effects.

Norming of Persuasive Messages

We first began with a behavioral study to normalize our stimuli. 52 student participants at Stony Brook University rated the emotional appeal, logical appeal, and persuasiveness of 24 health issues on a scale of 1 to 9. The weak and strong message versions of each health issue were presented so that participants were either shown a total of 48 messages as standalone arguments (N = 22) or 48 messages embedded within a narrative context (N = 23). In the narrative context condition there is a brief story set-up introducing the characters and situation relevant to the health issue. The message would then be delivered as character dialogue.

An example of the persuasive messages used in our study is a health issue concerning whether all individuals should donate blood. In the non-narrative condition the message is displayed alone:

> Sooner or later, almost everyone ends up needing to get blood, but only a small fraction of people who are eligible actually donate when they can. If you give blood, you will give someone's child another chance at life.

In the narrative context condition, the message follows a story from the point of

view of a mother who is waiting in the hospital for news on whether her daughter's rare blood type was successfully obtained for a needed transfusion. During her wait she reflects on a conversation she had with her coworker who left during work to donate blood earlier that week. See Appendix A for entire transcription of the narrative context and weak persuasive version of the message.

Persuasive Message Presentation in fMRI

Participants listened to audio recordings of either 24 messages with a narrative context (N = 12) that average 90 seconds each or 24 as standalone arguments (N = 12) that average 14 seconds each; half of which would be strong persuasive messages. The transcript was also shown while the audio recording played. Messages for our fMRI study were chosen based on behavioral results so that emotional appeal would not influence the perceived persuasiveness of strong from weak messages.

Participants and Measures

Participants were students who volunteered through the Georgia Institute of Technology's School of Psychology SONA online platform. All participants were at least 18 years old, right-handed with normal vision and no professionally diagnosed neurological or psychiatric disorders. Participants completed the study during one session at the GSU/GT Center for Advanced Brain Imaging (CABI) with scan time varying from 30 to 75 minutes depending on the experiment condition group (narrative context or non-narrative). The total duration of the experiment, including preparation time and post-scan attitude testing, was at most one and a half hours.

fMRI Data Acquisition & Procedure

The study began with a practice session of 2 messages presented as narratives or arguments, depending on the condition. The audio recording automatically played when the transcript is presented on screen. In the narrative context condition, following the audio recording, participants answered one true or false comprehension question to ensure that participants had attended to the stimuli presentation. The participant's response is recorded with a button box. A fixation cross is shown before the next message appeared. During the practice, a structural brain scan occurred. Following the practice, a resting state scan is taken to serve as a brain activity baseline. Then 6 randomized runs of the task occurred. After the scan, participants completed an attitude questionnaire in a separate testing room. They rated from 1 to 9 how much they agreed with each of the 24 health attitudes that take a particular stance on each of the health issues presented. A health attitude is presented as a suggested statement; for example "we should all donate blood". See Appendix B for list of all health attitude items on the questionnaire.

fMRI Data Analyses

Each trial from the fMRI session was coded based on each participant's subsequent responses given on the attitude questionnaire. Post-scan attitude ratings were used to differentiate strong and weak messages based on whether their attitude rating for a health attitude item was above or below the participant's median response on the attitude questionnaire. This classification for strong and weak messages was used for the fMRI analyses.

A whole-brain general linear model (GLM) analysis using AFNI was conducted on each participant to identify regions of significant activity change during the processing of strong versus weak messages. Group contrast maps were then spatially normalized to a

standard brain (Montreal Neurological Institute [MNI]) so cortical regions showing significant activity across participants can be tested. Of primary interest is the contrast between the processing of messages in the context of a narrative versus the same message presented on its own. We looked at strong-weak persuasive strength and high-low emotional appeal contrasts for narrative context condition and non-narrative condition. Statistical parametric maps of t-values for each contrast were thresholded at a corrected family-wise error rate of .05. This was achieved by first setting an uncorrected p-value of .001, then applying a minimum cluster size of 32 voxels, as determined with Monte Carlo simulations using the program 3dClustSim. These clusters of significant activity were used as ROIs to test for differences between groups. Data from these ROIs were extracted and subjected to a 2 x 2 mixed ANOVA of condition (narrative context, none) as a between-subjects factor and persuasive strength (strong, weak) as a within-subjects factor. A 2 x 2 mixed ANOVA of condition and emotional appeal (high, low) was also applied to ROIs data. Both persuasive strength and emotional appeal were defined according to ratings in the initial behavioral sample rather than the fMRI sample's post-scan scores.

CHAPTER 3

RESULTS & DISCUSSION

Perceived Persuasive Strength

Strong messages were considered more persuasive than weak messages for the behavioral sample (Figure 1, $F(1,51) = 155.01$, $p < .001$). When enfolded in a larger narrative context however, weak messages' perceived persuasiveness was strengthened (Figure 1, $F(1,51) = 5.55$, $p < .05$). The pattern is not observed for strong messages, which may indicate either a ceiling effect, where the addition of a narrative context can no longer make the message more persuasive, or that our narrative contexts were not effective enough to further strengthen already persuasive messages. No significant trends were observed for the fMRI sample, including the mean effect of strong vs. weak messages (M = 6.87, M = 6.38, p = .077).

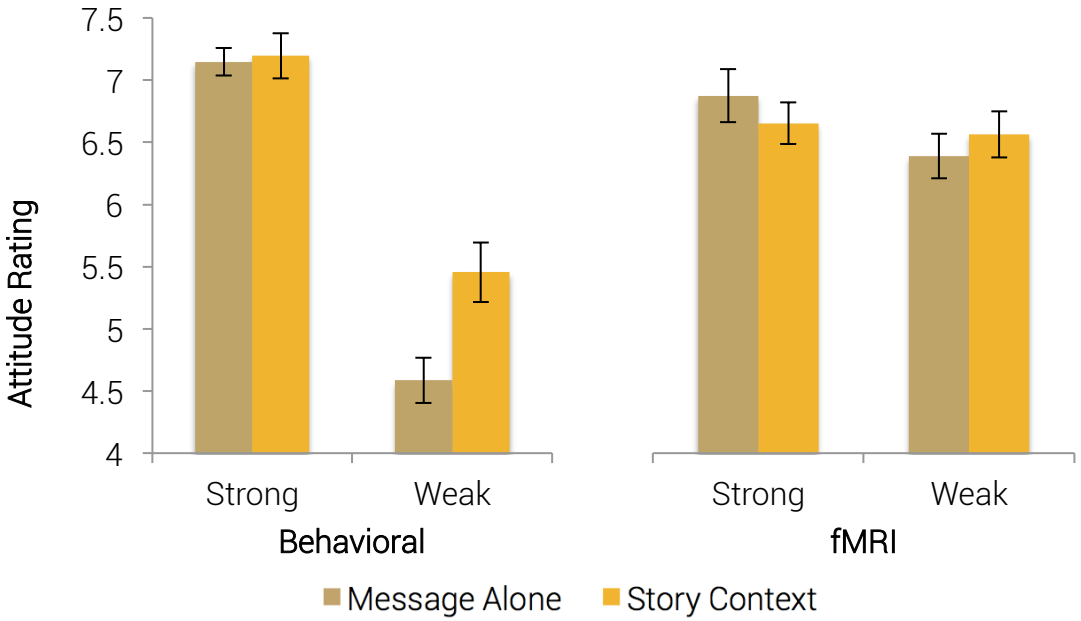

Figure 1. Post-Presentation Attitude Ratings. For the behavioral sample, strong messages were more persuasive than weak ($F(1,51) = 155.01$, $p < .001$), but only weak messages were perceived as more persuasive with a narrative context (M = 5.45, M = 4.59, $F(1,51) = 5.55$, $p < .05$). No significant trends were found for the fMRI sample.

Given the rudimentary structure and short length of our narrative contexts (see Appendix A), we believe the limited interaction of narrative context improving on messages' persuasive strength is due to their ineffectiveness as transportive narratives. Each stimulus took only on average 90 seconds in audio play and while narrative context took the majority of that time, the length may have affected how deep an emotional attachment participants developed towards the characters or events portrayed. The content for many of the health issues are neither psychologically intense, as in Green & Brock's study (1998) using a previously published story of a young child's murder in a shopping mall, or particularly emotional seeing as we intended to prevent emotional appeal to confound the perception of messages' persuasiveness when normalizing messages.

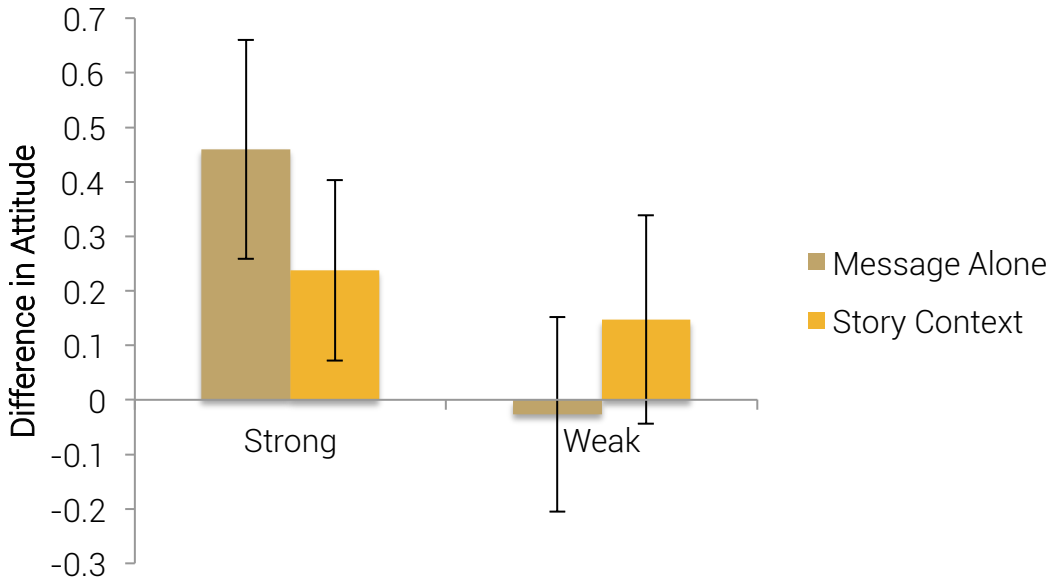

Figure 2. Difference in Post-Attitude Ratings Between Samples. Without narrative context strong and weak messages had greater difference in persuasive strength than messages with narrative context.

While the narrative contexts were able to improve the perceived persuasiveness of weak messages, the proposed mechanisms unique to narratives may be underdeveloped overall and thus ineffective at improving the persuasiveness of strong messages that are already highly persuasive through aspects narratives do not have as strong an effect on, such as logical appeal. If the narrative contexts were longer or more resemble the suspense and complexity of an engaging narrative, it would increase the likelihood for participants to become emotionally attached to aspects of the narrative world. Feeling emotional attachment towards the characters may carry over to the emotional appeal of the messages. In other words, emotional attachment provides abstract persuasive arguments concrete emotional events that participants can recall more easily and in richer detail; particularly at the time of the attitude questionnaire following a barrage of 24 different narratives in the narrative context condition. Recall of these emotional narrative events would transport the participant back into the narrative and once again expose them to the persuasive messages enmeshed in those events. Another possible explanation could be that participants are not mentally forming counterarguments towards strong messages so narrative contexts would not be able to improve persuasiveness by inhibiting counter-arguing.

In narrative persuasion studies, researchers should consider having participants complete the general items in Green & Brock's (2000) Transportation Scale following each narrative presentation or as a part of narrative context normalization to ensure transportiveness of each narrative context does not differ for each stimulus. Our normalization did not look into how transportive each narrative context was itself, but inferred through comparison of persuasive strength. For that reason we intend to compare attitude ratings for each health attitude item rated by both behavioral and fMRI samples across persuasive strength conditions. A more meaningful interaction effect between persuasive strength and narrative context may be observed with this method.

Persuasive Strength and Emotional Appeal Related ROI Analyses

We found greater activity in the frontal and parietal regions for strong messages compared to weak and deactivation in the temporal lobes. High emotional appeal messages compared to low exhibit a similar pattern of activation, but in more subcortical and medial regions (Figure 3). Following ROI analyses, we found greater activity in the bilateral precuneus and middle frontal gyrus (Figure 4); and greater activity in bilateral precuneus, medial frontal gyrus, anterior cingulate cortex (ACC), and right supramarginal gyrus for messages high in emotional appeal compared to low (Figure 5).

Interestingly, research focused on persuasion in a social context has identified the dorsal ACC as a key region for updating behaviors to become aligned with the group's and is often coactivated with the anterior insula which encodes the feeling of discomfort from group misalignment (Cascio, Scholz, & Falk, 2015).

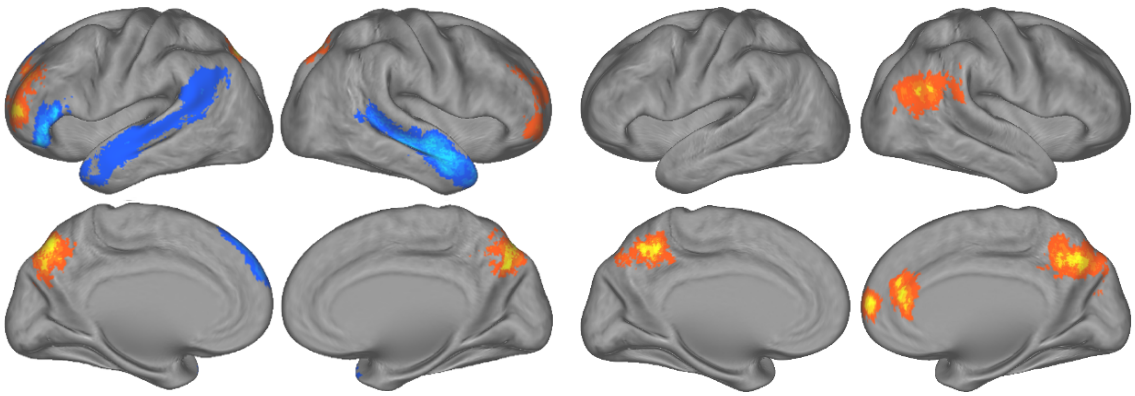

Figure 3. Main Effect of Strong vs. Weak Persuasive Strength (left); High vs. Low Emotional Appeal (right). Activation shown with a threshold of $q = .05$, false discovery rate (FDR) corrected for persuasive strength contrasts, except emotional appeal contrasts.

We did not find activation patterns in the DMPFC, or VMPFC that follow the patterns reported in past research (Falk et al., 2010a; Cassio, Scholz, & Falk, 2015), however this could be due to the usage of behavioral sample's attitude ratings, rather than

on an individual participant basis, to define strong and weak messages. High emotional appeal messages however, exhibited medial frontal gyrus activation, an area within the medial prefrontal cortex. There is also extensive overlap in regards to the precuneus, with greater activation for high emotional appeal than persuasive strength.

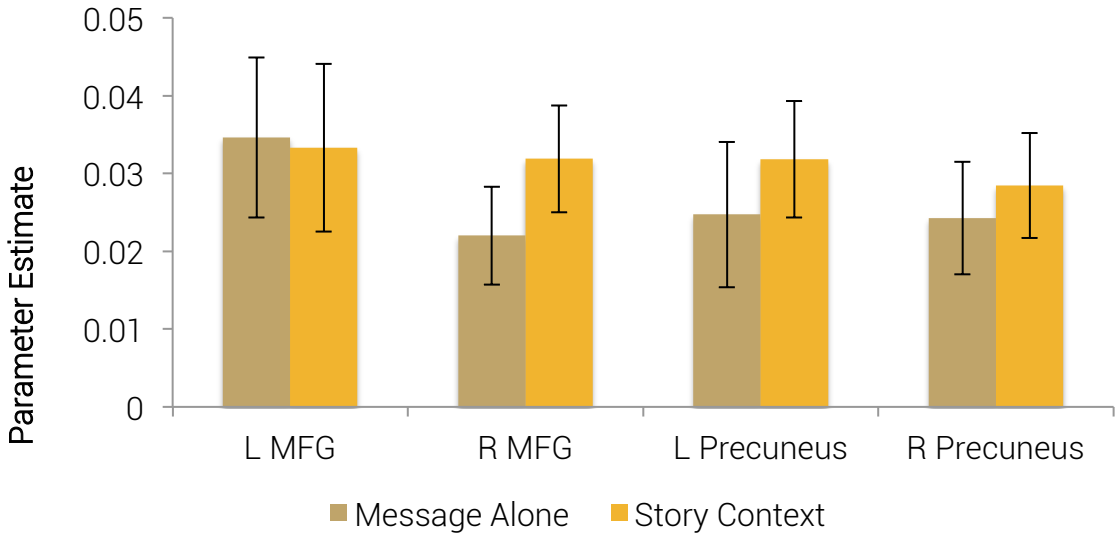

Figure 4. Regions of Interest for Strong vs. Weak Persuasive Strength. L = left; R = right; MFG = middle frontal gyrus.

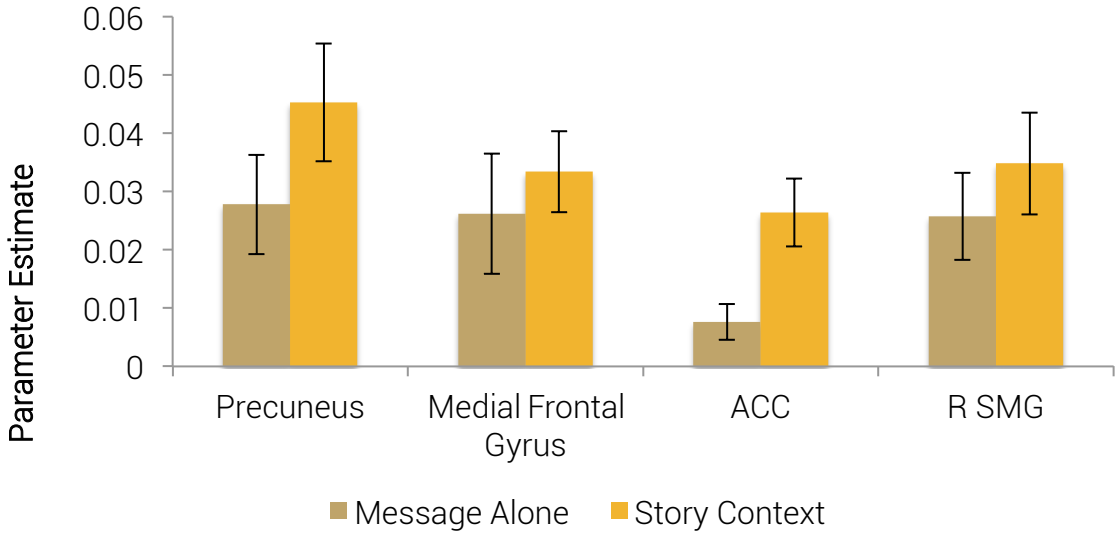

Figure 5. Regions of Interest for High vs. Low Emotional Appeal. L = left; R = right; ACC = anterior cingulate cortex; SMG = supramarginal gyrus.

It is peculiar that ROIs identified in past research as associated with the feeling of persuasion are more salient in analyses of high emotional appeal messages than strong persuasive messages, especially considering our strong messages did not differ from weak in their average emotional appeal as was intended in our normalization (M = 5.88, M = 5.56; p = .25). Seeing the overlap in ROIs between persuasive strength and emotional appeal then, past research may have confounded these two aspects of persuasion.

Further analyses will be conducted to see (1) whether high emotional appeal had an effect on subsequent attitudes and (2) if message presentation in narrative context condition overlap in neural activity with high emotional appeal messages. Multiple methods have been considered for these analyses, including measuring how emotional each narrative context is and applying this perspective to see how it affects the BOLD response and subsequent post-scan attitudes. For these analyses, we will redefine what is considered a strong or weak message based on individual post-scan ratings in the fMRI sample rather than behavioral sample and code trials from the fMRI session accordingly. Data from ROIs will then be subjected again to the mixed ANOVAs of group and persuasive strength or emotional appeal with this more accurate classification.

Seeing that the narratives are emotional within themselves (though messages were normalized for emotional appeal), there is likely some overlap in brain activation. If emotional narratives prove to have an effect on perceived persuasiveness, in future studies we can look more closely to see how specific narrative features modulate the effect, such as how much empathy particular narratives evoked or the timing of the message within the arc of rising and falling suspense.

To conclude, only weak messages were perceived as more persuasive with a narrative context while strong messages were unaffected. Strong messages exhibited greater activity in executive frontal and parietal regions than weak. In comparison to

strong messages, high emotional appeal messages exhibited greater activity in mentalizing and perspective taking ROIs associated with feeling persuaded. Previous research may have confounded persuasive strength with emotional appeal, but this provides further support that persuasion requires both executive and affective processes, in which narratives seem to activate more than rhetorical arguments (i.e. persuasive messages without narrative context). If the persuasive ability of narratives was better understood, they could be used in public service announcements to influence individuals to make beneficial health decisions or in other various forms and sectors to affect non-health related attitudes.

Table 1. Regions of Activation for Strong vs. Weak Persuasive Strength

Laterality	*Region*	*BA*	*t-value at peak voxel*	*Size (voxels)*	*x*	*y*	*z*
Increases:							
Right	Middle Frontal Gyrus	10	5.683	103	45	51	6
Right	Middle Frontal Gyrus	10	5.113	65	42	51	36
Left	Precuneus	7	4.993	50	-12	-69	36
Decreases:							
Left	Superior Temporal Gyrus	38	-8.766	392	-48	15	-36
Left	Supramarginal Gyrus	40	-5.835	137	-51	-51	21
Right	Middle Temporal Gyrus	21	-5.917	133	57	3	-21
Left	Superior Frontal Gyrus	9	-6.600	130	-9	60	39
Right	Uvula		-6.596	105	30	-78	-33
Right	Superior Temporal Gyrus	38	-7.375	70	48	18	-27

Notes. Clusters of at least 50 voxels with a threshold of $q = .05$, FDR corrected, are listed; BA = Broadmann's Area.

Table 2. Regions of Activation for Narrative Context vs. No Context

Laterality	*Region*	*BA*	*t-value at peak voxel*	*Size (voxels)*	*x*	*y*	*z*
Increases:							
Left	Parahippocampal Gyrus		13.005	5025	-27	-48	12
Left	Middle Frontal Gyrus	10/9	7.09	1164	-45	48	18
Right	Inferior Parietal Lobule	40	7.791	841	48	-45	51
Left	Inferior Parietal Lobule	40	6.872	770	-60	-42	45
Right	Precuneus	7	6.702	482	12	-63	39
Left	Superior Frontal Gyrus	6	4.334	119	-21	9	63
Right	Insula	47/13	4.112	113	39	15	-6
Left	Superior Frontal Gyrus	11	4.616	110	-24	48	-15
Right	Inferior Frontal Gyrus	9	4.849	76	57	15	30
Left	Insula	13	3.735	68	-42	9	0
Decreases:							
Right	Cuneus	17/18	-9.49	5339	12	-96	0
Right	Middle Temporal Gyrus	22/21	-8.005	1523	60	-36	3
Left	Superior Frontal Gyrus	11	-4.384	105	-3	69	-12
Right	Parahippocampal Gyrus	28/35	-3.944	88	21	-15	-15
Left	Inferior Frontal Gyrus	45	-3.468	85	-51	21	18

Notes. Clusters of at least 50 voxels with a threshold of $q = .05$, FDR corrected, are listed; BA = Broadmann's Area.

APPENDIX A

Sample Message for Blood Donation Health Issue

Below is the presented stimulus for the attitude item "we should all donate blood" for the narrative context condition. In the non-narrative condition the message shown as Carl's dialogue would be displayed alone.

Narrative Context Opening

Joan was waiting to get news about her teenage daughter, Penny. Joan had been in a meeting at work when her secretary ran into the room. The secretary had said, "Joan, you need to get to the hospital. Penny has been in an accident!"

Joan rushed to the hospital and found Penny lying in the emergency room. Penny had tripped at her friend's house, and crashed through a glass table. The glass had sliced into Penny's face and wrists.

Joan consulted with the doctor in the emergency room. The doctor said, "Penny has lost a lot of blood. We need to give her a transfusion. However, as you probably know, your daughter's blood type is incredibly rare. We don't have her type here right now, and even your blood doesn't match. We've put a call out to all the area hospitals to see if we can get the blood to save her."

Now Joan was waiting for the doctor to give her an update. She couldn't help but think back to a conversation she'd had only a week ago with her co-worker Carl.

It was lunchtime, and Carl was heading out of the office. He had said to Joan, "I'll see you in about an hour. I'm on my way to give blood."

Joan had asked, "Have you done that a lot?"

Version 1: Strong Message

Carl replied, “Sooner or later, almost everyone ends up needing to get blood, but only a small fraction of people who are eligible actually donate when they can. If you give blood, you will give someone's child another chance at life.”

Version 2: Weak Message

Carl replied, “When you give blood, you can feel good about the fact that you've done something good with very little inconvenience to yourself. It doesn't take that much time to give blood, and you can tell your friends when you're done.”

Narrative Context Closing

Joan had said, “I’ll be here when you get back.”

Jane heard her name being called by a doctor who looked like he’d just come from the operating room. The doctor told Jane that Penny was going to have to stay in Intensive Care, but they were hopeful that she would survive the accident.

APPENDIX B

Post-Reading Attitude Questionnaire

Following reading the messages or the scan in the behavioral sample and fMRI sample respectively, participants completed an attitude questionnaire regarding 24 health issues.

Attitude Questionnaire Items

1. We should all donate blood.
2. It is important for people to get their blood pressure checked regularly.
3. It is good for people to have pet dogs.
4. You should floss daily.
5. When cooking, you should use a food thermometer.
6. Children should be required to start learning a foreign language in elementary school.
7. Young children should not be allowed to play violent video games.
8. Children should learn Latin at a young age to make them smarter.
9. White lies are not only okay, but they are also necessary sometimes.
10. Marijuana should be legal for people who have medical issues.
11. It's worth it to spend money for a decent mattress.
12. All countries of the world should give up their nuclear weapons.
13. You should incorporate Omega-3 Fatty Acids into your diet.
14. We should all take public transportation.
15. Parents should provide strict rules for their children.
16. It is a good idea to use a shampoo containing avocado oil.
17. People should try to get at least 8 hours of sleep each night.
18. People shouldn't smoke tobacco products.

19. People shouldn't drive over the speed limit.

20. The use of steroids should be banned for all athletes.

21. You should wear sun block every time you go outside during the day.

22. You should wash your hands several times a day.

23. In foreign countries, people should only drink bottled water.

24. Practicing yoga has many benefits.

Questions Regarding Each Item

This argument is:

Weak/Unconvincing Strong/Convincing

1 2 3 4 5 6 7 8 9

How much do you think these statements appeal to emotions/feelings?

Not at all Very Much

1 2 3 4 5 6 7 8 9

How much do you think these statements appeal to facts/information?

Not at all Very Much

1 2 3 4 5 6 7 8 9

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