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Feeling the story: Background music's effect in news podcasts

Raymond Paul Grogan

A Thesis in the Field of Psychology

for the Degree of Master of Liberal Arts in Extension Studies

Harvard University

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Abstract

Narrative news podcasts are a popular form of podcast that combine storytelling and background music to make entertaining and informative audio reports about events in the news. Narratives are known to influence consumers' affect, feelings of transportation, and attitude about the story content, and the valence and arousal levels of background music can cause similar effects in listeners. The combined effect of narratives and music on listeners of narrative news podcasts is unknown but research suggests the effect may have differing effects on listener affect, attitude, and feeling of transportation, which together my make listeners more susceptible to the persuasive nature of narratives and cause them to make decisions based on misinformation. This study used a 2 x 2 x 2 between-subjects design to measure participant pre- and post-condition affect, post-condition transportation and post-condition attitude change. Participants listened to a podcast excerpt containing a narrative news script in either an economic benefit or environmental consequence framing combined with varying combinations of valence and arousal. The environmental consequence text, independent of background music, was most effective at influencing changes in participants' affect, attitude, and feeling of transportation. No significant differences were found between groups in conditions containing background music. This study fills the gap in the literature and provides an anchor for future narrative news podcast studies.

Keywords: podcast, narrative news, framing, affect, attitude, transportation, misinformation

Dedication

I dedicate this thesis and the work involved to my mother, Eula. Mom, thank you for giving me the freedom to explore my world and the encouragement to pursue my interests. I could not have developed into the person I am today without your continued support.

Acknowledgments

I would like to express my gratitude towards Professor Mayron Piccolo and Dr. Adrienne Tierney for their patience, guidance, and encouragement throughout my thesis development and execution. I would also like to thank all my professors and peers at Harvard Extension School and Harvard University for their contributions to my education. I would like to thank Dr. LeeAnne McNulty for providing an engaging experience during my first psychology class at Allan Hancock College, an experience that inspired me to pursue an academic education in psychology. I would like to thank Amanda Cooey and Tiffany Hutter for lending their voices in the creation of the stimuli for this study. Lastly, I would again like to thank Amanda Cooey for her patience, support, and encouragement. You have been the most understanding partner and friend that I have ever had and could ever ask for. Thank you for keeping me grounded during the difficult times.

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Chapter I.

Introduction

Narrative news podcasts are a contemporary form of news media that is underrepresented in the scientific literature, despite the popularity of news podcasts. Many podcast listeners, some 67% in 2022, listened to podcasts where news was discussed and 29% of listeners in 2022 consumed podcasts to stay up to date with current events (Shearer et al., 2023). Elements of narrative storytelling, including dialogue, first-person voice, and dramatic tension are used in narrative news podcasts, providing an engaging and entertaining experience for listeners (Nee & Santana, 2021). In addition to being engaging and entertaining, research suggests narratives influence audience affect and attitude, as well as feelings of transportation (Petty & Briñol, 2015; Shen et al., 2014). The stories used in narrative news podcasts may be framed within a certain theme or journalistic narrative (van Krieken & Sanders, 2021) and previous research suggests the framing of a news story can also influence audience affect and attitude (Shen et al., 2014). While the effects of narratives and narrative news used in print and audio-video have been studied, previous research has not investigated how the narrative in narrative news podcasts influence listener affect and attitude.

Studies examining the effect and usefulness of background music in narrative news podcasts are also absent from the literature. Background music typically accompanies narrative news podcasts and although the effects of background music in different fiction and non-fiction media formats has been studied, researchers have not included narrative news podcasts in their studies of background music. Upon listening to

narrative news podcasts, it is evident that the music used is not random but instead complimentary or congruent to the content and framing of the news story; uplifting news stories are accompanied by music that is happy, or positive in valence, and tragic or upsetting news stories are accompanied by music that is sad, or negative in valence. Although scientific literature containing research about the effects of congruent and incongruent music-narrative pairings in television news magazines (Herget & Albrecht, 2022; Kopiez et al., 2013), documentaries (Herget & Albrecht, 2022), and film (Pavlovic & Markovic, 2011) exists, no research exploring these effects in narrative news podcasts exists among the literature.

The literature surrounding narratives and background music suggests combining the two in podcast format may influence the affect, attitude, and feelings of transportation of listeners beyond what either is singularly capable of. Additionally, the combinatory effect of narrative news and music may make audiences more susceptible to persuasive communication in a time when mis- and disinformation are prevalent in sources of information (Southwell & Thorson, 2015). Audiences may have difficulty detecting and counterarguing mis-and disinformation (Lewandowsky et al., 2012) and should therefore be made aware of situations where persuasion attempts may occur. Doing so would help prevent misinformation-based decisions made by individuals and society but researchers have yet to investigate the effect (Herget & Albrecht, 2022)

The present question is how the background music and framing used in narrative news podcasts influence listener affect, attitude, and feelings of transportation. The following literature review will provide the context necessary to address this question by focusing on a) podcasts, b) news podcasts, and c) background music.

Podcasts

Podcasts are relative newcomers to the digital age of the information ecology, with consumers and markets welcoming podcasts with open ears and growth expectations. According to Edison Research (2023), 83% of Americans twelve years of age and older knew what a podcast was in 2023, and 42% had listened to a podcast in the last month. The podcast industry had an estimated worth of over $25 billion in 2023 and is expected to be worth four times as much by 2028 (Business Research Company, 2024; PBS NewsHour, 2024). Podcasts consist of narrations or dialogues about topics ranging from sports, comedy, and music, to history narrations, true crime, news, and politics. Consumers listen to podcasts due to the platform's diverse content and ability to deliver entertainment and information on-demand (Chan-Olmsted & Wang, 2022) as well as satisfying their need for social interaction (Tobin & Guagagno, 2022). In 2022, 55% of US adults listened to podcasts to learn about something of interest, 60% listened for entertainment, and 52% listened to podcasts while doing something else (Shearer et al., 2023). Podcast listeners may develop parasocial relationships with hosts over the course of repeated listening, a phenomenon that also occurs in other media (Schlütz & Hedder, 2021; Tobin & Guagagno, 2022). In parasocial relationships, consumers develop a one-sided relationship with a media figure in which the consumer feels connected to the media personality, satisfying a number of social needs (Schlütz & Hedder, 2021; Tobin & Guagagno, 2022).

Podcasting is similar to other audio formats, such as radio, in that podcast creation uses similar production techniques, addresses similar content, and employs relatable hosts (Asier & Luis Miguel, 2022; Tobin & Guadagno, 2022). However, due to

the on-demand digital characteristics of podcasts and the way the medium is distributed and consumed, the technology itself has naturally developed its own culture and practices (Chan-Olmsted & Wang, 2022). Podcast consumers can interact with like-minded individuals and groups about many different topics, forming a participative culture that possesses the intimacy of radio and the self-curating quality of digital media (Berry, 2015; Kim et al., 2016; Schlütz & Hedder, 2021). The lack of production standards and absence of gatekeepers in podcasting, along with the do-it-yourself nature of the medium (Schlütz & Hedder, 2021) make for interesting and creative content as exemplified in NPRs wildly successful 2014 podcast Serial. Serial made use of production and editorial techniques from narrative storytelling, including character development, background music tracks, and the employment of a relatable host to draw in listeners (Asier & Luis Miguel, 2022; Berry, 2015). This format became the template for later podcasts, including news podcasts such as New York Times' The Daily (Asier & Luis Miguel, 2022; Berry, 2015).

News Podcasts

One popular form of podcasts are news podcasts. According to the Pew Research Center, 23% of American adults in 2021 at least sometimes obtained their news from podcasts (Walker, 2022). News podcasts are typically produced in two formats, informational and narrative. The more traditional informational style of news is presented in micro-bulletins and news roundups, both of which are based off of the inverted pyramid format (Asier & Luis Miguel, 2022). This format presents news information in descending order of importance, promoting quick and efficient editing and an objective presentation of the news (Pöttker, 2003). The narrative news podcast format, on the other

hand, uses techniques of narrative journalism and narrative storytelling, including dialogue, scene setting, and dramatic tension, to discuss news topics (Nee & Santana, 2021). The use of narrative journalism began in newspapers of the twentieth century in an attempt to institute a more progressive and interpretative method of journalism. It later migrated from the pages of newspapers and magazines to the broadcast and digital space as a result of the longstanding competition between newspapers, cable, television, and radio for audience engagement (van Krieken & Sanders, 2021). The use of narrative journalism as a format became further distilled in narrative news podcasts in a format called a "daily." Daily formats typically have a length of three to thirty minutes and are published every weekday. This format provides enough time for deep-dive analyses of contemporary issues with hosts who, through a personal narrative style, project an identity that is congruent with the nature and value of their respective news production organization (Asier & Luis Miguel, 2022). Studies of narrative journalism in the digital space are largely absent from the literature. As of 2021, approximately 8% of scientific articles about narrative journalism involved studies of its use in online and multimedia formats. Newspapers made up about 37% of the articles studied and broadcast and film made up approximately 5% and 2%, respectively (van Krieken & Sanders, 2021).

Research suggests narratives, such as those used in narrative news podcasts, can influence affect and attitude (Herget & Albrecht, 2022; Shen et al., 2014). In their 2014 between-subjects study examining the immediate and delayed effects of news narratives, Shen, Ahern, and Baker constructed a news story about gas drilling and created news articles in informational and narrative formats framed in both environmental consequence and economic benefit frames. The authors used newspaper and online information about

gas drilling in the Marcellus Shale, which is located in the Appalachia of North America, to construct the news stories. Shen et al. (2014) created an informational news and a narrative news format of an environmental consequence framing of the story, as well as an informational news and a narrative news format of an economic benefit framing of the story to provide study participants with contrasting narratives that, when read, would have a measurable effect on affect, attitude, and feelings of transportation. At the time of their 2014 study, Shen et al. chose gas drilling as the topic for their study due in part to the existing dialogue and debate and unsettled public attitude towards gas drilling. In 2022, the attitude of Americans toward gas production was mostly favorable due largely to American gas producers expanding production in order to meet gas import demands by European countries after their decision to reduce the use of Russian-supplied gas (Tyson & Spencer, 2022) Pricing and climate change considerations also factor into American attitudes towards gas production, as does political party affiliation (Kennedy et al., 2023). Thus, the issue of gas drilling is salient in the consciousness of Americans and the narrative and informational news stories produced by Shen et al. (2014) offer room for participants to identify with the characters in a world/setting that is familiar to them. Participants were randomly assigned an article to read and were asked to report how the article made them feel, how it made them feel about gas drilling, and how they felt twenty-four hours later. Participants reported experiencing significantly higher levels of transportation and empathy for characters in the narrative news format versus the informational news format. Additionally, participants reading the narrative format version of the environmental consequence framing reported having more negative views of gas drilling, indicating a significant negative effect on attitude that was present when

participants reported on their attitude at post-test twenty-four hours later. Interestingly, neither the narrative nor informational news format versions of the economic benefit framing had a significant effect on attitude. The results show empathy was most affected by the transportation that was generated by the narrative news format. Empathy, in turn, influenced participants' attitude. These effects became significant when the story was framed in terms of negative consequences.

News podcasts that use narrative formats and frame news stories in support of a particular narrative may affect listeners in a similar fashion to that of narrative news readers but research on the topic is scant. Sound can be employed to aid in the framing of discussions and narratives. Narrative podcasts have adopted such a strategy, strategically placing sounds to emphasize areas that should be of particular interest to the listener. Background music further frames the narrative through the influencing qualities of music. Listeners quickly gain an interpretive framework that tells them how to process events occurring in the story (Boltz, 2001; Eckstein, 2017; Hung, 2001). This suggests that framing can be used as an argumentative structure to persuade audiences through the communication of information and opinion, regardless of their truthful nature. While there is literature examining the effect that framing has on the readers and viewers (Green & Brock, 2000; Shen et al., 2014), little or no work has examined the effect that framing has on listeners of news podcasts.

Framing involves producing a news story within a set theme or narrative and presenting that narrative to an audience. In this way, the information that is distributed is controlled by the producer (Cacciatore et al., 2016). Framing news stories using a particular narrative may leave out contextual information. A story about an issue

spanning some temporal distance, for example, may be framed with the most current events and cultural issues in mind, absent context (Price et al., 1997). When context is unavailable or unclear, audiences either seek out the contextual information themselves, ignore the story, or accept the story with little or no counterarguing (Lewandowsky et al., 2012; Price et al., 1997; Shen at al., 2014). People often align their news consumption with news organizations that fit their values and beliefs (Price et al., 1997). Changing the opening and closing paragraphs of a news story or creating informational and narrative versions of a story can have an effect on the readers' affect, thought process, and attitude (Price et al., 1997; Shen et al., 2014). A producer that frames all news in a certain way may gather an audience and may continue to produce news content under the values of its audience. This may produce an echo chamber that is devoid of exogenous context and counterarguments.

Background Music

Another characteristic of narrative news podcasts that is absent from the literature are studies of how the background music that is used affects listeners. Background music, also known as incidental music (Bates & Deutsch, 2008), has been used in news production since the orchestra-accompanied video newsreels and documentaries of the late 1800s and early 1900s (Kalinak, 2010). The historical use of background music includes accompanying communication formats such as television newsmagazines, documentaries, radio programming, commercials, and film with background music (Kopiez et al., 2013). Initial uses of background music in media were creative in nature and used to reinforce aspects of character relationships and plot development (Kopiez et al., 2013), attract listeners to radio programing (Carpentier, 2010), and influence

consumer purchasing attitude and memory of product through commercials (MacInnis & Park, 1991). As radio and television technology advanced and the process of combining audio and visual mediums became easier, background music became more prominent in news programming. Editors and producers began to use background music as both a temporal placeholder and as an expression of the intended emotional tone, perceptually transporting listeners and viewers to news event locations (Bates & Deutsch, 2008). Later uses of background music in news programming coincided with the medium's move from traditional, objective presentations of news events to more literary and narrative styles of journalism.

The usefulness of background music in non-fiction media like news podcasts, as opposed to the existing studies of the effects of background music in fiction media such as films (Herget, 2021a; Herget, 2021b), is unclear but researchers have attempted to substantiate music's use in non-fictional media and have found conflicting results. Boeckmann et al. (1990) found that background music had a negative effect on the recall of details pertaining to a training video. Recent studies on background music have uncovered positive effects of music on credibility, memory of content, and attitude in non-fictional media formats when manipulating specific characteristics of music, such as mode, melody, and tempo (Eerola & Vuoskoski, 2013; Herget & Albrecht, 2022). Early music studies have shown that music can induce arousal and emotions in listeners and can have an effect on pre-existing attitudes (Eerola & Vuoskoski, 2013). In their study about the effects that background music used in television news magazines had on participant evaluations on a report about an energy-saving lightbulb that was toxic, Kopiez et al. (2013) found background music was not successful at influencing

participant attitude towards energy-saving lightbulbs. The researchers also found no effect of the valence and arousal levels of the background music on participant attitude.

More recent studies have found that music can induce an emotional reaction in the listener, a quality considered to be the most important purpose of music in non-fiction media formats (Herget & Albrecht, 2022). If inducing emotions is a goal of using music in non-fictional media, then there is a potential for the listeners of news podcasts containing background music to experience changes in affect. Eckstein (2017) analyzed a podcast episode of WNYC's Radiolab in an attempt to uncover good practice use of sound as a presentation device. Eckstein found sound, including background music, was used throughout the Radiolab episode to direct the listener's attention. The sounds and music had arousing qualities, such sharp and ephemeral sounds that drew attention and enveloping sounds meant to draw the listener in to the discussion. Radiolab produced the episode in support of a particular stance on the topic of the episode and strategically placed the sounds and music to frame the story and capture listeners' attention. Eckstein concluded that Radiolab's use of sounds was "appropriate" based on a qualitative examination of the sound elements. Though this study is centered in argumentative studies, it demonstrates the explicit intent of the producers to frame the discussion in service of a particular point of view.

Transportation

Transportation is a phenomenon that occurs when a person attending to a story becomes immersed in the narrative and loses sense of reality (Green & Brock, 2000). Engagement in the narrative reduces their ability to think critically about the story and any message embedded in the narrative (Green & Brock, 2000). Audiences may identify

with the characters in narratives and want to see what happens to the characters in the story. Shen et al. (2014) investigated the mediating influence framing had on participants' feelings of transportation and the results showed that framing the story in terms of the environmental consequences of gas drilling and not the positive economic impact increased participants' feelings of transportation, which increased participants' feelings of empathy and directly affected their attitude about gas drilling. These results suggest narratives affect readers' attitude towards the topic of a narrative as a result of the empathy that is induced in readers. The empathy felt by participants is a result of the participants' identifying with the characters in the story and its effect is increased as a result of feelings of transportation. In other words, transportation can make readers more receptive of a message contained in a narrative, especially if the narrative is framed in such a way that the reader is drawn into the story and identifies with the characters.

Narrative transportation can evoke emotions and motivations, which in turn affect beliefs and attitudes, two key variables of persuasion (Petty & Briñol, 2015). Transportation is also a mediator of music's effects. Advertisers use moving music to create a cohesive, inviting, and persuasive experience for consumers. Research by Strick, de Bruin, de Ruiter, and Jonkers (2015) into the use of moving music in ads revealed that the use of moving music can decrease participants' detection of manipulation in audio-visual ads and increase participants' feeling of transportation. It is unclear if these same effects can be induced in news podcast audiences but framing the news presentation may increase the chance of effect.

In summary, narrative news podcasts are popular and ubiquitous, and contain elements of storytelling and entertainment, the effects of which influence affect, attitude,

and transportation. Though these properties by themselves influence affect, attitude, and transportation, there exists no literature that reports on whether these effects occur to listeners of narrative news podcasts and to what degree they occur. Given that this gap exists, the objective of the current paper is to investigate how narrative news format and background music affect listeners' affect, attitude, and transportation by stating and testing the following hypotheses:

RQ1: Does the frame impact listener behavior (i.e., affect, attitude, and transportation) independently of the background music?

The following hypotheses were developed to investigate RQ1:

H1a: It was hypothesized that, independent of background music, listener affect would decrease (i.e., decreased positive affect and increased negative affect) in the environmental benefit framing compared to the economic benefit framing and listener affect would increase (i.e., increased positive affect and decreased negative affect) in the economic benefit framing compared to the environmental consequence framing.

H1b: It was hypothesized that, independent of background music, there would be more incidences of attitude change in listeners of the environmental consequence frame than in listeners of the economic benefit frame.

H1c: It was hypothesized that, independent of background music, listener feelings of transportation would be greater after listening to the environmental consequence frame than after listening to the economic benefit frame.

RQ2: Does congruence between background music and framing (i.e., valence of background music and text framing) impact listener behavior (i.e., affect, attitude and transportation)?

The following hypotheses were developed to investigate RQ2:

H2a: It was hypothesized that when conditions contained congruent independent variables (i.e., economic benefit frame presented with background music that is positive in valence and environmental consequence frame presented with background music that is negative in valence), listeners' positive affect would decrease (i.e., decreased positive affect and increased negative affect) in the environmental consequence framing compared to the economic benefit framing and listeners' positive affect would increase (i.e., increased positive affect and decreased negative affect) in the economic benefit framing compared to the environmental consequence framing. When conditions contained incongruent independent variables (i.e., economic benefit frame presented with background music that is negative in valence and environmental consequence frame presented with background music that is positive in valence), listeners' positive affect would diminish (i.e., decreased positive affect and increased negative affect) and listeners' negative affect would increase (i.e., decreased positive affect and increased negative affect).

H2b: It was hypothesized that conditions containing congruent independent variables (i.e., economic benefit frame presented with background music that is positive in valence and environmental consequence frame presented with background music that is negative in valence) would cause more incidences of attitude change across listeners than conditions containing incongruent independent variables (i.e., economic benefit

frame presented with background music that is negative in valence and environmental consequence frame presented with background music that is positive in valence).

H2c: It was hypothesized that conditions containing congruent independent variables (i.e., economic benefit frame presented with background music that is positive in valence and environmental consequence frame presented with background music that is negative in valence) would cause listeners to experience greater feelings of transportation than listeners in conditions containing incongruent variables (i.e., economic benefit frame presented with background music that is negative in valence and environmental consequence frame presented with background music that is positive in valence).

RQ3: Does the arousal level of music impact listener behavior (i.e., affect, attitude and transportation) independent of framing?

The following hypotheses were developed in order to investigate RQ3:

H3a: It was hypothesized that, independent of the narrative frame background music low or high in arousal would increase positive affect and decrease negative affect when background music was positive in valence and decrease positive affect and increase positive affect when background music was negative in valence. However, background music high in arousal would have a greater effect on affect change than background music low in arousal.

H3b: It was hypothesized that, independent of framing, background music higher in arousal would cause more incidences of attitude change across listeners than background music lower in arousal.

H3c: It was hypothesized that, independent of framing, background music higher in arousal would increase feelings of transportation more than background music lower in arousal.

Chapter II.

Methodology

This chapter provides details on how the study was designed and executed in order to answer the research question and test the hypotheses. This study was approved by the Harvard Committee on the Use of Human Subjects on June 12, 2023 and data collection took place on September 20, 2023.

Design

The experiment employed a 2 x 2 x 2 between-subjects design. The independent variables included the narrative frame of the news story topic (economic benefit, environmental consequence), the congruency between narrative frame valence and background music valence (congruent, incongruent), and the arousal level of the background music (high, low). The dependent variables measured consisted of affect attitude, and transportation. The study was constructed and hosted on Qualtrics and hypotheses were preregistered on Open Science Framework (OSF). The podcast stimuli are also available on OSF.

Participants

Participants were recruited from the Prolific research website. Prolific keeps a registry of people that can be recruited as participants to take part in studies in exchange for compensation. G*Power (version 3.1; Faul et al., 2009) was used to determine an a

priori sample size of n = 390 [analysis of variance (ANOVA)]: Fixed effects, omnibus, one-way) based on G*Power's default small effect size of d = 0.25. Funding resources for the current study were limited, so only three hundred and thirty-three participants of the three hundred and ninety were recruited. The participants were recruited from the United States on Prolific and paid $4.00 USD each to complete the study. Funding for participant compensation was financed by the study author and no conflict of interest was reported. Forty-one participants left the study without completing it and 2 participants withdrew after completing the study. The demographics of the 290 participants are displayed in Table 1 and Table 2.

Table 1. Demographics- Economic Benefit Conditions

	Condition					
	EB Neg-High (*n*=29)	EB Pos-Low (*n*=28)	EB Pos-High (*n*=35)	EB Neg-Low (*n*=25)	No music (*n*=28)	Total (*n*=145)
Age (years)						
Mean (SD)	40.0 (11.6)	39.4 (12.4)	40.0 (14.3)	38.5 (12.4)	37.9 (14.8)	39.2 (13.1)
Median [Min, Max]	38.0 [19.0, 69.0]	36.5 [21.0, 60.0]	36.0 [19.0, 72.0]	38.0 [20.0, 68.0]	35.0 [22.0, 74.0]	43.7 [19.0, 74.0]
Gender						
Female	10 (34.5%)	14 (50.0%)	15 (42.9%)	13 (52.0%)	10 (35.7%)	62 (43.0%)
Male	19 (65.5%)	14 (50.0%)	18 (51.4%)	12 (48.0%)	17 (60.7%)	80 (55.1%)
Non-binary	0 (0%)	0 (0%)	1 (2.9%)	0 (0%)	1 (3.6%)	2 (1.3%)
Prefer not to say	0 (0%)	0 (0%)	1 (2.9%)	0 (0%)	0 (0%)	1 (0.6%)
Race						
Asian	1 (3.4%)	5 (17.9%)	0 (0%)	2 (8.0%)	1 (3.6%)	9 (6.6%)
Black or African American	4 (13.8%)	2 (7.1%)	5 (14.3%)	1 (4.0%)	5 (17.9%)	17 (11.4%)
White or Caucasian	19 (65.5%)	20 (71.4%)	25 (71.4%)	19 (76.0%)	19 (67.9%)	102 (70.4%)
Other	5 (17.1%)	1 (3.6%)	5 (14.4%)	3 (12.0%)	3 (10.7%)	17 (11.6%)
Prefer not to say	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Education						
Some high school or less	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
High school diploma or GED	3 (10.3%)	4 (14.3%)	5 (14.3%)	6 (24.0%)	1 (3.6%)	19 (13.3%)
Some college but no degree	7 (24.1%)	9 (32.1%)	8 (22.9%)	9 (36.0)	7 (25.0%)	40 (28.0%)

	Condition					
	EB Neg-High (*n*=29)	EB Pos-Low (*n*=28)	EB Pos-High (*n*=35)	EB Neg-Low (*n*=25)	No music (*n*=28)	Total (*n*=145)
Associates or technical degree	6 (20.7%)	3 (10.7%)	6 (17.1%)	1 (4.0%)	7 (25.0%)	23 (15.5%)
Bachelor's degree	13 (44.8%)	9 (32.1%)	12 (34.3%)	9 (36.0%)	11 (39.3%)	54 (37.3%)
Graduate or professional degree	0 (0%)	3 (10.7%)	4 (11.4%)	0 (0%)	2 (7.1%)	9 (5.8%)
Prefer not to say	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Note. Condition listings include the narrative frame and music; EB= economic benefit, Pos=positive valence, Neg=negative valence, High=high arousal, and Low=low arousal.

Table 2. Demographics- Environmental Consequence Conditions

	Condition					
	EC Neg-High (*n*=27)	EC Pos-Low (*n*=23)	EC Pos-High (*n*=27)	EC Neg-Low (*n*=32)	No music (*n*=36)	Total (*n*=145)
Age (years)						
Mean (SD)	41.8 (15.2)	39.3 (13.3)	37.0 (11.8)	33.6 (10.8)	35.3 (8.86)	37.4 (12.0)
Median [Min, Max]	37.0 [20.0, 77.0]	39.0 [20.0, 66.0]	36.0 [19.0, 64.0]	30.5 [21.0, 63.0]	33.0 [21.0, 60.0]	43.7 [19.0, 77.0]
Gender						
Female	13 (48.1%)	8 (34.8%)	10 (37.0%)	15 (46.9%)	11 (30.6%)	57 (39.5%)
Male	13 (48.1%)	13 (56.5%)	16 (59.3%)	17 (53.1%)	24 (66.7%)	83 (56.7%)
Non-binary	0 (0%)	2 (8.7%)	1 (3.7%)	0 (0%)	1 (2.8%)	4 (3.0%)
Prefer not to say	1 (3.7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0.7%)
Race						
Asian	1 (3.7%)	0 (0%)	2 (7.4%)	2 (6.3%)	3 (8.3%)	8 (5.1%)
Black or African American	2 (7.4%)	4 (17.4%)	1 (3.7%)	8 (25.0%)	1 (2.8%)	16 (11.3%)
White or Caucasian	22 (81.5%)	18 (78.3%)	22 (81.5%)	18 (56.3%)	27 (75.0%)	107 (74.5%)
Other	0 (0%)	1 (4.3%)	1 (3.7%)	4 (12.4%)	3 (8.4%)	9 (5.8%)
Prefer not to say	2 (7.4%)	0 (0%)	1 (3.7%)	0 (0%)	2 (5.6%)	5 (3.3%)
Education						
Some high school or less	1 (3.7%)	0 (0%)	0 (0%)	1 (3.1%)	0 (0%)	2 (1.4%)
High school diploma or GED	1 (3.7%)	4 (17.4%)	4 (14.8%)	5 (15.6%)	8 (22.2%)	22 (14.7%)
Some college but no degree	5 (18.5%)	6 (26.1%)	7 (25.9%)	8 (25.0%)	5 (13.9%)	31 (21.9%)
Associates or technical degree	5 (18.5%)	5 (21.7%)	4 (14.8%)	3 (9.4%)	9 (25.0%)	26 (17.9%)

	Condition					
	EC Neg-High (*n*=27)	EC Pos-Low (*n*=23)	EC Pos-High (*n*=27)	EC Neg-Low (*n*=32)	No music (*n*=36)	Total (*n*=145)
Bachelor's degree	13 (48.1%)	8 (34.8%)	8 (29.6%)	14 (43.8%)	8 (22.2%)	51 (35.7%)
Graduate or professional degree	2 (7.4%)	0 (0%)	4 (14.8%)	1 (3.1%)	5 (13.9%)	12 (7.8%)
Prefer not to say	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (2.8%)	1 (0.6%)

Note. Condition listings include the narrative frame and music; EC= environmental consequence, Pos=positive valence, Neg=negative valence, High=high arousal, and Low=low arousal

Materials and Measures

Development of the podcast stimuli included constructing and producing the narration, dialogue, background noise, and background music components of the podcast excerpt stimuli in Apple's Garage Band. These parts were then combined in Garage Band to form the ten tracks that were presented randomly to participants. Track lengths were between 3:37 and 4:08 minutes, depending on the condition. The length of each component is shown in Table 3 and the assembly of the components within any one track is shown in Figure 1.

All assessments were measured on a sliding scale. The Likert scale was changed to a sliding scale that contained the same Likert anchor descriptors for participant reference in Qualtrics during the experiment. For example, if the Likert scale used in the original questionnaire consisted of 7-points ranging from 1 = "Strongly Disagree" to 7 = "Strongly Agree," participants will be able to respond to the questionnaire items using a slider with a range of 0-100. The seven anchors from the Likert scale, e.g., Strongly Disagree, Disagree, Somewhat Disagree, Neither Agree Nor Disagree, Somewhat Agree, Agree, and Strongly Agree, were placed across the top of the sliding scale. Cronbach's alphas for each assessment were calculated with R.

Table 3. Length of Podcast Track Components

				Background Music				
Frame	Arousal	Valence	Music Type	Intro	Outro	Dialogue	Background Noise	Total Duration
EC								
	-	-	No music	-	-	3:32	1:02	3:42
	High	Positive	Happy	0:38	0:41	3:32	1:02	4:01
	Low	Positive	Calm	0:37	1:04	3:32	1:02	4:08
	High	Negative	Anxious	0:37	0:41	3:32	1:02	4:01
	Low	Negative	Sad	0:37	0:41	3:32	1:02	4:01
EB								
	-	-	No music	-	-	3:37	2:38	3:37
	High	Positive	Happy	0:36	0:50	3:37	2:38	4:02
	Low	Positive	Calm	0:37	0:58	3:37	2:38	4:02
	High	Negative	Anxious	0:37	0:58	3:37	2:38	4:02
	Low	Negative	Sad	0:37	0:58	3:37	2:38	4:02

Note. Length of time displayed is in minutes and seconds.



Figure 1. Example of Podcast Track Component Construction

Podcast Narration and Dialogue

The current study's author used the narrative news format version of the environmental consequence news story and the narrative news format version of the economic benefit news story developed by Shen et al. (2014) as the basis for the narration and dialogue in the podcast excerpts. These are provided in Appendix H (economic benefit) and Appendix I (environmental consequence). The narrative news format was used exclusively in the current study due to existing research having found the narrative news format to be more effective than the informational news format at influencing affect, attitude, and feelings of transportation (Green & Brock, 2000; Petty & Briñol, 2015; Shen et al., 2014). Additionally, time and funding resources for the current study were limited, therefore the use of a protocol where an observed effect was more probable was desired. Gas drilling was chosen by Shen et al. (2014) as a news story topic because the topic was salient and expected to have a significant effect on participant affect, attitude, and feelings of transportation. As the topic of gas drilling continues to be salient (Kennedy et al., 2023), it was also expected to have a significant effect on the affect, attitude, and feelings of transportation of participants in the current study.

Voice actors were recruited to perform the character dialogue. The narration was produced using ElevenLabs' generative artificial intelligence (A.I.) text-to-speech. This kept the voice actors and narration separate and reduced the chance of a confound that could have resulted from study participants recognizing a voice actor's voice as also performing the narration, which could cause participants to concentrate on how unreal the podcast was. Some participants used the "Do you have any thoughts or reactions about the study?" section of the funnel debrief to state their suspicion about the narrator's voice

being A.I. but the number of participants who stated this was small (n = 2). The final paragraph from the Shen et al. (2014) news stories, which was the same paragraph used in all of the stories the researchers created for their study, included examples of a pro and con about drilling in the Marcellus Shale, as well as information about its geographic location. A 25-second narration based on this paragraph was created using ElevenLabs' generative A.I. and was used as the intro narration on all podcast productions in the current study.

Background Music

Valence and arousal were chosen as dimensions of music to be used in the construction of the background stimuli due to both their common use in music and emotion studies (Eerola & Vuoskoski, 2013) and the expectation that combinations of the podcast scripts, which contain positive and negative valence, and background music, which also contain positive and negative valence, would have a larger effect on participant affect, attitude, and transportation than the podcast script alone. When background music was added to the podcast script, the pair were either congruent (i.e., environmental consequence frame combined with negative valence music (either sad or anxious music), economic benefit frame combined with positive valence music (either happy or calm music) or incongruent (i.e., environmental consequence frame combined with either positive valence music (happy or calm music), economic benefit frame combined with negative valence music (either sad or anxious music).

Apple's Garage Band was used to construct the background music. Four versions of background music were created to represent the four combinations of valence and arousal: anxious (negative valence, high arousal) calm (positive valence, low arousal)

happy (positive valence, high arousal), and sad (negative valence, low arousal). Music tracks were created by combining preexisting Garage Band instrument and music loops that were judged by the author and a rater as being representative of the four valence and arousal combinations. Eerola and Vuoskoski (2013) suggested using music samples ranging from thirty to sixty seconds in length, as this timeframe was found to be substantial enough to induce changes in the affect of listeners in previous music and emotion studies. The total amount of background music present in each track was approximately ninety to ninety-five seconds. Ten seconds of background music was presented alone at the beginning of the track. For the next twenty-five seconds, intro narration was played as the background music slowly faded out. No background music was presented during the main narration and character dialogues. Approximately sixty seconds of background music was played alongside either the narrator exposing some fact about the character's situation in the story or both the narrator and characters discussing some fact about the character's situation. Guidance on how to incorporate background music in the construction of a podcast is limited (Geoghegan & Klass, 2007), so the author adopted guidelines from existing studies that investigated background music's effects on film viewers (Boeckmann et al., 1990; Kalinak, 2010; Pavlovic & Markovic, 2011; Tan et al., 2007) and listeners of audio (Eckstein, 2017).

Demographics

After providing consent at the beginning of the study, participants were asked to provide their race/ethnicity, education level, and age using multiple choice answers.

Positive and Negative Affect Schedule

Due to the anticipated effect of the podcast narrative on the affect of participants, an instrument was needed to measure the change in participant affect. The Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) was used to capture participant affect due to the inventory's thoroughness in capturing affect (see Appendix C). The PANAS contains twenty items that are divided into two subscales, one measuring positive affect and the other measuring negative affect. Each subscale contains ten items that are answered using a sliding scale of 0 = "very slightly or not at all" to 100 = "extremely." Both PANAS subscales were administered to participants before and after listening to the podcast excerpt. The Cronbach's alphas for each subscale, pre- and post-condition, were: PANAS-negative-pre = 0.94, PANAS negative post = 0.93, PANAS-positive-pre = 0.92, and PANAS-positive-post = 0.92.

Attitude

The attitude questionnaire (Appendix D) was created by the author to capture participant's pre-existing attitude about the podcast topic and any change that occurred after being exposed to the podcast stimulus. Participants answered "yes" or "no" to two questions. The first question asked if an opinion about the podcast topic existed before listening to the podcast. This question included a follow-up question that, if the first question was answered in the affirmative, asked participants if their opinion was in support of or in opposition to gas drilling. The second question asked participants if their attitude about the podcast topic changed after having listened to the podcast. This question also included a follow-up question that, if the first question was answered in the

affirmative, asked participants if their change in attitude was towards supporting or opposing gas drilling.

The Transportation Scale

The Transportation Scale (Appendix A) developed by Green and Brock (2000) was used to measure participants' experience of transportation caused by the news story portion of the podcast excerpts. The scale was originally developed to be used when measuring levels of transportation that occurred when reading fiction and non-fiction text material. A transportation scale constructed to measure audio-based narratives does not currently exist. The Transportation Scale was adopted and modified by Williams et al. (2010) to be used with audiovisual stimuli. The authors replaced phrasing in the Green and Brock (2000) Transportation Scale that referenced reading with phrasing that referenced watching. The current study applied a similar strategy and rephrased the wording of the Transportation Scale to reference the act of listening. For example, the transportation scale item "While I was reading the narrative, I could easily picture the events in it taking place" was changed to "While I was listening to the podcast, I could easily picture the event in it taking place." Participants used a sliding scale from 0 = "not at all" to 100 = "very much" to answer the 11 items of the scale. Items 2 and 9 were reversed scored. The Transportation Scale had a Cronbach's $\alpha = 0.66$.

Podcast Uses and Gratification Scale

The Podcast Uses and Gratification (U&G) Scale as developed by Perks et al. (2019; Appendix B) and was used in the current study as a distractor at the beginning of

the experiment to reinforce the deception that participants were taking part in a study about a new podcast format.

Funnel Debrief

The funnel debrief consisted of four open-ended questions and two multiple choice questions. The funnel debrief allowed participants to express their opinion about what they thought the study was about and disclose behaviors that may be sources of confounding variables. The funnel debrief is available in Appendix E.

Procedure

Upon accessing the study invitation on Prolific, participants were redirected to Qualtrics where they were given a description of the study's purpose and asked to consent. Participants were told that they would be listening to a podcast with a new format and that its producer wanted to test audiences' reception prior to the format's release to the public. Upon giving consent, participants were asked to answer the demographic questions and were then presented with the items from the Podcast Uses and Gratification Scale. After completing the Podcast Uses and Gratification Scale, participants were presented with the first of two PANAS questionnaires (pre) to answer. After completing the PANAS, participants were told they would be presented with a podcast excerpt on the following screen and that they should listen to the podcast in a quiet setting, use headphones, and limit distractions. These requests are in line with previous research methods that attempted to reduce the effect of confounding variables that exist in participants' real-world setting but are generally absent in lab settings (Herget & Albrecht, 2022). Participants were randomly presented with one combination

of topic framing and background music. Skipping the podcast presentation was disabled in Qualtrics. Upon completion, participants were first presented with the second PANAS (post), followed by the Transportation Scale, two questions regarding podcast use ("Do you listen to podcasts?" and "Please specify the number of hours per week you listen to podcasts."), the attitude questionnaire, the funnel debrief, and lastly, the debrief. The funnel debriefing present at the end of the experiment allowed participants to provide information about how they deviated from this request if they did so.

Data Analysis

Significance for all hypothesis tests was set to $p \leq 0.050$. All tests and comparisons were computed using R Studio (version 4.3.1; Posit Team, 2023). The following analyses were performed to test the hypotheses:

Narrative Frame

H1a: To test H1a, pre- and post-condition affect results were segregated into the negative and positive affect subscales and were then log transformed. Linear regressions were performed on the log transformed data, using post-condition negative and positive affect as outcome variables and both the environmental consequence and economic benefit framing and pre-condition negative and positive affect as predictor variables. The *anova* function in R was used on the resulting linear model to obtain *F* statistics and *p* level. The effect size, $\eta^{2,}$ was calculated in R using the *etaSquared* function.

H1b: To test H1b, a data subset consisting of data from participants that responded with "Yes" to the attitude question "Has your attitude about the topic discussed in the podcast excerpt changed as a result of listening to the podcast excerpt?"

was first created (attitude change subset). Next, a table using this data subset was created and consisted of the narrative news framing, either environmental consequence or economic benefit, and the direction of participant attitude change, either towards supporting or towards opposing, as answered in the follow-up question "How did your attitude change?" Finally, Fisher's Exact Test for Count Data was applied to the table.

H1c: To test H1c, Welch's Two Sample t-test was used to analyze participant responses to the Transportation Scale as explained by the narrative news framing (i.e., environmental consequence or economic benefit) independent variable.

Congruency

H2a: To test H2a, pre- and post-condition affect results were segregated into the negative and positive affect subscales log transformed data were used. Linear regressions were performed on the log transformed data, using post-condition negative and positive affect as outcome variables and both congruency and pre-condition negative and positive affect as predictor variables. The *anova* function in R was used on the resulting linear model to obtain *F* statistics and *p* level. The effect size, $\eta^{2,}$ was calculated in R using the *etaSquared* function.

H2b: To test H2b, the attitude subset was used. Next, a table using this data subset was created and consisted of congruency and the direction of participant attitude change, either towards supporting or towards opposing, as answered in the follow-up question "How did your attitude change?" Finally, Fisher's Exact Test for Count Data was applied to the table.

H2c: To test H2c, Welch's Two Sample t-test was used to analyze participant responses to the Transportation Scale as explained by congruence.

Arousal

H3a: To test H3a, pre- and post-condition affect results were segregated into the negative and positive affect subscales and the log transformed data were used. Linear regressions were performed on the log transformed data, using post-condition negative and positive affect as outcome variables and both arousal and pre-condition negative and positive affect as predictor variables. The *anova* function in R was used on the resulting linear model to obtain F statistics and p level. The effect size, η^2, was calculated in R using the *etaSquared* function.

H3b: To test H3b, the attitude subset was used. Next, a table using this data subset was created and consisted of congruency and the direction of participant attitude change, either towards supporting or towards opposing, as answered in the follow-up question "How did your attitude change?" Finally, Fisher's Exact Test for Count Data was applied to the table.

H3c: To test H3c, Welch's Two Sample t-test was used to analyze participant responses to the Transportation Scale as explained by the arousal independent variable.

Chapter III.

Results

In this section, the research questions that guided the development of the hypotheses are restated and the results of the analyses performed to test each hypothesis are presented.

RQ1: Does the frame impact listener behavior (i.e., affect, attitude, and transportation) independently of the background music?

The results of the H1a ANOVA revealed that compared to the economic benefit framing, the environmental consequence framing significantly reduced positive affect ($F(1,288) = 8.972$, $p = 0.003$) and increased negative affect ($F(1,288) = 145.2$, $p = 0.000$) in participants independent of background music, providing partial support for H1a. The effect sizes for positive and negative affect were $\eta^2 = 0.030$ and $\eta^2 = 0.335$, respectively. See Figures 2 and 3.

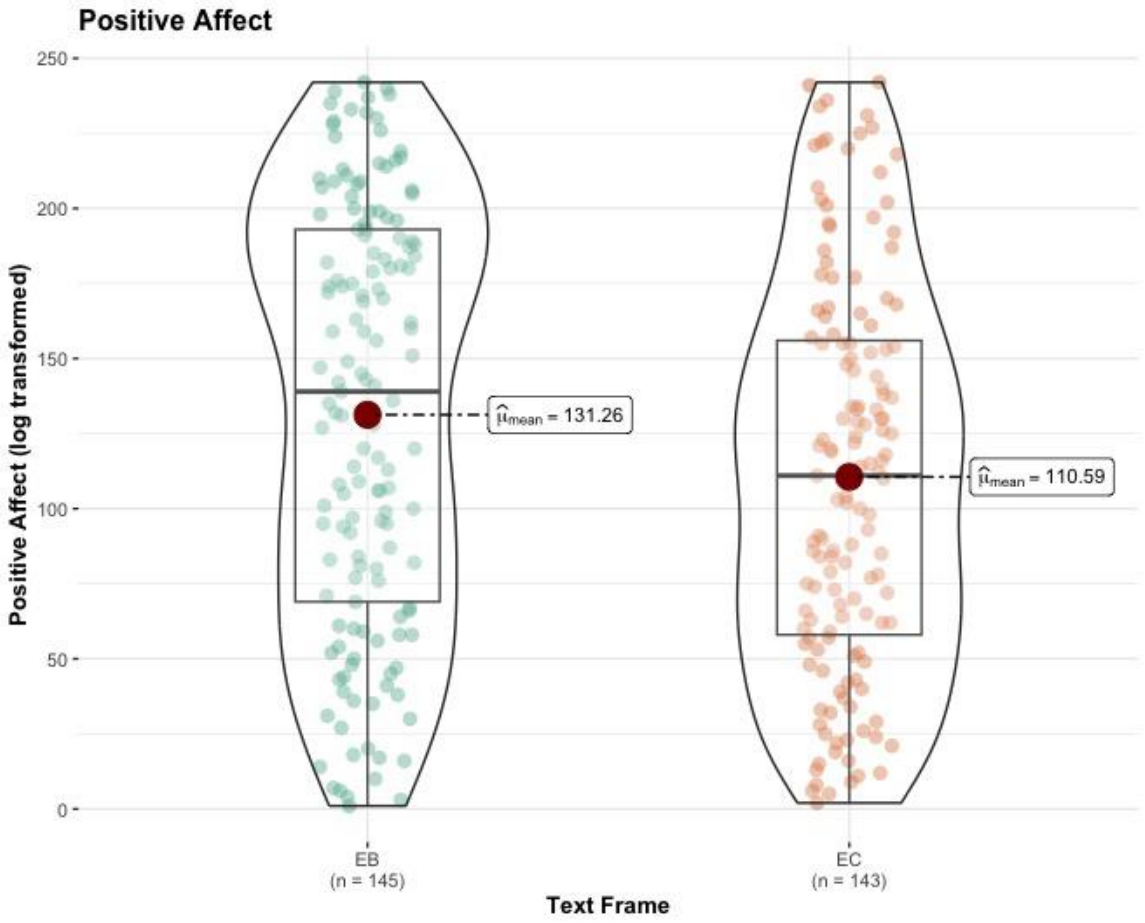


Figure 2. Post-Condition Positive Affect Means as a Function of Narrative News Frame (Economic Benefit (EB) vs Environmental Consequence (EC))

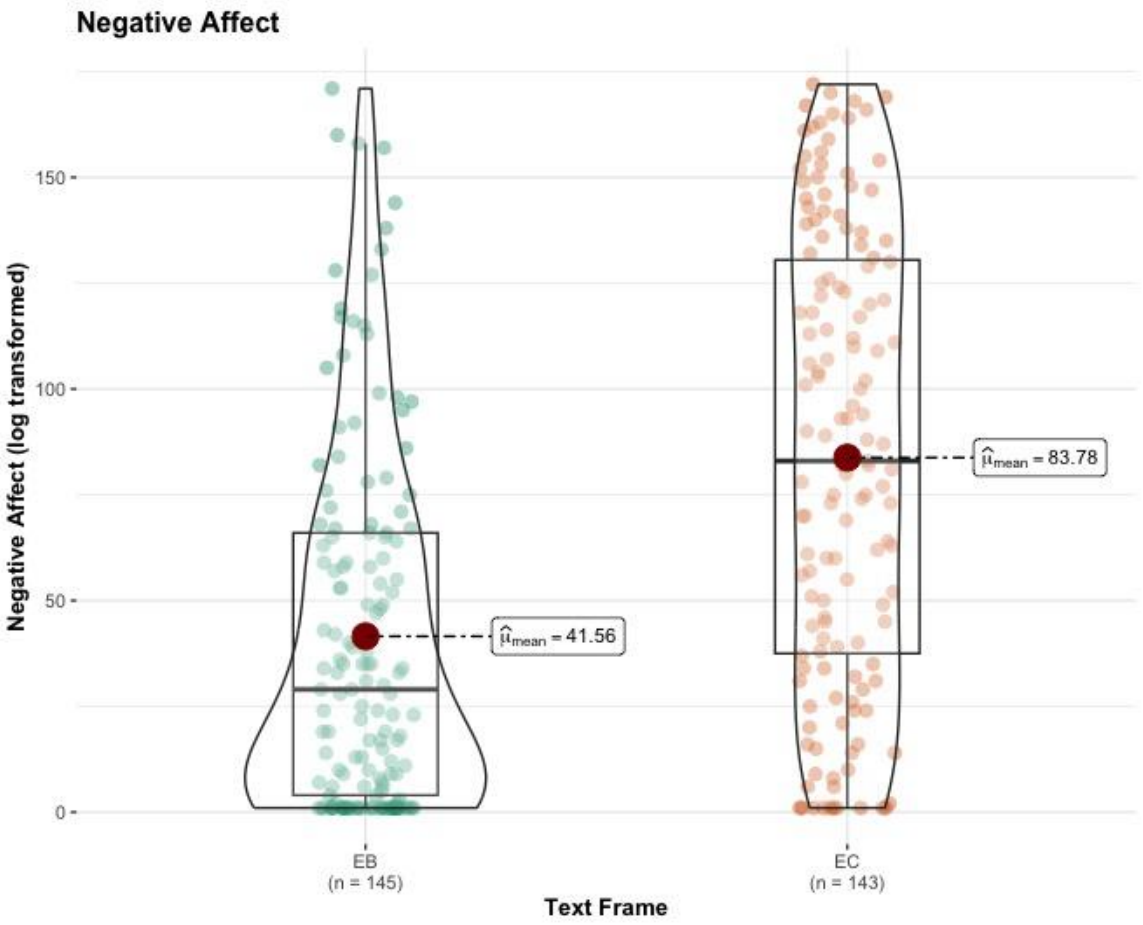


Figure 3. Post-Condition Negative Affect Means as a Function of Narrative News Frame (Economic Benefit (EB) vs Environmental Consequence (EC))

The results of the Fisher test performed to test H1b revealed a significant difference (p < 0.000) in the number attitude changes between the environmental consequence frame (n = 37) and the economic benefit frame (n = 21), providing support for H1b. See Table 4.

Table 4. Frequency and Direction of Participant Attitude Change as a Function of Narrative Frame

Narrative Frame	Participant Attitude Change Direction	Frequency (# of Participants)
EB	Towards Opposing Drilling	8
EB	Towards Supporting Drilling	13
EC	Towards Opposing Drilling	33
EC	Toward Supporting Drilling	4

Note: Environmental Consequence (EC), Economic Benefit (EB)

The results of the t-test performed to test H1c revealed participants who listened to the environmental consequence frame reported significantly greater feelings of transportation ($t = 2.744$, $p = 0.006$) than participants who listened to the economic benefit frame, providing support for H1c. The individual responses and means for both groups are reported in Figure 4.

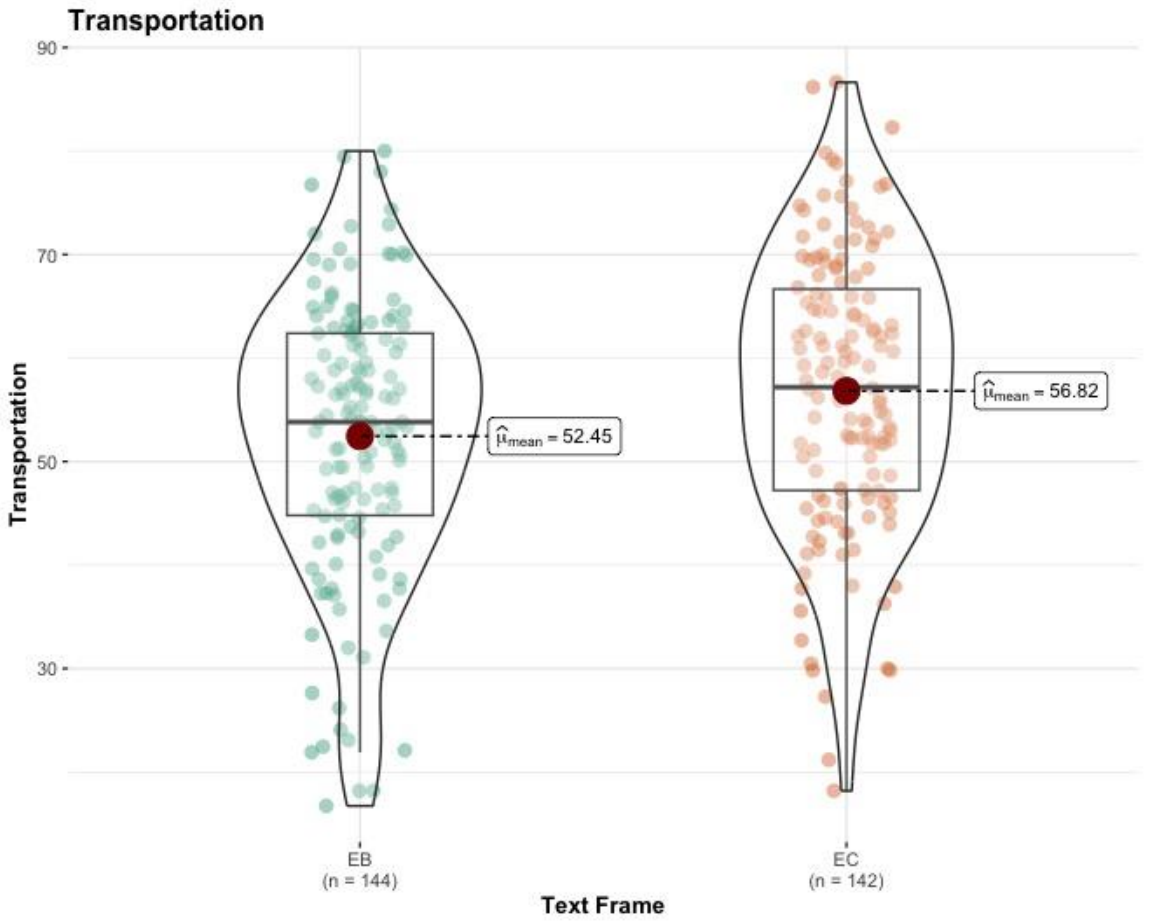


Figure 4. Transportation Means as a Function of Narrative News Frame (Economic Benefit (EB) vs Environmental Consequence (EC))

RQ2: Does congruence between background music and framing (i.e., valence of background music and text framing) impact listener behavior (i.e., affect, attitude and transportation)?

The results of the H2a ANOVA revealed that there were no significant differences between the positive ($F(1,222) = 2.408$, $p = 0.122$) and negative ($F(1,182) = 0.805$, $p = 0.371$) affect of participants in conditions containing congruent narrative news frames

and background music valence and conditions containing incongruent narrative news frames and background music valence. This result did not provide support for H2a and therefore the null hypothesis was not rejected. The effect sizes for positive and negative affect were $\eta^2 = 0.011$ and $\eta^2 = 0.004$, respectively. See Figures 5 and 6.

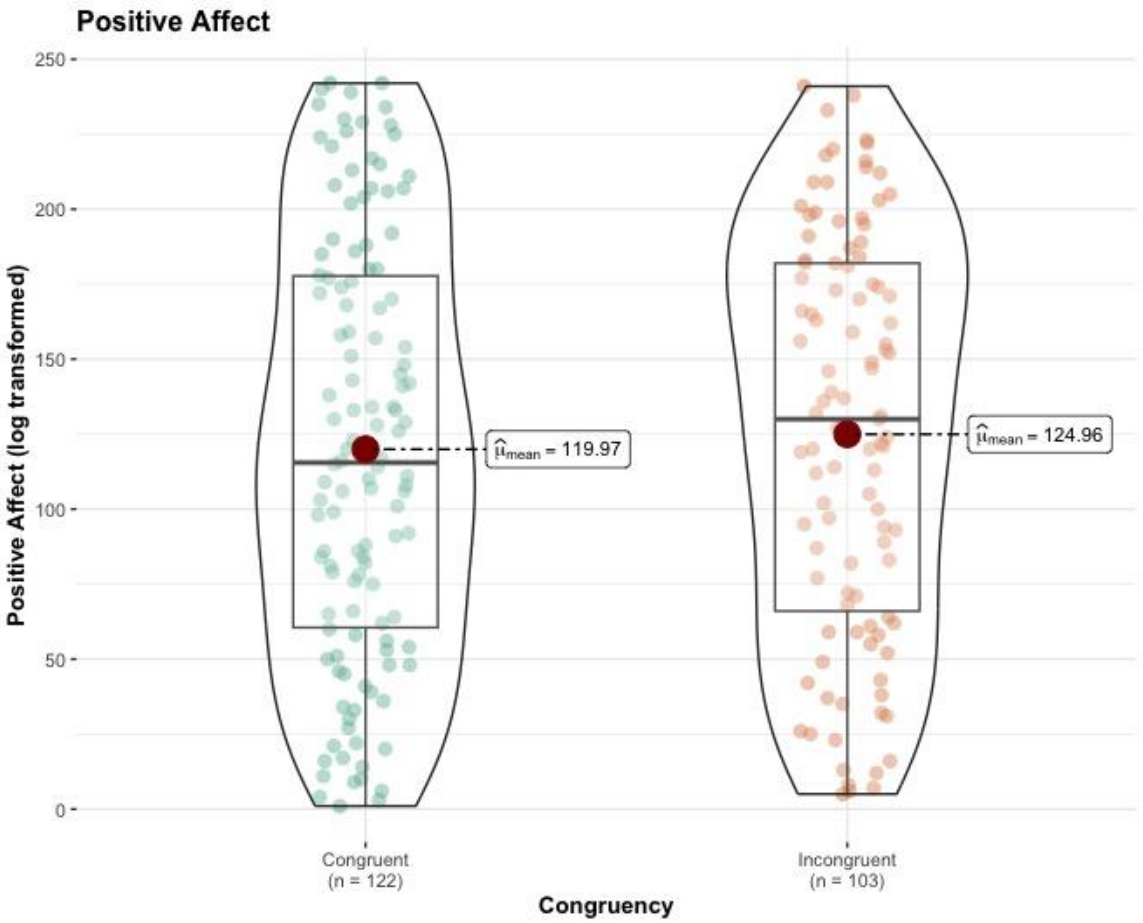


Figure 5. Post-Condition Positive Affect Means as a Function of Congruency (Congruent vs Incongruent)

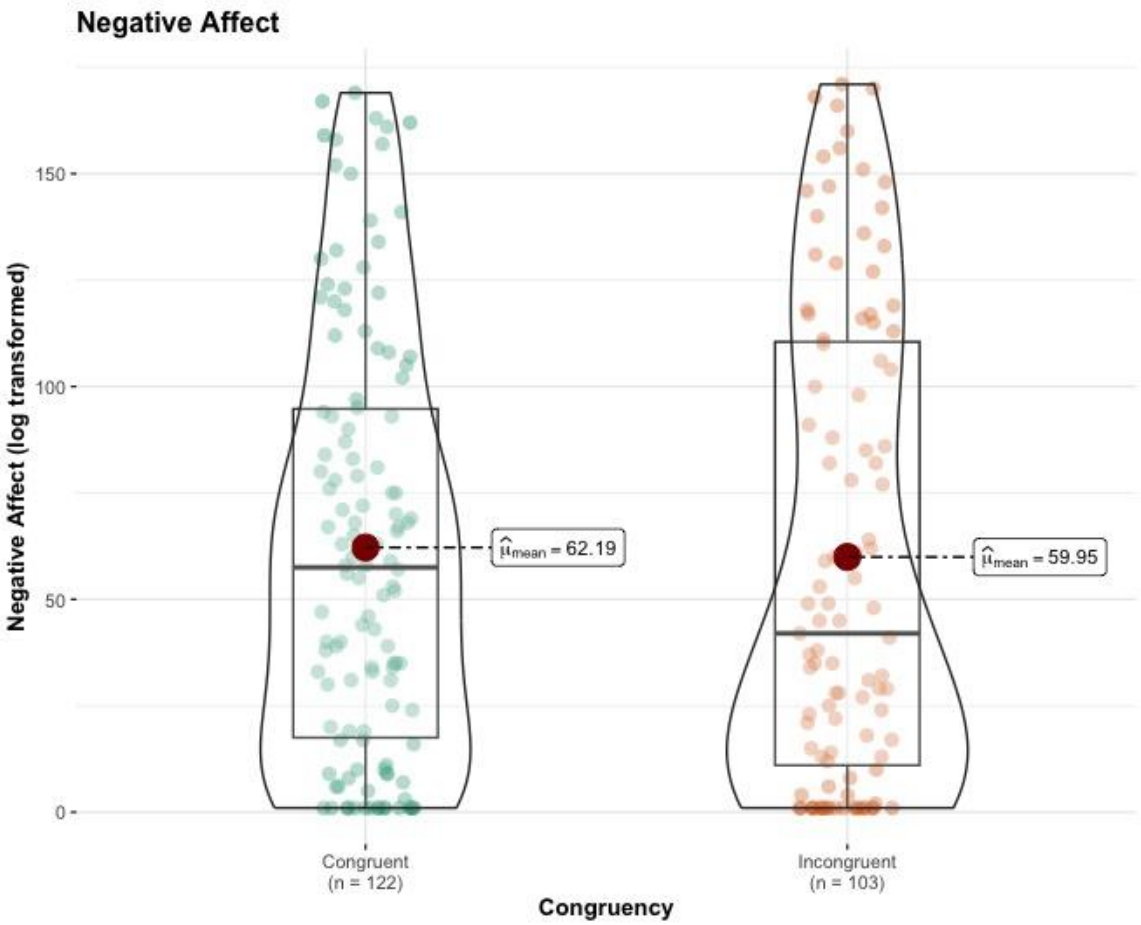


Figure 6, Post-Condition Negative Affect Means as a Function of Congruency (Congruent vs Incongruent)

The results of the Fisher test performed to test H2b revealed there was not a significant difference (p = 0.536) in the number of attitude changes between conditions containing congruent independent variables (n = 29) and conditions containing incongruent independent variables (n = 20), providing no support for H2b. See Table 5.

Table 5. Frequency and Direction of Participant Attitude Change as a Function of Congruency

Congruency	Participant Attitude Change Direction	Frequency (# of Participants)
Congruent	Towards Opposing Drilling	21
Congruent	Towards Supporting Drilling	8
Incongruent	Towards Opposing Drilling	12
Incongruent	Toward Supporting Drilling	8

The results of the t-test performed to test H2c revealed that there were no significant differences in participants' feelings of transportation ($t = 0.521$ $p = 0.601$) between congruent and incongruent conditions, providing no support for H2c. Therefore, the hypothesis was rejected and the null hypothesis was accepted. The individual responses and means for both groups are reported in Figure 7.

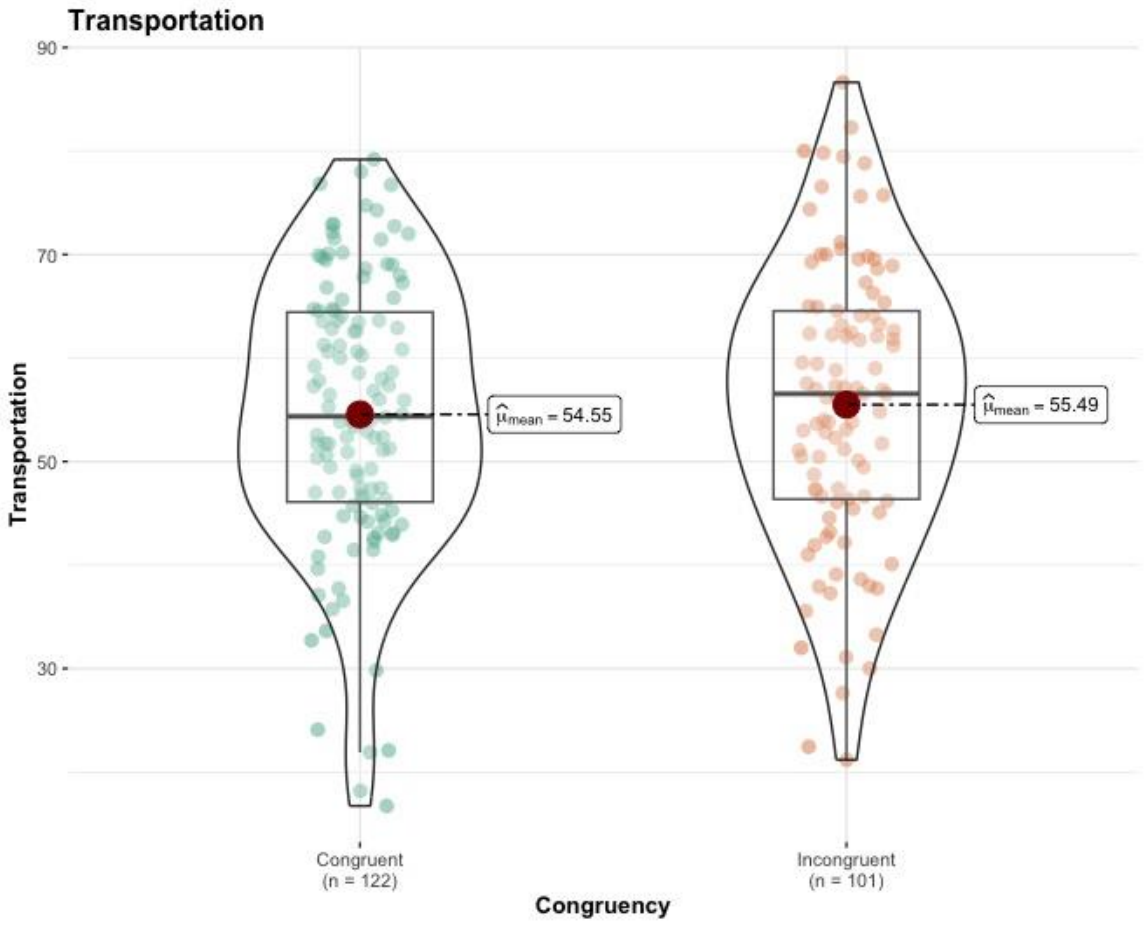


Figure 7. Transportation Means as a Function of Congruency (Congruent vs Incongruent)

RQ3: Does the arousal level of music impact listener behavior (i.e., affect, attitude and transportation) independent of framing?

The results of the H3a ANOVA revealed that though they approached significance, there were no significant differences between the positive ($F(1,222) = 3.548$, $p = 0.061$) and negative ($F(1,182) = 3.095$, $p = 0.080$) affect of participants in conditions containing high arousal background music and conditions containing low arousal background music. This result did not provide support for H3a, therefore the

hypothesis was rejected and the null hypothesis was accepted. The effect sizes for positive and negative affect were $\eta^2 = 0.016$ and $\eta^2 = 0.017$, respectively. See Figures 8 and 9.

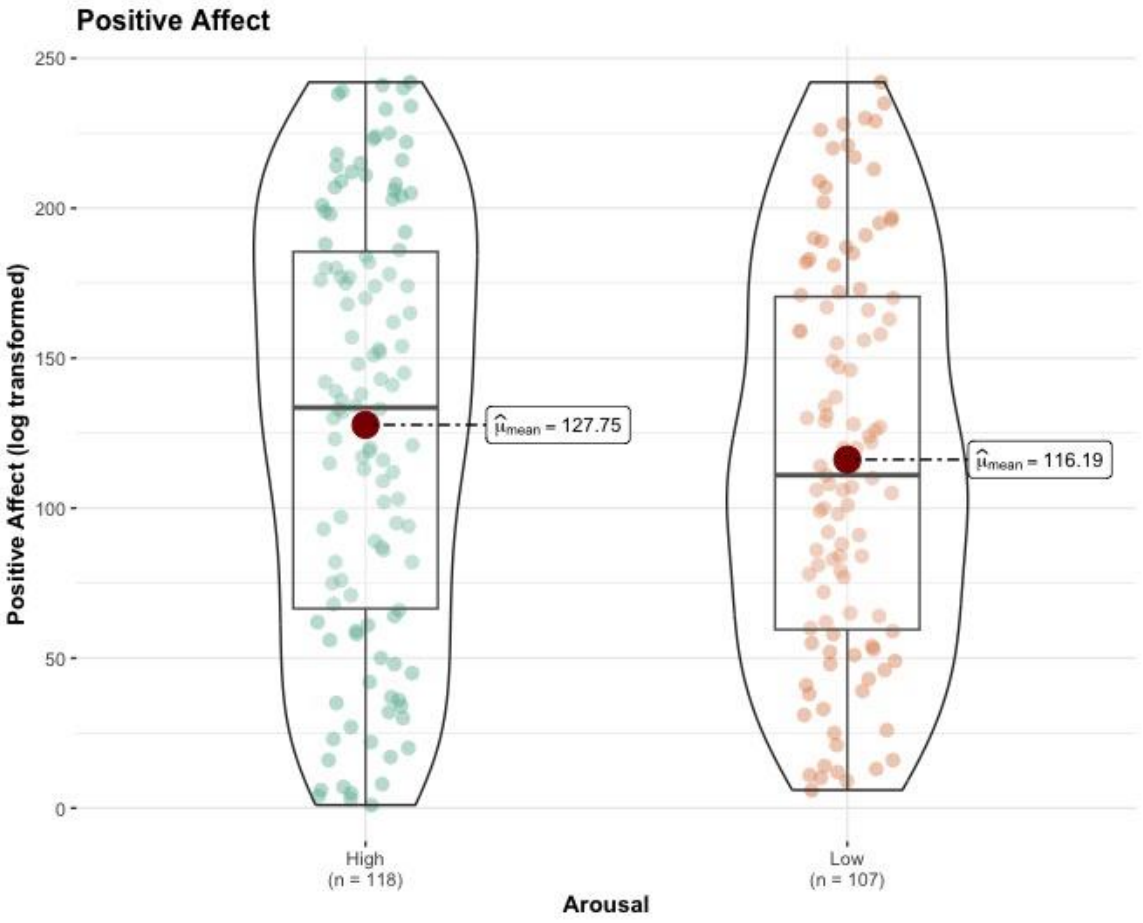


Figure 8. Post-Condition Positive Affect Means as a Function of Arousal (High vs Low)

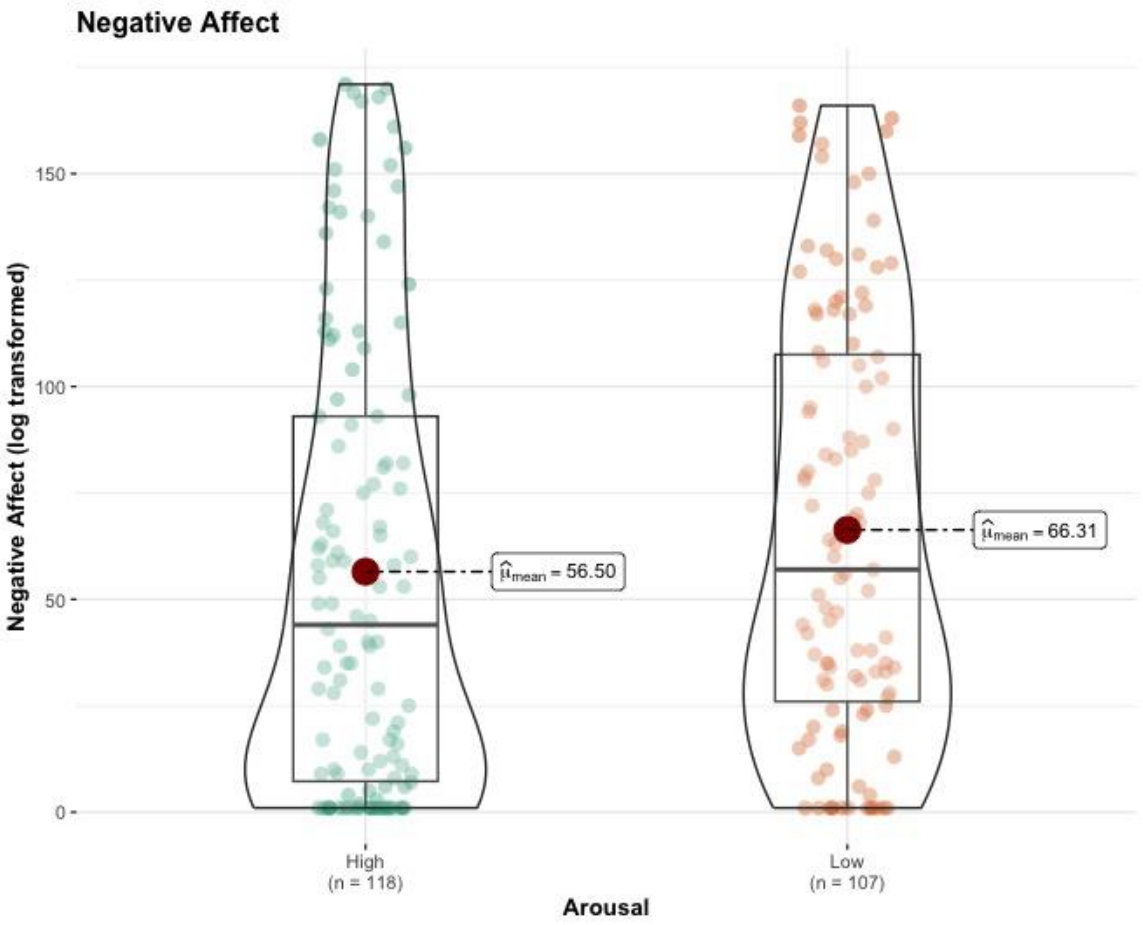


Figure 9. Post-Condition Negative Affect Means as a function of Arousal (High vs Low)

The results of the Fisher test performed to test H3b revealed there was not a significant difference (p = 0.762) in the number of attitude changes between conditions containing high arousal background music (n = 25) and conditions containing low arousal music (n = 24), providing no support for H3b. See Table 6.

Table 6. Frequency and Direction of Participant Attitude Change as a Function of Arousal

Arousal	Participant Attitude Change Direction	Frequency (# of Participants)
High	Towards Opposing Drilling	16
High	Towards Supporting Drilling	9
Low	Towards Opposing Drilling	17
Low	Toward Supporting Drilling	7

The results of the t-test performed to test H3c revealed that there were no significant differences in participants' feelings of transportation ($t = 0.554$, $p = 0.580$) between high arousal and low arousal conditions, providing no support for H3c. Therefore, the hypothesis was rejected and the null hypothesis was accepted. The individual responses and means for both groups are reported in Figure 10.

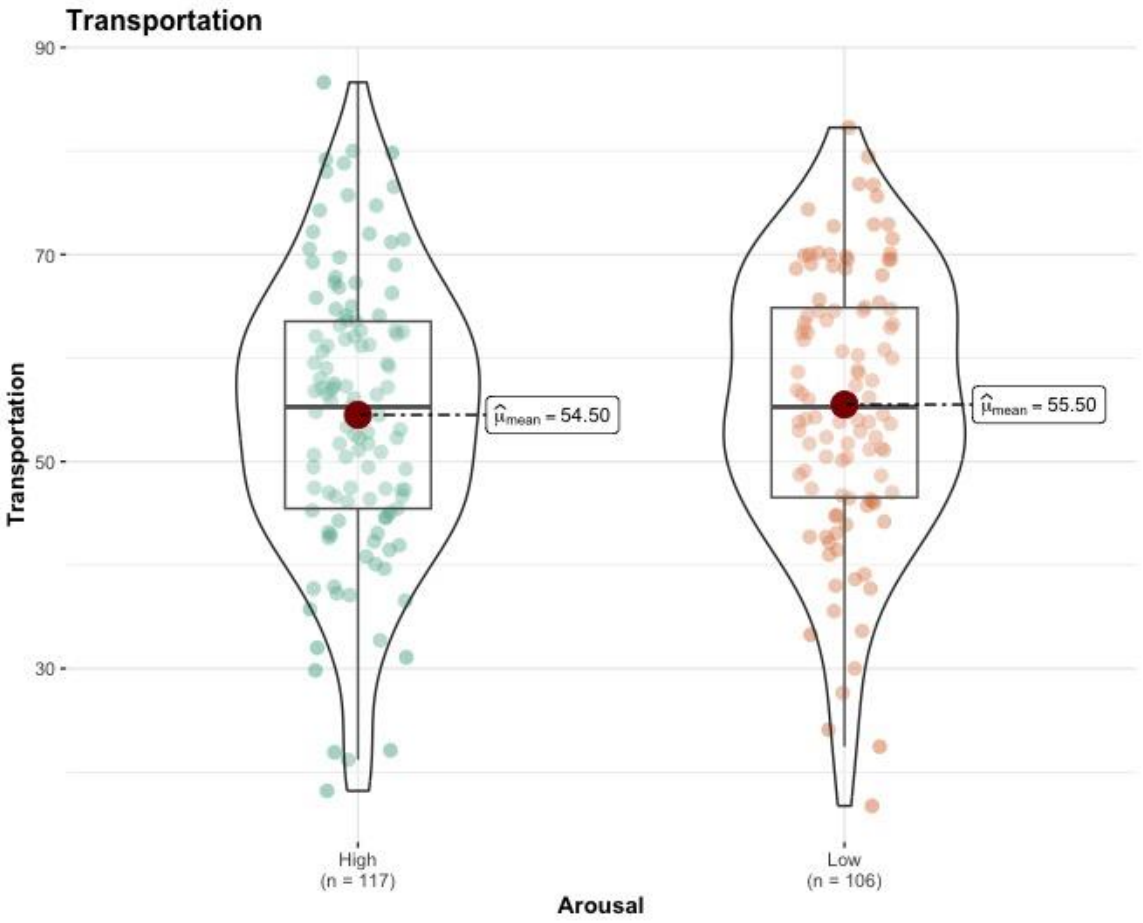


Figure 10. Transportation Means As a function of Arousal (High vs Low)

Chapter IV.

Discussion

The aim of the current study was to examine the effect that narrative framing and background music used in narrative news podcasts had on listener affect, attitude, and feelings of transportation. Results from the experiment indicated the framing of the narrative, independent of the accompanying background music, had the only significant effect on listener behavior.

H1a posited that the environmental consequence frame would increase negative affect and decrease positive affect in listeners, and posited that the economic benefit frame would decrease negative affect while increasing positive affect in listeners, independent of music. The results revealed that, independent of music, negative affect increased significantly for participants who listened to the podcast excerpt containing the environmental consequence frame compared to participants who listened to the economic benefit frame, and positive affect decreased significantly for those who listened to the environmental consequence frame compared to their economic benefit counterparts. This is in line with findings from Shen et al. (2014), whose study revealed that the narrative format of the environmental consequence framing of the news story caused the most significant effects in participants. Although Shen et al. (2014) did not include affect as a measurement in their study, they did measure empathy, attitude, transportation, and cognitive responses, all of which were significantly affected by the environmental consequence frame. When considering empathy in the context of the current study, the negative valence of the environmental consequence script may have increased participants empathy for the characters and their experiences in the story and resulted in

increased negative affect, which in turn may also have affect their attitude towards gas drilling. Indeed, the attitude of participants changed significantly towards opposing gas drilling after listening to the environmental consequence frame (H1b). The effect size of η^2=0.335 for post-condition negative affect was larger or as large than that found in similar affect and narrative studies (Herget & Albrecht, 2022; Shen et al., 2014). The large effect size suggests narratives containing negative consequences for the characters in the story are highly efficient at increasing the negative affect of its audience.

H1b posited that compared to the economic benefit frame, and independent of music, the environmental consequence frame would cause more incidences of attitude change. The results of the analysis found data supported this hypothesis. The number of participants who listened to the environmental consequence frame and changed their attitude about gas drilling was significantly more than the number of listeners who changed their attitude about gas drilling after listening to the economic benefit frame. The study by Shen et al. (2014) also found a significant effect of the environmental consequence narrative frame on participant attitude, even at retest twenty-four hours later. Shen et al. (2014) found empathy to have mediated the narrative's effect on participant attitude, which may also have been the case in the current study, but mediation tests were not performed in the current study, so empathy's effect in the current study is speculatory.

H1c posited that participants who listened to the environmental consequence frame would report greater feelings of transportation than those that listened to the economic benefit frame, independent of background music. The analysis showed support for H1c, suggesting participants were more engaged in the story containing

environmental consequences. The results may be due to the affect induced by a consequential and empathy-inducing story. According to Green and Brock (2000), when individuals experience feelings of transportation, their beliefs about the story topic are more likely to be consistent with the story's conclusion. A story's conclusion typically involves an outcome for the characters. If the attitude of the participants in the current study can be thought of a belief, participants may have come to believe that the outcome experienced by the characters in the story was real and if the participant identified or empathized with the characters enough, all of which requires enough transportation to accomplish (Green & Brock, 2000; Shen et al., 2014), then changes in attitude are likely to happen. Additionally, the factuality of the story has no impact on an individual's feeling of transportation (Green & Brock, 2000; Shen et al., 2014), which illustrates the magnitude of the effect transportation can have on attitude and the cause for concern about mis- and disinformation in news. The majority of American journalists are concerned about the existence of misinformation and view its management by news organizations as an issue (Gottfried et al., 2022). Consumers of news have difficulty distinguishing real information from misinformation and the presence of fact, opinion, and misinformation in the digital news space may increase a consumer's susceptibility to the influence or persuasion of misinformation (Lewandowsky et al., 2012).

H2a posited that when conditions contained congruent independent variables, listeners' positive affect would decrease (i.e., decreased positive affect and increased negative affect) in the environmental consequence framing compared to the economic benefit framing and listeners' positive affect would increase (i.e., increased positive affect and decreased negative affect) in the economic benefit framing compared to the

environmental consequence framing, and when conditions contained incongruent independent variables, listeners' positive affect would diminish (i.e., decreased positive affect and increased negative affect) and listeners' negative affect would increase (i.e., decreased positive affect and increased negative affect). The results of the study revealed no significant effect of congruency on listener affect, which was not expected. The current study was designed to replicate contemporary narrative news podcasts, which include music that, as the literature suggests, draws listeners into the news story by highlighting specific information and adding emotion to the content (Dillman Carpentier & Potter, 2007; Eckstein, 2017). The small effect sizes for post-condition positive (η^2=0.011) and post-condition negative (η^2=0.004) affect suggests adding background music, even background music containing valence similar to that of a podcast narrative, has no effect on either positive or negative affect. Instead of the narrative news podcast being a vehicle for changing the affect of the participants, it may have turned the podcast into entertainment. Participants in the current study did seem to notice the effect that the podcast (i.e., the components of the podcast) was having on them as they listened to it. One of the funnel debrief questions for the current study asked participants for their opinion on what the study was about and many opined that the study was about how podcasts affect emotions and influence opinions. One participant commented, "I would guess it was about how the music at the end impacted the message…", a sentiment expressed by many of the participants. Another participant provided their opinion on what they thought the study was about by saying, "how listening to a story can change the way you feel." This participant's comment is interesting in that the participant mentions the "story", which could be interpreted as referring to the narrative itself or to

the podcast stimulus as a whole. Referring only to the narrative makes sense in light of the significant effect of narrative found in H1a.

H2b posited that conditions containing congruent independent variables would cause more incidences of attitude change across listeners than conditions containing incongruent independent variables. The analysis revealed no significant difference between the number of incidences of attitude change between groups. This is somewhat surprising because the effect of the frame was enough to create a significant effect on the number of listeners who changed attitude when background music was not included in the analyses (H1b). The same effect was expected to be observed in the congruent conditions in this analysis. The background music was expected to create something similar to an additive effect to the effect created by the narrative, which would increase the effect of the frame and result significant changes in affect and attitude. Participants may have suspected that there was a behavior manipulation present and may have responded defensively by providing an answer to the question of attitude change that was the same as their pre-condition attitude, even if a change had occurred. The plausible suspicion is encapsulated in one participant's response to the funnel debrief question that asked for participants thoughts and reactions to the study; "I was annoyed that the podcast seemed to be trying to change my opinion."

H2c posited that conditions containing congruent independent variables would cause listeners to experience greater feelings of transportation than listeners in conditions containing incongruent variables. The analysis revealed no significant effect of congruency on listeners' feeling of transportation. This was also an unexpected result of congruency on participants. It was expected that combining the narrative frame with

background music that had similar valence properties would increase participant engagement in the story. The background music was placed at the beginning and end of the excerpt, and it may have been that this strategy did not allow the background music and narrative enough time to interact. Outro music was presented for approximately the last forty seconds to one minute of the environmental consequence condition, and approximately fifty seconds to one minute of the economic benefit condition. extending the amount of time the background ground music was presented with the narrative may have had greater influence on feelings of transportation.

H3a posited that independent of the narrative frame background music low or high in arousal would increase positive affect and decrease negative affect when background music was positive in valence and decrease positive affect and increase positive affect when background music was negative in valence. However, background music high in arousal would have a greater effect on affect change than background music low in arousal. The analysis revealed no significant difference in listener affect as a result of exposure to high or low arousal background music. Interestingly, although the results were not significant, post-condition affect measures influenced by low arousal, compared to high arousal, did approach significance (positive affect $p = 0.061$, negative affect $p = 0.080$). This suggests low arousal background music may have had an effect on lister affect but due to the smaller than needed sample size (two hundred ninety of the three hundred ninety needed), there was not enough power to detect a significant effect. The effect sizes of post-condition positive ($\eta^2 = 0.016$) and post-condition negative ($\eta^2 = 0.017$) affect were slightly larger than the effect sizes found in H2a but were nowhere near the post-condition negative affect effect size found in H1a. Some participants

responded to the funnel debrief question “Do you have any thoughts or reactions about the study?” by stating “this podcast was hard to listen to. the music was annoying and did not fit the content” This participant was in the environmental consequence frame condition and was presented with background music high in arousal and positive in valence (happy). The participant’s comment is interesting as it points to the incongruity of the high arousal, positive valence music accompanying the negative valence of the environmental consequence frame. The incongruity may have increased this participant’s negative affect, as predicted by H2a, and the high arousal music, described by the participant as “annoying,” may also have contributed to the participant’s negative affect.

Another participant stated that the background music they heard was “over the top dramatic.” This participant was also presented with an incongruent condition consisting of the economic benefit frame, which was positive in valence, and background music high in arousal and negative in valence (anxious). Again, the presence of high arousal music resulted in a participant commenting on their negative experience of the music. A participant assigned to the congruent condition containing the economic benefit frame, which was positive in valence, and background music high in arousal and positive in valence (happy), stated “The podcast was well-produced and the music was upbeat.” This suggests that the happy music was produced well enough to reflect positively on participants. It is worth questioning if this participant would have felt differently about the podcast and music production had they been presented with the same background music and the incongruent environmental consequence frame as the participants above.

To further illustrate the effect that high arousal background music had on some participants, two participants presented with the environmental consequence frame and

background music with high arousal and negative valence (anxious) stated “the music could have been toned down a little” and “the music in the podcast was a bit much.” It may have been that the anxious background music had too much arousal. The comments from participants who experienced high arousal music and the absence of significant effect in this condition suggests the sample size may not have been large enough to detect an effect.

H3b posited that independent of framing, background music higher in arousal would cause more incidences of attitude change across listeners than background music lower in arousal. The analysis revealed no support for this hypothesis. Based on the funnel debrief comments, the background music may have been too arousing for some participants and may have increased their negative affect. This could have led to a dismissal of the stimuli by some participants, leading to a pre-condition confirmatory response to the question of attitude change. It may also be that background music, no matter how arousing, cannot change attitude by itself and must be accompanied by some form of narrative. H2b tested this very situation but as suggested by the results, detecting significant changes in attitude may have been compromised by not having a large enough sample size.

H3c posited that independent of framing, background music higher in arousal would increase feelings of transportation more than background music lower in arousal. Similar to H1c and H2c, no significant effect of high arousal background music was observed in participants’ feeling of transportation. The findings for H3c suggest that the arousal levels of background music may not be enough to induce feelings of transportation in participants. The analysis of the data from H2c and H3c point to

background music not having the ability to draw in listeners, at least not in the way background music was placed in the podcast stimuli of the current study. In light of the results from H2c, it was unsurprising that the amount of arousal in background music did not affect participants' feeling of transportation. The results from H1c showed narrative was enough to induce feelings of transportation in participants and by adding background music, as in H2c, the effect was no longer detectable. This may be due, again, to the sample size but it may also be due to the background music distracting participants instead of further engaging them in the narrative.

Limitations

Several limitations of the current study should be acknowledged. Available time and financial resources for the study were limited, which affected sample size and analyses. The analysis was adopted to fit the smaller sample size so that the hypotheses could be tested. This resulted in using two music components, arousal and valence, to perform the analysis instead of comparing four music types (happy, anxious, calm, sad). The lower sample size also decreased the amount of power to detect effects. The attitude and transportation measurements used in the current study may not have been properly adapted. The study used categorical variables to measure attitude change, which reduced detection of small changes in attitude. Providing participants with a continuous scale may have provided an opportunity to phrase the attitude questions differently, as was done in Shen et al. (2014), and provide more data for a better analysis. The Transportation Scale as created by Green and Brock (2000) was not created for audio narrations, though the authors state that all audiences of narratives are susceptible to transportation. The wording of the scale was adjusted for use with the current study, but the resulting scale

had a Cronbach's $\alpha = 0.66$ at analysis, which is much lower than desired. The current study was not conducted in a controlled setting. Controlled settings have the advantage of reducing confounding variables, such as distractions, which have the potential to interfere with the main effects. Participants were asked to limit or eliminate distractions but their cooperation with this request could not be verified. Self-report was used to measure all effects on participants. Participant self-report may not have been reliable, but it was still the most reliable and direct way to measure affect, as other methods such as skin conductance, heart rate, and temperature measure affect indirectly.

Future Directions

Future studies that use narrative frames and background music to examine the effect that narrative new podcasts have on audiences' behavior would benefit from utilizing longer podcast excerpts where background music can be presented in more than two places. This may increase the chance of detecting an effect caused by the congruency of the narrative frame and background music. Future studies should use more than one news topic to examine the magnitude of the effect created by narratives positive or negative in valence. Future research may want to include both male and female narrators and examine the effect that both have on listener affect and attitude about the narrative.

Appendix A.

Transportation Scale

Transportation Scale Items (7-point Likert scale, 1=not at all, 7=very much; range is 15-105)

Instructions: Please rate how much you agree with the following statements as they pertain to the news story portion of the podcast. Please use a scale ranging from 1 (not at all) to 7 (very much).

1. While I was listening to the news story, I could easily picture the events in it taking place.
2. While I was listening to the news story, activity going on in the room around me was on my mind. (reverse scored)
3. I could picture myself in the scene of the events described in the news story.
4. I was mentally involved in the news story while listening to it.
5. After finishing the news story, I found it easy to put it out of my mind. (reverse scored)
6. I wanted to learn how the news story ended.
7. The news story affected me emotionally.
8. I found myself thinking of ways the news story could have turned out differently.
9. I found my mind wandering while listening to the news story. (reverse scored)
10. The events in the news story are relevant to my everyday life.
11. The events in the news story have changed my life.

Appendix B.

Podcast Uses and Gratification Scale

Instructions: You will now be asked a series of questions about your podcast use. Please respond using the scale below.

Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

I can learn something new from podcasts.	1	2	3	4	5	6	7
I can educate myself when I listen to podcasts.	1	2	3	4	5	6	7
I can expand my mind from podcasts.	1	2	3	4	5	6	7
I can listen to the podcast I want when I want.	1	2	3	4	5	6	7
Podcasts provide entertainment at times that are convenient for me.	1	2	3	4	5	6	7
Podcasts are entertaining.	1	2	3	4	5	6	7
I like to learn about other people's experiences through podcasts.	1	2	3	4	5	6	7
I can picture the stories told through podcasts in my mind as I listen.	1	2	3	4	5	6	7
Time passes quickly when I listen to podcasts that feature storytelling.	1	2	3	4	5	6	7
Podcasts make the time go by quickly.	1	2	3	4	5	6	7
Podcasts allow me to consume fresh or novel content not otherwise available in the media.	1	2	3	4	5	6	7
I like to hear about the experiences of people who are different than me.	1	2	3	4	5	6	7
I use social media to recommend podcasts to others.	1	2	3	4	5	6	7
I use social media to discuss podcasts with my friends.	1	2	3	4	5	6	7
I talk with other fans about the podcasts I listen to.	1	2	3	4	5	6	7
I usually accomplish several tasks simultaneously.	1	2	3	4	5	6	7
I am usually occupied with several things simultaneously.	1	2	3	4	5	6	7
I like to do more than one thing at a time.	1	2	3	4	5	6	7

Appendix C.

Positive and Negative Affect Scale (PANAS)

Indicate to what extent the podcast topic discussion made you feel. Use the following scale to record your answers.

Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
1	2	3	4	5

Interested	1	2	3	4	5
Distressed	1	2	3	4	5
Excited	1	2	3	4	5
Upset	1	2	3	4	5
Strong	1	2	3	4	5
Guilty	1	2	3	4	5
Scared	1	2	3	4	5
Hostile	1	2	3	4	5
Enthusiastic	1	2	3	4	5
Proud	1	2	3	4	5
Irritable	1	2	3	4	5
Alert	1	2	3	4	5
Ashamed	1	2	3	4	5
Inspired	1	2	3	4	5
Nervous	1	2	3	4	5
Determined	1	2	3	4	5
Attentive	1	2	3	4	5
Jittery	1	2	3	4	5
Active	1	2	3	4	5
Afraid	1	2	3	4	5

Appendix D.

Attitude Questionnaire

Please answer the following questions related to the podcast excerpt you listened to:

1. Did you have an established opinion about the topic of discussion prior to hearing it discussed in the podcast excerpt? Yes/No
    a. Please specify what your opinion was: In support of gas drilling/In opposition to gas drilling.
2. Has your attitude about the topic discussed in the podcast excerpt changed as a result of listening to the podcast excerpt? Yes/No
    a. How did your attitude change? Towards supporting gas drilling/Towards opposing gas drilling.

Appendix E.

Funnel Debrief

1. Do you have any thoughts or reactions about the study? If so, please note below. (Your response will not affect your compensation in any way.)
2. What do you think this study was about? Please note below. (Your response will not affect your compensation in any way.)
3. Did what you think the study is about influence your responses in the study in any way? (Your response will not affect your compensation in any way)
4. Were you doing anything during the study, such as eating, drinking, listening to background music, etc.? Please not below. (Your response will not affect your compensation in any way)
5. Which of the following did you use to complete this study? (Your response will not affect your compensation in any way) Laptop, Desktop, Mobile phone, other mobile device
6. Did you use headphones to listen to the podcast excerpt? (Your response will not affect your compensation in any way) Yes/No
    a. 'No' response: If you did not use headphones to listen to the podcast excerpt, what did you use?

Appendix F.

Participant Informed Letter of Consent

What is the purpose of this research?

Podcasting is a relatively new form of media that is available for streaming and downloading on many digital devices. Podcasts provide listeners with a variety of information and entertainment that can be consumed on demand, including while completing other tasks. Additionally, podcasts enable producers to be more creative with their formatting than traditional media, which has led to the experimentation and streamlining of podcast formatting over the years. The podcast producer involved with the current study has developed a new format that it wants to test prior to its distribution. The podcast producer is collaborating with Harvard to gather data about how the new podcast format will be received.

What can I expect if I take part in this research?

Upon providing consent, you will be automatically directed to the study website where you will first be asked to answer a set of questions about your podcast use. Next, you will be asked to listen to the podcast. It is important that this is done in a quiet setting with no distractions. At the completion of the podcast, you will be asked to answer a set of questions about the podcast you listened to. You will be debriefed upon completing this second set of questions. The whole study is expected to take approximately 30 minutes.

What should I know about a research study?

- Whether or not you take part is up to you.
- Your participation is completely voluntary.
- You can choose not to take part.
- You can agree to take part and later change your mind.
- Your decision will not be held against you.
- Your refusal to participate will not result in any consequences or any loss of benefits that you are otherwise entitled to receive.
- You can ask all the questions you want before you decide.

You may not be told everything or may be misled.

As part of this research design, you may not be told or may be misled about the purpose or procedures of this research. However, the purpose or procedures of the research will be disclosed to you following your participation.

Who can I talk to?

If you have questions, concerns, or complaints, or think the research has hurt you, talk to the research team at rag610@g.harvard.edu

Appendix G.

Participant Debriefing Statement

Debriefing Statement

Thank you for taking part in this research study. There was some information about the study that we did not share with you at the beginning of your participation. In order for the study to work, it was necessary to leave out some information so that your response/reaction would be real.

We would now like to fully inform you of the nature of this research and provide some additional details about the study.

1. What was the study about?

Earlier in our consent form we told you that the purpose of the study was the evaluation of a new podcast format. In actuality, our study is about the effects that podcasts, specifically narrative news podcasts that contain background music, have on listeners' emotions, attitudes, and feelings of transportation. Specifically, the researchers are testing whether the format of the news story, either narrative of information, has an effect on listeners' attitude, feelings of induced emotion, and feelings of transportation. Additionally, the researchers are investigating if the valence and arousal of the background music also influence changes in listeners' attitude, feelings of induced emotion, and feelings of transportation.

2. What information was not shared with you before the study?

We did not share that there were ten different combinations of the podcast and background music, one of which you were randomly assigned to. The study randomly assigned you to one version of the podcast consisting of a combination of one of two versions of the podcast story and one of five different versions of the background music.

The combinations of story and background music were designed to evoke a detectable amount of emotion, as well as feelings of transportation, which are common when engaging with narrative stories.

3. Why couldn't we share this information with you?

In order to gather authentic and spontaneous responses in a study, researchers sometimes need to withhold or manipulate information from participants. If participants know in advance what the researchers want to find out, it can bias their responses, and this can compromise the outcome of the study. We regret withholding the study's true purpose, but we hope you understand the reason for it.

4. Was any of the information included in the consent form accurate?

Yes. Although the true purpose of this study was not fully disclosed to you at the beginning of the study, everything else on the consent form is correct. This includes the ways in which we will keep your data confidential.

Please do not disclose research procedures and/or this new information to anyone who might participate in this study in the future, as this could impact the results of our study.

5. What is the value of my participation?

Your time and responses are very much appreciated by our team, thank you!

Your input will contribute to the continued exploration into how podcast media affects listeners. Your responses produced valuable data that, when combined with the responses from the other study participants, will help test the researchers' hypotheses, the results of which may help future podcast producers and inform policy surrounding the production and distribution of podcasts.

6. Can I withdraw from the study now, even though I have already participated?

Yes. We recognize that debriefing is not the same as initial full informed consent, so we would like to give you the chance to reconsider your participation in this study. Now that you know the true purpose of our study and have received the complete information, you may decide that you do not want your data used in this research. At the end of this form, you will have the opportunity to choose whether you still want to contribute to this study.

Your options at this time include:

- If you would like all of your data removed from the study and permanently deleted please contact us at rag610@g.harvard.edu

7. Do you have any additional questions or concerns about the study?

Please feel free to contact us with any questions or if you have any further concerns about your participation. You can email us at rag610@g.harvard.edu.

If you would like to receive a copy of the final report of this study (or a summary of the findings) when it is completed, please feel free to contact us at rag610@g.harvard.edu.

For information about your rights as a participant in this research, questions, concerns, suggestions, or complaints that have not been or cannot be addressed by the researcher, or to report research-related harm, please contact the Harvard University Area Institutional Review Board ("IRB") at (617) 496-2847 or cuhs@harvard.edu.

Appendix H.

Economic Benefit Frame Script

Stimulus B (Economic Benefit Frame/Narrative News Format, 616 Words)

Gas Exploration Changes Lives in Western PA Thursday, December 1, 2011

By Marc Schmit, Pittsburgh Post-Gazette

PITTSBURGH—A year ago, Craig and Julie Sauer were sitting behind the counter of their struggling diner in Carrollton, PA, when something unusual happened. A motorcade of cars and trucks angled into the parking spots in front of their restaurant. Two dozen men emerged, and moments later, every table was filled. The Sauers looked at each other in shock. They had never seen so many people in their diner before—and they didn't recognize a single one of them.

That day marked the beginning of major changes in clientele for the restaurant. At first, Julie resented the men with their Southern drawls and thick mud on their boots. "I hated mopping an extra three times a day," Julie recalled. "But these guys brought huge appetites and full wallets with them. I sure didn't resent that." She said they would often order two meals each and top them off with a slice of her momma's homemade pumpkin pie.

Other new customers wore business suits, Craig observed, and seemed just as out of place. They would spread out maps on the tabletops between their coffee cups, work their cell phones frantically, and hurry back and forth to the county courthouse across the street.

"We had heard there would be an increase in business when the developers started to move in, but this is more than we ever expected," Craig said. Before long, the Sauers hung a help-wanted sign in their window. They hired additional cooks and wait staff in the restaurant, and two new maids for the small hotel they were trying to start. Louise, a single mother of two, who had been working part time at the restaurant for the past five years, became a full-time employee.

"This is a dream come true," Louise said. "I even earn overtime when things get crazy."

Just a few months ago, Craig feared they would lose the businesses they had worked so hard to make viable, and the small-town life they had come to love. Craig said they had been losing money for years, with the persistent unemployment in Carroll County taking its toll.

But the new regular customers—the rig workers, truckers, engineers, and surveyors drawn to the region by the boom in natural gas exploration—changed all that. Julie and Craig affectionately refer to these men as the "gas guys": the men drilling for natural gas in the portion of the Marcellus Shale running through Western Pennsylvania-one of biggest natural gas development opportunities in the world.

"They have been the nicest people," Julie said. "Extremely courteous and hard-working. We're happy they're here, and they're happy to be here."

The Sauers' hotel is the only one in Carrollton and their restaurant is just a few blocks away. But good luck booking a room or getting a table. "This is a busy place because of them," Craig said, smiling. "We are packed every single day."

This economic success has led to two exciting new renovations for Julie and Craig. They have purchased an empty apartment building near their hotel and are modifying the space into long-term rentals that will be perfect housing for the "gas guys." And they have purchased a new home, where they are busy changing the second bedroom into a nursery.

Their first child is due in a few months.

Pennsylvanians remain divided over the pros and cons of drilling for natural gas in the Marcellus Shale. While supporters argue that Shale drilling is an essential form of energy development, critics are concerned that hydraulic fracturing—known as fracking—damages the environment and contaminates groundwater. The Marcellus shale formation stretches for 65 million acres across Ohio, West Virginia, western Pennsylvania, and southern New York.

Appendix I.

Environmental Consequence Frame Script

Stimulus A (Environmental Consequence Frame/Narrative News Format, 614 Words)

Gas Exploration Changes Lives in Western PA

Thursday, December 1, 2011

By Marc Schmit, Pittsburgh Post-Gazette

PITTSBURGH—A year ago, Craig and Julie Sauer were preparing dinner in their home in Dimock, PA, when something unusual happened. Craig was filling a pot of water to boil potatoes when he detected a strange smell. Moments later, the water from the tap began to turn brown. The Sauers looked at each other in shock. They had never had a problem with their well-water before—but the water filling the pot was clearly undrinkable.

According to Julie, that day marked the beginning of major changes for their family. A week before their water supply began to go bad, the Sauers were working on renovating their modest home on tree-canopied Carter Road, when a man knocked on their door. He represented Houston-based Cabot Oil & Gas, a midsize player in the energy exploration industry. He wanted to talk to them about leasing the mineral rights to their three and a half acres of land.

"He said most of the land-owners in the area had already signed, including our closest neighbor," Julie recalled. "Their property meets ours just beyond the creek behind the barn. It is practically our back yard."

The Sauers were offered $2,500 per acre for mineral development rights. It was well more than most people in the county were getting, Craig discovered, but they still refused to sign. "We moved here for the natural setting and pure environment," Craig explained. "We just couldn't bring ourselves to sign away what we had come here to experience."

Just a few months ago, everything had seemed ideal with the Sauers' new home. They had taken their time looking for the perfect place in which to raise their two young children and four dogs, and they felt they had finally found it.

But drilling operations near their property changed all that. On a site only 350 yards from their property, old-growth forest was cleared and the ground leveled to make room for 24-hour drilling operations.

“We could feel the earth beneath our home shake whenever the well was fracked,” Craig said.

Over time, their water became so corrosive that it scarred dishes in their dishwasher and stained laundry. “It was so bad sometimes that my daughter would have to get out of the shower and lay on the floor because she was dizzy from the chemicals in the water,” Craig said. She didn’t speak up about it for a while because she wondered whether she was imagining the problem. But she wasn’t the only one in the family suffering.

“My son had sores up and down his legs from the water,” Craig said. Craig and Julie also experienced frequent headaches and dizziness.

By October 2011, the Department of Environmental Protection had taken all the water wells in the Sauers’ neighborhood offline. It acknowledged that a major contamination of the aquifer had occurred. In addition to methane, dangerously high levels of iron and aluminum were found in the Sauers’ water.

The Sauers now rely on water delivered to them every week by Cabot. The value of their land has been decimated. Their children no longer take showers at home. They desperately want to move but cannot afford to buy a new house on top of their current mortgage.

“The drilling has made our land worthless,” Craig said. “Who is going to buy this house?”

Pennsylvania remains divided over the pros and cons of drilling for natural gas in the Marcellus Shale. While supporters argue that Shale drilling is an essential form of energy development, critics are concerned that hydraulic fracturing—known as fracking—damages the environment and contaminates groundwater. The Marcellus shale formation stretches for 65 million acres across Ohio, West Virginia, western Pennsylvania, and southern New York.

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