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Design of audio ads to prebunk misinformation and promote civil discourse

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Abstract

Introduction. This paper reports on an experimental pilot study, involving 99 student participants at a large southwestern US university, that measured the effectiveness of ads designed to prebunk, or increase scepticism, of audio misinformation to increase information literacy.

Method. The research team created short prebunking advertisements based on audio recordings of theatrical sketches they developed, some further enhanced by AI-generated visualizations of the transcripts. The team then used new and existing measurement tools to gauge the effectiveness of one of the ads in increasing information literacy.

Results. Prebunking ads were found to be effective in increasing information literacy overall, with ads involving AI-assisted visualization correlated with improved information literacy, and audio-only ad findings more mixed.

Introduction

In the face of escalating misinformation and radicalization in digital audio, our research team sought to develop and evaluate a novel intervention method designed to prebunk problematic audio content before it takes hold individually or socially and enhance our approach using artificial intelligence for speed and scalability. Our study focused on the creation and deployment of short prebunking audio advertisements, some further enhanced by AI-generated visualizations of the transcripts, to assess their effectiveness in building information literacy gauged through identifying true and false news headlines.

Background

Audio-based misinformation and radicalization are topics of increasing concern in digital environments (Muhammed T & Mathew, 2022; Wirtschafter 2023), where lies spread faster than truth (Vosoughi et al., 2018) and can cause serious harm. While there is a canon of new research on media misinformation interventions, audio misinformation and polarization interventions have not been sufficiently studied. Pew Research has found many Americans listen to and get information from audio sources, including podcasts which have gained popularity over the previous decade, and terrestrial radio which has continued to reach large audiences (Jurkowitz, 2023). Research on podcasts in particular has found high trust in hosts and advertisements (Brinson & Lemon, 2023), and significant spread of misinformation. The affordances of audio-centric content are well-suited for manipulation: voice-based misinformation and radicalization in Lebanon were found to exploit the medium's conveying of emotion and speaker source credibility (El Masri et al 2022). Of the scant research on audio misinformation interventions, one salient study successfully deployed audio dramas designed by researchers to debunk common health misconceptions among listeners in Sierra Leone (Winters et al 2021).

One strategy of increasing interest among misinformation interventions is prebunking, or the act of trying to build mental defences against manipulation techniques before problematic content is seen or consumed. Prebunking typically involves presenting consumers with a pre-emptive warning about the tactics used in misinformation, coupled with a refutation before they encounter the false information itself (Roozenbeek & van der Linden 2019). In some studies, prebunking has been found to be significantly more effective than debunking (Banas & Miller 2013; Lewandowsky & van der Linden, 2021). A foundation of prebunking is McGuire's (1961) Inoculation Theory, positing that exposing individuals to a weakened form of an argument along with refutations can build cognitive resistance against misinformation (McGuire 1964).

Our current work focuses on prebunking because this approach has shown promise in the current media landscape, where rapid misinformation dissemination often outpaces the ability to correct falsehoods effectively. To create prebunking messages, members of our research team drew on our backgrounds in audio production and theatre including sketch and improvisation (improv) to script, perform, record, and edit short audio sketches designed to be played as ads during podcasts. In acknowledgment of the growth of video podcasting and of limitations in our capacity to create video ads, we also used AI to add visualization to the ads we created. Here we report on our ad creation processes and our experimental pilot study conducted to gauge one ad's influence on information literacy.

Methods

Our research team created five audio ads that humorously dramatized misinformation- or radicalization-related situations and modelled civil responses. We next visualized the audio transcripts using artificial intelligence. The program descript provided general visual templates that animated words being spoken, with distinct colour schemes and visual waveforms for each speaker in the ad. Our team then finessed visualizations through minor changes in item placement and colour in video editing software. We also conducted experimental research to learn about the

effectiveness and impacts of one of the ads as an experimental pilot study. In this section, we explain the ad creation and study creation processes.

Ad title	Description	Targeted misinformation	Ad strategies
Buy This Idea!	Two men consider buying products in the Marketplace of Ideas, and one narrowly escapes a bad outcome.	marketplace of ideas; influencer-spread misinformation; truth from sport; polarization	masculine identification; vocal techniques; scatological humour; compassion
New Friends	Mel reunites with an old friend, but when she describes her new friends, he offers an alternative.	participatory disinformation; misinformation; radicalization	neutral location; vocal techniques; musical techniques; reward of community
Zoo Moms	Two moms and their kids meet at the zoo, where a new health trend is tested in the bear den.	health misinformation; wellness trends; distrust in medical science	feminine identification; motherhood identification; voice play; compassion
Dog Show	Two friends meet at the Dog Show, and a vendetta against schnauzers is exposed.	the ends justify the means; media manipulation; polarization	nonthreatening target proxy; emotional identification; compassion
Heroes and Sidekicks	Gas Man the superhero is confronted with the unintended effects of his powers, until his sidekick offers a compromise.	glorification of the past; motivated reasoning; science manipulation	masculine identification; flatulence humour; friendship; vocal techniques; sound design techniques

Table 1. Ads designed

Ad Design

The five ads we created all humorously dramatized situations in which people interact when misinformation or manipulation is involved, resolving when the problem is managed civilly. All ads end with a reference to our project website to learn more. Our first ad took three months to create, after which we began creating ads in one month or less in overlapping phases. Our ad creation process included steps described in this section.

Identifying misinformation to prebunk

Our first step in creating each prebunking ad was to identify a misinformation strategy or manipulation technique causing continuous harm. Working with a team of students, we analysed

social media trends and common misinformation tactics. One familiar manipulation technique emerging from our analysis was the *marketplace of ideas* (Kim & Gil De Zúñiga 2021), which we made into an actual marketplace in one ad entitled "Buy this Idea!" Our ad "New Friends" used in this study emerged from discussions about QAnon and its influence on the January 6th insurrection to target radicalization, illustrating how misinformation and the reward of community membership can lead to extreme ideological shifts, and how social connections can respond.

Scenario development

Once a misinformation strategy was identified, we brainstormed scenarios that could humorously and effectively engage with the strategy and model non-reactionary responses. Our team used techniques used from improv to manifest a scene through two characters and rapidly establish their relationship and the setting, so the remainder of the ad could be devoted to the attitudes actions and that would model misinformation-related dynamics.

Character development

We adhered to a basic rule of featuring only two main characters with distinct personalities in most ads, with any additional characters serving peripheral roles. This approach was designed around the original audio-only format of the ads to prevent listener confusion. Characters knew each other to model how individuals can engage with friends or family members who may be susceptible to misinformation.

Setting

Some scenarios were grounded in real-world locations or situations, such as the '*New Friends*' ad set in a post office or the '*Zoo Moms*' ad set in a zoo, as familiar and ideologically neutral locations to avoid triggering defensive reactions from the audience. For others we created metaphorical settings such as the marketplace of ideas.

Media production

We designed media to be 60 to 90 seconds in length, to optimize audience attention and allow for eventual podcast ad airing at reasonable cost. Production began with script drafting, followed by recording and editing.

Script drafting

With the scenario and characters established, one team member would take the lead on drafting the script. Subsequent revisions were then collaboratively discussed and refined, with a focus on maintaining the ad's clarity and humour while aligning with the intended time constraints.

Recording

The recording process was designed to maximize flexibility and adaptability. We often booked more voice actors than there were characters, allowing us to create multiple versions of each ad. This approach enabled us to test different voice actor combinations and enables testing on which versions resonate most with listeners. During the recording sessions, we aimed to capture at least one take that adhered closely to the script, while also allowing for improvisation and variations—a technique known as '*retroscripting*' in film and television production.

We provide an example of a transcript, with timestamps and emphases added after recording, for the ad '*New Friends*' used in the pilot study. Table 1 describes all ads created.

[00:00:00] Jason: Oh, hey Mel. Funny running into you here at the post office. We haven't seen you in a while.

[00:00:05] Mel: Well, I've been really busy with my *new* friends. They're pretty great and they *really* get me. Not like this POST OFFICE. They have PROBLEMS!

[00:00:13] Jason: Whoa, whoa, whoa, whoa. That's, that's cool you have new friends. So, do you guys talk karaoke? I know that's kind of your thing.

[00:00:19] Mel: No, but we have some GREAT online chats about Big Postal. Have you seen the price of stamps lately?

[00:00:25] Jason: Uh, well, uh, do you all go bowling? I know how much you love the lanes.

[00:00:29] Mel: They're not really big bowlers. They're more serious than that. Did you know that CARRIER PIGEONS are actually FASTER than MAIL TRUCKS???

[00:00:36] Jason: I, I don't think that's true, but um, hey, have they heard you do The your *amazing* cover of Forest for the Trees?

[00:00:42] Mel: No, but we have talked about storming this post office tomorrow night.

[00:00:48] Jason: Oh boy. Uh, well look, I'm really sorry I haven't called in a while. We all love having you around, so why don't you join us for some karaoke tomorrow night instead? We can talk about whatever you want.

[00:00:59] Mel: Really? [00:01:00] Well, I guess we could just *not* storm the post office. I mean, it *is* conveniently located.

[00:01:13] Narrator: It's great to find a new community online. But you shouldn't have to be extreme just to get them to accept you. Find out more at immersivetruth.org.

Audio editing

Different versions of the ads were created through editing using various combinations of voice actors, with a priority placed on meeting the target duration without compromising the message's clarity.

Intended uses and applications of Ads

Ads created in this project are designed to be aired during podcasts, particularly those known to spread misinformation. Our work focused on audio prebunking is modelled in part on other campaigns designed to intervene in misinformation spread. Previously researched prebunking video campaigns have been scaled up and distributed broadly to mitigate the harms of misinformation in locations including Europe (Lewandowski and Van der linden, 2021) and India (Parihar et al, 2024). While our campaigns on audio misinformation interventions could be similarly scaled up with corporate partnership, we intend at the time of this writing to scale up more modestly, through modeling collaborative and user-based ad creation in workshops and educational settings, and through production accelerated using AI assistance.

Experimental study

The primary goal of our study was to evaluate the effectiveness of our prebunking ads in reducing susceptibility to misinformation, increasing the ability to identify false news headlines, and influencing attitudes towards civil discourse. We formulated specific research questions to guide our inquiry thus far:

1. Will exposure to a specific prebunking ad enhance an individual's ability to identify false news headlines?
2. How will the visualization of ad script using AI assistance impact respondent literacy?

3. How will participants describe and gauge the effectiveness of a specific prebunking audio ad?

These questions framed our study design, which involved a controlled experimental setup with undergraduate students at a large university in the southwestern US as participants.

Study participants and recruitment

We recruited participants through instructors of courses related to study topics, encouraging the offer of extra credit as an incentive to participate. Recruitment materials included flyers and wording for announcements to be included in the course management system D2L Brightspace used by the university.

Data collection

Participants who followed the invitation link provided through the recruitment materials first completed a pre-screening survey to assess their eligibility. Eligible participants were then invited to participate in Part 1 of the study, which involved providing informed consent, demographic information, and details about their social media practices.

In addition to answering questions about themselves and their social media use, participants completed qualitative questionnaires and three scales: the generic conspiracist belief scale (Brotherton et al., 2013), the misinformation susceptibility test or MIST-20 (Maertens et al., 2024). We also developed and applied our own misinformation susceptibility test based around the model of the MIST-20, called ITMIST, using different real and fake headlines.

Participants were then exposed to one of the prebunking ads or a control ad, in a format of either audio-only or an audiogram with AI-generated visualizations. Following ad exposure, participants completed a survey response questionnaire, marking the end of Part 1. The next day, participants received a link to Part 2 of the study, where they were asked to take the GCBS, MIST-20, and ITMIST scales and completed another qualitative questionnaire within one week of their completion of the first survey.

Results

Demographic information and social media practices

143 respondents filled out Part 1 of the survey; of these, 99 went on to complete Part 2 of the survey within one week as was required. Participants were predominantly young adults, with ages ranging between 18 and 48. 59 identified as female (59.6%), 38 as male (38.4%), 2 preferred not to disclose their gender (2.1%), and none chose other gender options. 54 identified as White/Caucasian (54.5%), 9 as Hispanic (9.1%), 8 as Asian/Pacific Islander (8.1%), 5 as Black/African American (5.1%), 2 as American Indian/Alaskan Native (2.0%), 19 as multiracial or from other backgrounds (19.2%), and 2 preferred not to disclose their ethnicity (2.0%). Politically, 34 participants identified as Democrats (34.4%), 32 as Republicans (32.3%), 18 as Independents (18.2%), and 15 affiliated with other parties or chose not to disclose political preference (15.6%). In terms of religious affiliation, 37 identified as Christian (37.4%), 16 as non-Religious but Spiritual (16.2%), 11 as Roman Catholic (11.1%), 6 as Jewish, 6 as Atheist (6.1% each), 5 as Muslim (5.1%), 3 as Agnostic, 3 as Protestant (3% each), 5 as another affiliation (5.1%), and 6 preferred not to say (6.1%).

100% of respondents stated that they used a social media platform at least once a week. Of the major platforms, 89 respondents use Instagram (89.9%), 67 use Tik Tok (67.6%), 66 use Snapchat (66.7%), 34 use Twitter/X (34.3%), 21 use Facebook (21.2%), and 8 use other platforms (8.1%). In terms of average daily time spent on social media, 43 respondents reported usage over 2 hours a day (43.4%), 26 between 90 minutes and 2 hours (26.3%), 12 between 60-90 minutes (12.1%), 14 between 30-60 minutes (14.1%), and 4 less than 30 minutes (4.0%). When asked how much of their information on current events/politics/news respondents get from social media, 28 said Most (28.3%), 67 said Some (67.7%), and 4 said None (4.0%).

For podcast engagement, 23 respondents said they frequently tune in to podcasts (23.2%), 50 said sometimes (50.5%), and 26 said never (26.3%). Of respondents who listen to podcasts, 52 reported they always skip podcast ads (71.2%), 19 said they sometimes skip them (26.0%), and 1 said they never skip them (1.4%). There was a wide range of podcasts that respondents said they listened to for entertainment and education, and clustered most strongly by political affiliation. Of respondents who identified as Democrats, the most popular podcasts for entertainment were '*Call Her Daddy*' (CHD) and '*Cancelled*', while the most popular answer for educational podcasts was '*None*'. Of respondents who identified as Republicans, '*The Joe Rogan Experience*' (JRE) was the most popular podcast both for entertainment and for education. Of Independents and those who preferred not to specify their political affiliation, the most popular entertainment podcasts were JRE and CHD, and for education the most common response was '*None*' followed by JRE.

MIST-20 and ITMIST averages

Between the Visual Control group and the Visual Experimental group, the Experimental group showed a significantly larger average improvement on the MIST-20 (Visual Control $\bar{x} = 0.33$, Visual Experimental $\bar{x} = 0.93$), and a moderate improvement on the ITMIST (Visual Control $\bar{x} = 0.81$, Visual Experimental $\bar{x} = 0.98$).

Between the Audio Control group and the Audio Experimental group, there were more mixed results. The Control group showed higher improvement than the Experimental group on the MIST-20 (Audio Control $\bar{x} = 1.41$, Audio Experimental $\bar{x} = 0.85$), but lower improvement than the Experimental group on the ITMIST (Audio Control $\bar{x} = 0.45$, Audio Experimental $\bar{x} = 0.78$).

Individual respondent improvements and declines

Viewed by group, respondents who improved across the two tests showed a larger change as an absolute value than respondents who showed a decline. Subsequently, results leaned toward improved averages across all groups.

Other materials and variables

Results of the GCBS are still being analysed, but do not appear to show clear findings. No significant differences were found based on demographic variables.

Average Improvement Across Groups and Materials

	MIST-20		ITMIST	
	Experimental	Control	Experimental	Control
Visual	**↑0.93**	**↑0.33**	**↑0.81**	**↑0.98**
Audio	**↑0.85**	**↑1.41**	**↑0.45**	**↑0.78**

Percentage Improvement Across Groups and Materials

	MIST-20		ITMIST	
	Experimental	Control	Experimental	Control
Visual	**↑52%**	**↑48%**	**↑62%**	**↑52%**
Audio	**↑56%**	**↑73%**	**↑52%**	**↑45%**

Percentage Decline Across Groups and Materials

	MIST-20		ITMIST	
	Experimental	Control	Experimental	Control
Visual	**↓14%**	**↓43%**	**↓7%**	**↓14%**
Audio	**↓11%**	**↓18%**	**↓22%**	**↓23%**

Table 2. Limited results

Discussion

Our study was designed around audio misinformation interventions and did not emphasize visualization, but results of our early analysis remind us of the axiom popularized by Marshall McLuhan (2017) that '*the medium is the message*.' The ads our team created differed significantly in effectiveness by format: our visualized ads were found to be correlated with improved literacy scores after viewing, while the effectiveness of our audio ads on literacy was not clear. The improvements from the visual ad spanned multiple measures: a greater percentage of respondents in the visual experimental group improved their scores on the MIST-20 and ITMIST compared to the visual control group, and a smaller percentage of respondents in the visual experimental group saw a decline in their scores on those tests when compared to the visual control group.

Results so far show less promise in our audio ad campaign, a finding we attribute in part to increased sensory engagement of video over audio online, and in part to today's online media ecosystem. In light of the increased engagement visuality demonstrates across platforms (Li & Xie, 2020; Dhaoui & Webster, 2021; Sprejer et al., 2022), we theorize the audio-only format left a sensory gap during the playback—and even in deciding whether or not to play the audio—for a population immersed in visual media. The audio-only ads also suffer from a scarcity of genres of popular aural media: while the visualized sketches our team produced may fit into the genre of short videos popular on platforms like TikTok, no elective audio format easily corresponds to our audio-only content, so these are understood as ads. While podcast advertising has been found to heavily

influence listeners, this influence is most noted when the ad is read by the host with whom the listener identifies (Brinson and Lemon 2023), which does not fit the format of our ads.

Future work

Based on early analysis, we see promise in the use of theatrical video sketches to prebunk misinformation, and research planned in the future will include broader populations using all ads created. We plan to increase ad production with AI and to explore their more robust options such as visual storyboarding. While these results show more promise for visualized prebunking ads than audio-only, we judge further work in both types of interventions to be essential, based on our respondents' reliance on podcasts for education and on the spread of audio-only misinformation. Audio campaigns are also more scalable intervention models based for our team, with quality video content taking more time and resources to produce. In future audio-only work, we hope to track playback and move the delivery method offscreen, to capture impacts on listeners performing low-focus tasks like exercise or housework.

Limitations

Limitations include that this pilot study gauged the impact of only one ad described here. Additionally, participants may have learned from the study when they showed improved literacy in the second survey. Most of the population of undergraduate university students completed the study for extra credit in courses unaffiliated with the research team, and some may have entered random answers to earn the credit more quickly. Analyses of results are limited at the time of this writing, with some data including both quantitative and qualitative responses still being analysed. Finally, it would benefit the field of information sciences to develop more tools to measure the effectiveness of these and other misinformation interventions in the future, as measuring the accuracy of headlines may not provide sufficient nuance to accurately measure an individual's scepticism or media literacy.

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