

Pilot study of peer modeling with psychological inoculation to promote coronavirus vaccination

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Abstract

Promoting coronavirus vaccination is deterred by misinformation, ranging from elaborate conspiracy theories about sinister purposes to exaggeration of side effects, largely promulgated by social media. In this pilot study, we tested the effects of different messages on actions leading to vaccination. Two theory-based advertisements were produced for Facebook, which provided video testimonials from peer role models recommending vaccination and its benefits while providing psychological inoculation through the models' acknowledging misinformation, rejecting it and receiving the vaccine. These ads were paid to appear on Facebook users' feeds in rural counties in South Texas, along with a generic vaccine promotion ad from the CDC without peer models or psychological inoculation. Ad viewers could click a link to 'find a vaccine near you'; these responses served as the outcome variable for assessing experimental effects. Ads featuring peer modeling with psychological inoculation yielded a significantly higher rate of positive responses than CDC ads (30.5 versus 14.9/1000 people reached in English and 49.7 versus 31.5/1000 in Spanish; $P < 0.001$ for both English and Spanish rate comparisons). This provides useful pilot data supporting the hypothesis that theory-based communication, i.e. peer modeling with psychological inoculation, may be more effective

than more traditional forms of advertising for promoting coronavirus vaccination.

Introduction

Vaccine hesitancy is as old as vaccination [1] and is considered by the World Health Organization as one of the top 10 threats to global health impacting polio, measles and HPV vaccination, among others [2–4]. It includes a delay in acceptance, or declining immunizations despite the availability of adequate services [5], and is higher for populations experiencing health disparities. There is evidence of disparities in the acceptance and uptake of vaccinations among adults from racial and ethnic minority populations, including vaccines for influenza and HPV. Recent research on influenza vaccination uptake shows a pattern of racial and ethnic minorities being less likely to receive the vaccine, with socioeconomic and clinician/health care system factors that decrease access and impair provider–patient relationships playing a role [6]. The reasons for hesitancy are varied, but may include concerns about perceived safety, skepticism about the trustworthiness of the source(s) of vaccination recommendations, misinformation about conspiracies by powerful interests to use vaccination as a cover for malevolent objectives, considering immunization a low priority, perceived low risk of illness, limited knowledge about the disease or the benefits of vaccination, limited health literacy, difficulty accessing services, clinician bias, cost or

personal, cultural or religious beliefs discouraging vaccination [6–9].

Some common misbelief spreading through social media include conspiracy theories and claims that the COVID-19 vaccine contains a microchip that will be used to track individuals, has the virus in it and will be used to eliminate parts of the population, causes cancer, will alter people's DNA and even cause vaccinated persons' skin to shed. In addition to conspiracy theories and wild exaggerations of potential side effects, religious beliefs are also keeping some Hispanics from getting vaccinated, including believing that God will cure COVID-19 and that the only cure needed is the church. Social media groups (Facebook, YouTube, etc.) share memes supporting these beliefs that are shared among users' own networks. In addition, religious antivaccination websites promoting hesitancy claim that the vaccine represents loyalty to God's enemies, as part of a satanic ritual that will confer the 'mark of the beast.' Vaccine misinformation has spread easily in many Hispanic populations due to lack of reliable information in Spanish and poorly translated information, combined with little government outreach [10]. The coronavirus pandemic is the first in history in which technology and social media are being used on a massive scale to keep people safe, informed, productive and connected [11]. At the same time, the same technology is enabling and amplifying the dissemination of misinformation that is polarizing public debate on COVID-19 related topics, increasing stigmatization of those who are vaccinated and thus producing poor adherence to public health recommendations and jeopardizing the country's ability to control the pandemic, in particular vaccination efforts [11, 12]. We, and others, have identified many sources of misinformation that increase vaccine hesitancy generally [12] and more specifically among Hispanics in South Texas. These are mainly social media and most particularly Facebook and YouTube, where many video presentations can be found providing various reasons why people should not allow themselves to be vaccinated against COVID-19.

Our team has many years of experience using 'peer modeling' as a method of communication to influence beliefs, attitudes, intentions and behavior change. Peer modeling is grounded in Albert Bandura's social cognitive theory, which asserts that the main way humans learn is by observing others around them [13, 14]. We have pioneered the concept of 'behavioral journalism', i.e. using real stories about real people to present information that can be imitated by those who read or observe them [15–19]. Beginning with a 'reality TV' program in Finland in which real people were followed over time as they improved diet, lost weight, controlled blood pressure and achieved sustained cessation of smoking [17], we have employed this technique in many studies [20–23] and the empirical evidence for the effectiveness of what McAlister [16] termed 'behavioral journalism' in a 2017 publication [18]. The most substantial body of research supporting this method for communicating about infectious diseases was in the AIDS Community Demonstration Studies, where peer modeling was conveyed creatively through many different modalities (e.g. four-panel cartoons, tabloid print stories with copious illustrations, erotic images with brief vignettes on condom wrappers about learning to enjoy condom use in anonymous anal sex) [24–26].

Research on persuasion and resistance to persuasion in situations where audiences are exposed to strong arguments against a recommendation has identified a communication technique known as 'psychological inoculation [27–29],' which was first used to prepare soldiers who might be captured to resist indoctrination into opposing political ideologies [30]. In psychological inoculation, existing or anticipated persuasive arguments against a desired belief are explicitly presented and refuted before or after people are exposed to misinformation [31–33]. Prior research has shown that inoculating messages from trusted sources can prevent belief in new conspiracy theories, increase vaccine intentions and activate protective responses, such as critical thinking when exposed to future COVID-19 misinformation [8, 32–36]. In a recent study, participants identified doctors are the most

trusted source of COVID-19 information, even for those who believed conspiracy theories, who trusted doctors' information more than social media or other sources where misinformation proliferates [33, 34, 37, 38]. Healthcare providers, as well as trusted community leaders, and academic/community organizations, have a powerful opportunity to educate the community about the importance of COVID-19 vaccination and to inoculate them against current misinformation and beliefs while promoting vaccine uptake [33, 34]. But we believe that peer modeling, in which the sources of messages are also members of their intended audiences, will be the most effective strategy for psychological inoculation communication, and this formed the theoretical basis for the communication strategy in the pilot work we report here.

Methods

Through existing social networks, the research team of *Salud America!*, a Latino health equity program based at UT Health San Antonio, Texas, identified and interviewed two Hispanic peer role models who reported initial misgivings about vaccination before deciding to be vaccinated. The video interviews with the peer role models were used to create digital stories and brief bilingual videos around how the peer models overcame misinformation, turned initial fear into confidence, got the vaccine, reconnected with family and are helping end the pandemic. We conducted a pilot test via Facebook advertising to compare the video peer model stories to a CDC social media vaccine graphic ad to test the hypothesis that our peer model videos with psychological inoculation would prompt more viewers to click or tap on a link to find a vaccine near them via the CDC's [vaccinefinder.org](https://www.cdc.gov/vaccines/imz/downloads/#vaccinefinder) (which has English and Spanish versions). See Fig 1. CDC is the official provider of accurate COVID-19 vaccine-related information. We tested Facebook ads for two peer model video stories, Jesus Larralde from South Texas and Rosa Herrera of Minnesota [39, 40]. The peer model

videos featured playable 2 min videos that showed Rosa and Jesus answering questions on why they were hesitant, why they changed their minds and got the shot and what getting the shot has helped them do now. Both peer models were initially hesitant about COVID vaccination, and they expressed knowledge about conspiracy theories and misbeliefs about side effects that provided psychological inoculation with explicit recognition of widely heard arguments against getting the vaccination, but decided to reject those erroneous beliefs and accept vaccination.

In Rosa's Spanish-language video (English link <https://youtu.be/pZKAvBdEIUE>), she talked about how she became reluctant to obtain vaccination when she read on Facebook that the COVID-19 vaccine would inject her with a microchip to track her but then learned that was not true by watching a webinar with public health experts who explained the vaccine; and how she decided, despite misgivings about misinformation, to get the shot to make sure her daughters, who had gotten COVID-19, did not get sick again from her and to be able to visit family who live in Mexico. 'I'm able to see my grandkids and my kids. It gives you more freedom,' Rosa said. 'If you don't do it for yourself, do it for your family.' In Jesus' English-language video (<https://youtu.be/1qIFRAxPiqE>), he talked about fearing dangerous vaccine side effects after hearing misinformation on Facebook exaggerating the risk of harmful side effects and then saw his wife and sisters get their shots with no ill effects and got his shot after his doctor recommended it because of his underlying high blood pressure and diabetes. He explains that he experienced very minor side effects, and how he is looking forward to family gatherings and barbecues. '[The vaccine shot] was really quick ... less than 15 minutes. Didn't seem to have any side effects. I was pretty much fine,' Jesus said. 'We need to stop spreading this thing around. If we don't take our shots, [getting back to family is] not going to happen.' We tested these two peer model video ads on Facebook in comparison with CDC social media vaccine graphics (one in English and one in Spanish). The CDC ad showed a container of the COVID-19 vaccine, with

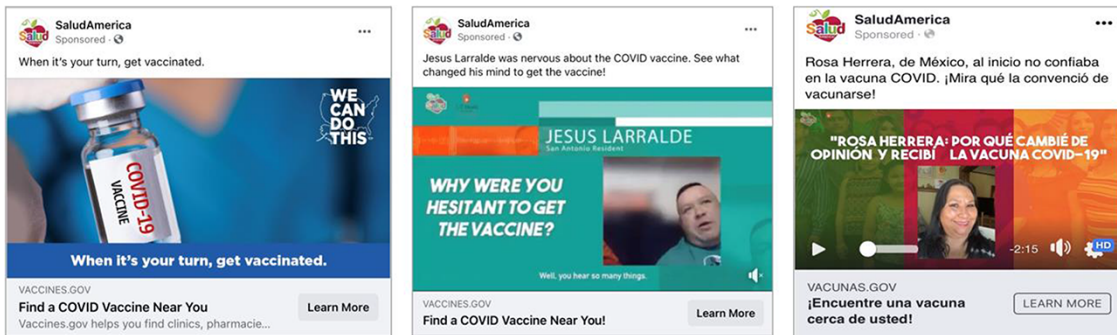


Fig. 1. Screenshots of pilot study ads.

a tagline of ‘When it’s your turn, get vaccinated,’ in English and ‘Cuando sea tu turno, vacúnate,’ in Spanish. All of the ads – both the peer models and the CDC graphic – featured a call to action to click to ‘find a vaccine near you,’ which linked directly to the CDC’s [vaccinefinder.org](https://www.cdc.gov/vaccines/imz/finding) either in English or Spanish.

For this Facebook advertising pilot test, we spent a total of \$1995.26 to place the CDC’s generic graphic in Spanish and English and the peer role model videos in two rural counties with a high proportion of Hispanic residents near San Antonio, Texas. Funds were distributed evenly to purchase placement of the Jesus Larralde peer model video in English in Medina County, Texas, and also the CDC’s generic vaccination graphic in Spanish there. We also purchased placement for the CDC’s generic vaccination graphic in English and the Rosa Herrera peer model video in Spanish in Atascosa County, Texas. This quasi-experimental design was necessary because when two similar ads are placed on Facebook in a particular location, the platform’s algorithms automatically purchase more placements of ads that yield higher response rates, which would not provide a good comparison for research purposes. Due to limited funds for this pilot work, we only studied placements of one theory-based ad in English in a single county and one in Spanish in another county. These two rural counties were chosen based on similar population size, high proportion of Spanish speaking residents and physical proximity to Bexar County.

Results and discussion

Our approximately \$2000 expenditure yielded a total of 125 287 impressions (exposures) in the two counties, 26 564 for the theory-based ad with Jesus Larralde and 32 636 for Rosa Herrera and 31 354 and 34 733 for the respective CDC ads in Spanish and English. We first calculated the cost in ad placement expense that was needed to obtain the desired response. Both theory-based ads achieved lower cost per click to find a vaccine (\$2.66 per click for Jesus in English and \$3.14 per click for Rosa in Spanish), compared to the CDC generic ads (\$4.03 in English and \$5.43 in Spanish).

Next, for significance testing, we calculated and compared the number of positive responses divided by the number of ‘people reached’ with the different ads to obtain the rate per 1000 exposed Facebook users who responded by taking action toward obtaining vaccination. For English ads these were 14.9/1000 for the CDC ad and 30.5/1000 for the theory-based ad ($P < 0.001$, Fisher exact test). Regarding Spanish ads, the corresponding rates were 31.5/1000 for the CDC ad and 49.7/1000 for our theory-based ad ($P < 0.001$, Fisher exact test). Our peer modeling with psychological doubled the effects seen with a conventional CDC ad in English and yielded a 58% higher response rate in Spanish.

This pilot study has some limitations. Only one CDC ad was used for comparison purposes against two peer-modeling video ads, and the outcome

variable was only tapping or clicking on the CDC's vaccinefinder.org link, not actually receiving vaccination. In addition, the study did not assess vaccine hesitancy among people clicking on the link. It is possible that the higher response rates were obtained only because the theory-based ads were videos featuring people, rather than mainly graphic information. Only two peer models were presented, and it is possible that they had unique persuasive characteristics that other models may not. Lastly, the quasi-experimental design and the lack of randomization may limit the study's ability to conclude a causal association between an intervention and the outcome. Nevertheless, these data demonstrate the feasibility and potential to achieve a useful impact of carefully tailored bilingual peer role model stories with psychological inoculation against misinformation, in promoting vaccine confidence and persuading reluctant persons to obtain vaccination. The peer-modeling ads outperformed a CDC control ad that included only a sentence encouraging vaccination and featuring a vaccine container. Further, more rigorous research is clearly warranted. We believe that a high volume of tailored peer modeling communication can overcome vaccine hesitancy and enhance efforts to help the USA achieve the level of herd immunity needed to fully contain COVID-19 [41]. To study this more rigorously and comprehensively, we have very recently submitted a research proposal to the National Institutes of Health in which rural and urban counties in South Texas will be the units of randomization and observation and recorded vaccination rates reported by the Texas Department of State Health Services will be the primary outcome measured. With more extensive research like this, we expect to find that theory-based communication, in the form of peer modeling with psychological inoculation, is a highly effective way to promote coronavirus vaccination in a communication environment filled with misinformation that deters many from following the advice of public health leaders and promptly obtaining recommended vaccination.

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Conflict of interest statement

None declared.

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