**A systematic review of narrative interventions:
Lessons for countering anti-vaccination conspiracy theories and misinformation**

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conspiracy theories and misinformation

[T]he scientific community needs to be better at storytelling. Stories are the most fundamental way we communicate. Even Jesus told nearly all his messages in parables, why don't we? #vaccines #vaccinessavelives (tweet by Ethan Lindenberger, https://twitter.com/j_lindenberger/status/1155944720364793856 [last accessed August 2, 2019])

Introduction

From a public health perspective, vaccination is the most effective way to protect both individuals and communities from vaccine-preventable diseases. However, global coverage with vaccines such the diphtheria-tetanus-pertussis or the first-dose measles vaccine, has plateaued at 85 percent (WHO, 2018a). It is estimated that an additional 1.5 million deaths a year could be avoided if the coverage improved (WHO, 2019). Even in the absence of structural barriers (e.g., problematic access to healthcare or vaccination cost), some people are hesitant or refuse recommended vaccinations. These individuals cannot be ignored since vaccines need to reach a high proportion of the population to prevent outbreaks (Fine et al., 2011). For example, the World Health Organization (WHO) recommends that measles vaccinations reach uptake levels of 95 percent to maintain herd immunity (WHO, 2018b). The WHO has, in fact, declared vaccine hesitancy as one of the top ten threats to global health (WHO, n.d.), and the 2020 COVID-19 pandemic, unfortunately, made it even more relevant. To successfully tackle this issue, community-wide consensus and cooperation need to be secured, which poses a unique challenge to those who design and implement interventions.

Misinformation, as an important determinant of vaccine hesitancy, is often embedded in anti-vaccine conspiracy theories (CTs), that is, in the claims of secret plots by powerful actors, who attempt to conceal their role (Sunstein and Vermeule, 2009). In fact, CTs have been identified as a favored way to spread misinformation about vaccines and infectious diseases through online media (Wang et al., 2019). Conspiracy belief was found to involve negative attitudes toward vaccination (Lewandowsky et al., 2013a) and to deter people from getting themselves and their children vaccinated (Craciun and Baban, 2012; Jolley and Douglas, 2014; Oliver and Wood, 2014b; Teovanović et al., 2020). Even mere exposure to misinformation has been shown to be detrimental – in one experiment, false information supporting anti-vaccine CTs (e.g., data about the profitability of vaccine sales) made participants more reluctant to get vaccinated (Jolley and Douglas, 2014).

Many of the interventions addressing vaccine hesitancy were based on the view that misinformation (such as “vaccines cause autism” or “the flu vaccine can give people the flu”) should be met with counterinformation (ECDC, 2017). We believe that the typical approach to addressing anti-vaccination CTs might not be enough due to the fact that CTs it aims to debunk are communicated to the public in a way that makes them potentially “viral”. CTs can be thought of as “memes” or units of cultural transmission and imitation (Blackmore, 2000; Dawkins, 1976). As they are copied from one person to another, CTs can quickly spread through society, competing with memes such as “fair debate” and “scientific expertise” (Goertzel, 2010). We argue that confronting based only on straightforward facts would not have a competitive edge over CTs. If during a vaccine scare period, for example, journalists and social media users produce anti-vaccination anecdotes and human-interest stories, while health authorities respond by providing scientific arguments and citing findings from epidemiological studies (Burgess et

al., 2006), there is a high chance that anti-vaccination sentiment will prevail (for an experiment during the COVID-19 pandemic, see Solnick et al., 2020). What is more, compared to scientific information, both pro- and anti-vaccine personal stories as well as CTs tend to gain more attention online (Xu, 2019).

We introduce our view in which CTs are intricate narratives expressing personal and cultural values and that should, therefore, be countered with equally memetic pro-vaccination narratives. Thus, after providing an overview of the dominant psychological approaches to CTs, with emphasis on the use of factual corrections in debunking anti-vaccine CTs, our first aim is (a) to outline our alternative theoretical position. Next, we present a review of experimental studies exploring whether the exposure to pro-vaccine narratives influences vaccination outcomes (e.g., beliefs, attitudes, intentions, and behaviors), with the aim (b) to identify the additional prerequisites for a successful narrative intervention. Finally, we propose (c) a list of specific recommendations for public pro-vaccine communicators.

Introducing the Terminology

“Conspiracy theories” are allegations that powerful individuals or organizations are working together in secret to achieve their own unlawful or malevolent goals through deception of the public (Abalakina-Paap et al., 1999; Douglas and Sutton, 2011; Oliver and Wood, 2014a; Douglas et al., 2019). For example, one common anti-vaccine CT is that the “big pharma” is forcing expensive vaccinations on children in an attempt to reap large profits.

“Debunking” commonly refers to attempts at refuting or removing misinformation by correcting it with counterinformation (Lewandowsky et al., 2012). We reserve the term “debunking” for correction interventions and use the term “countering (CTs)” for the narrative approach that we put forward.

A “narrative” is “a cohesive, causally linked sequence of events that takes place in a dynamic world subject to conflict, transformation, and resolution through non-habitual, purposeful actions performed by characters” (Braddock and Dillard, 2016: 2).

Current State of Research and Interventions on Vaccination Conspiracy Theories and Misinformation

Complexity of conspiratorial beliefs

A defining characteristic of CTs – one that is often brought up in social psychological literature – is that they are alternatives to mainstream or received accounts (e.g., Douglas and Sutton, 2011; Wood and Douglas, 2013). Some authors further argue that CTs oppose official accounts in a way that is generalized, vague, plotless, and incoherent (e.g., Dean, 2002; Wood and Douglas, 2013). However, CTs can also be, and often are, elaborate accounts of events that corroborate one another and that are connected to a set of more abstract beliefs which can form complex structures (Wood, 2016; Wood et al., 2012). In spite of this, the most common way to assess conspiracy beliefs uses standardized questionnaires in which CTs are reduced to single statements and in which participants are asked to rate their agreement with them (e.g., Abalakina-Paap et al., 1999; Brotherton et al., 2013; Lantian et al., 2016; for an overview, see Swami et al., 2017). Agreement with enough similar items makes one a believer and disagreement – a disbeliever (for why this leads to wrongly attributing irrationality to the respondents see Lukić et al., 2019).

There have also been a few attempts to assess CTs which did not rely on questionnaires: researchers analyzed online comments on news stories (Wood and Douglas, 2013), semi-structured interviews (Sapountzis and Condor, 2013), and tweets (Wood, 2018). Going even further, Raab and colleagues (2013) developed the method of narrative construction. It presents

participants with a set of statements about a widely known event in contemporary history (like 9/11 attacks), bearing both official and conspiratorial claims. They are asked to order the statements with the goal to “construct a plausible story of the events ... as a single coherent story consisting of coherent or controversial fragments” (Raab et al., 2013: 4).

Even with these exceptions, CTs are typically defined as a mere opposition to the official truth and measured in a simplified way, which further implies that, in order to debunk CTs, one first has to separate believers from disbelievers, and then face the former with a straightforward explanation.

Attempts at Debunking by Correcting Misinformation

A typical experiment aiming to test the effectiveness of corrections on vaccination-related CTs and misinformation consists of the following steps:

1. Participants rate their agreement with statements capturing *beliefs* in anti-vaccine CTs or misinformation. They might also rate their vaccination *attitudes* (e.g., “The risk of side effects outweighs any protective benefits of vaccines”) and *intention* or willingness to get vaccinated.
2. Participants read materials that refute anti-vaccine CTs or misinformation (e.g., data about the safety of vaccines or about financial benefits of preventing illnesses outweighing the profits from vaccines). Some of the participants are assigned to a control group which receives no such information.
3. If the participants who have received corrective information now report statistically significantly weaker beliefs in anti-vaccine CTs or misinformation than the control group, or if their pro-vaccination attitudes and vaccination intentions are now statistically

significantly stronger than the control group, researchers conclude that debunking has proven to be effective.

In Jolley and Douglas's (2014) study that used this design, intentions to vaccinate a fictitious child were not significantly different from the control (this was replicated in Jolley and Douglas, 2017). In a similar study by Stojanov (2015), this intervention was again not effective in either reducing belief in CTs or increasing vaccination intentions. In contrast to these findings, Schmid and Betsch (2019) showed that providing scientific facts was able to mitigate the influence of a denier in public discussions about vaccination; in other words, the presence of an advocate who corrected the facts had positive effects on vaccination intentions and attitudes. Furthermore, a recent meta-analysis (Walter et al., 2020) found that, while corrections of health misinformation on social media were successful on average, misinformation in the context of infectious diseases was more difficult to correct, compared to other health-related misinformation.

There is similarly mixed evidence regarding whether corrections have the potential to backfire or to have unexpected outcomes (for a review, see Swire-Thompson et al., 2020). For example, while some studies found no backfire effect (e.g., Horne et al., 2015; Schmid and Betsch, 2019), other studies found that corrective information decreased vaccination intention among the people who were very concerned about vaccine side effects or who had negative vaccination attitudes (Nyhan and Reifler, 2015; Nyhan et al., 2014). Furthermore, a strongly negated risk of vaccine side effects ("It is absolutely impossible that...") can paradoxically increase the perception of that risk, especially when it comes from a non-credible source (a pharmaceutical company) (Betsch and Sachse, 2013). Debunking is also limited by the fact that people are not able to tell apart good and bad arguments (Branković and Žeželj, 2016; but see

also Hoeken and Hustinx, 2009) and that one can even erode relatively strong attitudes (e.g., pro-vaccine) with bad arguments (Anzelm et al., 2018). However, preemptively exposing people to corrective information might “inoculate” against future persuasion attempts (McGuire and Papageorgis, 1961; Cook et al., 2017; cf. Žeželj et al., 2006), including in the domain of vaccination (Jolley and Douglas, 2017).

An Alternative Approach to Countering Conspiracy Theories

In the following sections, we lay out the foundations of an alternative approach to countering anti-vaccination CTs, based on two main assumptions: (a) CTs are best understood as narratives and (b) CTs are embedded in a person’s worldview. Based on these assumptions, interventions should strive to: (a) provide a coherent and engaging narrative and (b) account for individual and cultural values.

Conspiracy Theories Are Best Thought of as Narratives

Although ordinary people who believe in CTs are not always able to spontaneously express them as narratives, CTs are presented or “marketed” to them as such (e.g., Wang et al., 2019). Take, for example, the following CT put forward by a prominent anti-vaccination public figure:

Scientists have established a strong link between vaccination and these diseases [autism, epilepsy, child paralysis, diabetes, numerous allergies, asthma, poor concentration, learning disorders, skin lesions, multiple sclerosis], but this can’t be scientifically confirmed because, as soon as the experiments enter this phase, companies that produce vaccines cease further precise experiments. They fund faculties, and hospitals, and these studies, so when such findings come to light, they won’t be published. (Kurir, 2012)

The above account tells a story of a conspiracy marked by connected characters (pharmacy companies, scientists, etc.) who perform purposeful actions (to amass profit) and by seemingly contradictory claims (anti-vaccine findings are scientifically well *established* yet not scientifically *confirmed*) smoothed over with an attempt to explain the causal links leading to the outcome, thus securing coherence.

Intervention should provide a coherent and engaging narrative

Lewandowsky and colleagues (2012) point out that retracting misinformation leaves a person with gaps in coherence and in causality, causing them to be irrationally resistant to new information. The authors recommend that corrective information should therefore fit the broader story of the event equally well (filling the coherence gap) and that it should provide alternative explanations for all of the observed features of the event (filling the causal gap). Rather than arguing that an intervention has to offer a piece of counterinformation that does not disturb the person's mental coherence, we argue that it has to provide a whole, coherent narrative. We believe that such counterconspiracy stories would be more easily retained. For example, some studies suggested that narrative text was more memorable (e.g., Graesser and Ottati, 1995; cf. Ecker et al., 2020) and that people lower in numeracy perceived narrative information about vaccines as more informative than the statistical information (De Bruin et al., 2017).

A narrative aimed at countering a CT should also aim to tackle the themes featured in it. It should primarily focus on the concerns through which anti-vaccine conspiracy beliefs might increase vaccine hesitancy, such as the perceived danger of vaccines, feelings of powerlessness, disillusionment, and lower trust in medical authorities (Jolley and Douglas, 2014).

Anti-conspiracy narratives may prove to be more viral and persuasive by fostering engagement or involvement with the narrative and its characters (e.g., Ratcliff and Sun, 2020). The receiver of the narrative might feel transported or swept up by the storyline (Green and Brock, 2000); they might imagine being one of the characters in the narrative, who they perceive as likeable and as similar to themselves (for a review, see Moyer-Gusé, 2008). Involvement with characters can be promoted by, for example, telling stories about parents of children on the autism spectrum who do not see a link to vaccines, parents whose children have suffered a vaccine-preventable disease (Burgess et al., 2006), or vaccinated individuals who were the only ones in their family not to get infected with COVID-19 (Kolarević, 2021). Provoking emotional responses could be a necessary component for transportation into a narrative (Green and Brock, 2000) and thus one of narratives' advantages in health communication.

Interventions need not be only stories illustrating firsthand or secondhand personal experience. They can also be “cultural narratives”, such as this one:

[T]he story of a deadly disease ... Heroic researchers, working altruistically, marshal the forces of modern science to develop a simple intervention to ready the body's own defenses: a vaccine. Properly prepared, we can defend ourselves, just as our science demonstrates human mastery of death. (Heller, 2008: 22)

Conspiracy Theories Are Embedded in Worldviews

CTs are often consistent with one's ideologies and broad belief systems. In other words, CTs can be embedded in and provide support for a person's worldview. For example, it has been shown that the endorsement of laissez-faire free-market ideology can predict whether a person believes in specific CTs and rejects scientific evidence (Lewandowsky et al., 2013b) and that

those with strong populist beliefs are more likely to believe in various CTs (e.g., that harmful effects of vaccines are being hidden from the public) (Smith, 2019).

These findings show that the social psychology of CTs does not ignore the importance of worldviews – researchers agree that certain worldviews make certain CTs more palatable and plausible, making, in turn, the individual more predisposed to endorse them. However, it is important to acknowledge not only that people endorse CTs based on their worldviews, but that they also create, modify, and disseminate CTs precisely in order to express their worldviews (Raab et al., 2013).

Intervention should account for individual and cultural values

People tend to process information in a biased manner to support their pre-existing views. As a classic study by Lord, Ross, and Lepper (1979) showed, presenting mixed evidence can cause people to become more entrenched in their initial beliefs. When it comes to CTs, Lewandowsky and his colleagues warn about a similar “worldview backfire effect” (Cook and Lewandowsky, 2011; Lewandowsky et al., 2012). For those with firmly held worldviews, encountering a counterargument can cause them to strengthen their original beliefs.

We believe that the backfire effect could partially stem from the fact that CTs are not only embedded in, but also express a person’s worldview (Biddlestone et al., 2020). Debunking that does not take into account this functional purpose of CTs might leave the person with a “self-expression gap”. If filling in the coherence and causality gaps serves an explanatory function, filling in the self-expression gap would serve a communicative one.

This makes it central to present counterarguments in a worldview-affirming manner (Cohen et al., 2000), for example, “by focusing on opportunities and potential benefits rather than risks and threats” (Lewandowsky et al., 2012: 123). It would mean that, for example,

communication directed at mothers whose narratives of vaccine choices mention neoliberal goals – as identified in interviews by Reich (2014) – should focus on individual benefits of vaccination rather than on the fact that those who decide to “free-ride” on herd immunity put the community at a collective disadvantage.

Similar suggestions come from the studies of “cultural cognition” (e.g., Kahan et al., 2010; Kahan et al., 2007; Kahan et al., 2009). Cultural theory posits that group values can influence how we form risk perceptions. In one study (Kahan et al., 2010), people with hierarchical values, who respect authority, and those with individualistic values, who prize personal initiative, were more concerned about the risks of the human papillomavirus (HPV) vaccine. As opposed to individuals with egalitarian and communitarian worldviews, they saw relatively more risk probably because mandatory HPV vaccination seems to condone sexual behavior that defies traditional norms and because it intrudes on individual decision-making. Cultural cognition can also be curbed by making sure that the content is put forward by experts with diverse values so that their worldview can match the audiences’ (Kahan, 2010). For example, a typical traditional parent would feel safe to consider evidence about HPV vaccination if they know that a respected and knowledgeable member of their cultural community accepts such evidence.

Finally, there is evidence that people holding opposing cultural outlooks can in fact be “rooting for the same outcome: the health, safety and economic well-being of their society” (Kahan, 2010: 297). Public communication, therefore, needs to steer away from partisan rhetoric and from ridiculing conspiracy believers as corrupt, irrational, and senseless.

A Systematic Review of Narrative Interventions Addressing Vaccine Hesitancy

A broad search on Web of Science and PubMed in December 2019, using the search string (narrativ* AND vaccin* AND conspiracy) in all fields, returned only seven results in total. None of the retrieved articles explored narrative interventions, allowing us to conclude that there have not been any studies directly testing the effectiveness of the exposure to a pro-vaccine narrative in countering anti-vaccine CTs.

In recent years, however, there has been an increasing interest in exploring whether people can be persuaded by narratives in a range of different domains, such as support for public policies, environmental attitudes or organ donation (e.g., Braddock and Dillard, 2016). There were also studies evaluating pro-vaccine narratives' persuasive influence on risk perceptions, beliefs, attitudes, self-efficacy, intentions, and behaviors related to vaccination. Although they are not specifically tackling anti-vaccine CTs, these interventions are useful in that they provide insight into how a narrative can be designed, while keeping in mind the specific challenges of vaccination and the specific characteristics of different target populations.

Method

Search strategy

Our reporting strategy follows the PRISMA guidelines (Moher et al., 2009). The completed PRISMA checklist is available at <https://osf.io/4d5rp>.

We used all relevant primary studies that were identified in the following systematic reviews and meta-analyses: Winterbottom et al., 2008; Fu et al., 2014; Zebregs et al., 2015; Shen et al., 2015; De Graaf et al., 2016; Braddock and Dillard, 2016. To identify studies published since the publication of these reviews, we additionally searched PubMed, Cochrane Library, Web of Science, and Google Scholar for articles published between January 2015 and December

2019, using the following search terms in the title: (narrativ* OR story OR stories OR storytelling OR interview* OR messag* OR anecdot* OR testimonial OR exemplar) AND (vaccin* OR immunization). Full search strategies are available at <https://osf.io/4d5rp>. We included only peer-reviewed and published articles.

Study selection

Design-related criteria. We included experimental design studies that contrasted the group receiving the narrative message to (a) a control group and/or (b) a pre-intervention baseline (a pretest-posttest design) and/or (c) a condition with only a statistical/risk or an educational message. We also included the designs that contrasted the combination of a narrative and a statistical/risk or an educational message to (a) a narrative-only message and/or (b) a condition with only a statistical/risk or an educational message. Messages that contained both statistical and factual information were considered to be “educational”. We excluded comparisons of narrative interventions with any other intervention not listed here, such as reminders, and comparisons of different narrative characteristics, such as first-person versus third-person point of view.

Message-related criteria. To be included, the study had to involve a narrative intervention consisting only of a narrative message. Studies that tested multifaceted interventions (except narratives combined with statistical/risk or an educational message) were excluded (e.g., photos or warnings alongside a narrative). We distinguished narrative from non-narrative messages by following the definition of the narrative as outlined above (Braddock and Dillard, 2016). Furthermore, the narrative message could tell either a personal-experience story or a cultural story. The tone of the narrative message had to be either positive (pro-vaccination) or neutral. We excluded the studies that tested anti-vaccination narratives as well as studies that

explored how the exposure to personal narratives reporting occurrences of vaccine side effects influences the perceived risk of vaccine side effects.

Outcome-related criteria. The measured outcome had to be directly related to the vaccine(s) or vaccine-preventable diseases addressed in the narrative. It could be assessed either on the individual or on the community level.

Article retrieval

Seven articles were identified through previous systematic reviews and meta-analyses. Our additional search initially identified 407 records; 267 titles and abstracts were screened after duplicates were removed using JabRef 4.1 (JabRef Development Team, 2020); 220 articles were removed because they were irrelevant or because they did not meet the design-, message-, and outcome-related criteria. A total of 47 articles were selected to be retrieved full-text and assessed for eligibility. This process resulted in ten articles eligible for this review. The list of all articles identified in the additional search as well as the reasons for exclusion of each article are available at <https://osf.io/4d5rp>. A total of 17 articles were included in our review. The PRISMA diagram (Figure 1) shows this process in full.

Figure 1. PRISMA flow diagram

Data extraction and analysis

The following information was extracted from each of the 17 studies reported in the included articles: (1) publication details – author, date of publication; (2) intervention details – country, target population, target vaccine; and (3) narrative characteristics – narrator (and protagonist where different), channel (and format where distinct), key themes. Characteristics of the intervention narrative were identified either from the experimental materials or, if those were not published, from the description of the materials reported in the study. The first author identified key themes in the narratives through inductive analysis.

We extracted a total of 97 relevant comparisons (k) of intervention groups (receiving narrative only or combined messages) and contrast groups. For each comparison, we coded the vaccination outcome that was measured as well as the time delay between the intervention and when this measure was taken. For 80 comparisons, we were able to extract data for calculation of effect sizes and their 95% confidence intervals (CIs). For comparisons of continuous outcomes, we calculated Cohen's d for independent ($k = 63$) or paired ($k = 4$) group designs (using pooled standard deviation and average variance as denominators, respectively); when the outcome was measured using one or more two-level (yes, no) categorical variables, we calculated Odds Ratio (OR) ($k = 6$) or Average OR ($k = 3$); when the outcome was measured using a three-level ordinal variable, we calculated Cramér's V ($k = 4$). All calculations were done using the *esci* module (Cumming and Calin-Jageman, 2017) for jamovi (The jamovi project, 2020) and the packages DescTools (Signorell et al., 2020) and metaphor (Viechtbauer, 2010) for R (R Core Team, 2020). Additional details regarding effect size calculations are available at <https://osf.io/4d5rp>. Finally, we coded the magnitude of the effect size using scales developed by Cohen (1988). The effect sizes that did not meet the threshold for being categorized as "small" were categorized as "very

small". For the remaining 17 comparisons, we coded whether the intervention was described by the study authors as having statistically significantly improved or worsened the outcome or not, compared to the contrast group. The complete dataset is available at <https://osf.io/4d5rp>.

Results

Characteristics of included studies

All studies were published in English, between 2005 and 2019. The majority of the studies were conducted in the United States (11); the other countries included in the review were Australia (1), Canada (1), China (1), Italy (1), Japan (1), and the Netherlands (1). Most of the interventions concerned the HPV vaccine (11), with the target population often being girls, women, and parents. Also covered were the flu (2), Hepatitis B (1), MMR (1), and polio (1) vaccine, as well as vaccines in general (1). All of the interventions featured only a personal-experience narrative, which was sometimes used as an opportunity to send disease and vaccine facts, as well as direct recommendations to get vaccinated (vaccine prompts). Disease symptoms, disease susceptibility, disease diagnosis, individual protection from the disease, and positive vaccination decisions were most prominent themes in the narratives. Full description of intervention characteristics is given in Table 1.

Table 1. Publication details and the characteristics of the intervention narrative of the included studies.

Authors, Year	Country	Target Population	Vaccine	Narrator	Narrative Channel	Narrative Themes
Wilson, et al., 2005	CA	Alternative medicine students	Polio	Former polio patient	Oral In-person presentation	Disease symptoms; individual benefits of vaccination
De Wit, et al., 2008	NL	Men who have sex with men	Hep. B	Peer	Text	Disease susceptibility; regret over not vaccinating
Dunlop, et al., 2010	AU	Female college students	HPV	Former cervical cancer patient	Audio (radio ad)	Disease symptoms; disease treatment
Kepka, et al., 2011	US	Hispanic parents	HPV	Young girl; parents; expert	Audio (radionovela)	Positive vaccination decision; vaccination decision-making activities; disease facts; vaccine facts; vaccine concerns
Hopfer, 2012	US	Female college students	HPV	Peer; expert	Video	Disease susceptibility; disease symptoms; vaccination self-efficacy; vaccine safety; vaccine prompt; parental support
Prati, et al., 2012	IL	People aged 65 and over	Flu	Peer	Text	Disease susceptibility; positive vaccination decision; social benefits of vaccination; vaccination self-efficacy; vaccine safety
Nyhan, et al., 2014	US	Parents	MMR	Mother (protagonist: her child)	Text	Disease susceptibility; disease symptoms; social benefits of vaccination
Nan, et al., 2015	US	College students	HPV	Peer; news article author (protagonist: peer)	Text (newspaper)	Disease susceptibility; disease symptoms
Frew, et al., 2016	US	Black/African American pregnant women aged 18-50	Flu	Black/African American pregnant woman; expert	Video	Vaccination decision-making activities; vaccine concerns; social influence; vaccine prompt
Kim and Nan, 2016	US	College students	HPV	Female peer	Text	Disease facts; vaccine facts; positive vaccination decision; individual benefits of vaccination; positive emotional aspects of vaccination
Nan, et al., 2016	US	Female college students	HPV	Peer; magazine/radio author (protagonist: peer)	Text (magazine ad); audio (PSA)	Disease symptoms; disease's impact on life quality

Authors, Year	Country	Target Population	Vaccine	Narrator	Narrative Channel	Narrative Themes
Lee, et al., 2016	US	Korean American women aged 21-29	HPV	Peer; text message author	Text (mobile phone; interactive)	Disease diagnosis; disease experience, general; positive vaccination decision; vaccination experience, general; cultural vaccination barriers
Walter, et al., 2017	US	Mexican American women	HPV	Older daughter, younger daughter, mother, mother's friend	Video	Disease diagnosis; disease prevention; social influence
Lee, et al., 2018	US	Khmer mothers and daughters	HPV	Khmer mothers and daughters	Video	Disease facts; vaccine facts; individual benefits of vaccination; social influence; cultural vaccination barriers; linguistic vaccination barriers; positive emotional aspects of vaccination
Okuhara, et al., 2018	JP	Mothers of daughters aged 12-16	HPV	Patient who experienced cervical cancer; mother whose daughter experienced cervical cancer (protagonist: daughter)	Text	Disease diagnosis; disease symptoms; disease treatment; disease's impact on life quality; negative emotional aspects of the disease; vaccine prompt
Johnson, et al., 2019	US	Vaccine hesitant college students	All	Community/family member who experienced a VPD	In-person interview conducted by the participant	Disease symptoms; disease's impact on life quality; disease's impact on social connections; financial impact of the disease
Liu, et al., 2019	CN	Women aged 18-45	HPV	Young mother	Text	Disease prevalence; disease symptoms; disease diagnosis; individual benefits of vaccination

Note. AU = Australia. CA = Canada. CN = China. IL = Italy. JP = Japan. NL = The Netherlands. US = United States. VPD = vaccine-preventable disease. MMR = measles, mumps, and rubella. HPV = human papillomavirus. Hep. B = Hepatitis B. All = vaccines in general. PSA = public service announcement.

Effectiveness of narrative interventions

A table provided in the Appendix lists the magnitude and direction of 80 comparisons; the rest of the comparisons ($k = 17$) could not be quantified and are described in terms of their direction and statistical significance. Where possible, the table also reports whether the intervention favorably or adversely affected the outcome, compared to the reference intervention.

Included studies most frequently assessed vaccination intention ($k = 37$); they rarely assessed the intention to recommend the vaccine to patients ($k = 1$) or the actual vaccination behavior ($k = 5$). Studies also assessed disease and vaccine awareness and knowledge ($k = 3$) and, more frequently, general attitudes and beliefs about vaccination ($k = 15$), sometimes also including certain misperceptions (e.g., that vaccines cause autism). Other outcomes included perceived vaccine risk, vaccine efficacy, and probability of vaccine side effects ($k = 5$), perceived social norms ($k = 6$), perceived self-efficacy and barriers ($k = 7$), and perceived disease risk, susceptibility, and severity ($k = 18$). Outcomes were rarely assessed after a delay (ranging from about one week to two months); most of the time, they were tested immediately after the intervention was provided ($k = 83$).

When compared to no messages, control messages, and pre-intervention measurements ($k = 32$), most of the time, narrative-only messages tended to positively affect vaccination outcomes ($k = 19$). This effect, however, tended to be very small or small ($k = 14$). In nine instances, the effect of these messages was described as non-statistically significant. In four instances, a narrative intervention backfired, adversely affecting vaccination outcomes.

When compared to educational, statistical or risk messages ($k = 45$), narrative-only messages tended to more favorably affect vaccination outcomes roughly half of the time ($k = 23$). This effect, however, tended to be very small ($k = 13$) and in four additional instances the effect

of these messages was described as non-statistically significant. In fourteen instances, educational, statistical or risk messages were better than narrative-only interventions, although this effect also tended to be very small ($k = 9$).

A total of twenty comparisons involved an intervention that combined narratives with statistical and/or educational messages. Such combined interventions always fared better than no-message controls or pretest groups ($k = 8$) and these effects ranged from small to large. Combined interventions fared better than statistics-only interventions in six out of nine instances, and better than narrative-only interventions in two out of three instances (with these effects being very small or small).

Discussion and Limitations

In sum, we found that the narrative-only interventions were more effective than the reference interventions in 42 out of 73 instances, but that they were outperformed by educational, statistical or risk messages in 14 out of 73 instances. When embedded in the socio-cultural environment of the target population (Hopfer, 2012; Walter et al., 2017; Lee et al., 2018), the narrative intervention generally improved vaccination outcomes (in 14 out of 17 instances). In these studies, suitable community members were interviewed to code for relevant themes and were chosen to be the voice behind the narrative (Hopfer, 2012; Lee et al., 2018), and focus groups were conducted to check whether the story resonated with the culture of the participants (Walter et al., 2017). The studies that tested combined interventions ($k = 20$), suggest that presenting both narratives and statistical and/or educational messages has the potential to be more effective than narrative- or statistical-only interventions. These effects, however, came from only three studies (Nan et al., 2015; Lee et al., 2016; Okuhara et al., 2018).

Two instances in the Hopfer (2012) study in which the narrative-only intervention backfired suggest that the narrative should not be delivered only by medical experts; this effect was mitigated when either a peer or both a peer and an expert delivered the narrative. The backfire effect found by Nyhan and colleagues (2014) could be interpreted as a warning against the over-reliance on dramatic and negative emotional narratives.

Even though this review suggest that narratives have the potential to improve diverse vaccination outcomes, the relatively wide 95% CIs indicate that the size of the effect is not yet precisely known and that we would need further data before we could draw a more certain conclusion. For example, most of the comparisons came from independent groups and these effects had intervals ranging from 0.28 to 0.50 ($k = 20$) and even from 0.51 to 2.01 ($k = 43$). Future primary studies should more frequently assess vaccination outcomes after a delay. As suggested in a meta-analysis by Oschatz and Marker (2020), narrative messages might have a stronger impact than non-narrative messages at delayed measurement.

In the future, researchers should try to move beyond the generic benchmarks developed by Cohen (1988) and develop contextualized guidelines for interpreting the effects in this field as small, medium, or large (Bakker et al., 2019). Although we did not assess whether there is any publication bias present in the literature, future reviews should include unpublished or grey literature to limit the potential file-drawer effect.

General Discussion

We argued that pro-vaccine narratives can be a powerful communication tool in countering anti-vaccine CTs, but the existing evidence does not yet provide strong support for our argument. Taking together our literature review and the two theoretical principles we put

forward as well as our systematic review of narrative interventions addressing vaccine hesitancy, we offer a list of recommendations for pro-vaccine communicators in Table 2.

Table 2. Recommendations for pro-vaccine public communicators.

Recommendations	Description	Evidence in the article
<i>Rely both on personal and cultural experiences</i>	Tell the stories of firsthand or secondhand personal experiences of vaccination and vaccine-preventable diseases, but rely on broader cultural narratives about vaccines as well (e.g., about the world before vaccinations or about vaccine breakthroughs).	Theory
<i>Be coherent</i>	Ensure that the narrative is not only cohesive but also coherent (i.e., that sentences follow from one another so that people understand what the main idea of the narrative is).	Theory
<i>Tailor to the target audience</i>	Present the narrative in a socially and culturally normative manner, so that it aligns with the expectations of the target audience.	Theory, Review
<i>Affirm audience's worldview</i>	Frame the narrative in a way that affirms rather than threatens people's values and worldviews. Focus on the opportunities that vaccination opens up for the activities valued by their group rather than on restrictions.	Theory
<i>Mind the "who"</i>	Choose storytellers who reflect the life of the target audience; storytellers can be community members, friends, family, healthcare providers. Include storytellers with diverse cultural values. Combine the voices of the medical experts and non-experts. To foster involvement, choose characters whose characteristics are similar to the target audience (e.g., in terms of culture, history, life, gender, age or language).	Theory, Review
<i>Research the existing conspiracy theories</i>	Using qualitative techniques, identify themes of acceptance and resistance in anti-vaccine conspiracy theories and vaccination decision narratives in the given socio-cultural environment and incorporate them into the narrative. The narrative may also tackle paths through which anti-vaccine conspiracy theories have been experimentally shown to influence vaccination decision-making (e.g., perceived danger of vaccines, powerlessness, disillusionment, and trust in medical authorities).	Theory, Review
<i>Mind the "whom"</i>	Identify those who would benefit most from a narrative intervention (e.g., people low in numeracy).	Theory

Recommendations	Description	Evidence in the article
<i>Combine facts and narratives</i>	Provide facts (e.g., vaccine safety and efficacy data, individual risk of infection, or risk of disease symptoms and of vaccine side effects) along with the narrative.	Test
<i>Don't go to extremes in emotion</i>	Avoid over-reliance on extreme negative emotional appeals.	Theory, Review
<i>Don't divide</i>	Do not use polarizing Us vs. Them narratives. Do not ridicule or shame conspiracy believers.	Theory

Note. Evidence in the article = source of the evidence in this article that supports each listed recommendation; Theory = recommendation is supported by the theoretical principles presented in this article (article section “An Alternative Approach to Countering Conspiracy Theories”); Test = recommendation is supported by the effects coming from the studies that directly tested it (article section “A Systematic Review of Narrative Interventions Addressing Vaccine Hesitancy”, subheading “Effectiveness of narrative interventions”); Review = recommendation is supported by the interpretation of the results of the systematic review presented in this article (article section “A Systematic Review of Narrative Interventions Addressing Vaccine Hesitancy”, subheading “Discussion and Limitations”).

It should be noted that these recommendations are limited by the relatively small number of studies (17) experimentally testing the effects of narrative interventions on vaccination outcomes which could be included in our review, with none of the studies directly exploring narratives' persuasion effects on anti-vaccination conspiracy beliefs. While the present paper brings together theoretical and empirical work (mostly in social psychology) on the interventions for countering CTs, on the one hand, and theoretical and empirical work (mostly in health communication studies) on narrative persuasion, on the other hand, the theoretical principles it proposes have yet to be tested in future studies.

The recommendations we laid out should be followed with respect to how narratives interact with other types of evidence to produce unintended consequences. Notably, exposure to personal narratives can distort the comprehension of statistical information. Studies on so-called “narrative bias” (e.g., Betsch et al., 2015; Betsch et al., 2011) have shown that the more personal stories reporting occurrences of vaccine side effects people read, the higher their perception of the risk of vaccine side effects, even when they know the statistical base rate. Communicators should, therefore, use the advantages of the narrative format to present medical and epidemiological evidence, and bring such evidence together with stories. Combining narratives with corrective scientific information would not only increase narrative's persuasiveness but would also increase its comprehension and informativeness, making it more ethical towards the audience (Dahlstrom and Ho, 2012). Ideally, scientific evidence should be presented before personal and cultural narratives to preserve agency and autonomy of the non-expert individual who receives such information.

Another ethical issue to be considered is that narratives can provoke intense emotions. In the health context, narratives with high emotional content tend to be more often persuasive (e.g.,

De Graaf et al., 2016). However, some studies suggest that narratives should avoid over-reliance on extremely negative emotional appeals (e.g., Murphy et al., 2013; Nyhan et al., 2014). We recommend that narrative interventions should not, therefore, rely only on emotions and that they should be carefully piloted to determine whether the evoked emotion actually has the intended effect.

In conclusion, this review aimed to articulate guidelines for public communicators who are obliged to inform the public about vaccination. While it is undoubtedly their duty to provide the public with correct factual information to counter anti-vaccination CTs and misinformation, we propose that their messages would be more competitive if they complemented them with narratives tailored using theoretically and empirically sound principles.

References

- Abalakina-Paap M, Stephan WG, Craig T and Gregory WL (1999) Beliefs in conspiracies. *Political Psychology* 20(3): 637–647. <https://doi.org/10.1111/0162-895X.00160>.
- Anzelm D, Stojković A, Lazarević J, Žeželj I and Damnjanović K (2018) Support for mandatory childhood vaccination, and how it can be eroded even with weak evidence. In: *24th Empirical Studies in Psychology*, Belgrade, Serbia, 23–25 March 2018, pp.11–12. Available at: <http://empirijskaistrazivanja.org/wp-content/uploads/2020/01/Knjiga-Rezimea-EIP-18-c.pdf>.
- Bakker A, Cai J, English L, Kaiser G, Mesa V and Van Dooren W (2019) Beyond small, medium, or large: points of consideration when interpreting effect sizes. *Educational Studies in Mathematics* 102(1): 1–8. <http://dx.doi.org/10.1007/s10649-019-09908-4>
- Betsch C, Haase N, Renkewitz F and Schmid P (2015) The narrative bias revisited: what drives the biasing influence of narrative information on risk perceptions?. *Judgment and Decision Making* 10(3): 241–264. <http://journal.sjdm.org/14/141206a/jdm141206a.pdf>.
- Betsch C and Sachse K (2013) Debunking vaccination myths: strong risk negations can increase perceived vaccination risks. *Health Psychology* 32(2): 146–155. <https://doi.org/10.1037/a0027387>.
- Betsch C, Ulshöfer C, Renkewitz F and Betsch T (2011) The influence of narrative v. statistical information on perceiving vaccination risks. *Medical Decision Making* 31(5): 742–753. <https://doi.org/10.1177/0272989X11400419>.
- Biddlestone M, Cichocka A, Žeželj I and Bilewicz M (2020) Conspiracy theories and intergroup relations. In: Butter M and Knight P (eds) *Routledge Handbook of Conspiracy Theories*. Routledge, pp.219–230. https://doi.org/10.4324/9780429452734-2_6.

Blackmore S (2000) *The Meme Machine*. Oxford, UK: Oxford University Press.

Braddock K and Dillard JP (2016) Meta-analytic evidence for the persuasive effect of narratives on beliefs, attitudes, intentions, and behaviors. *Communication Monographs* 83(4): 446–467. <https://doi.org/10.1080/03637751.2015.1128555>.

Branković M and Žeželj I (2016) Does it take a good argument to be persuaded? how manipulating quality of evidence affects message persuasiveness. *Psihologija* 49(1): 1–18. <https://doi.org/10.2298/PSI1601001B>.

Brotherton R, French CC and Pickering AD (2013) Measuring belief in conspiracy theories: the generic conspiracist beliefs scale. *Frontiers in Psychology* 4: 279. <https://doi.org/10.3389/fpsyg.2013.00279>.

Burgess DC, Burgess MA and Leask J (2006) The MMR vaccination and autism controversy in United Kingdom 1998-2005: inevitable community outrage or a failure of risk communication?. *Vaccine* 24(18): 3921–3928. <https://doi.org/10.1016/j.vaccine.2006.02.033>.

Cohen J (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Cohen GL, Aronson J and Steele CM (2000) When beliefs yield to evidence: reducing biased evaluation by affirming the self. *Personality and Social Psychology Bulletin* 26(9): 1151–1164. <https://doi.org/10.1177/01461672002611011>.

Cook J and Lewandowsky S (2011) *The Debunking Handbook*. St. Lucia, Australia: University of Queensland. <http://sks.to/debunk>.

- Cook J, Lewandowsky S and Ecker UKH (2017) Neutralizing misinformation through inoculation: exposing misleading argumentation techniques reduces their influence. *PLoS ONE* 12(5). <https://doi.org/10.1371/journal.pone.0175799>.
- Craciun C and Baban A (2012) ‘Who will take the blame?’: understanding the reasons why romanian mothers decline HPV vaccination for their daughters. *Vaccine* 30(48): 6789–6793. <https://doi.org/10.1016/j.vaccine.2012.09.016>.
- Cumming G and Calin-Jageman R (2017) *Introduction to the New Statistics*. New York: Routledge. <https://doi.org/10.4324/9781315708607>.
- Dahlstrom MF and Ho SS (2012) Ethical considerations of using narrative to communicate science. *Science Communication* 34(5): 592–617. <https://doi.org/10.1177/1075547012454597>.
- Dawkins R (1976) *The Selfish Gene*. Oxford, UK: Oxford University Press.
- De Bruin W, Wallin A, Parker AM, Strough J and Hanmer J (2017) Effects of anti- versus pro-vaccine narratives on responses by recipients varying in numeracy: a cross-sectional survey-based experiment. *Medical Decision Making* 37(8): 860–870. <https://doi.org/10.1177/0272989X17704858>.
- De Graaf A, Sanders J and Hoeken H (2016) Characteristics of narrative interventions and health effects: a review of the content, form, and context of narratives in health-related narrative persuasion research. *Review of Communication Research* 4: 81–131. <https://doi.org/10.12840/issn.2255-4165.2016.04.01.011>.
- De Wit JBF, Das E and Vet R (2008) What works best: objective statistics or a personal testimonial? an assessment of the persuasive effects of different types of message

- evidence on risk perception. *Health Psychology* 27(1): 110–115.
<https://doi.org/10.1037/0278-6133.27.1.110>.
- Dean J (2002) If anything is possible. In: Knight P (ed) *Conspiracy Nation: The Politics of Paranoia in Postwar America*. New York, NY: New York University Press, pp.85–106.
- Douglas KM and Sutton RM (2011) Does it take one to know one? endorsement of conspiracy theories is influenced by personal willingness to conspire. *British Journal of Social Psychology* 50(3): 544–552. <https://doi.org/10.1111/j.2044-8309.2010.02018.x>.
- Douglas KM, Uscinski JE, Sutton RM, Cichocka A, Nefes T, Ang CS and Deravi F (2019) Understanding conspiracy theories. *Political Psychology* 40(S1): 3–35.
<https://doi.org/10.1111/pops.12568>.
- Dunlop SM, Kashima Y and Wakefield M (2010) Predictors and consequences of conversations about health promoting media messages. *Communication Monographs* 77(4): 518–539.
<https://doi.org/10.1080/03637751.2010.502537>.
- ECDC (European Centre for Disease Prevention and Control) (2017) *Catalogue of interventions addressing vaccine hesitancy*. Stockholm.
<https://ecdc.europa.eu/sites/portal/files/documents/Catalogue-interventions-vaccine-hesitancy.pdf>.
- Ecker UKH, Butler LH and Hamby A (2020) You don't have to tell a story! a registered report testing the effectiveness of narrative versus non-narrative misinformation corrections. *Cognitive Research: Principles and Implications* 5(1). <http://dx.doi.org/10.1186/s41235-020-00266-x>.
- Fine P, Eames K and Heymann DL (2011) 'Herd immunity': a rough guide. *Clinical Infectious Diseases* 52(7): 911–916. <https://doi.org/10.1093/cid/cir007>.

- Frew PM, Kriss JL, Chamberlain AT, Malik F, Chung Y, Cortés M and Omer SB (2016) A randomized trial of maternal influenza immunization decision-making: a test of persuasive messaging models. *Human Vaccines & Immunotherapeutics* 12(8): 1989–1996. <https://doi.org/10.1080/21645515.2016.1199309>.
- Fu LY, Bonhomme LA, Cooper SC, Joseph JG and Zimet GD (2014) Educational interventions to increase HPV vaccination acceptance: a systematic review. *Vaccine* 32(17): 1901–1920. <https://doi.org/10.1016/j.vaccine.2014.01.091>.
- Goertzel T (2010) Conspiracy theories in science. *EMBO Reports*.
<https://doi.org/10.1038/embor.2010.84>.
- Graesser AC and Ottati V (1995) Why stories? Some evidence, questions, and challenges. In: Wyer RS (ed) *Knowledge and Memory: The Real Story*. Mahwah, NJ: Lawrence Erlbaum Associates, pp.121–132.
- Green MC and Brock TC (2000) The role of transportation in the persuasiveness of public narratives. *Journal of Personality and Social Psychology* 79(5): 701–721.
<https://doi.org/10.1037/0022-3514.79.5.701>.
- Heller J (2008) *The Vaccine Narrative*. Nashville, TN: Vanderbilt University Press.
- Hoeken H and Hustinx L (2009) When is statistical evidence superior to anecdotal evidence in supporting probability claims? the role of argument type. *Human Communication Research* 35(4): 491–510. <https://doi.org/10.1111/j.1468-2958.2009.01360.x>.
- Hopfer S (2012) Effects of a narrative HPV vaccination intervention aimed at reaching college women: a randomized controlled trial. *Prevention Science* 13(2): 173–182.
<https://doi.org/10.1007/s11121-011-0254-1>.

Horne Z, Powell D, Hummel JE and Holyoak KJ (2015) Countering antivaccination attitudes.

Proceedings of the National Academy of Sciences 112(33): 10321–10324.

<https://doi.org/10.1073/pnas.1504019112>.

JabRef Development Team (2020). JabRef - An open-source, cross-platform citation and reference management software. <https://www.jabref.org>.

Johnson DK, Mello EJ, Walker TD, Hood SJ, Jensen JL and Poole BD (2019) Combating vaccine hesitancy with vaccine-preventable disease familiarization: an interview and curriculum intervention for college students. *Vaccines* 7(2).

<https://doi.org/10.3390/vaccines7020039>.

Jolley D and Douglas KM (2014) The effects of anti-vaccine conspiracy theories on vaccination intentions. *PLoS ONE* 9(2). <https://doi.org/10.1371/journal.pone.0089177>.

Jolley D and Douglas KM (2017) Prevention is better than cure: addressing anti-vaccine conspiracy theories. *Journal of Applied Social Psychology* 47(8): 459–469.

<https://doi.org/10.1111/jasp.12453>.

Kahan D (2010) Fixing the communications failure. *Nature*. <https://doi.org/10.1038/463296a>.

Kahan DM, Braman D, Cohen GL, Gastil J and Slovic P (2010) Who fears the HPV vaccine, who doesn't, and why? an experimental study of the mechanisms of cultural cognition.

Law and Human Behavior 34(6): 501–516. <https://doi.org/10.1007/s10979-009-9201-0>.

Kahan D, Braman D, Gastil J, Slovic P and Mertz CK (2007) Culture and identity-protective cognition: explaining the white-male effect in risk perception. *Journal of Empirical Legal Studies* 4(3): 465–505. <https://doi.org/10.1111/j.1740-1461.2007.00097.x>.

- Kahan DM, Braman D, Slovic P, Gastil J and Cohen G (2009) Cultural cognition of the risks and benefits of nanotechnology. *Nature Nanotechnology* 4(2): 87–90.
<https://doi.org/10.1038/nnano.2008.341>.
- Kepka D, Coronado GD, Rodriguez HP and Thompson B (2011) Evaluation of a radionovela to promote HPV vaccine awareness and knowledge among Hispanic parents. *Journal of Community Health* 36(6): 957–965. <https://doi.org/10.1007/s10900-011-9395-1>.
- Kim J and Nan X (2016) Temporal framing effects differ for narrative versus non-narrative messages: the case of promoting HPV vaccination. *Communication Research* 46(3, SI): 401–417. <https://doi.org/10.1177/0093650215626980>.
- Kolarević A (2021) Ljubinka Klarić: Cela porodica mi je zaražena koronom. *Nova.rs*, 23 March. Available at: <https://nova.rs/zabava/showbiz/ljubinka-klaric-cela-porodica-mi-je-zarazena-koronom/> (accessed 24 March 2021).
- Kurir (2012) *Vakcine nam ubijaju decu?!*. 1 August. Available at: <https://www.kurir.rs/vesti/drustvo/345739/vakcine-nam-ubijaju-decu> (accessed 2 November 2019).
- Lantian A, Muller D, Nurra C and Douglas KM (2016) Measuring belief in conspiracy theories: validation of a French and English single-item scale. *International Review of Social Psychology* 29(1): 1–14. <http://doi.org/10.5334/irsp.8>.
- Lee H, Kim M, Cooley ME, Kiang P, Kim D, Tang S, Shi L, Thiem L, Kan P, Peou S, Touch C, Chea P and Allison J (2018) Using narrative intervention for HPV vaccine behavior change among Khmer mothers and daughters: a pilot RCT to examine feasibility, acceptability, and preliminary effectiveness. *Applied Nursing Research* 40(April): 51–60. <https://doi.org/10.1016/j.apnr.2017.12.008>.

- Lee HY, Koopmeiners JS, McHugh J, Raveis VH and Ahluwalia JS (2016) mHealth pilot study: text messaging intervention to promote HPV vaccination. *American Journal of Health Behavior* 40(1): 67–76. <http://dx.doi.org/10.5993/ajhb.40.1.8>.
- Lewandowsky S, Ecker UKH, Seifert CM, Schwarz N and Cook J (2012) Misinformation and its correction: continued influence and successful debiasing. *Psychological Science in the Public Interest, Supplement* 13(3): 106–131. <https://doi.org/10.1177/1529100612451018>.
- Lewandowsky S, Gignac GE and Oberauer K (2013a) The role of conspiracist ideation and worldviews in predicting rejection of science. *PLoS ONE* 8(10): e75637. <https://doi.org/10.1371/journal.pone.0075637>.
- Lewandowsky S, Oberauer K and Gignac GE (2013b) NASA faked the Moon landing-therefore, (climate) science is a hoax: an anatomy of the motivated rejection of science. *Psychological Science* 24(5): 622–633. <https://doi.org/10.1177/0956797612457686>.
- Liu S, Yang JZ and Chu H (2019) Now or future? analyzing the effects of message frame and format in motivating Chinese females to get HPV vaccines for their children. *Patient Education and Counseling* 102(1): 61–67. <https://doi.org/10.1016/j.pec.2018.09.005>.
- Lord CG, Ross L and Lepper MR (1979) Biased assimilation and attitude polarization: The effects of prior theories on subsequently considered evidence. *Journal of Personality and Social Psychology* 37(11): 2098–2109. <http://dx.doi.org/10.1037/0022-3514.37.11.2098>.
- Lukić P, Žeželj I and Stanković B (2019) How (ir)rational is it to believe in contradictory conspiracy theories?. *Europe's Journal of Psychology* 15(1): 94–107. <https://doi.org/10.5964/ejop.v15i1.1690>.

- McGuire WJ and Papageorgis D (1961) The relative efficacy of various types of prior belief-defense in producing immunity against persuasion. *The Journal of Abnormal and Social Psychology* 62(2): 327–337. <https://doi.org/10.1037/h0042026>.
- Moher D, Liberati A, Tetzlaff J, Altman DG and the PRISMA Group (2009) Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of Internal Medicine* 151(4): 264–269. <https://doi.org/10.7326/0003-4819-151-4-200908180-00135>.
- Moyer-Gusé E (2008) Toward a theory of entertainment persuasion: explaining the persuasive effects of entertainment-education messages. *Communication Theory* 18(3): 407–425. <https://doi.org/10.1111/j.1468-2885.2008.00328.x>.
- Murphy ST, Frank LB, Chatterjee JS and Baezconde-Garbanati L (2013) Narrative versus nonnarrative: the role of identification, transportation, and emotion in reducing health disparities. *Journal of Communication* 63(1): 116–137. <https://doi.org/10.1111/jcom.12007>.
- Nan X, Dahlstrom MF, Richards A and Rangarajan S (2015) Influence of evidence type and narrative type on HPV risk perception and intention to obtain the HPV vaccine. *Health Communication* 30(3): 301–308. <https://doi.org/10.1080/10410236.2014.888629>.
- Nan X, Futerfas M and Ma Z (2016) Role of narrative perspective and modality in the persuasiveness of public service advertisements promoting HPV vaccination. *Health Communication* 32(3): 320–328. <https://doi.org/10.1080/10410236.2016.1138379>.
- Nyhan B and Reifler J (2015) Does correcting myths about the flu vaccine work? an experimental evaluation of the effects of corrective information. *Vaccine* 33(3): 459–464. <https://doi.org/10.1016/j.vaccine.2014.11.017>.

- Nyhan B, Reifler J, Richey S and Freed GL (2014) Effective messages in vaccine promotion: a randomized trial. *Pediatrics* 133(4): e835–e842. <https://doi.org/10.1542/peds.2013-2365>.
- Okuhara T, Ishikawa H, Okada M, Kato M and Kiuchi T (2018) Persuasiveness of statistics and patients' and mothers' narratives in human papillomavirus vaccine recommendation messages: a randomized controlled study in Japan.” *Frontiers in Public Health* 6(APR). <https://doi.org/10.3389/fpubh.2018.00105>.
- Oliver JE and Wood TJ (2014a) Conspiracy theories and the paranoid style(s) of mass opinion. *American Journal of Political Science* 58(4): 952–966. <https://doi.org/10.1111/ajps.12084>.
- Oliver JE and Wood T (2014b) Medical conspiracy theories and health behaviors in the United States. *JAMA Internal Medicine*. American Medical Association. <https://doi.org/10.1001/jamainternmed.2014.190>.
- Oschatz C and Marker C (2020) Long-term persuasive effects in narrative communication research: a meta-analysis. *Journal of Communication* 70(4): 473–496. <http://dx.doi.org/10.1093/joc/jqaa017>.
- Prati G, Pietrantoni L and Zani B (2012) Influenza vaccination: the persuasiveness of messages among people aged 65 years and older. *Health Communication* 27(5): 413–420. <https://doi.org/10.1080/10410236.2011.606523>.
- R Core Team (2020) *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>.
- Raab MH, Ortlieb SA, Auer N, Guthmann K and Carbon C-C (2013) Thirty shades of truth: conspiracy theories as stories of individuation, not of pathological delusion. *Frontiers in Psychology* 4. <https://doi.org/10.3389/fpsyg.2013.00406>.

- Ratcliff CL and Sun Y (2020) Overcoming resistance through narratives: findings from a meta-analytic review. *Human Communication Research*. <https://doi.org/10.1093/hcr/hqz017>.
- Reich JA (2014) Neoliberal mothering and vaccine refusal. *Gender & Society* 28(5): 679–704. <https://doi.org/10.1177/0891243214532711>.
- Sapountzis A and Condor S (2013) Conspiracy accounts as intergroup theories: challenging dominant understandings of social power and political legitimacy. *Political Psychology* 34(5): 731–752. <https://doi.org/10.1111/pops.12015>.
- Schmid P and Betsch C (2019) Effective strategies for rebutting science denialism in public discussions. *Nature Human Behaviour* 3(9): 931–939. <http://dx.doi.org/10.1038/s41562-019-0632-4>.
- Shen F, Sheer VC and Li R (2015) Impact of narratives on persuasion in health communication: a meta-analysis. *Journal of Advertising* 44(2): 105–113. <https://doi.org/10.1080/00913367.2015.1018467>.
- Signorell A et al. (2020) *DescTools: Tools for descriptive statistics*. R package version 0.99.38. <https://cran.r-project.org/package=DescTools>.
- Smith M (2019) Which conspiracy theories do populists believe?. *YouGov*. 3 May. Available at: <https://yougov.co.uk/topics/politics/articles-reports/2019/05/03/which-conspiracy-theories-do-populists-believe> (accessed 2 November 2019).
- Solnick RE, Chao G, Ross RD, Kraft-Todd GT and Kocher KE (2020) Emergency physicians and personal narratives improve the perceived effectiveness of COVID-19 public health recommendations on social media: a randomized experiment. *Academic Emergency Medicine* 28(2): 172–183. <http://dx.doi.org/10.1111/acem.14188>.

- Stojanov A (2015) Reducing conspiracy theory beliefs. *Psihologija* 48(3): 251–266.
<https://doi.org/10.2298/PSI1503251S>.
- Sunstein CR and Vermeule A (2009) Conspiracy theories: causes and cures. *Journal of Political Philosophy* 17(2): 202–227. <https://doi.org/10.1111/j.1467-9760.2008.00325.x>.
- Swami V, Barron D, Weis L, Voracek M, Stieger S and Furnham A (2017) An examination of the factorial and convergent validity of four measures of conspiracist ideation, with recommendations for researchers. *PLoS ONE* 12(2): e0172617.
<https://doi.org/10.1371/journal.pone.0172617>
- Swire-Thompson B, DeGutis J and Lazer D (2020) Searching for the backfire effect: measurement and design considerations. *Journal of Applied Research in Memory and Cognition* 9(3): 286–299. <http://dx.doi.org/10.1016/j.jarmac.2020.06.006>.
- The jamovi project (2020) *jamovi*. (Version 1.6). <https://www.jamovi.org>.
- Teovanović P, Lukić P, Zupan Z, Lazić A, Ninković M and Žeželj I (2020) Irrational beliefs differentially predict adherence to guidelines and pseudoscientific practices during the COVID-19 pandemic. *Applied Cognitive Psychology* 35(2): 486–496.
<http://dx.doi.org/10.1002/acp.3770>.
- Viechtbauer W (2010) Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software* 36(3): 1–48. <https://www.jstatsoft.org/v36/i03/>.
- Walter N, Murphy ST, Frank LB and Baezconde-Garbanati L (2017) Who cares what others think? the role of Latinas' acculturation in the processing of HPV vaccination narrative messages. *International Journal Of Communication* 11: 4946–4964.
<https://ijoc.org/index.php/ijoc/article/view/6395>.

- Walter N, Brooks JJ, Saucier CJ and Suresh S (2020) Evaluating the impact of attempts to correct health misinformation on social media: a meta-analysis. *Health Communication*: 1–9. <http://dx.doi.org/10.1080/10410236.2020.1794553>.
- Wang Y, McKee M, Torbica A and Stuckler D (2019) Systematic literature review on the spread of health-related misinformation on social media. *Social Science and Medicine* 240: 112552. <https://doi.org/10.1016/j.socscimed.2019.112552>.
- Wilson K, Mills EJ, Norman G and Tomlinson G (2005) Changing attitudes towards polio vaccination: a randomized trial of an evidence-based presentation versus a presentation from a polio survivor. *Vaccine* 23(23): 3010–3015. <https://doi.org/10.1016/j.vaccine.2004.12.002>.
- Winterbottom A, Bekker HL, Conner M and Mooney A (2008) Does narrative information bias individual's decision making? a systematic review. *Social Science and Medicine* 67(12): 2079–2088. <https://doi.org/10.1016/j.socscimed.2008.09.037>.
- WHO (World Health Organization) (n.d.) Ten threats to global health in 2019. Available at: <https://www.who.int/emergencies/ten-threats-to-global-health-in-2019> (accessed 2 November 2019).
- WHO (World Health Organization) (2018a) *2018 assessment report of the Global Vaccine Action Plan: strategic advisory group of experts on immunization*. Geneva. <https://apps.who.int/iris/handle/10665/276967>.
- WHO (World Health Organization) (2018b) *Surveillance standards for vaccine-preventable diseases*, 2nd edn. Geneva. <https://apps.who.int/iris/handle/10665/275754>.

WHO (World Health Organization) (2019) Immunization. Available at:

<https://www.who.int/news-room/facts-in-pictures/detail/immunization> (accessed 2 November 2019).

Wood MJ (2016) Conspiracy suspicions as a proxy for beliefs in conspiracy theories: implications for theory and measurement. *British Journal of Psychology* 108(3): 507–527. <https://doi.org/10.1111/bjop.12231>.

Wood MJ (2018) Propagating and debunking conspiracy theories on Twitter during the 2015–2016 Zika virus outbreak. *Cyberpsychology, Behavior, and Social Networking* 21(8): 485–490. <https://doi.org/10.1089/cyber.2017.0669>.

Wood MJ and Douglas KM (2013) ‘What about building 7?’ a social psychological study of online discussion of 9/11 conspiracy theories. *Frontiers in Psychology* 4(JUL). <https://doi.org/10.3389/fpsyg.2013.00409>.

Wood MJ, Douglas KM and Sutton RM (2012) Dead and alive: beliefs in contradictory conspiracy theories. *Social Psychological and Personality Science* 3(6): 767–773. <https://doi.org/10.1177/1948550611434786>.

Xu Z (2019) Personal stories matter: topic evolution and popularity among pro- and anti-vaccine online articles. *Journal of Computational Social Science* 2(2): 207–220. <https://doi.org/10.1007/s42001-019-00044-w>.

Zebregs S, Van den Putte B, Neijens P and De Graaf A (2015) The differential impact of statistical and narrative evidence on beliefs, attitude, and intention: a meta-analysis. *Health Communication* 30(3): 282–289. <https://doi.org/10.1080/10410236.2013.842528>.

Žeželj I, Jović S, Mihajlović B, Savić S, Tadić M and Vučetić A (2006) Eksperimentalna provera efikasnosti strategija izgradnje otpornosti na ubeđivanje u zavisnosti od kanala prijema

poruke [Experimental testing of inoculation strategies' efficacy through different message channels]. *Psihologija* 39(2): 147–167. <https://scindeks-clanci.ceon.rs/data/pdf/0048-5705/2006/0048-57050602147Z.pdf>.

Appendix

Effectiveness of the Interventions in the Included Studies

Authors, Year	Target Population	Vacc.	Intervention Group	Contrast Group	Outcome	Time Delay	ES with 95% CI		Stat. Sig.	Mag.	Conseq.
Wilson, et al., 2005	Alternative medicine students	Polio	N	Edu.	Change in intent to recommend the vacc.	Immediate	<i>CramerV</i>	0.16 [0.00; 0.36]		Small	-
Wilson, et al., 2005	Alternative medicine students	Polio	N	Edu.	Change in perc. vacc. risk	Immediate	<i>CramerV</i>	0.09 [0.00; 0.27]		Small	-
Wilson, et al., 2005	Alternative medicine students	Polio	N	Edu.	Change in perc. disease severity	Immediate	<i>CramerV</i>	0.40 [0.13; 0.61]		Large	-
De Wit, et al., 2008	Men who have sex with men	Hep. B	N	Mere assertion of risk	Perc. disease severity	Immediate	<i>ds</i>	-0.94 [-1.57; -0.4]		Large	Neg.
De Wit, et al., 2008	Men who have sex with men	Hep. B	N	Mere assertion of risk	Perc. disease susceptibility	Immediate	<i>ds</i>	4.24 [3.40; 5.41]		Large	Pos.
De Wit, et al., 2008	Men who have sex with men	Hep. B	N	Mere assertion of risk	Vacc. intent	Immediate	<i>ds</i>	2.93 [2.25; 3.85]		Large	Pos.
De Wit, et al., 2008	Men who have sex with men	Hep. B	N	No-message	Perc. disease severity	Immediate	<i>ds</i>	-1.97 [-2.67; -1.4]		Large	Neg.
De Wit, et al., 2008	Men who have sex with men	Hep. B	N	No-message	Perc. disease susceptibility	Immediate	<i>ds</i>	1.49 [0.96; 2.14]		Large	Pos.
De Wit, et al., 2008	Men who have sex with men	Hep. B	N	No-message	Vacc. intent	Immediate	<i>ds</i>	0.84 [0.33; 1.42]		Large	Pos.
De Wit, et al., 2008	Men who have sex with men	Hep. B	N	Stat.	Perc. disease severity	Immediate	<i>ds</i>	-1.71 [-2.45; -1.11]		Large	Neg.
De Wit, et al., 2008	Men who have sex with men	Hep. B	N	Stat.	Perc. disease susceptibility	Immediate	<i>ds</i>	1.87 [1.27; 2.64]		Large	Pos.
De Wit, et al., 2008	Men who have sex with men	Hep. B	N	Stat.	Vacc. intent	Immediate	<i>ds</i>	2.21 [1.58; 3.04]		Large	Pos.

Authors, Year	Target Population	Vacc.	Intervention Group	Contrast Group	Outcome	Time Delay	ES with 95% CI		Stat. Sig.	Mag.	Conseq.
Dunlop, et al., 2010	Female students	HPV	N (without discussion)	Edu.	Perc. subjective & descriptive social norms	Immediate	<i>ds</i>	0.84 [0.23; 1.54]		Large	Pos.
Dunlop, et al., 2010	Female students	HPV	N (with discussion)	Edu.	Perc. subjective & descriptive social norms	Immediate	<i>ds</i>	0.12 [-0.66; 0.93]		Very Small	Pos.
Dunlop, et al., 2010	Female students	HPV	N (without discussion)	Edu.	Vacc. intent	Immediate	<i>ds</i>	0.72 [0.12; 1.41]		Medium	Pos.
Dunlop, et al., 2010	Female students	HPV	N (with discussion)	Edu.	Vacc. intent	Immediate	<i>ds</i>	-0.73 [-1.61; 0.03]		Medium	Neg.
Dunlop, et al., 2010	Female students	HPV	N (without discussion)	Edu.	Vacc. attitude	Immediate	<i>ds</i>	0.59 [-0.02; 1.26]		Medium	Pos.
Dunlop, et al., 2010	Female students	HPV	N (with discussion)	Edu.	Vacc. attitude	Immediate	<i>ds</i>	-0.06 [-0.85; 0.73]		Very Small	Neg.
Kepka, et al., 2011	Hispanic parents	HPV	N	Control	Change in perc. vacc. self-efficacy	Immediate	-		<i>n.s.</i>	-	-
Kepka, et al., 2011	Hispanic parents	HPV	N	Control	Change in vacc. intent (for daughters)	Immediate	-		<i>n.s.</i>	-	-
Kepka, et al., 2011	Hispanic parents	HPV	N	Control	Disease & vacc. awareness	Immediate	<i>AvrgOR</i>	1.5 [0.82; 2.74]		Small	Pos.
Kepka, et al., 2011	Hispanic parents	HPV	N	Control	Disease & vacc. knowledge	Immediate	<i>AvrgOR</i>	2.58 [1.78; 3.74]		Small	Pos.
Kepka, et al., 2011	Hispanic parents	HPV	N	Control	Perc. vacc. self-efficacy	Immediate	<i>OR</i>	1.48 [0.52; 4.21]		Very Small	Pos.
Kepka, et al., 2011	Hispanic parents	HPV	N	Control	Pro-vacc. beliefs	Immediate	<i>AvrgOR</i>	2.00 [1.11; 3.58]		Small	Pos.
Kepka, et al., 2011	Hispanic parents	HPV	N	Control	Vacc. intent (for daughters)	Immediate	<i>OR</i>	0.69 [0.30; 1.59]		Very Small	Pos.
Kepka, et al., 2011	Hispanic parents	HPV	N	Pretest	Perc. vacc. self-efficacy	Immediate	-		<i>n.s.</i>	-	-
Kepka, et al., 2011	Hispanic parents	HPV	N	Pretest	Vacc. intent (for daughters)	Immediate	-		<i>n.s.</i>	-	-
Hopfer, 2012	Female students	HPV	N (peer)	Control	Perc. vacc. self-efficacy	Immediate	<i>ds</i>	0.03 [-0.22; 0.28]		Very Small	Pos.

Authors, Year	Target Population	Vacc.	Intervention Group	Contrast Group	Outcome	Time Delay	ES with 95% CI		Stat. Sig.	Mag.	Conseq.
Hopfer, 2012	Female students	HPV	N (peer; expert)	Control	Perc. vacc. self-efficacy	Immediate	<i>ds</i>	0.04 [-0.22; 0.29]		Very Small	Pos.
Hopfer, 2012	Female students	HPV	N (expert)	Control	Perc. vacc. self-efficacy	Immediate	<i>ds</i>	-0.03 [-0.35; 0.29]		Very Small	Neg.
Hopfer, 2012	Female students	HPV	N (peer)	Control	Vacc. intent	Immediate	<i>ds</i>	0.01 [-0.24; 0.26]		Very Small	Pos.
Hopfer, 2012	Female students	HPV	N (peer; expert)	Control	Vacc. intent	Immediate	<i>ds</i>	0.03 [-0.22; 0.29]		Very Small	Pos.
Hopfer, 2012	Female students	HPV	N (expert)	Control	Vacc. intent	Immediate	<i>ds</i>	-0.01 [-0.33; 0.31]		Very Small	Neg.
Hopfer, 2012	Female students	HPV	N (peer)	Control	Vacc. uptake	Two Months	<i>OR</i>	1.61 [0.80; 3.28]		Small	Pos.
Hopfer, 2012	Female students	HPV	N (peer; expert)	Control	Vacc. uptake	Two Months	<i>OR</i>	2.07 [1.05; 4.10]		Small	Pos.
Hopfer, 2012	Female students	HPV	N (expert)	Control	Vacc. uptake	Two Months	<i>OR</i>	0.48 [0.13; 1.69]		Very Small	Pos.
Prati, et al., 2012	People aged 65 & over	Flu	N	Edu.	Perc. disease risk	Immediate	<i>ds</i>	0.07 [-0.20; 0.34]		Very Small	Pos.
Prati, et al., 2012	People aged 65 & over	Flu	N	Edu.	Perc. vacc. efficacy	Immediate	<i>ds</i>	0.15 [-0.13; 0.42]		Very Small	Pos.
Prati, et al., 2012	People aged 65 & over	Flu	N	Edu.	Vacc. intent	Immediate	-		<i>n.s.</i>	-	-
Prati, et al., 2012	People aged 65 & over	Flu	N	No-message	Perc. disease risk	Immediate	<i>ds</i>	0.35 [0.08; 0.63]		Small	Pos.
Prati, et al., 2012	People aged 65 & over	Flu	N	No-message	Perc. vacc. efficacy	Immediate	<i>ds</i>	0.32 [0.04; 0.59]		Small	Pos.
Prati, et al., 2012	People aged 65 & over	Flu	N	No-message	Vacc. intent	Immediate	-		<i>n.s.</i>	-	-
Nyhan, et al., 2014	Parents	MMR	N	Control	Perc. probability of vacc. side effects	Immediate	-		<i>sig.</i>	-	Neg.
Nyhan, et al., 2014	Parents	MMR	N	Control	Vacc. intent	Immediate	-		<i>n.s.</i>	-	-
Nyhan, et al., 2014	Parents	MMR	N	Control	Vacc. misperception	Immediate	-		<i>n.s.</i>	-	-

Authors, Year	Target Population	Vacc.	Intervention Group	Contrast Group	Outcome	Time Delay	ES with 95% CI		Stat. Sig.	Mag.	Conseq.
Nan, et al., 2015	Students	HPV	Combined (N; N stat.)		Perc. disease susceptibility	Immediate	<i>ds</i>	0.43 [0.10; 0.79]		Small	Pos.
Nan, et al., 2015	Students	HPV	Combined (N; N stat.)		Vacc. intent (free of cost)	Immediate	<i>ds</i>	-0.05 [-0.39; 0.29]		Very Small	Neg.
Nan, et al., 2015	Students	HPV	Combined (N; N stat.)		Vacc. intent (with cost)	Immediate	<i>ds</i>	0.07 [-0.27; 0.41]		Very Small	Pos.
Nan, et al., 2015	Students	HPV	N	Stat.	Perc. disease susceptibility	Immediate	<i>ds</i>	-0.04 [-0.44; 0.35]		Very Small	Neg.
Nan, et al., 2015	Students	HPV	Combined (N; Stat. stat.)		Perc. disease susceptibility	Immediate	<i>ds</i>	0.39 [-0.01; 0.81]		Small	Pos.
Nan, et al., 2015	Students	HPV	N	Stat.	Vacc. intent (free of cost)	Immediate	<i>ds</i>	-0.07 [-0.47; 0.33]		Very Small	Neg.
Nan, et al., 2015	Students	HPV	Combined (N; Stat. stat.)		Vacc. intent (free of cost)	Immediate	<i>ds</i>	-0.12 [-0.53; 0.28]		Very Small	Neg.
Nan, et al., 2015	Students	HPV	N	Stat.	Vacc. intent (with cost)	Immediate	<i>ds</i>	-0.25 [-0.65; 0.15]		Small	Neg.
Nan, et al., 2015	Students	HPV	Combined (N; Stat. stat.)		Vacc. intent (with cost)	Immediate	<i>ds</i>	-0.18 [-0.59; 0.23]		Very Small	Neg.
Frew, et al., 2016	Black-African American pregnant women aged 18-51	Flu	N	Edu.	Vacc. intent (during pregnancy)	Some Delay	<i>CramerV</i>	0.05 [0.00; 0.19]		Very Small	-
Frew, et al., 2016	Black-African American pregnant women aged 18-50	Flu	N	Edu.	Vacc. uptake (during pregnancy)	Some Delay	<i>OR</i>	1.11 [0.25; 4.88]		Very Small	Pos.
Kim and Nan, 2016	Students	HPV	N	Edu.	Perc. logistic barriers for vacc.	Immediate	<i>ds</i>	-0.02 [-0.22; 0.17]		Very Small	Pos.
Kim and Nan, 2016	Students	HPV	N	Edu.	Perc. disease severity	Immediate	<i>ds</i>	-0.13 [-0.33; 0.06]		Very Small	Neg.
Kim and Nan, 2016	Students	HPV	N	Edu.	Perc. disease susceptibility	Immediate	<i>ds</i>	0.02 [-0.17; 0.21]		Very Small	Pos.
Kim and Nan, 2016	Students	HPV	N	Edu.	Perc. vacc. efficacy	Immediate	<i>ds</i>	-0.17 [-0.37; 0.02]		Very Small	Neg.

Authors, Year	Target Population	Vacc.	Intervention Group	Contrast Group	Outcome	Time Delay	ES with 95% CI		Stat. Sig.	Mag.	Conseq.
Kim and Nan, 2016	Students	HPV	N	Edu.	Vacc. intent (free of cost)	Immediate	<i>ds</i>	-0.03 [-0.22; 0.16]		Very Small	Neg.
Kim and Nan, 2016	Students	HPV	N	Edu.	Vacc. intent (with cost)	Immediate	<i>ds</i>	-0.11 [-0.31; 0.08]		Very Small	Neg.
Kim and Nan, 2016	Students	HPV	N	Edu.	Vacc. attitude	Immediate	<i>ds</i>	-0.15 [-0.35; 0.04]		Very Small	Neg.
Kim and Nan, 2016	Students	HPV	N	Edu.	Perc. vacc. harms	Immediate	<i>ds</i>	0.05 [-0.14; 0.25]		Very Small	Neg.
Nan, et al., 2016	Female students	HPV	N (1st-person)	Edu. (audio)	Perc. disease susceptibility	Immediate	<i>ds</i>	0.13 [-0.51; 0.78]		Very Small	Pos.
Nan, et al., 2016	Female students	HPV	N (3rd-person)	Edu. (audio)	Perc. disease susceptibility	Immediate	<i>ds</i>	0.34 [-0.25; 0.96]		Small	Pos.
Nan, et al., 2016	Female students	HPV	N (1st-person)	Edu. (text)	Perc. disease susceptibility	Immediate	<i>ds</i>	0.01 [-0.61; 0.64]		Very Small	Pos.
Nan, et al., 2016	Female students	HPV	N (3rd-person)	Edu. (text)	Perc. disease susceptibility	Immediate	<i>ds</i>	-0.69 [-1.40; -0.06]		Medium	Neg.
Lee, et al., 2016	Korean American women aged 21-29	HPV	Combined (N; Pretest edu.; stat.)		Disease & vacc. knowledge	One Week	<i>dav</i>	1.39 [0.87; 2.02]		Large	Pos.
Lee, et al., 2016	Korean American women aged 21-29	HPV	Combined (N; Pretest edu.; stat.)		Vacc. intent	One Week	-		<i>sig.</i>	-	Pos.
Walter, et al., 2017	Mexican American women	HPV	N	Edu.	Perc. descriptive social norm (for fict. daughter)	Immediate	<i>ds</i>	0.03 [-0.26; 0.32]		Very Small	Pos.
Walter, et al., 2017	Mexican American women	HPV	N	Edu.	Perc. descriptive social norm (for fict. son)	Immediate	<i>ds</i>	0.01 [-0.27; 0.30]		Very Small	Pos.
Walter, et al., 2017	Mexican American women	HPV	N	Edu.	Perc. injunctive social norm (for fict. daughter)	Immediate	<i>ds</i>	0.15 [-0.13; 0.45]		Very Small	Pos.

Authors, Year	Target Population	Vacc.	Intervention Group	Contrast Group	Outcome	Time Delay	ES with 95% CI		Stat. Sig.	Mag.	Conseq.
Walter, et al., 2017	Mexican American women	HPV	N	Edu.	Perc. injunctive social norm (for fict. son)	Immediate	<i>ds</i>	0.15 [-0.13; 0.45]		Very Small	Pos.
Walter, et al., 2017	Mexican American women	HPV	N	Edu.	Vacc. intent (for fict. daughter)	Immediate	<i>ds</i>	0.28 [-0.01; 0.57]		Small	Pos.
Walter, et al., 2017	Mexican American women	HPV	N	Edu.	Vacc. intent (for fict. son)	Immediate	<i>ds</i>	0.02 [-0.27; 0.31]		Very Small	Pos.
Lee, et al., 2018	Khmer mothers & daughters	HPV	N	Edu.	Vacc. uptake	Three Weeks	-		<i>n.s.</i>	-	-
Lee, et al., 2018	Khmer daughters	HPV	N	Edu.	Vacc. intent	Three Weeks	-		<i>sig.</i>	-	Pos.
Okuhara, et al., 2018	Mothers of daughters aged 12-16	HPV	Combined (N, No-1st-person; message stat.)		Vacc. intent (for daughter)	Immediate	<i>ds</i>	0.56 [0.40; 0.73]		Medium	Pos.
Okuhara, et al., 2018	Mothers of daughters aged 12-16	HPV	Combined (N, No-3rd-person; message stat.)		Vacc. intent (for daughter)	Immediate	<i>ds</i>	0.50 [0.33; 0.67]		Medium	Pos.
Okuhara, et al., 2018	Mothers of daughters aged 12-16	HPV	Combined (N, No-1st-person; message stat.)		Vacc. attitude	Immediate	<i>ds</i>	0.87 [0.71; 1.05]		Large	Pos.
Okuhara, et al., 2018	Mothers of daughters aged 12-16	HPV	Combined (N, No-3rd-person; message stat.)		Vacc. attitude	Immediate	<i>ds</i>	0.83 [0.66; 1.00]		Large	Pos.
Okuhara, et al., 2018	Mothers of daughters aged 12-16	HPV	Combined (N, Pretest 1st-person; stat.)		Vacc. intent (for daughter)	Immediate	<i>dav</i>	0.33 [0.20; 0.47]		Small	Pos.
Okuhara, et al., 2018	Mothers of daughters aged 12-16	HPV	Combined (N, Pretest 3rd-person; stat.)		Vacc. intent (for daughter)	Immediate	<i>dav</i>	0.38 [0.24; 0.52]		Small	Pos.
Okuhara, et al., 2018	Mothers of daughters aged 12-16	HPV	Combined (N, Stat. 1st-person; stat.)		Change in vacc. intent (for daughter)	Immediate	<i>ds</i>	0.14 [0.00; 0.28]		Very Small	Pos.

Authors, Year	Target Population	Vacc.	Intervention Group	Contrast Group	Outcome	Time Delay	ES with 95% CI		Stat. Sig.	Mag.	Conseq.
Okuhara, et al., 2018	Mothers of daughters aged 12-16	HPV	Combined (N, Stat. 1st-person; stat.)		Vacc. intent (for Immediate daughter)		<i>ds</i>	0.04 [-0.10; 0.18]		Very Small	Pos.
Okuhara, et al., 2018	Mothers of daughters aged 12-16	HPV	Combined (N, Stat. 3rd-person; stat.)		Vacc. intent (for Immediate daughter)		<i>ds</i>	-0.04 [-0.18; 0.10]		Very Small	Neg.
Okuhara, et al., 2018	Mothers of daughters aged 12-16	HPV	Combined (N, Stat. 3rd-person; stat.)		Vacc. intent (for Immediate daughter)		<i>ds</i>	0.20 [0.06; 0.34]		Small	Pos.
Okuhara, et al., 2018	Mothers of daughters aged 12-16	HPV	Combined (N, Stat. 1st-person; stat.)		Vacc. attitude	Immediate	<i>ds</i>	0.11 [-0.03; 0.25]		Very Small	Pos.
Okuhara, et al., 2018	Mothers of daughters aged 12-16	HPV	Combined (N, Stat. 3rd-person; stat.)		Vacc. attitude	Immediate	<i>ds</i>	0.02 [-0.12; 0.16]		Very Small	Pos.
Johnson, et al., 2019	Vacc. Hesitant students with no vacc. curriculum	All	N	Control	Vacc. attitude	Some Delay	<i>ds</i>	0.91 [0.29; 1.63]		Large	Pos.
Johnson, et al., 2019	Vacc. Hesitant students with no vacc. curriculum	All	N	Pretest	Vacc. attitude	Some Delay	<i>dav</i>	1.56 [0.90; 2.42]		Large	Pos.
Johnson, et al., 2019	Vacc. Hesitant students with some vacc. curriculum	All	N	Control	Vacc. attitude	Some Delay	-		<i>n.s.</i>	-	-
Johnson, et al., 2019	Vacc. Hesitant students with some vacc. curriculum	All	N	Pretest	Vacc. attitude	Some Delay	-		<i>n.s.</i>	-	-
Johnson, et al., 2019	Vacc. Hesitant students with intensive vacc. curriculum	All	N	Pretest	Vacc. attitude	Some Delay	-		<i>sig.</i>	-	Pos.
Liu, et al., 2019	Women aged 18- 45	HPV	N	Edu. (gain- framed)	Vacc. intent (for Immediate real or fict. children)		-		<i>n.s.</i>	-	-

Authors, Year	Target Population	Vacc.	Intervention Group	Contrast Group	Outcome	Time Delay	ES with 95% CI	Stat. Sig.	Mag.	Conseq.
Liu, et al., 2019	Women aged 18- 46	HPV	N	Edu. (loss- framed)	Vacc. intent (for real or fict. children)	Immediate	-	<i>n.s.</i>	-	-

Note. Students = college students. Vacc. = vaccine. MMR = measles, mumps, and rubella. HPV = human papillomavirus. Hep. B = Hepatitis B. All = vaccines in general. N = narrative. Edu. = educational. Stat. = statistical. Perc. = perceived. Fict. = fictitious. Time Delay = time delay between the intervention and when the measure of the vaccination outcome was taken. Immediate = measure taken immediately before/after the intervention. Some Delay = the article does not report the exact amount of time that passed between the intervention and the when the measure was taken. ES = Effect Size. CI = Confidence Interval. CramerV = Cramér's V. ds = Cohen's *d* for independent groups. dav = Cohen's *d* for paired groups. OR = Odds Ratio. AvrgOR = Average Odds Ratio. Stat. Sig. = Statistical Significance. n.s. = not statistically significant. sig. = statistically significant. Mag. = Magnitude of the effect. Small = 0.07 cut-off for Cramér's V (Min(r-1,c-1)=2); 0.2 for Cohen's *d*; 1.5 for OR and average OR. Medium = 0.21 cut-off for Cramér's V (Min(r-1,c-1)=2); 0.5 for Cohen's *d*; 3.5 for OR and average OR. Large = 0.35 cut-off for Cramér's V (Min(r-1,c-1)=2); 0.8 for Cohen's *d*; 9.0 for OR and average OR. Very Small = did not meet the threshold for being categorized as Small. Conseq. = consequence of the intervention. Pos. = intervention favorably affected the outcome. Neg. = intervention adversely affected the outcome.