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The Empathetic Refutational Interview to Tackle Vaccine Misconceptions: Four Randomized Experiments

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Objective: We introduce and report early stage testing of a novel, multicomponent intervention that can be used by healthcare professionals (HCPs) to address false or misleading antivaccination arguments while maintaining empathy for and understanding of people's motivations to believe misinformation: the "Empathetic Refutational Interview" (ERI). ***Method:*** We conducted four experiments in 2022 with participants who were predominantly negative or on the fence about vaccination (total $n = 2{,}545$) to test four steps for tailoring an HCP's response to a vaccine-hesitant individual: (a) elicit their concerns, (b) affirm their values and beliefs to the extent possible, (c) refute the misinformed beliefs in their reasoning in a way that is tailored to their psychological motivations, and (d) provide factual information about vaccines. Each of the steps was tested against active control conditions, with participants randomized to conditions. ***Results:*** Overall, compared to controls, we found that observing steps of the ERI produced small effects on increasing vaccine acceptance and lowering support for antivaccination arguments. Critically, an HCP who affirmed participants' concerns generated significantly more support for their refutations and subsequent information, with large effects compared to controls. In addition, participants found tailored refutations (compared to control responses) more compelling, and displayed more trust and openness toward the HCP giving them. ***Conclusions:*** The ERI can potentially be leveraged and tested further as a tailored communication tool for HCPs to refute antivaccination misconceptions while maintaining trust and rapport with patients.

Public Significance Statement

To effectively address misinformed beliefs about vaccination, communicators must go beyond simply refuting these and show an understanding of people's underlying motivations for their beliefs. We developed a new approach toward such conversations, taking into account individuals' possible psychological motivations and responding with empathy even while correcting their misconceptions. Our approach is based on past work in healthcare communication and misinformation correction and provides a guide for more productive vaccine conversations.

Keywords: vaccine communication, vaccine hesitancy, empathy, attitude roots, affirmation

Supplemental materials: https://doi.org/10.1037/hea0001354.supp

Communication with trusted healthcare professionals (HCPs) can be highly effective at dealing with patients' (and caregivers') concerns and encouraging them to be vaccinated (Paterson et al., 2016). This is particularly the case in light of the fact that misconceptions are often triggered by misinformation disseminated by antivaccination activists. As people increasingly consume information online and through

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Dawn Holford served as lead for data curation, formal analysis, methodology, project administration, resources, validation, visualization, and writing–original draft and contributed equally to investigation. Angelo Fasce served in a supporting role for methodology. Stephan Lewandowsky served as lead for funding acquisition, investigation, and supervision. Dawn Holford, Philipp Schmid, Angelo Fasce, and Stephan Lewandowsky contributed equally to conceptualization. Philipp Schmid and Stephan Lewandowsky contributed equally to methodology. Philipp Schmid, Angelo Fasce, and Stephan Lewandowsky contributed equally to writing–review and editing.

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social media networks, antivaccination misinformation can spread quickly and to a wide audience (Johnson et al., 2020). Countering such misconceptions about vaccines is crucial to ensure patients make informed decisions based on factual information. Experimental studies have shown that misinformation can be successfully debunked to increase vaccine acceptance (e.g., Schmid & Betsch, 2019). However, providing factual information can fail if it does not provide a sufficient level of detail (Ecker et al., 2022). One way to increase the level of detail is to engage with an individual's motivations for believing the misinformation (Walter & Tukachinsky, 2020). For example, individuals may oppose vaccines based on social and cultural factors, or because they challenge a person's particular personal interests, worldviews, or ideologies (Lewandowsky & Oberauer, 2016). A tailored approach has a better chance of successfully correcting misconceptions than mass communication of information, especially if misconceptions are based on one's personal motivations or attitudes (Fasce et al., 2023). Discussing concerns with a trusted medical advisor offers such a highly tailored approach. However, HCPs need skills and support to effectively refute vaccine misconceptions held by patients without damaging their trusted relationship with patients (Loftus et al., 2021). If an individual perceives that their HCP's attempt to correct their misinformed belief is an attack on their worldview, the attempt may even backfire, resulting in more support for the misinformed belief (Nyhan et al., 2014). The challenge for HCPs is to navigate the conversation in a way that is perceived by patients as supportive and compelling.

A tailored approach to rebutting antivaccination arguments therefore needs to go beyond addressing flaws in individual arguments and consider the "attitude roots" of opposition to vaccines (Hornsey, 2020). While an individual may express their resistance to vaccination as a specific argument, this may be motivated by a range of underlying psychological attributes, from religious concerns to reactance or conspiracist ideation (see Fasce et al., 2023 for a review). For example, an attitude rooted in a tendency to believe in conspiracy theories may manifest in the argument that one should reject vaccinations because they are part of a secret plot to control the population, whereas an attitude rooted in religious beliefs may manifest in perceived violations of dietary norms, such as blood components and pharmaceutical excipients of porcine origin. Understanding the attitude root of an individual's resistance to vaccines would thus allow an HCP to align their message with the individual's motivation for holding their position, thereby avoiding triggering the individual's motivation to reject the provaccination message (Hornsey, 2020). This approach could increase the likelihood of successful communication compared to the HCP only providing factual information (Kaufman et al., 2018). In this article, we combined different strands of psychological research on patient communication, persuasion, and belief revision, while incorporating communication skills regarded as best clinical practice (e.g., King & Hoppe, 2013). We propose a new technique for delivering attitude-consistent corrections of vaccine misconceptions in a healthcare setting, which we call the "Empathetic Refutational Interview" (ERI).

The ERI is designed to guide a conversation in situations where patients express concern about being vaccinated. The ERI proposes four steps in response (summarized in Figure 1): (a) elicit concerns; (b) affirm; (c) offer a tailored refutation; and (d) provide factual information. Underlying the ERI is the principle of empathy, conceptualized in healthcare settings as a response that communicates one's understanding of the patients' experiences, concerns, and perspectives (Hojat, 2016). Empathy is widely advocated as essential in vaccine communication (Gagneur, 2020). We explain each step below, accompanied by a brief explanation of what it seeks to achieve and why we expected it to be beneficial.

Step 1: Elicit Concerns

The interview commences by inviting the patient to share their thoughts. This step draws from motivational interviewing, an approach involving active listening, which has shown success in improving pediatric vaccination uptake (Gagneur, 2020). Probing patients' motivations can help identify a patient's attitude roots—a necessary step to tailor one's response in subsequent steps. We additionally considered and tested whether this step could also be used to temper a patient's negative vaccination attitudes by asking for an explanation of why they hold their view. Previous research found that when people were asked to explain their position on an issue (e.g., a political opinion), their overconfidence in their position was reduced and their attitudes became less extreme (Fernbach et al., 2013; Fisher & Keil, 2014).

Step 2: Affirm

The next ERI step is an expression of empathy for the patient's position, demonstrated through providing an affirmation of the patient's concerns (Gagneur, 2020) that is tailored to acknowledge their motivations to reject vaccination. For example, an HCP can agree that a patient has a legitimate worry that medications are overprescribed (which has some truth) without agreeing that vaccinations are overused (which is a misconception). The affirmation acknowledges the (partial) truth in an argument without endorsing the misinformed argument(s) itself, which could reduce potential dissonance between HCPs' own beliefs and their response to the patient. An affirmation allows the HCP to show they understand and care about the patient's concern, which can build trust even between individuals who hold opposing views (Zlatev, 2019). Responding with affirmations may also support a positive response to and continued engagement with the information provider (Buller et al., 2022). We therefore tested whether an HCP providing an affirmation, compared to one who did not, would receive a better reception, even when the HCP subsequently seeks to refute the patient's misconceptions.

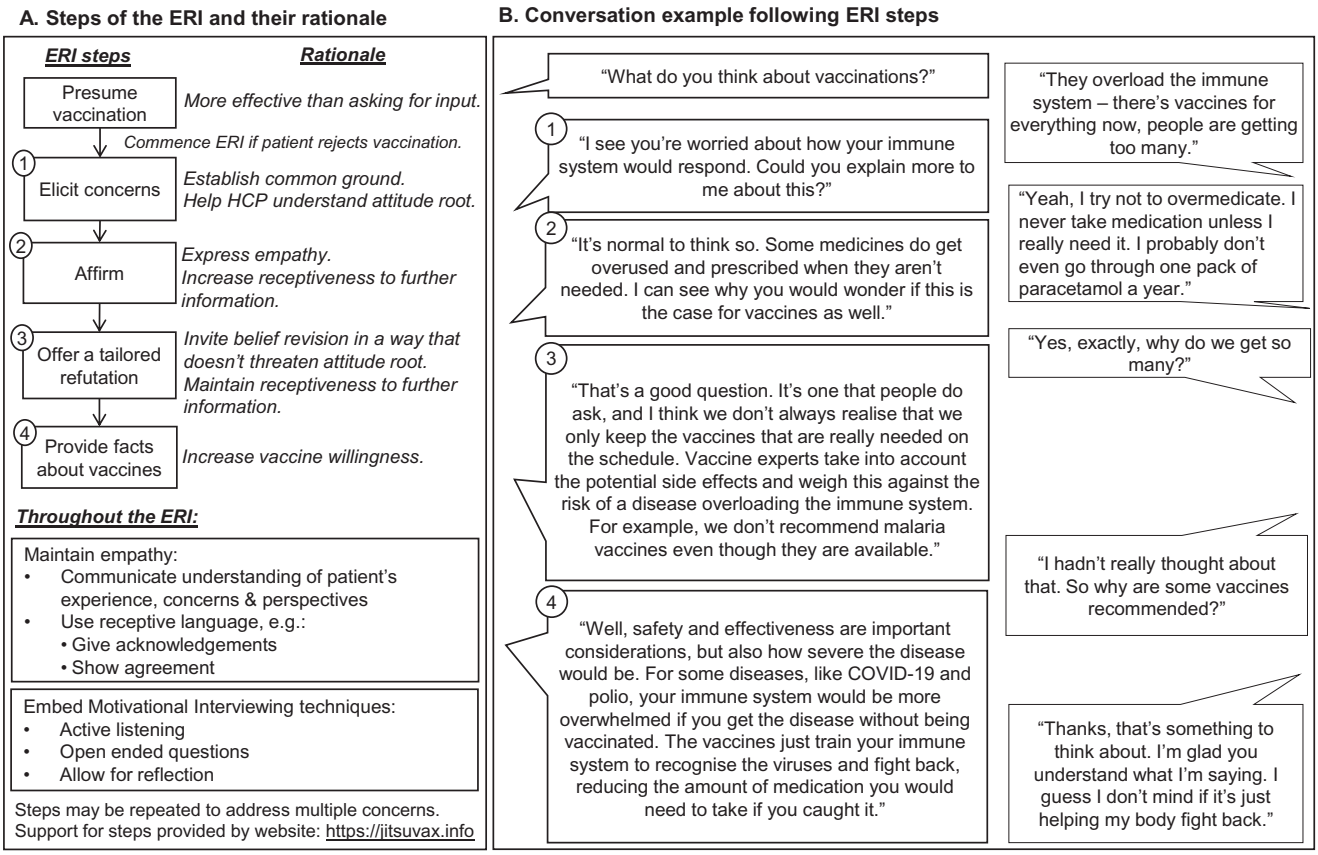
Step 3: Offer a Tailored Refutation

After establishing rapport through elicitation and affirmation, the HCP can then begin to refute vaccine misconceptions. The refutation process is important because explaining why a misconception is wrong and replacing it with facts is more effective at revising people's incorrect beliefs than simply telling them the facts (Schroeder & Kucera, 2022). To be effective and protect against subsequent regression to the misconception, refutations need to replace the misconception with a believable and acceptable alternative for the patient (Ecker et al., 2022; Seifert, 2002). Refutations should thus be tailored to the misconception. We propose additionally that they should also be tailored to the motivation, that is, attitude root(s), driving the patient's overall concerns, to raise acceptance for and avoid producing resistance to the proposed alternative (Nyhan et al., 2014).

On top of tailoring, refuting health misinformation in an empathetic way may be judged as more reliable and satisfying than refuting it

Figure 1

Explanation and Example of the ERI



Note. ERI = emphathetic refutational interview; HCP = healthcare professional; COVID-19 = coronavirus disease 2019.

directly and factually (Gesser-Edelsburg et al., 2018). To achieve this, refutations can use language that includes features such as acknowledgment, first-person pronouns, and use of modal conditionals, which is perceived as more empathetic than language without these features (Minson et al., 2023). For instance, "I see your point. Perhaps we could consider this information" is a more receptive formulation than "That's not correct. It is necessary to consider this information." We thus tested whether tailored refutations with empathetic language would help temper people's antivaccination positions and whether an empathetic tailored refutation, paired with an affirmation (Step 2), would be more effective than other types of responses, while also generating greater receptivity to the HCP.

Step 4: Provide Factual Information

The ERI concludes by providing the patient with evidence beyond the corrected information in Step 3, often facts that are known to be effective at increasing vaccine acceptance in mass communication studies—for example, explaining the risks one faces from a vaccine-preventable disease, or how high vaccine uptake can achieve social and individual benefits of herd immunity—compared to when people have no information (e.g., Betsch et al., 2017; Horne et al., 2015). We thus sought to replicate the positive effects of presenting those facts (about how vaccines generate herd immunity and reduce the risk of severe disease) on vaccine acceptance (Sprengholz & Betsch, 2020).

The Present Study

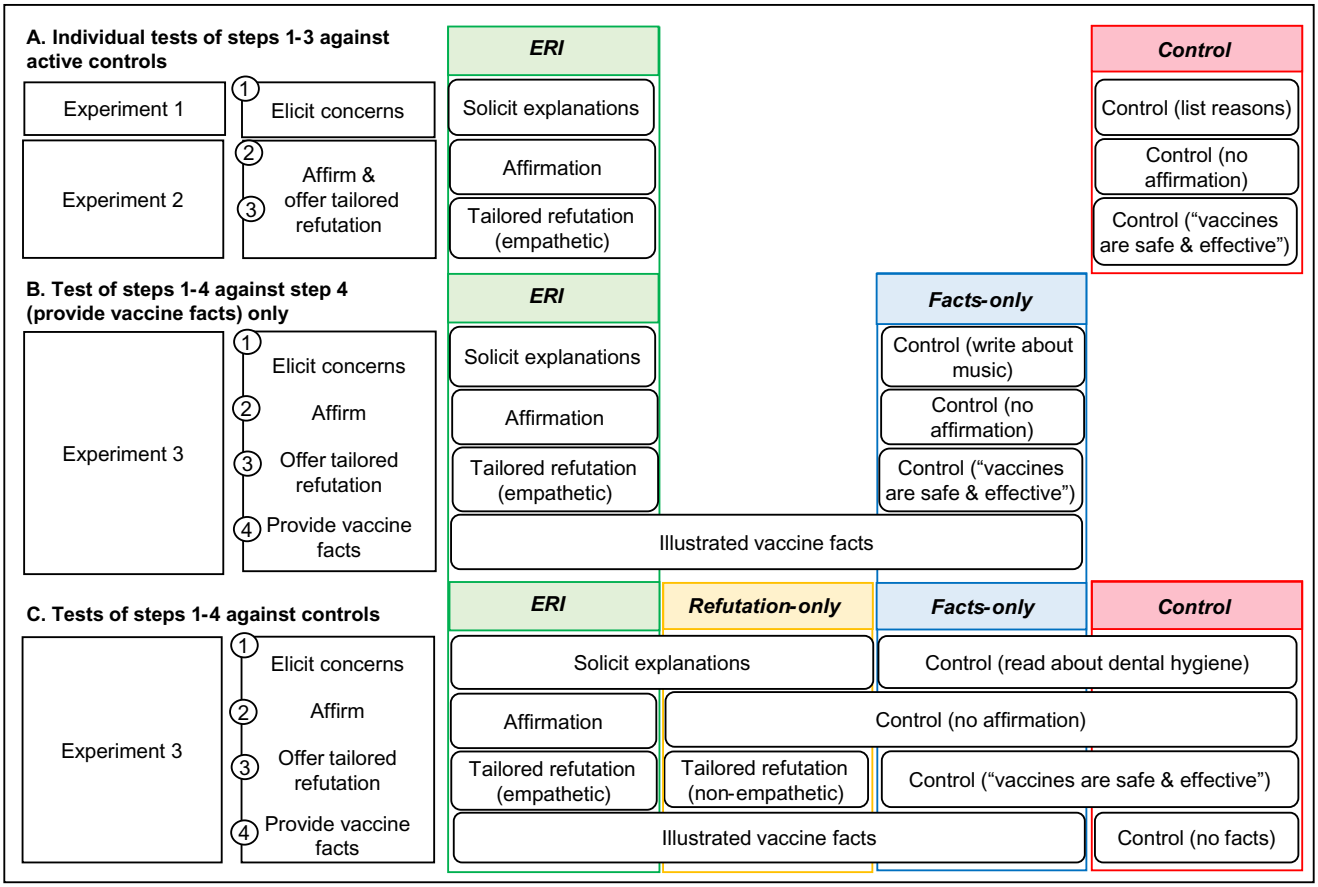
We report a series of four randomized experiments, which were built on the previous literature supporting the different components of the ERI. Each experiment included a test of an intervention for each of the four steps described above against a control condition, illustrated in Figure 2. Overall, the research offers early stage proof of concept, conducted on large samples, that the ERI is potentially effective for refuting patient misconceptions about vaccines and would receive a positive reception from patients. The present experiments are part of a wider research program to develop and test ERI tools to support HCPs' vaccine conversations.

Transparency and Openness Section

We report how we determined our sample size, all data exclusions, all manipulations, and all measures that were included in the study. Data were analyzed using R version 4.1.1 (R Core Team, 2021). For brevity, we include the critical statistics that inform the key hypotheses tested within this article and refer to the online supplemental materials for detailed statistics and data visualizations from the analyses. We also provide the exact wording of questions in the online supplemental materials. All data, analysis code, and research materials are publicly available at https://osf.io/knq9g (Holford, Schmid, et al., 2023). Before data collection, each experiment was approved by the

Figure 2

Experimental Design for Four Experiments to Test the ERI



Note. The relevant experimental conditions used in each experiment are indicated by the headers of the grouped boxes. ERI = empathetic refutational interview; HCP = healthcare professional. See the online article for the color version of this figure.

University of Bristol School of Psychological Science Ethics committee and the study methods and planned analyses were preregistered (individual preregistrations can be found at the link above). All data collection was conducted online through the platform Prolific,[1] with participants paid at the rate of £9/hr. No participant was allowed to participate in more than one experiment. Participants gave informed consent through an online tick box prior to participation.

Experiment 1

Experiment 1 tested a hypothesized benefit of Step 1 in the ERI: soliciting causal explanations for their position, compared to simply listing reasons for it, would reduce participants' support for their antivaccination position, and recalibrate their self-perceived understanding and ability to justify their position.

Method

Participants

We recruited 226 UK participants (sociodemographic information reported in Table 1) who had not had a COVID-19 vaccine. At the time of the study (June 17–22, 2022), 18% of the British population were unvaccinated against COVID-19 (UK Health Security Agency, 2022a). The sample was powered to achieve 90% power (at $\alpha = .05$) to detect a between-subjects main effect of size $\eta_P^2 = 0.034$ found in Fernbach et al. (2013).

Design

We used a 2 (experimental vs. control condition, between-subjects) ×2 (pre vs. postmeasure, within-subjects) design to test the benefit of soliciting explanations from participants about their antivaccination position, compared to a control where participants only listed reasons for their position (see Figure 2A).

Materials and Procedure

Participants first completed three vaccine acceptance measures: the confidence, complacency, and collective responsibility subscales

[1] Prolific is a research panel provider that provides researchers with a prescreening tool to recruit specific participant demographics, based on data it holds about their panel. Participants are only shown studies for which they are eligible, but are not shown what prescreening filters a given study has applied (Prolific, 2023).

Table 1
Demographic Characteristics of the Participants in the Experiments

Experiment	1 ($n = 226$)	2 ($n = 1{,}100$)	3 ($n = 519$)	4 ($n = 700$)
Country of origin	United Kingdom	United Kingdom	United	United States
Age (years)				
M(*SD*)	36.24 (12.23)	40.52 (13.38)	34.27 (10.37)	40.03 (12.97)
Range	19–74	18–85	18–76	18–90
Gender				
Female	45%	49%	34%	47%
Male	54%	51%	66%	52%
Other gender identity	1%	<1%	<1%	<1%
Highest education				
Less than high school	1%	1%	1%	1%
High school or equivalent	19%	18%	17%	22%
Two-year college or equivalent	31%	30%	33%	37%
Bachelor's degree or equivalent	40%	38%	35%	30%
Postgraduate degree	9%	13%	13%	9%
Prefer not to say	0%	<1%	1%	1%
Ethnicity				
White	78%	88%	80%	78%
Mixed or multiple ethnicities	6%	3%	5%	4%
Asian	6%	4%	5%	2%
Black	8%	5%	8%	11%
Other	1%	<1%	1%	4%
Prefer not to say	1%	<1%	1%	1%
Vaccination status	Unvaccinated	—	Unvaccinated	—
Opinion of COVID vaccines				
Positive	—	37%	—	0%
Neutral	—	40%	—	48%
Not stated	—	2%	—	4%
Negative	—	21%	—	48%
Distribution of political leanings (11-point scale)				
Skewness	−0.18	−0.02	−0.06	−0.12
Kurtosis	0.33	−0.52	0.73	−0.63

Note. —, Details not available for that sample. Bar charts showing the distribution of political leanings can be found in the online supplemental materials.

of the 5C determinants of vaccine behavior (Betsch et al., 2018).[2] They then rated how much they supported 10 antivaccination arguments, randomly sampled for each participant from a pool of 30 prototypical arguments in a taxonomy of antivaccination arguments (Fasce et al., 2023). Ratings were made on a 7-point Likert scale ($M = 5.27$, $SD = 1.18$).[3] Participants then rated only their top three most supported arguments for how well they understood these arguments and how well they thought they could justify their support for them, also on a 7-point scale.

Next, following the exact procedures and wording of instructions in Fernbach et al. (2013; see the online supplemental materials), participants wrote text responses to an open-ended question. In the control condition (randomly assigned; $n = 115$), participants were instructed to list reasons for their position on the argument without explaining any of them, whereas in the experimental condition (soliciting explanations; $n = 111$), participants were asked to give their reasons but, critically, also included an explanation of the causal connection between their reasons and their position. Participants provided three text explanations, one for each of their top three supported antivaccination arguments, each on a separate page. For each response, participants were prevented from moving forward for 60 s to encourage them to take their time.

After this, participants completed the ratings of support, understanding, and justification ability again for the three arguments, followed by a posttest completion of the same vaccine acceptance measures, and finally sociodemographic information.

Results and Discussion

Our primary effect of interest was the interaction between experimental condition and timing (pre/postprocedure) of the argument ratings, which would indicate a difference in rating changes between conditions. Between–within analyses of variance (ANOVAs) found that this interaction was not significant for support and understanding ratings, support, $F(1, 224) = 0.82$, $p = .367$, $\eta_P^2 < 0.01$; understanding, $F(1, 224) = 1.75$, $p = .187$, $\eta_P^2 = 0.01$. However, a significant interaction for justification ability showed that the intervention was successful only in the experimental condition, $F(1, 224) = 5.42$, $p = .021$, $\eta_P^2 = 0.02$. Participants rated themselves as less able to justify their position following the experimental

[2] We used all three items per subscale to check the reliability of the measure, but due to experimental time constraints, we focused on the three subscales that were most likely to be affected by the intervention.

[3] We had previously found the arguments used to have higher levels of endorsement in a UK sample (Holford, Fasce, et al., 2023). Only four participants expressed no endorsement of any of the antivaccination arguments (their top three responses were at the midpoint of the scale). Excluding these participants did not change any of the results.

procedure, but not the control (see Figure S1A in the online supplemental materials). Pre–post main effects also showed that participants lowered their ratings of support and understanding of the antivaccination arguments ($ps < .001$) but not justification ability. The main effects of the condition were not significant (see Table S1 for detailed statistics in the online supplemental materials). We also ran between–within ANOVAs on the vaccine acceptance measures but did not find any significant changes in these (all $ps > .100$; see Table S2 in the online supplemental materials).

Thus, Experiment 1 provided some limited support for the additional benefits of Step 1 (eliciting concerns) by showing that it reduced people's confidence in justifying their support for antivaccination arguments. However, it did not change participants' level of vaccine acceptance, indicating a need for further intervention steps.

Experiment 2

Experiment 2 tested Steps 2 and 3 of the ERI. We hypothesized that an HCP's response to an antivaccination argument that comprised an affirmation and refutation tailored to the attitude root of the argument would be perceived more favorably, result in less endorsement of the antivaccination argument, and increase vaccine acceptance compared to a control response that simply stated the safety and efficacy of vaccines. We first established the effects of this novel procedure targeting vaccines in general and in a sample with varying vaccine attitudes.

Method

Participants

We recruited 1,100 UK participants with varying vaccine opinions between June 21–24, 2022, powered to achieve 90% power (at $\alpha = .05$) to detect a between-subjects main effect in the planned comparison for the main dependent variables assuming a small effect size ($d = 0.2$, $f = 0.1$). Our aim was to test the intervention on a broad sample (see Table 1).

Design, Materials, and Procedure

We used a between-subjects design to test the effect of an affirmation and tailored refutation versus a control (Figure 2A) on participants' perceptions of an HCP, with an additional repeated measures design for vaccine acceptance. Participants first completed the full confidence and complacency 5C subscales as vaccine acceptance measures and three covariate measures in randomized order, with order of items within each set of measures randomized.[4]

Participants then rated one antivaccination argument, which was selected randomly for each participant from a set of 24 arguments.[5] As a baseline measure, participants provided ratings of how much they (a) supported the argument; (b) found the argument compelling; (c) thought they would be able to justify the position in the argument (irrespective of how much they supported it), all on a 7-point Likert scale (1 = *not at all* to 7 = *completely*).

Using a procedure adapted from Schmid and Betsch (2019), participants then read a scenario that featured an online forum discussion between a regular forum user ("Tom") who was against vaccines and a medical professional ("Dr. Jones," a General Practitioner). In the scenario, Tom stated another randomly selected antivaccination argument (different from the one at baseline). In the control condition ($n = 521$), Dr. Jones responded by saying "I know that the recommended vaccines are safe and effective" and nothing else. In the affirming refutation condition ($n = 579$[6]), Dr. Jones responded with an affirmation and tailored refutation (see Table S8, middle column, for an example response in the online supplemental materials; we share the full set of responses on the Open Science Framework [OSF]). Participants first rated Tom's argument, and then Dr. Jones' response on a different page, using the same rating scales as the baseline argument rating measure. Participants then completed the two vaccine acceptance measures, posttest, and sociodemographic information.

Results and Discussion

Overall, participants supported Dr. Jones' affirmation and refutation more and found it more compelling and justifiable than Dr. Jones' response in the control version (see Figure S2 in the online supplemental materials). We report results of an analysis of covariance (ANCOVA) model here that was preregistered as a secondary analysis, but did not change any results of the primary preregistered analysis (that only controlled for baseline ratings of the first antivaccination arguments and not any covariates). Compared to participants in the control condition, participants in the experimental condition supported Dr. Jones's refutation more, found it more compelling, and felt themselves more able to justify the refutation, all $ps < .001$ (see Table S3 for test statistics and Figure S2 for intervention effects for three COVID-19 vaccine opinion subgroups in the online supplemental materials).

We did not find a significant effect on ratings of Tom's antivaccination argument between conditions (all $ps > .30$ in the ANCOVAs on these measures, see Table S3 in the online supplemental materials). Nor were there significant changes in vaccine acceptance (all $ps > .26$ in preregistered ANOVAs; see Table S4 in the online supplemental materials).

Thus, Experiment 2 offered initial support for affirmation and tailored refutation of arguments against vaccines in general, as a means to build rapport and receptivity to information, in a sample with varied vaccination attitudes, but there were no effects on vaccine acceptance. However, while we attempted to minimize systematic biases by randomizing both baseline and scenario arguments, this generated a limitation in that participants were not predisposed to support Tom's argument and thus could more likely accept Dr. Jones's response even in the control condition. A second issue was that the scenarios discussed vaccines generically, which might not have raised as strong emotions among participants. In the

[4] Due to experimental time constraints, we reduced the number of 5C items to allow the inclusion of covariates that we expected to influence belief revision. Only one covariate had the expected effect: the Patient Trust in Medical Profession scale (Dugan et al., 2005; 5-point Likert, Cronbach's $\alpha = .89$, $\{M = 2.95$, $\{SD = 0.83)$. We report other covariates (cognitive reflection and health literacy) in the online supplemental materials.

[5] This was a subset of the 30 arguments used in Experiment 1, but we selected only those that had received between 60% and 75% of the maximum rating in Holford, Fasce, et al. (2023). This procedure ensured that arguments fell within a range that would avoid floor or ceiling effects.

[6] Thirteen more participants in the control compared to the experimental group did not finish the study, which was a significant drop-out rate between the two conditions, $\chi^2(1) = 5.82$, $p = .016$. However, this is unlikely to have affected the experiment as we found no significant differences between conditions in terms of participants' baseline support of an antivaccination argument, $t(1{,}075) = -0.38$, $\{p = .705$.

following experiments, we addressed these limitations by using Step 1 of the ERI first to elicit antivaccination arguments participants themselves supported before targeting those arguments in the HCP's response (Steps 2 and 3). In addition, we focused the scenarios on the COVID-19 vaccine as it was a highly salient vaccine that evoked strong emotions at the time. Finally, we integrated Step 4 (providing factual vaccine information) into the experiments after the HCP's response so that we simulated the full ERI procedure. We conducted these experiments with unvaccinated participants as well as those who might have been vaccinated, but held nonpositive attitudes about vaccination, so that we could better capture a wider spectrum of vaccine hesitancy in our samples.

Experiment 3

Experiment 3 aimed to conceptually replicate Experiments 1 and 2 by testing all four ERI steps against a "facts-only" control condition (see Figure 2B), which allowed us to test for incremental benefits of Steps 1–3. The effects of Step 4 were tested in Experiment 4. In these experiments, we used scenarios targeted at the COVID-19 vaccine.

Method

Participants

We recruited 519 UK participants who had not had a COVID-19 vaccine. At the time of testing (October 6–20, 2022), 18% of eligible adults in the UK were unvaccinated for COVID-19 (UK Health Security Agency, 2022b). We powered our sample ($n = 519$) to achieve 90% power (at $\alpha = .05$) to detect an interaction effect of size $\eta_P^2 = 0.02$ (calculated based on Experiments 1 and 2) in our planned ANOVA. Participant demographics are shown in Table 1.

Design, Materials, and Procedure

Our overall intervention was delivered between subjects, with participants randomized to either receive the ERI (i.e., Steps 1–4 of Figure 1, with some adaptations to link the procedures together, detailed below) or an active, "facts-only" control (i.e., Step 4 only; see Figure 2B). In addition, we used a repeated measures design for two outcomes: antivaccination argument ratings and vaccine acceptance, where participants completed these measures before and after the intervention.

At the start of the experiment, participants completed four pretest vaccine acceptance measures. These included the confidence, complacency, and collective responsibility 5C subscales used in previous experiments, but this time we also added a more specific measure of willingness to get a COVID-19 booster vaccine if recommended (measured on a 5-point Likert scale, 1 = *very unwilling* to 5 = *very willing*). Participants also completed the Trust in the Medical Profession scale used in Experiment 2. These measures were presented in randomized order.

Participants then began the experimental procedure by rating their support for six antivaccination arguments (randomly chosen from a pool of 22 arguments[7] used in Experiment 2) on the same 7-point Likert scale from Experiment 1 ($M = 5.17$, $SD = 1.29$). Participants then rated their understanding of and ability to justify their top two most supported arguments.[8] For these two arguments, participants completed either the explanation solicitation task (identical to Experiment 1; $n = 256$) or a control task ($n = 263$), which was adjusted such that participants were asked to write about why they disliked a type of music. This allowed us to compare the explanation solicitation method for Step 1 to control where participants did not discuss vaccination at all. Participants rated the two arguments again posttask.

To simulate Steps 2 and 3, participants then read an excerpt of a consultation between Tom and Dr. Jones similar to Experiment 2 (with either a control or affirming refutation), but this time Dr. Jones offered Tom a COVID-19 vaccination and Tom raised the two antivaccination arguments that were the participants' own top two. Participants rated how much they supported Dr. Jones's position and how compelling they found it. Due to time constraints, participants did not rate Tom in this experiment. Each argument and refutation excerpt was presented on a separate page. Participants responded to the first excerpt before moving on to read and rate the second. We calculated the average of each rating across the two scenarios.

We then extended the scenario with a short text in which Dr. Jones offered more information to Tom in either a direct (control condition) or empathetic (experimental condition) way. Participants indicated how open they would be to receiving Dr. Jones's information if they were in Tom's position (on a 7-point scale, 1 = *not at all* to 7 = *completely*) and then rated Dr. Jones on the Trust in a Doctor scale ($\alpha = .88$; Dugan et al., 2005).

The experimental procedure concluded with Step 4: all participants (in both conditions) viewed an illustrated page with facts about COVID-19 vaccines, which included the risks of COVID-19 disease and the benefits of herd immunity (available on the OSF, along with pretests of these types of information). Participants completed a multiple-choice attention check question after reading the facts page to assess how well they had taken in the information. We did not find any differences between conditions in correct responses to the attention check, $\chi^2(1) = 2.11$, $p = .147$.

After reading the facts page, participants completed ratings of support for the two antivaccination arguments again. They completed the four vaccine acceptance measures posttest, then provided sociodemographic information.

Results and Discussion

To test Step 1, we conducted the same between–within ANOVAs from Experiment 1 on all antivaccination argument ratings given before and immediately after Step 1 (see Table S5 in the online supplemental materials). The critical interaction indicating that the intervention affected changes in argument ratings was not significant for support and justification ability ratings, support, $F(1, 517) = 0.02$, $p = .883$, $\eta_P^2 < 0.01$; ability to justify, $F(1, 517) < 0.01$, $p = .990$, $\eta_P^2 < 0.01$ (Figure S1B in the online supplemental materials). The interaction was significant for a perceived understanding of the argument, but this increased in the control and not the experimental condition, $F(1, 517) = 4.59$, $p = .033$, $\eta_P^2 = 0.01$.

To test Steps 2 and 3, we analyzed the four ratings of the HCP's response in an ANCOVA model controling for trust in the medical profession and baseline antivaccination argument ratings obtained

[7] These arguments were also used for the HCP/patient consultation scenario that followed. Two arguments did not fit linguistically with that scenario in this experiment, so they were not used; see the OSF for all arguments.

[8] We ran a robustness check with all analyses repeated excluding 32 participants who did not support any arguments. Excluding these participants did not change the nature of any of the results.

during the Step 1 procedure.[9] Participants rated Dr. Jones significantly better in the affirming refutation condition compared to the control condition (see Figure 3 and Figure S3 in the online supplemental materials). All four intervention effects were significant at $p < .001$ (see Table S6 for test statistics in the online supplemental materials), with effect sizes ranging from $d = 0.31$ to 1.31). Thus, the affirming response (vs. the control) received more support, was more compelling, and produced more openness to and trust for Dr. Jones.

Finally, we compared the overall ERI to the facts-only control condition with between–within ANOVAs on argument support and vaccine acceptance. First, we tested for further reductions in antivaccination support between Step 1 and the end of all steps (see Table S5 in the online supplemental materials), but did not find a significant interaction to indicate differences in support reduction between conditions, $F(1, 517) = 0.02$, $p = .902$, $\eta_P^2 < 0.01$ (see Figure 3C).

Second, we tested for differences between conditions in the pre–post change for each individual measure of vaccine acceptance (as preregistered), and for a composite of these measures (see Table S7 in the online supplemental materials). Vaccine acceptance increased more with the ERI than the facts-only condition across the individual measures, though this interaction was only significant for the composite measure, $F(1, 517) = 3.98$, $p = .046$, $\eta_P^2 = 0.01$ (Figure 3E).

Experiment 3 was thus consistent with Experiment 2, showing that Steps 2 and 3 generated a better reception for the HCP, and extending those results to unvaccinated vaccine-hesitant participants. Additionally, it found overall positive changes in vaccine acceptance following all four ERI steps, though the effect was small. However, Experiment 3 did not replicate the effect in Experiment 1, where soliciting explanations but not the control (Step 1) lowered participants' confidence in justifying their argument support. In Experiment 4, we sought to test Step 1 again and extend the experimental design further to isolate the empathetic components in Steps 2 and 3 and replicate previous research on the benefits of providing vaccination facts (Step 4).

Experiment 4

Experiment 4 extended Experiment 3 by testing the four ERI steps against three different conditions (see Figure 2C) allowing us to conceptually replicate Experiments 1–3 and independently test individual components in the ERI.

Method

Participants

We recruited 700 US participants who had either negative or neutral opinions of the COVID-19 vaccine (sociodemographic characteristics reported in Table 1) to replicate findings from Experiment 3 under a broader spectrum of vaccine hesitancy. We switched our sampling to the US to increase the generalizability of our findings to a different population, especially one where substantial and highly polarized opposition to COVID-19 vaccination still remained (Bolsen & Palm, 2022). We powered our sample to achieve 90% power (at $\alpha = .05$) to detect the same interaction effect that Experiment 3 was powered for ($\eta_P^2 = 0.02$), while increasing the number of between-ysubjects groups from two to four. Data collection took place between November 8, 2022 and November 10, 2022.

Design

We randomized participants into four different between-subjects conditions (see Figure 2C): (a) In the control condition, participants saw control versions of all the interventions, and no vaccine facts page during the experiment. (b) The "facts-only" condition was the same as the control except participants saw a vaccine facts page at the end, before the posttest measures. (c) In the "refutation-only" condition, participants followed the same procedure as for the experimental condition in Experiment 3, but instead of an affirming refutation, Dr. Jones directly refuted the antivaccination argument and offered more information in a direct manner as well. (d) In the "ERI" condition, participants followed an identical procedure to the experimental condition in Experiment 3 (Dr. Jones gave an affirmation and tailored refutation, followed by offering more information in an empathetic way). This revised design allowed us to compare the incremental benefits of an affirmation (Step 2) and empathetic language in the tailored refutation (Step 3) to a refutation without these elements but with the same counter-arguments. It also allowed us to test the incremental benefit of Step 4 (facts vs. no facts). As with Experiment 3, we included repeated measures antivaccination argument ratings and vaccine acceptance but only a single measure of HCP ratings.

Materials and Procedure

Participants completed the same four vaccine acceptance measures as in Experiment 3, but we adapted the COVID-19 booster vaccine willingness question to use the same 7-point scale as the 5C measures. Participants then rated their support for six antivaccination arguments ($M = 4.94$, {$SD = 1.33$) and then rated understanding and ability to justify support for the top two supported arguments.[10]

Participants then completed either the control ($n = 370$) or explanation solicitation ($n = 330$) condition for Step 1 (randomly assigned[11]), with one key change to the control condition: instead of a writing task, participants read a page of information about dental health (available on the OSF). A timer was set to ensure participants spent at least 60 s reading (to match the writing tasks). The explanation solicitation condition remained the same. Then, participants again rated the top two arguments for support, understanding, and justification ability.

Participants next considered the scenarios featuring two argument–response interactions between Dr. Jones and Tom, presented in sequential order (as in Experiment 3). The control condition was the same as Experiment 3, except in the final section, participants were asked to

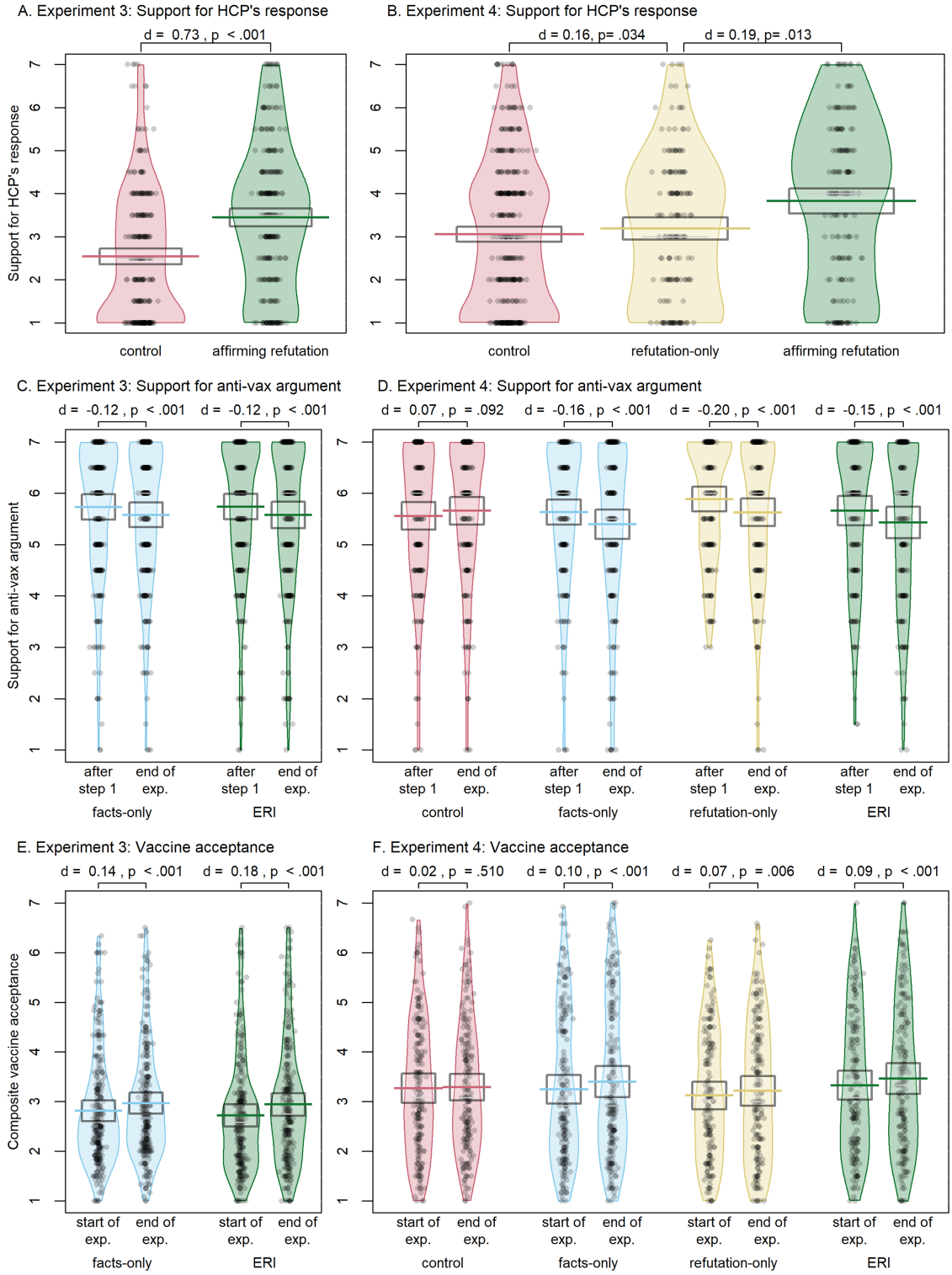
[9] This model was preregistered as a secondary analysis, but including the trust covariate did not change the effects of the experimental condition found in the primary preregistered ANCOVA that only included baseline argument rating as a control variable.

[10] We ran a robustness check excluding 50 participants who did not endorse at least one argument. Excluding these individuals did not change the nature of any of the results.

[11] Significantly more participants in the explanation solicitation condition did not finish the study ($n = 47$) compared to the control ($n = 6$), $\chi^2(1) = 32.36$, $p < .001$. However, we did not find any significant differences in the pretest characteristic (vaccine acceptance and initial argument ratings) between the groups, nor between our final sample and those who dropped out. The difference in study completion rate was likely due to the requirement to write explanations versus read a page of information in the control condition. We did not see any significant differences in drop-out rates in the earlier Experiment 3 which used writing tasks in both conditions, but only one related to vaccination, suggesting that it was the task itself and not the vaccination topic that caused more participants to drop out.

Figure 3

Participant Responses for Three Target Outcomes by Experimental Condition in Experiments 3 and 4



Note. Violins and black dots show the distribution of responses, with the central lines showing the mean (gray boxes show 95% confidence intervals). Cohen's *d* effect sizes and *p*-values were calculated from follow-up contrasts between the conditions. (A, B) Experiments 3 and 4: Support for HCP's response. (C, D) Experiments 3 and 4: Support for antivax argument. (E, F) Experiments 3 and 4: Vaccine acceptance. ERI = empathetic refutational interview; HCP = healthcare professional. See the online article for the color version of this figure.

imagine Dr. Jones had offered more information rather than being shown Dr. Jones doing so. Participants who had undergone the explanation solicitation procedure were randomly assigned to either the ERI ($n = 164$) or refutation-only ($n = 166$) condition (see Table S8 for examples of scenarios in all three conditions in the online supplemental materials). The ERI condition was identical to the one in Experiment 3 (an affirming refutation). In the refutation-only condition, Dr. Jones directly refuted Tom's argument without affirming Tom or using empathetic language. To maintain this tone, Dr. Jones also offered more information in a direct manner (as per the control in Experiment 3). We used the politeness package in R, which measures linguistic markers of conversational receptivity (Yeomans et al., 2020) to confirm that the ERI scenarios were indeed more empathetic than the refutation-only ones (see the online supplemental materials). Participants completed four ratings of Dr. Jones using the same items and procedure as in Experiment 3.

Finally, participants who had received control interventions thus far were now randomly assigned to either continue in the control condition and proceed straight to posttest measures ($n = 185$) or read a COVID-19 vaccine facts page identical to that used in Experiment 3, first (facts-only condition, $n = 185$). Participants in the ERI and refutation-only conditions all received this facts page before continuing to posttest measures.

As in Experiment 3, participants provided posttest support ratings of their top two antivaccination arguments, and then four posttest vaccine acceptance measures, before providing sociodemographic information. Participants in the control condition were debriefed with the same COVID-19 vaccine facts page to ensure they still received this critical information.

Results and Discussion

We again ran preregistered between–within ANOVAs to test the benefit of Step 1 (see Table S9 in the online supplemental materials). The critical interaction between experimental condition and pre/posttiming was not significant for perceived understanding nor justification ability, understanding, $F(1, 698) = 2.19$, $p = .139$, $\eta_P^2 < 0.01$; justification ability, $F(1, 698) = 0.13$, $p = .720$, $\eta_P^2 < 0.01$. Contrary to our expectation, the reduction in argument support was greater in the control than in the experimental condition, with a significant interaction, $F(1, 698) = 4.57$, $p = .033$, $\eta_P^2 = 0.10$ (see Figure S1C in the online supplemental materials). There is no obvious reason to explain this, since participants in this control condition read about an unrelated topic (dental hygiene).

To test participants' receptivity for Steps 2 and 3, we preregistered the ANCOVAs from Experiment 3 on these ratings (see Table S10 in the online supplemental materials). Because the fixed factor had three conditions, we additionally preregistered follow-up contrasts to compare (a) the two refutation conditions against the control and (b) the affirming refutation against the nonaffirming ("refutation-only") condition (reported in Table S11 in the online supplemental materials). Participants supported the refutations (see Figure 3B), $F(2, 695) = 13.02$, $p < .001$; and found them more compelling than the control, $F(2, 695) = 55.41$, $p < .001$. Participants also felt the refuting HCP was more trustworthy than the control, $F(2, 695) = 27.63$, $p < .001$. We did not replicate the effect on openness, although descriptively, the refutations performed better (see Figure S3 in the online supplemental materials), $F(2, 695) = 1.00$, $p = .370$. Compared to the refutation-only condition, the affirming refutation was significantly more supported, but these two conditions did not differ significantly on the other measures (see Table S11 for means and test statistics in the online supplemental materials).

Finally, we preregistered the ANOVAs from Experiment 3 on further changes in antivaccination argument support and overall changes in the composite vaccine acceptance measure, focusing on the interaction effect with experimental condition (see Tables S9 and S12 in the online supplemental materials). We found a significant interaction for ratings of argument support, $F(3, 696) = 8.21$, $p < .001$, $\eta_P^2 = 0.03$. Preregistered follow-up contrasts showed significant further reduction in argument support only in intervention conditions, $t(696) = -6.81$, $p < .001$, and not the control, $t(696) = 1.69$, $p = .175$ (Figure 3D). There were no significant differences between the two refutation conditions and the facts-only condition, $t(696) = -0.08$, $p = .933$, nor between the affirming refutation and refutation-only conditions, $t(696) = 0.34$, $p = .733$.

We also found a significant interaction for vaccine acceptance, $F(3, 696) = 3.16$, $p = .024$, $\eta_P^2 = 0.01$ (Figure 3F), with follow-up contrasts showing no significant change for the control, $t(696) = 0.66$, $p = .760$, but an increase across the other three conditions, $t(696) = 2.79$, $p = .005$. Unlike in Experiment 3, vaccine acceptance change did not differ significantly between the facts-only and refutation conditions, $t(696) = -0.94$, $p = .345$, nor between the affirming refutation and refutation-only conditions, $t(696) = 0.81$, $p = .417$.

Overall, conditions including at least one component of the ERI showed various benefits relative to the control condition (without any ERI components) among our US sample with varying nonpositive vaccine attitudes. The ERI condition including all four steps was best at generating support for the HCP's response—a consistent result across experiments. It is less clear that all four steps had additional benefits for vaccine acceptance and argument support reduction relative to refutation-only (without affirmation; Step 3) or facts-only (Step 4); this differed from Experiment 3, where vaccine acceptance benefitted more from four ERI steps than facts-only. However, except the soliciting explanations procedure in Step 1, there is evidence that other ERI steps can provide some benefit to conversations with vaccine-hesitant patients that also maintain relationships.

General Discussion

We conducted four experiments to test participants' responses to the steps of our proposed new technique, the ERI (Figure 1). The ERI aims to provide a tailored approach that would help HCPs refute antivaccination arguments while maintaining trustful relationships with patients, which is highly valued by HCPs (Loftus et al., 2021). Our experiments simulated the ERI with a large number of participants with varying levels of vaccine hesitancy, in generic and specific (COVID-19) vaccine contexts, to provide early stage evidence of the suitability of this approach for a conversational purpose.

The ERI opens with Step 1, "elicit concerns," which is necessary to show empathy and respect through listening and identify patients' attitude roots so the HCP can tailor subsequent responses. We had posited that an additional benefit could be to temper negative vaccine attitudes by engaging the patient in an explanation of their position, but we failed to replicate previous work showing these effects (Fernbach et al., 2013; Fisher & Keil, 2014). Vaccine attitudes may be harder to shift than the political attitudes studied in those earlier papers. Nonetheless, our results provide reassurance that fulfilling the basic function of discussing patients' concerns and motivations can be done without inadvertently causing more entrenched antivaccination attitudes. Steps 2 and 3 involve a tailored, empathetic response to the

patient, using an affirmation of the patients' attitude root and correction of the patient's misconceptions while maintaining empathy and being attitude-root-consistent. We hypothesized, and observed, that responses including these steps were consistently better received than other responses—in particular, the affirmation and tailored refutation were always most supported. This held both when the HCP discussed vaccines in general (Experiment 2) and COVID-19 vaccines specifically (Experiments 3 and 4). Finally, in Experiment 4, we replicated previous work on the beneficial effects of providing vaccine facts (Step 4) on vaccine acceptance (Betsch et al., 2017; Horne et al., 2015). Interestingly, Experiment 4, conducted with participants who indicated nonpositive attitudes toward the COVID-19 showed that having one of either Step 2, 3, or 4 could also increase vaccine acceptance and reduce antivaccination argument support relative to the control. This was in contrast to Experiment 3, conducted with participants who had remained unvaccinated by October 2022, so were likely more resistant. Here, the ERI increased vaccine acceptance more than facts only. This could mean that the ERI approach has greater benefits when individuals are more resistant. Nevertheless, the affirmation (Step 2) and tailored refutation (Step 3) had one important advantage in generating a better reception for the HCP.

Our findings are especially interesting in light of mixed evidence in the literature regarding how refutations should be delivered. On the one hand, affirming people seems not to enhance belief revision (Bode et al., 2020). On the other hand, it does improve how the refutation is perceived (Gesser-Edelsburg et al., 2018). This is important in the context of an HCP–patient relationship, where building rapport and trust can lead to improved patient outcomes (Birkhäuer et al., 2017). Moreover, maintaining trust helps to sustain a longer-term relationship over time, during which the HCP has more opportunities to advise the patient (Healy & Pickering, 2011). One limitation of the current (and preceding) research is that participants assessed the refutations immediately, so longer-term effects cannot be observed. Participants also read refutations made to a third party rather than directly addressed to the participants themselves, making it hard to generalize directly to a face-to-face conversation. However, we suspect that affirming refutations would produce more pronounced benefits in practice than we were able to observe within the limitations of our controlled online studies, because people are likely to react less badly to impersonal and unempathetic responses that are not directed at them. Our studies were also conducted online, with two predominantly Western samples. It is likely that the principles of the ERI would also be useful for communicating with other groups, since tailored communication to build trust and debunk misinformation is especially advocated in outreach to marginalized groups (Hussain et al., 2022). Future studies may wish to examine if these groups respond similarly to the ERI.

To sum up, we integrated previous research on the benefits of elicitation, affirming and empathizing (Gagneur, 2020), refuting misinformation (Schmid & Betsch, 2019), and informational interventions (Betsch et al., 2017; Horne et al., 2015) to increase vaccine acceptance and combined them as a proposed ERI technique to support tailored conversations in healthcare settings. Our experiments showed generally positive effects for these interventions. Our findings are promising as a proof of concept conducted in controlled settings. The ERI still needs to be tested in real healthcare contexts, to evaluate its impact on actual vaccine uptake as well as how to successfully implement it in a clinical setting where HCPs may experience competing demands and time pressures (Glenton et al., 2021). Further studies to field test the ERI are underway as part of a wider international program to support HCPs in addressing vaccine misconceptions (https://sks.to/jitsuvax).

Resumen

Objetivo: Descripción y evidencias iniciales de una novedosa intervención multicomponente, la cual puede ser empleada por profesionales de la salud a fin de abordar argumentos falsos o engañosos en contra de la vacunación, manteniendo al mismo tiempo la empatía a través de la comprensión de las motivaciones de las personas para creer en la información errónea: la "entrevista empática-refutacional" (ERI, por sus siglas en inglés). ***Métodos:*** Llevamos a cabo cuatro experimentos en 2022 con participantes que presentaban actitudes predominantemente negativas o dubitativas respecto a la vacunación (n total = 2545), con el objetivo de poner a prueba cuatro pasos diseñados para alinear la refutación al individuo que duda sobre las vacunas: (1) suscitar sus preocupaciones, (2) afirmar sus creencias y valores en la medida de lo posible, (3) refutar los razonamientos que subyacen a sus creencias erróneas de una manera que se adapte a sus motivaciones psicológicas, y (4) proporcionar información objetiva sobre la vacunación. Cada uno de estos componentes fue comparado con condiciones de control activo, compuestas por participantes asignados al azar. ***Resultados:*** En comparación con las condiciones de control, los componentes de la ERI produjeron pequeños efectos positivos en la aceptación de la vacuna y en la reducción del apoyo a los argumentos antivacunas. De forma crucial, la afirmación de las preocupaciones de los participantes por parte del profesional de la salud también generó un apoyo significativamente mayor para sus refutaciones y la información posteriormente ofrecida, con tamaños de efecto grandes en comparación con los controles. Además, también en comparación con las respuestas de control, los participantes encontraron las refutaciones personalizadas más convincentes y confiables, mostrando una mayor apertura hacia el profesional de la salud. ***Conclusiones:*** La ERI puede ser utilizada y probada aún más como una herramienta de comunicación personalizada, con el objetivo de que los profesionales de la salud refuten creencias erróneas contra la vacunación y, al mismo tiempo, mantengan la confianza y la relación con los pacientes.

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