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A randomized controlled trial of empathetic refutational learning with health care professionals

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Abstract

Background Health care professionals are in a key position to promote vaccinations. However, consulting vaccine-hesitant patients can be difficult, especially when patients bring up anti-vaccination arguments. Whereas prior research has identified essential skills for refuting anti-vaccination arguments, little is known about how to acquire these skills. Our aim was to determine if empathetic refutational interview text scenarios help health care professionals build confidence and abilities in countering anti-vaccination arguments.

Methods We conducted an online randomized controlled experiment with UK and Finnish health care professionals in which we randomly assigned them to an empathetic refutational interview group ($n = 167$) or a control group ($n = 180$). Participants in the empathetic refutational interview group were presented with examples of the empathetic refutational interview approach, which encompasses the identification of attitude roots, affirmations, corrections of misconceptions, and provision of facts. Control group participants received a standard facts-based approach. We examined posttest use of empathetic refutational interview techniques and pre- and posttest perceived difficulty of refuting anti-vaccination arguments.

Results Participants in the empathetic refutational interview group used more empathetic affirmations than control group participants. The empathetic refutational interview group and the control group did not differ significantly in how often they explicitly tried to identify attitude roots, correct misconceptions, and provide vaccination facts, nor in how difficult they found anti-vaccination arguments to be to refute.

Conclusions Brief empathetic refutational interview text scenarios can increase health care professionals' use of affirmations when discussing vaccines with patients. Additional materials are needed to efficiently teach refutations of attitude roots.

Keywords Health communication, Empathetic refutational interview, Vaccine hesitancy, Health care professionals

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Health care professionals (HCPs) play an important role in encouraging individuals to take up vaccination [1]. In fact, HCPs have repeatedly been cited as the most important source of vaccine-related information for patients [2, 3], placing HCPs in a key position to promote vaccinations and to reassure patients who have concerns and doubts about vaccines. Even though HCPs are typically highly trained and knowledgeable about vaccination facts, reassuring hesitant patients can still be challenging. In fact, studies have found that some HCPs feel ill-equipped to address vaccine hesitancy [4–6], and that many of them wish for more training in how to handle discussions surrounding vaccines [6].

Vaccine communication training has been found to increase HCPs' confidence in discussing vaccines [7], and even to increase vaccine uptake among their patients [8, 9]. However, previous vaccine communication training has not addressed how to efficiently refute anti-vaccination arguments [10]—an essential skill considering that vaccine hesitancy often stems from misconceptions about vaccination that are based on misinformation and flawed reasoning [11–13]. Moreover, recent studies posit that opposition to vaccines stems from underlying motivations known as "attitude roots" [14, 15]. For example, people can be motivated to reject information about vaccines because it does not align with their worldviews [11] or their social identities [16]. Anti-vaccination attitudes can be such an intrinsic part of a group's identity that accepting vaccines would be viewed as rejecting the group. Vaccine misinformation therefore usually taps into a person's attitude roots and uses some partial truth that makes the misinformation believable [17], such as with the misconception that vaccines contain cells from aborted fetuses, which likely stems from the fact that fetal cells were used in the development of some vaccines [18].

To effectively refute misconceptions, research suggests that the refutation: (1) should aim to address the underlying attitude roots to people's vaccine concerns [19]; (2) needs to replace the misconception with a compelling and correct alternative [20]; and (3) must contain an explanation of why the misconception is wrong and why the new alternative is correct [21–23]. Refutations that address these points have been shown to be effective at revising beliefs about vaccines [24–26] and to be well received by individuals [19].

To increase the believability and acceptance of refutations, HCPs also need to consider how refutations are delivered. A patient will likely be more receptive towards an HCP who seeks to correct them if the patient perceives that the HCP cares about them [27]. To make patients feel heard and cared for, HCPs need to understand and acknowledge patients' attitude roots in an empathetic manner [28–30]. Empathy is particularly important within health care settings, where building rapport with patients is considered a cornerstone of medical practice and is known to improve patient outcomes [31–33]. To demonstrate empathy in the vaccination setting, HCPs can use the Motivational Interviewing technique [9]. This technique suggests giving affirmations that demonstrate one's understanding of a patient's concerns and validates any aspects of those concerns that are based on accurate information. Adding an empathetic, affirmative preface to a refutation, especially one that addresses the attitude roots, is thus likely to enhance the acceptability and success of a refutation [19].

While there is considerable support for the refutational techniques presented above, little is known about how to acquire these skills. Prior research has largely focused on generating conceptual change among individuals, rather than teaching individuals to effectively generate conceptual change in others [34, 35]. For example, studies have found that participants who read a refutational text—i.e., one that corrects the misconception and replaces it with a plausible explanatory alternative—become better at revising their own conceptual beliefs than participants who read an expository text that only states facts [21, 36–38]. Such results have also been obtained with texts related to vaccination [39, 40]. While guides and handbooks have been created on the topic of how to refute myths and misconceptions (e.g., the *Debunking Handbook* [41]), it is not known empirically whether people are able to acquire the techniques taught in such guides, or whether these guides make people feel better equipped to refute misconceptions. We therefore sought to address these gaps in the extant literature by investigating the development of empathetic refutational interview (ERI) techniques in HCPs, and their confidence in using these techniques in vaccine discussions with patients.

In this study, we presented HCPs in the UK and Finland with text scenarios that demonstrated the ERI techniques. More specifically, the ERI scenarios described a consultation between a fictitious HCP and a patient, and the scenarios explained and exemplified how to understand the attitude roots of a patient's anti-vaccination arguments, how to affirm the patient, and how to refute the patient's misconceptions. The objective was to investigate whether the HCPs were able to use the ERI techniques in their own responses to hypothetical patients after having read the text scenarios. We also investigated whether presenting these scenarios could decrease the perceived difficulty of refuting anti-vaccination arguments. To be able to do this, we compared a group who read scenarios including ERI techniques to a group who read matched control scenarios in which the fictitious HCP provided the same facts as the HCP in the ERI scenarios without explaining attitude roots, giving affirmations, or refuting the misconception. We hypothesized that participants in the ERI group would rate the

difficulty of refuting anti-vaccination arguments as significantly easier at posttest than the control group when controlling for pretest levels. Also, we hypothesized that participants in the ERI group would use ERI techniques significantly more often when responding to hypothetical patients at the end of the experiment as compared to the control group.

Methods

The study design and analyses were preregistered on the Open Science Framework (link: https://osf.io/3cp9t).

Participants

As a part of the EU-funded JITSUVAX project [42], we recruited HCPs who were involved in vaccination tasks from both the UK and Finland. The recruitment process in each country was done through convenience and snowball sampling via professional channels available to the researchers and which targeted the HCPs who had vaccination duties in that country. In the UK, we recruited HCPs through four partner health care organizations who signed up to participate through the UK National Institute for Health Research (NIHR) Clinical Research Network. These organizations distributed the study link to staff through internal channels only (e.g., staff mailing lists and internal newsletters). Participants were offered a £15 shopping voucher as compensation for their time. In Finland, we recruited nurses working in the Wellbeing Services County of Ostrobothnia, and medical students from all universities training medical doctors in Finland (Tampere University, University of Eastern Finland, University of Helsinki, University of Oulu, and University of Turku). Invitations to participate in the study were sent by email to head nurses in the county—who forwarded the message to nurses in their team—and to the university email lists for 5th- and 6th-year medical students. Participants had the option to take part in a lottery where 30 nurses could win a 50€ convenience store gift card, and 50 medical students could win two cinema tickets each. In the UK, 201 HCPs participated in the study, whereas in Finland, 146 HCPs participated. Thus, the total sample consisted of 347 participants. For sample demographics, see Table 1. The experimental conditions (control and ERI) were balanced on key demographic variables and on baseline measurements (see Tables S1 and S2).

Table 1 Demographic variables by sample

Variable	Combined ($n=347$)	UK ($n=201$)	Finland ($n=146$)
Age			
18–29	41%	14%	78%
30–39	16%	17%	13%
40–49	16%	23%	5%
50–59	19%	30%	3%
60+	9%	15%	-
Gender			
Male	19%	11%	31%
Female	80%	88%	69%
Other/ND	1%	1%	-
Profession			
Medical student	35%	-	82%
Nurse	52%	76%	18%
Doctor	4%	6%	-
Other	10%	17%	-
Vaccination work			
Yes	87%	93%	78%
Will start soon	4%	7%	-
No	9%	0%	22%
Children			
Yes	-	79%	-
No	-	20%	-
Missing	-	1%	-

Note. Other health care roles include midwives & health visitors, health care assistants/administrators, and other ancillary roles (e.g., community vaccinator, pharmacists)

Design and procedure

Figure S1 summarizes the overall experimental procedure. After providing informed consent, participants proceeded to the pretest where they responded to 13 questions related to their vaccine-communication confidence and rated the perceived difficulty of refuting six anti-vaccination arguments (randomly selected for each participant).

After the pretest, participants proceeded to the intervention phase. Participants were randomly assigned by survey software to either the control ($n=180$) or the ERI ($n=167$) condition. In both groups, participants first received instructions that explained the tasks in the intervention phase before they read six different text scenarios featuring an HCP addressing a patient's vaccine concerns. The concerns addressed in the scenarios featured six randomly selected anti-vaccination arguments that had not already been shown in the pretest. For each of the scenarios, participants completed the Epistemic Emotions Scale [43] and one question on how well they thought the HCP in the scenario had handled the conversation (see Materials section). Each scenario and its accompanying questions were presented on a separate page.

After the intervention phase, participants proceeded to the posttest in which they rated the perceived difficulty of refuting the six anti-vaccination arguments from the intervention phase and an additional set of six arguments that had not been shown before. Therefore, over the whole experiment, each participant rated 18 different arguments: six at pretest and 12 at posttest. In the UK, each participant received a different, randomly chosen, set of arguments for the pretest, scenarios, and posttest.

In Finland, the arguments were block-randomized using a Latin Square design due to software constraints.

After providing their posttest rating of argument difficulty, participants explained in writing how they would refute two arguments, one that was randomly selected from the intervention phase, and another one that was not shown previously. The two arguments were presented in random order on separate pages.

Finally, participants responded to the 13 vaccine-communication confidence questions again. Socio-demographic information was collected at the end of the survey in the UK and after the informed consent (before the rest of the survey) in Finland. After completing all questions, participants were given the opportunity to provide any feedback they wished about the study. They were also given more information about the purpose of the study. The median time for completing the survey experiment was approximately 25 min (IQR: 18–37 min).

Materials

All materials were developed originally in English and translated into Finnish and Swedish (the two main languages in Finland) for the data collection in Finland. For each target language, the translations were conducted and discussed by three researchers fluent in English and the target language. Participants in Finland could choose to conduct the study in Finnish or Swedish.

ERI and control text scenarios

We developed 18 pairs of text scenarios. Within each pair, one scenario was a control scenario and the other an ERI scenario. Each scenario featured an HCP having a discussion with a patient (or caregiver) about a vaccination they were due to have. In the scenario, the patient presented a concern about the vaccine that featured one of 18 arguments against vaccination. These arguments were selected from a taxonomy of anti-vaccination arguments [14], based on ratings in earlier studies [19, 44]. First, we selected 11 arguments that had received the highest endorsement by vaccine-hesitant individuals. Then, we selected an additional seven arguments that scored above the mean in terms of difficulty for British and Finnish HCPs to refute (see Table S3 for the full list of arguments and their ratings in the earlier studies).

The intervention phase commenced with brief instructions. In the control condition, the instructions explained that patients had different reasons for why they were reluctant to get a vaccine, and that the HCP in the scenario would offer the patient vaccine information that was relevant to the patient's concerns. In the ERI condition, the ERI techniques were introduced and explained in addition to describing the scenario (see Figure S2 for an example scenario). Participants were instructed to pay attention to the structure of the scenarios. The instructions stated that the HCP in the scenario would first identify the patient's underlying "root of concern" and then empathize with the patient using an affirmation technique. The HCP in the scenario would then identify and correct a misconception and provide an explanation for why the misconception was not true. Participants in both the ERI and control conditions were told that, for each scenario, they would be asked how they felt when reading and whether they thought the HCP in the scenario handled the discussion well. The complete set of scenarios can be found at: https://osf.io/khfwz/. We me asured participants' emotional responses to the ERI and control scenarios to check that they produced similar reactions in participants. No statistically significant differences in emotional responses were observed between the two conditions (see Table S4).

All English versions of the scenarios were checked before translation to ensure that their reading level was no higher than 10th-12th grade school level (or roughly 16-17-year-old students) [45]. In addition, the scenarios were reviewed by a Clinical Advisory Group from the UK, comprised of HCPs with vaccine-communication expertise, to ensure the scenarios were appropriate and realistic for HCPs.

Measures

Perceived performance of fictitious HCPs

We measured the perceived performance of the fictitious HCPs for each scenario separately by asking participants to indicate how well they thought the fictitious HCP handled the discussion on a 5-point Likert scale (1 = *not at all well* to 5 = *very well*). We calculated an average perceived performance rating for each participant across the six scenarios, that they had rated, to be used in later analyses (the reliability for the six scenarios was $\alpha = 0.80$).

Perceived difficulty of refuting anti-vaccination arguments

We measured the perceived difficulty of refuting anti-vaccination arguments by asking participants to rate the difficulty of refuting anti-vaccination arguments if they encountered it from a patient. This was measured separately for the 18 presented argument on a 5-point Likert scale (1 = *I would find it very easy* to 5 = *I would find it very difficult*).

Use of ERI techniques

We assessed participants' use of ERI techniques when responding to anti-vaccination arguments by asking participants to provide written text explaining how they would respond to two different arguments from a patient. Participants' written responses were coded by two independent coders in each country, according to a pre-registered coding framework (see Table S5). The coding classified the presence of the following five

elements in the responses: (1) whether the participant sought to understand the root of the patient's concern; (2) whether the participant described an empathetic or affirming response to the patient; (3) whether the participant described correcting the patient's misconceptions; (4) whether the participant mentioned providing factual information, and if so: (a) whether the participant included the actual vaccine facts they would give to the patient, and (b) whether the facts included were relevant to the argument shown, and; 5) whether the participant expressed uncertainty about how to respond.

Coding reliability was satisfactory across all categories (average Krippendorf's $\alpha = 0.64$ in the UK, 0.53 in Finland; see Table S6 for individual agreement ratings). Disagreements in coding were resolved through discussion between each pair of coders.

Vaccine-communication confidence

We measured four determinants of vaccine-communication confidence using four subscales of the I-Pro-VC-Be: (1) proactive efficacy, (2) reluctant trust, (3) openness to patients, and (4) commitment to vaccination. These scales have been validated in English, Finnish, and Swedish [5]. The I-Pro-VC-Be (and its original version—the Pro-VC-Be) [46, 47] was specifically developed to probe HCPs' confidence in delivering vaccinations, with the above-mentioned subscales targeting elements that are specific to communication, e.g., "*I feel sufficiently trained and informed to discuss vaccines with all patients.*" Participants rated their agreement with statement items on 5-point Likert scales (1 = *strongly disagree* to 5 = *strongly agree*). For the reliability of these measures, see Table S7.

Check on emotional response to scenarios

We measured participants' emotional responses to the scenarios using the seven-item short version of the Epistemic Emotions Scale [43] with two additional items, namely anger and irritation to be able to measure psychological reactance [48]. Thus, participants assessed the strength of nine emotions (surprise, curiosity, excitement, confusion, anxiety, frustration, boredom, anger, and irritation) on a five-point Likert scale (1 = *not at all* to 5 = *very strong*). For each emotion, we calculated the average strength of the emotion for each participant across the six scenarios.

Analyses

We used *R* version 4.4.2 [49] for all analyses. We used the *rstatix* package [50] for independent-samples *t*-tests, repeated-measures analyses of covariances, and Pearson's chi-squared tests, the *psych* package [51] to calculate Cronbach's alphas for the scales, and the *lm.beta* package [52] to calculate standardized regression coefficients. We used the lme4 package [53] together with the lmerTest package [54] for mixed-effects models. Where the analyses reported here differ from the original pre-registered analyses, we report the pre-registered analysis results in the Supplementary Material 1 file.

Results

For means and standard deviations for all variables, see Tables S8–S11. The primary dependent variables were (1) perceived performance of fictitious HCPs, (2) perceived difficulty of refuting anti-vaccination arguments, (3) use of ERI techniques, and (4) the vaccine-communication confidence measures.

Perceived performance of fictitious HCPs

To analyze the difference in fictitious HCP ratings between the two experimental conditions, we used Student's t-test with the average perceived performance rating as the dependent variable and condition (control/ERI) as the independent variable. Participants in the ERI group gave significantly higher ratings of the fictitious HCPs' performances ($M = 4.01$, $SD = 0.65$) than participants in the control group ($M = 3.79$, $SD = 0.68$; $t = 2.98$, Cohen's $d = 0.32$, $p = 0.003$). See Fig. 1 for the control and ERI groups' fictitious HCP rating distributions.

Perceived difficulty of refuting anti-vaccination arguments

To analyze the difference in perceived difficulty of refuting anti-vaccination arguments between the experimental conditions, we used a linear mixed-effects model with perceived difficulty of refuting anti-vaccination arguments as the outcome, time (pre-/posttest) and condition (control/ERI) as predictors, while accounting for random effects for participants. The interaction term between time and condition was included in the model, which is the critical effect that indicates the difference in the pre-/posttest change between conditions. The results showed that there was no statistically significant difference between the ERI and the control groups in terms of perceived difficulty of refuting anti-vaccination arguments, $b = 0.01$, $SE = 0.06$, $p = 0.832$. The other fixed effects in the model were also non-significant (condition fixed effect: $b = -0.02$, $SE = 0.08$, $p = 0.766$; time fixed effect: $b = -0.04$, $SE = 0.04$, $p = 0.318$). See Fig. 2 for a visualization of the linear mixed-effects model results. For the preregistered regression analysis results, see Table S12.

To investigate the moderating effect of argument familiarity (i.e., whether the argument had been seen in the intervention phase and was therefore familiar), we used a linear mixed-effects model with perceived difficulty of refuting anti-vaccination arguments as the outcome, time (pre-/posttest), argument familiarity (familiar/not familiar), and condition (control/ERI) as predictors, while accounting for random effects for participants. All interaction terms between time, argument familiarity,

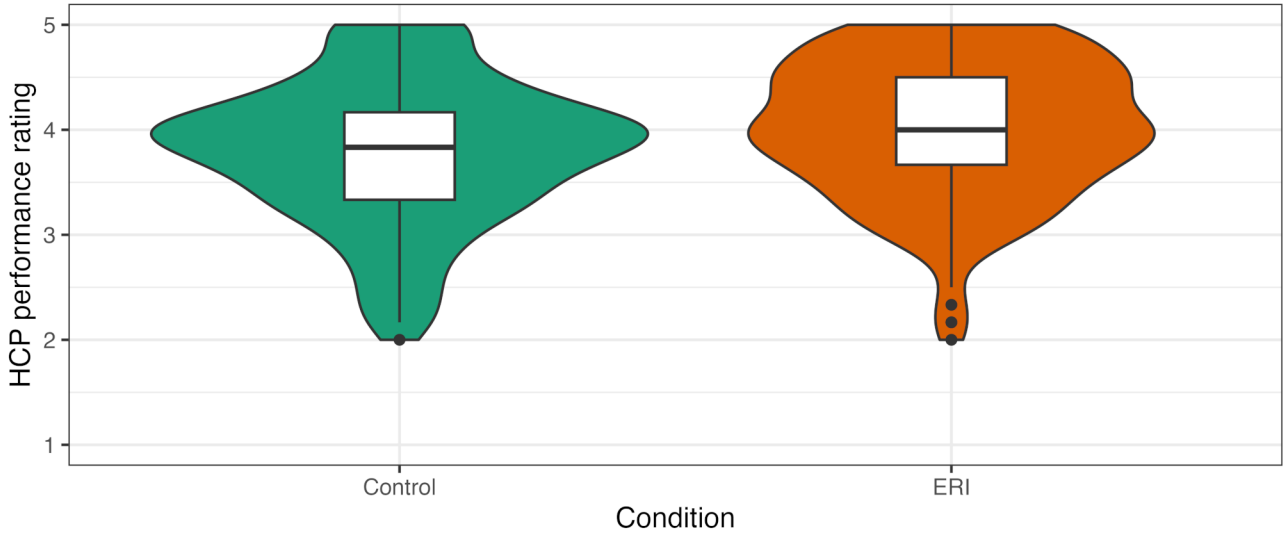

Fig. 1 Perceived performance of fictitious HCPs for the control and ERI groups
Note. The outer boarders of the violin shapes represent the frequency of responses. The middle black line represents the median response, and the white rectangle represents the interquartile range of responses

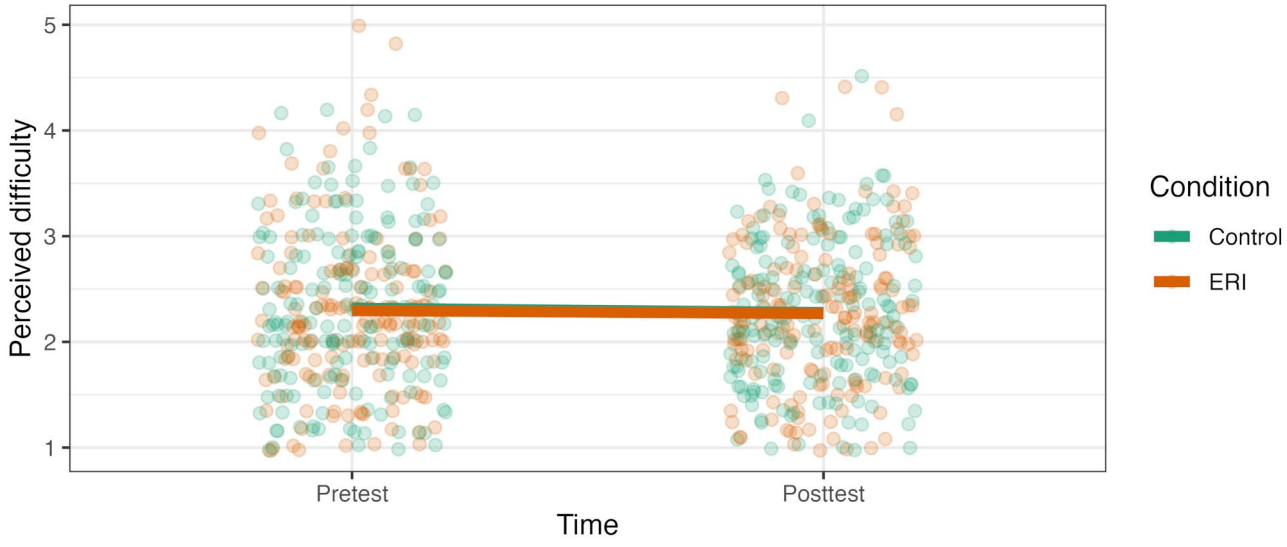

Fig. 2 Change in perceived difficulty of refuting anti-vaccination arguments for the control and ERI groups
Note. The points represent average responses, and the points connected by the two lines (Control/ERI) are estimated marginal means in the linear mixed-effects model predicting perceived difficulty of refuting anti-vaccination arguments as a function of condition and time

and condition were included in this model. The full three-way interaction between time, argument familiarity, and condition would indicate if differences in pre-/posttest changes between conditions varied as a function of argument familiarity. Again, we found no statistically significant difference in the perceived difficulty of refuting anti-vaccination arguments between the conditions, $b = -0.01$, $SE = 0.06$, $p = 0.903$, nor did we find that argument familiarity moderated this effect, $b = 0.04$, $SE = 0.08$, $p = 0.625$. All other effects in the model also remained non-significant (all p's > 0.10).

Use of ERI techniques

We next examined participants' use of ERI techniques when refuting anti-vaccination arguments. We used mixed-effects logistic regression models for each of the coded categories (see Table S13) to compare the ERI and control groups on the frequency that the category was present in the groups' responses, while accounting for random effects for participants. However, as the mixed-effects logistic regression model did not converge for the identify-root outcome, we used a simple logistic regression model for it instead. The p-values were adjusted for the seven models using Bonferroni correction. Compared

to participants in the control condition, participants who read the ERI scenarios were statistically significantly more likely to describe using empathetic affirmations, $b = 1.52$, $SE = 0.27$, $OR = 4.57$, $p < .001$. We observed no statistically significant differences between the ERI and control groups on how often they identified roots, $b = 0.24$, $SE = 0.24$, $OR = 1.27$, $p = 1.000$, how often they corrected misinformation, $b = 0.34$, $OR = 1.40$, $SE = 0.19$, $p = 0.490$, how often they provided facts, $b = -0.53$, $SE = 0.26$, $OR = 0.59$, $p = 0.301$, how often they described the facts, $b = 0.19$, $SE = 0.75$, $OR = 1.21$, $p = 1.000$, how often they presented relevant facts, $b = 0.09$, $SE = 0.30$, $OR = 1.09$, $p = 1.000$, nor on how often they described uncertainty about what to do, $b = 0.56$, $SE = 1.39$, $OR = 1.74$, $p = 1.000$. See Fig. 3 for a visual representation of the ERI techniques used by the control and ERI groups. For the preregistered chi-squared test results, see Table S14.

Vaccine-communication confidence

We analyzed participants' responses to the Pro-VC-Be questions on reluctant trust, openness to patients, self-efficacy, and commitment to vaccination in separate linear mixed-effects models with the subscale scores as the outcomes and time (pre-/posttest) and condition (control/ERI) as predictors, while accounting for random effects for participants. The interaction term between time and condition was included in the models as the critical effect indicating whether changes in vaccine communication confidence differed between conditions. The *p*-values were adjusted for four models using Bonferroni correction. We found no significant differences between the ERI and control groups on vaccine-communication confidence: reluctant trust $b = -0.02$, $SE = 0.09$, $p = 1.000$, openness to patients $b = -0.02$, $SE = 0.07$, $p = 1.000$, self-efficacy $b = 0.03$, $SE = 0.08$, $p = 1.000$, and commitment to vaccination $b = 0.04$, $SE = 0.08$, $p = 1.000$. There was a significant overall increase in reluctant trust between pre- and post-test ($b = 0.17$, $SE = 0.06$, $p = 0.018$), however, all other fixed effects in these models were not significant (all p's > 0.20). For the preregistered multiple regression model results, see Table S15. See Fig. 4 for a visualization of the linear mixed-effects model results.

Discussion

In this study, we presented HCPs with texts exemplifying how to use ERI techniques to refute anti-vaccination arguments. Most importantly, we examined whether the HCPs adopted the presented ERI techniques in their responses to anti-vaccination arguments. We also investigated whether the ERI technique exemplars increased HCPs' vaccine-communication confidence and whether the exemplars decreased their perceived difficulty of refuting anti-vaccination arguments.

In accordance with our hypothesis, HCPs who read the ERI scenarios were more likely to describe empathetic affirmations in their own responses to hypothetical

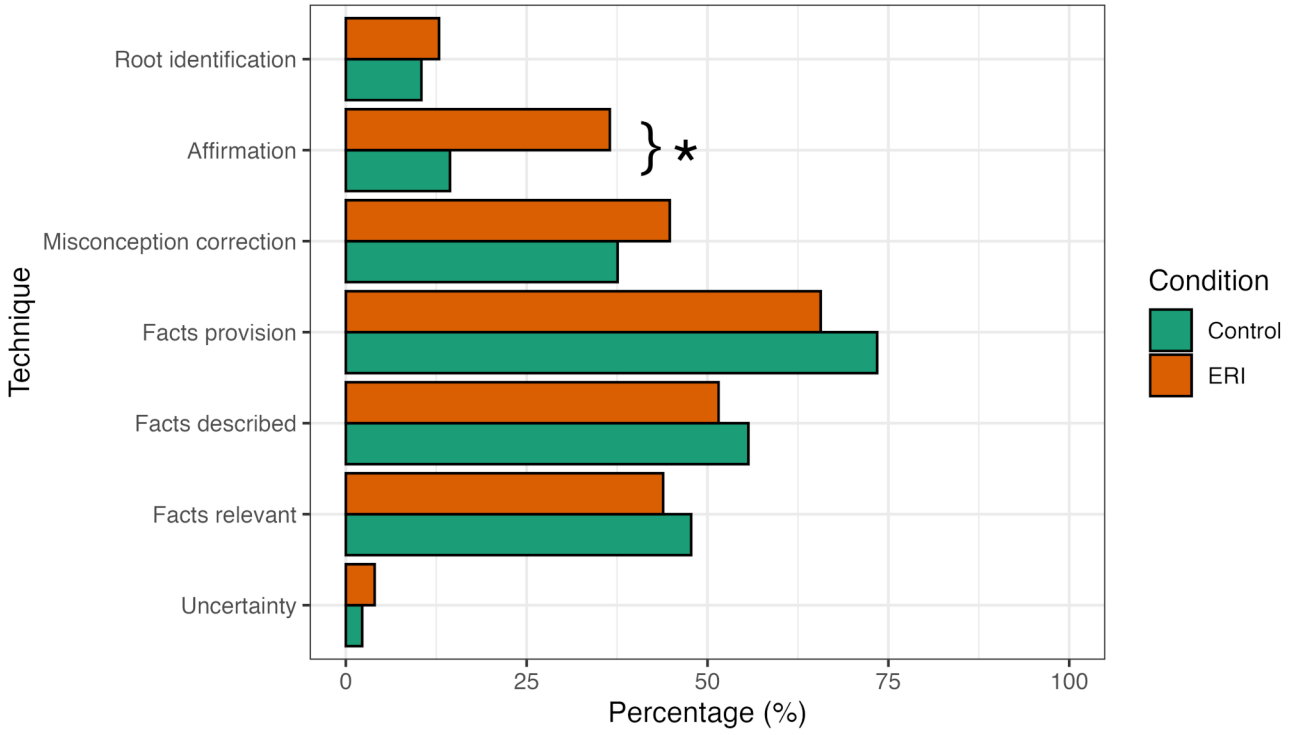

Fig. 3 Percentage of HCPs that used ERI techniques in the control and ERI groups
Note. The * indicates a statistically significant difference between the ERI group and the control group

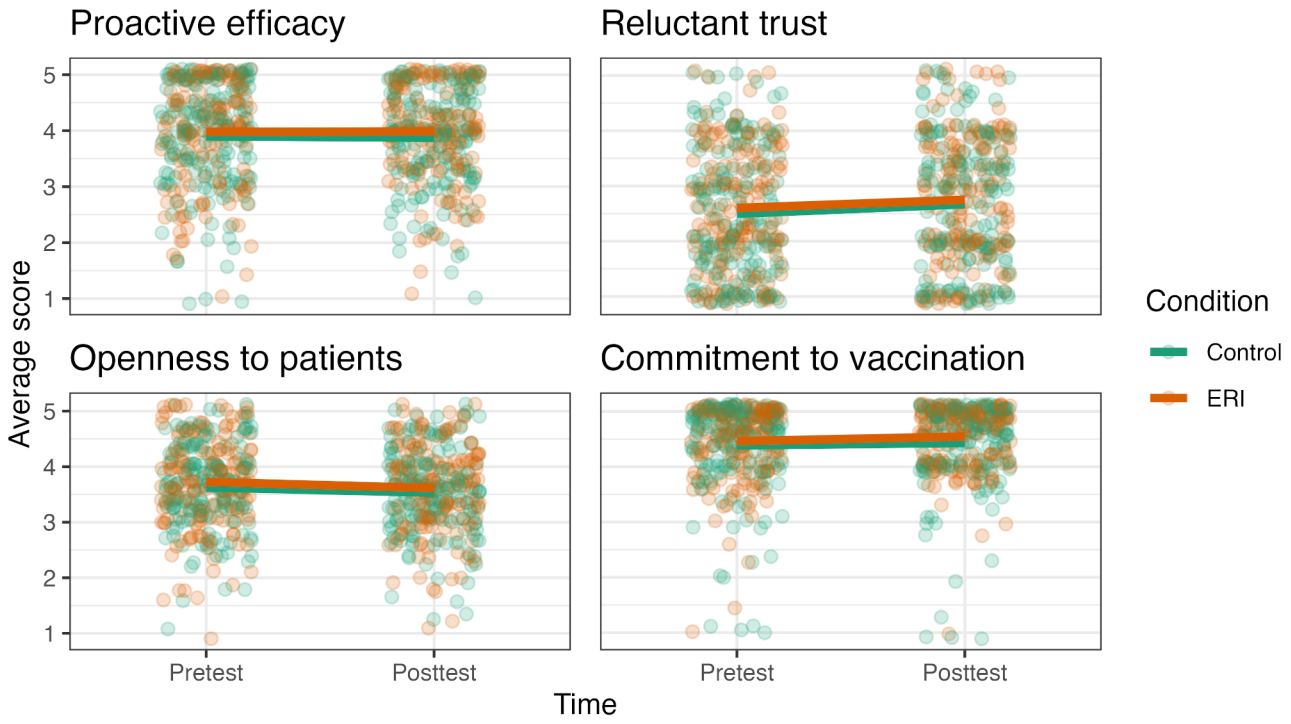

Fig. 4 Change in vaccine-communication confidence for the control and ERI groups
Note. The points represent average responses, and the points connected by the lines (Control/ERI) are estimated marginal means in the linear mixed-effects models predicting vaccine-communication confidence as a function of condition and time

patients than HCPs in the control group. This indicates that the HCPs picked up these skills from the ERI exemplars and were able to apply these skills to new anti-vaccination arguments that the ERI exemplars had not addressed. The HCPs in the ERI group were neither more nor less likely than those in the control group to present vaccination facts. This result could be attributed to facts being presented in both the control and ERI exemplars. Also, providing vaccination facts is a common communication strategy [55], highlighted by the fact that most HCPs in both conditions provided vaccination facts in their responses (see Table S13).

Contrary to our expectations, HCPs in the ERI group did not refute misconceptions more often than HCPs in the control group, and only a few HCPs in the ERI group described possible attitude roots of their hypothetical patients or sought to identify those roots. It is possible that the ERI scenarios did not make the refutation process sufficiently clear, and that the importance of refuting patients' misconceptions was not sufficiently stressed. It is also possible that the training intervention was not extensive enough for HCPs to fully grasp and apply the concept of attitude roots and refutations. However, an alternative explanation for why only a few HCPs mentioned attitude roots in their responses may have been a limitation of the question that we used. The HCPs were asked to describe their approach to responding to the anti-vaccination arguments, but largely, they either answered as though speaking directly to a patient or purely described what they would say without explaining their thought process. Considering that the attitude roots should not be mentioned by the HCP when discussing vaccines with patients, it is positive that the HCPs did not describe the attitude root to the hypothetical patient in their response. However, this means that asking participants to describe their approach is an insufficient way to assess if participants learned the concept of attitude roots. If one wishes to discern this, for example in a training program, a more specific assessment question might be needed.

Contrary to expectations, the scenarios which included ERI techniques did not decrease participants' perceived difficulty of refuting anti-vaccination arguments relative to the control group. This result could be explained by the brevity of the training intervention as well as by the lack of practice. A COVID-19 vaccine-communication training module—developed by the Vaccine-preventable Diseases and Immunization Programme—was found to have increased HCPs' confidence in their ability to discuss COVID-19 vaccinations with patients [7]. Compared to the median time of 25 min it took HCPs to complete the current study, the COVID-19 vaccine-communication training module alone was estimated to take 180 min to complete, not accounting for the time to fill pre- and

posttest surveys. Moreover, this module included sessions in which HCPs were able to practice using the techniques presented in the module materials [56]. In another study, medical students were asked to rate the effectiveness of different teaching methods [57]. The results showed that most medical students considered practical training to be significantly more effective than lectures in increasing their confidence in their ability to discuss vaccines with patients. Taken together, these findings combined with ours suggest that extending the training time and including sessions where HCPs could practice ERI techniques could better support HCPs in learning to use these techniques. Future studies could also test whether including visual materials could aid HCPs adoption of the ERI techniques, as visual aids are known to increase reading comprehension [58].

While the effects of the training intervention on the HCPs' skills and vaccine-communication confidence were modest, the fact that the ERI group rated the fictitious HCP's performance more positively than the control group indicates that the HCPs saw value in the ERI techniques, even if they were not always able to adopt said techniques.

Limitations

This study has some limitations that are worth noting. First, to reach HCPs whose jobs included vaccination tasks, we had to rely on convenience sampling. Also, including participants from two different countries resulted in a heterogeneous sample, with UK and Finnish HCPs having different professional and cultural backgrounds. However, considering that the ERI training intervention is intended for all HCP tasked with vaccinations, having a representative sample with different types of HCPs can also be viewed as a strength of this study. Second, the coding of the use of ERI techniques from free-text responses inevitably introduces some level of subjectivity to the measurement. While the inter-rater reliability was poor according to Krippendorff's α, the proportion of agreement between coders ranged from moderate to high (see Table S6). Moreover, if the coding disagreements have biased the results, it is more likely that they have biased the results in favor of false negatives (i.e., an undetected difference between groups) rather than false positives (i.e., overstating differences between groups), considering the low use of ERI techniques in general. Lastly, as we did not include attention checks, it remains unclear how conscientiously the HCPs read the text scenarios and how it may have affected the results. While it may not be a strong measure of attention during training, the fact that the median time for completing the experiment was approximately 25 min does suggest that most participants read the materials.

Conclusions

The ERI-based vaccine-hesitancy communication approach was received well by HCPs, considering that the ERI-based approach was rated as better than the facts-only approach. Furthermore, HCPs that read the ERI scenarios were in a short time able to learn and utilize more empathetic affirmations in their written responses to anti-vaccination arguments. However, HCPs' ability to identify attitude roots and correct misconceptions related to anti-vaccination arguments was not enhanced by reading the ERI materials, indicating that these skills require different or more extensive teaching methods like hands-on practice. Taken together, our results are promising and encourage further development of ERI-focused vaccine-hesitancy communication training for HCPs.

Abbreviations

ERI Empathetic refutational interview
HCP Health care professional

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-025-21787-4.

Supplementary Material 1

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Not applicable.

Author contributions

DH and KOM contributed equally to this work and share first authorship. DH - Conceptualization, data curation, formal analysis, investigation, methodology, visualization, writing original draft, writing review & editing. KOM - Conceptualization, data curation, formal analysis, investigation, methodology, visualization, writing original draft, writing review & editing. LCK - Conceptualization, investigation, methodology, supervision, writing review & editing. SL - Conceptualization, funding acquisition, methodology, project administration, supervision, writing review & editing. VCG - Investigation, project administration, resources, writing review & editing. AS - Conceptualization, funding acquisition, methodology, project administration, supervision, writing review & editing.

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Data availability

Pre-registration, experimental materials, data, and the code used to derive the reported analyses is found at: https://osf.io/khfwz/. The study methods and planned analyses were pre-registered separately in each of the countries.

Declarations

Ethics approval and consent to participate

The UK data collection was approved by the University of Bristol School of Psychological Science Ethics committee and the Finnish data collection was approved by the Ethics Committee for Human Sciences at the University of

Turku. All participants gave their informed consent to participate in the study. The study was conducted in accordance with the Declaration of Helsinki.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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