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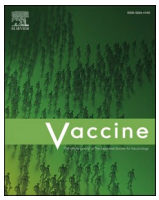

Increasing confidence for pediatric COVID-19 and influenza vaccines using messages affirming parental autonomy: A randomized online experiment

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A B S T R A C T

Objectives: To test the effects of autonomy-affirming pediatric vaccine messages for U.S. parents on overall vaccine confidence and intention to vaccinate against COVID-19 and flu while examining potential moderation effects of political ideology.
Methods: We conducted an online randomized messaging experiment with 1718 parents, balanced across political ideology (31 % conservative, 37 % moderate, 31 % liberal). We compared four types of vaccine messages: 2 (autonomy-confirming vs authoritarian tone) x 2 (COVID-19 or flu). Parents viewed three messages within a single condition and rated their overall vaccine confidence and intentions to vaccinate their children.
Results: Adjusted for covariates, we found significant interactions between autonomy-confirming language and ideology. Conservative parents who saw COVID-19 messages increased vaccine confidence in response to autonomy-confirming messages, compared to both moderate and liberal parents. For flu messages, we found that autonomy-confirming messages increased confidence and intention to vaccinate for conservative parents only.
Discussion: Messages promoting pediatric COVID-19 and flu vaccination were generally more effective at increasing overall confidence toward vaccines for conservative parents when using autonomy-confirming language.
Conclusions: Pediatric vaccinations are politicalized in the United States, and messaging strategies targeting parents must consider this. Public health agencies serving conservative parents can use autonomy-confirming messaging to positively influence parents' confidence in giving their children vaccines.

1. Introduction

Vaccination is a widely successful and cost-effective tool for preventing millions of deaths globally each year, and pediatric vaccination is an essential part of community immunity that protects global public health [1,2]. While vaccines are one of the most important public health achievements of the 20th century [3], vaccine hesitancy remains an issue worldwide, with the World Health Organization listing vaccine hesitancy as one of the top ten threats to global health [2]. Recent calls-to-action have encouraged new approaches to vaccine promotion [4]. Despite working diligently to communicate health information to the public, politicization of public health issues and communication shortcomings between government agencies and the public resulted in a decline in public trust [5], highlighting the importance of continued research on building trust and developing effective vaccination messaging strategies. Health agencies need specific, effective strategies to provide health information to parents with different political ideologies [6,7].

There are several ways to measure parents' attitudes toward pediatric vaccines. The most common is vaccine hesitancy, either a delay or refusal of a vaccination despite availability [2], or low motivation or intention to get vaccinated [8]. This is often reflected in parents lacking confidence in the vaccine and identifying risks with vaccinating their child [9]. Vaccine hesitancy can become vaccine refusal if parents decline one or more recommended vaccines. Another measure of parental attitude toward vaccination is vaccine confidence, which describes believing that vaccines are effective, safe, and part of a trustworthy system [8]. Vaccine confidence also includes past experiences,

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and increasing confidence may help decrease vaccine hesitancy and help increase vaccination rates [10].

There is wide variation in pediatric vaccine uptake rates for different vaccines, and the rates change over time. In the U.S., the vast majority (92 %) of children received routine childhood vaccines [11], but less than half (47.5 %) of children received annually-recommended flu vaccines in 2022. Broadly, pediatric flu vaccination rates have been declining, even before the COVID-19 pandemic [12]. In 2022, 44 % of US children completed a primary COVID-19 vaccine series, but parental attitudes vary substantially by the age of the child [13]. This reluctance influences vaccination rates with 63 % coverage among children ages 12–17, 44 % among children 5–11, and just 13.2 % among children under 5 [13]. Parental attitudes toward pediatric vaccines also vary considerably between vaccines. For example, while about a quarter of parents reported being hesitant to vaccinate their children against influenza and HPV, only about 7 % of parents were reported being hesitant to get their children routine pediatric vaccines such as MMR [9,12–14].

Political ideology may drive some of these differences in vaccine attitude [15]. During the COVID-19 pandemic, many parents were hesitant to vaccinate their children against COVID-19, while many others actively sought out available vaccines, calling special attention to a political-ideological divide in views on vaccine efficacy and safety for both the adult and pediatric populations [16]. Overall, individuals identifying as politically conservative reported more vaccine-hesitant attitudes toward the COVID-19 vaccination than those with other political ideologies [16,17]. Partisanship among parents and caregivers similarly mediates pediatric COVID-19 vaccine attitudes [18]. Political ideology also influences uptake of flu vaccines; during the H1N1 flu outbreak in 2009–2010 there was much more flu vaccine hesitancy among political conservatives [19]. This mistrust may be due to differential exposure to information about the risks and benefits of vaccination [20], trust in medical professionals and healthcare entities [21], and broader disagreements over what roles the U.S. government should play in making policies about individual health behavior choices [15]. While the politicization of health issues has been investigated, little evidence provides insights into how parents of different political ideologies may respond to specific vaccine promotion message strategies.

Health messaging strategies for promoting vaccinations may need to be tailored to parents with varying political beliefs due to these ideological differences in beliefs about trust, agency, and authority. Providing messages that better align with participants' beliefs [22] may be helpful for explaining/disseminating/etc. vaccine information in the context of partisan differences in vaccination attitudes. One potentially promising messaging strategy is utilizing autonomy-confirming language. Autonomy-supporting messages, which are messages highlighting message recipients have decision making authority in matters of health, have succeeded in persuading people to vaccinate against influenza in healthcare settings and on college campuses [23,24]. In contrast, messaging using authoritarian language, invokes the authority of an external health agency (e.g., CDC or state department of health), rather than that of the parent or caregiver. Research has demonstrated that authoritarian-style health messages are not persuasive toward inducing action, and can instead result in resistance [25,26]. In addition, self-identified conservatives report more resistance to such messages than liberals [25]. Based on past research showing the benefit of autonomy-confirming language for conservative-leaning people combined with the variation in hesitancy by partisanship and for different types of vaccines, we pose the following hypotheses: autonomy-confirming language in pediatric vaccine promotion health messages will increase parents' a) overall confidence in vaccines and b) their intention to get their child vaccinated, and that this effect will be moderated by parent political ideology. We test this hypothesis in messages promoting both flu and COVID-19 vaccines to identify differences by vaccination types. This study fills the existing gap between understanding partisan pediatric vaccine differences in attitude, and providing actionable messaging strategies by testing and supporting an actionable communication strategy tailored to parents' political ideology.

2. Methods

2.1. Sample and experimental design

As a part of a larger study looking at vaccine messages and health intentions, we recruited 2043 parents and caregivers (mean age = 39, woman = 46 %, rural = 42.8 %) through the survey company Lucid's online panel to complete an online survey in Fall 2023. As described in detail below, participants in the study viewed static pediatric vaccine promotion messages which included text and images. Some of the messages tested in this study were tailored to the state of the respondents' residence. For example, some messages included the logo of the state's Department of Health and featured images that were cropped to the shape of the state. We therefore recruited participants from specific pre-selected states. We selected 7 states based on a ranking system (Alabama, Arizona, Illinois, Mississippi, Pennsylvania, Washington, Wisconsin). Criteria for state selection included total size of the rural population, overall partisan leanings, and representation in different regions of the U.S. Finally, when all else was equal, we selected states with broadly rectangular shapes to better allow us to crop images to the state shapes.

Qualifying participants were randomly assigned to 1 of 16 conditions in this 2 (vaccine type: influenza vs. COVID-19) x 2 (parental autonomy: confirming vs. authoritarian tone) x 4 (community level: physician, abstract community activity, concrete community activity, national) study. This analysis focuses on the first two conditions (vaccine type and parental autonomy), collapsing the community levels that did not moderate the effects of either vaccine type or parental autonomy or their two-way interactions. The full study design also included a no-message control, which is not reported here. Details about the full study design and all study stimuli can be found at https://osf.io/acwng/ or by contacting the study authors. Study population demographics are available in Table 1. The CONSORT diagram is available in Supplementary Table A.

Participants answered demographic questions and told us if they had received flu or COVID-19 vaccinations in the past year. Then, they were shown three different messages randomly selected from a large condition-specific stimuli pool. After seeing all three messages, participants reported their vaccine intentions for their children. This study protocol was reviewed and deemed exempt by the leading author's Minimal Research Risk Institutional Review Board (Reference 2022–1247).

2.2. Measures

2.2.1. Demographics

Parents answered demographic questions regarding race, education, marriage status, income, and self-described rurality. Finally, parents self-reported if they had gotten that season's flu vaccination, and any COVID-19 vaccinations.

2.2.2. Political ideology

Parents chose a response on a seven-point scale from (1) "Very liberal" to (7) "Very conservative" with "Moderate, middle of the road" as the center point (4). This was aggregated into Liberal (1–3), Moderate (4), and Conservative (5–7) [27].

2.2.3. Outcomes

2.2.3.1. Intention to vaccinate. Participants randomized to the COVID-19 message condition responded to the following question: "Let's

Table 1
Population demographics.

	Conservative ($N = 547$)	Moderate ($N = 632$)	Liberal ($N = 539$)	Overall ($N = 1718$)
Self-described Rurality				
Rural	279 (51.0 %)	278 (44.0 %)	183 (34.0 %)	740 (43.1 %)
Urban	268 (49.0 %)	354 (56.0 %)	356 (66.0 %)	978 (56.9 %)
Gender				
Man	309 (56.5 %)	304 (48.1 %)	279 (51.8 %)	892 (51.9 %)
Another gender	3 (0.5 %)	7 (1.1 %)	21 (3.9 %)	31 (1.8 %)
Woman	232 (42.4 %)	320 (50.6 %)	239 (44.3 %)	791 (46.0 %)
Missing	3 (0.5 %)	1 (0.2 %)	0 (0 %)	4 (0.2 %)
Race				
Black	62 (11.3 %)	104 (16.5 %)	104 (19.3 %)	270 (15.7 %)
Hispanic	21 (3.8 %)	46 (7.3 %)	38 (7.1 %)	105 (6.1 %)
NHPI/AIAN/Asian	22 (4.0 %)	38 (6.0 %)	31 (5.8 %)	91 (5.3 %)
White	438 (80.1 %)	438 (69.3 %)	362 (67.2 %)	1238 (72.1 %)
Another Race	4 (0.7 %)	6 (0.9 %)	4 (0.7 %)	14 (0.8 %)
Education				
College/advanced degree	181 (33.1 %)	171 (27.1 %)	252 (46.8 %)	604 (35.2 %)
HS or below	169 (30.9 %)	231 (36.6 %)	125 (23.2 %)	525 (30.6 %)
Some college	197 (36.0 %)	230 (36.4 %)	162 (30.1 %)	589 (34.3 %)
Marriage Status				
Not married	158 (28.9 %)	248 (39.2 %)	177 (32.8 %)	583 (33.9 %)
Married	389 (71.1 %)	384 (60.8 %)	362 (67.2 %)	1135 (66.1 %)
Income				
Under 20 k	68 (12.4 %)	116 (18.4 %)	85 (15.8 %)	269 (15.7 %)
20-60 k	183 (33.5 %)	256 (40.5 %)	177 (32.8 %)	616 (35.9 %)
60 k to 150 k	218 (39.9 %)	213 (33.7 %)	188 (34.9 %)	619 (36.0 %)
Over 150 k	67 (12.2 %)	39 (6.2 %)	86 (16.0 %)	192 (11.2 %)
Refused	11 (2.0 %)	8 (1.3 %)	3 (0.6 %)	22 (1.3 %)
Prev Parent Flu Vaccine	235 (43.0 %)	272 (43.0 %)	340 (63.1 %)	847 (49.3 %)
Prev Parent COVID Vaccine	324 (59.2 %)	408 (64.6 %)	457 (84.8 %)	1189 (69.2 %)

imagine that a COVID-19 booster shot has been recommended for children this Fall, 2023. How likely is your youngest child to get a COVID-19 vaccination booster this Fall?" Participants randomized to the Flu message condition responded to a question about flu: "How likely is your youngest child to get a flu vaccination this coming Fall?" Both questions had four options (1) Will definitely get one, (2) Will probably get one, (3) Will probably not get one, or (4) Will definitely not get one, which were analyzed continuously [28].

2.2.3.2. Confidence in vaccines. Participants answered four attitudinal questions about their overall vaccine confidence: "Vaccines are important for children to have," "Overall, I think vaccines are safe," "Overall, I think vaccines are effective," and "Vaccines are compatible with my religious, personal, or philosophical beliefs." Questions were averaged to create a scale from 1 (strongly disagree) to 5 (strongly agree) ($M = 3.65$, $SD = 1.05$, $\alpha = 0.91$) [29,30].

2.3. Messages

We created short textual messages promoting pediatric COVID-19 and influenza vaccination. Message text was developed in a qualitative co-design process with rural parents [31]. The research team then constructed a base set of autonomy-confirming and authoritarian messages. They then used an iterative process with ChatGPT (ver. 4.0, OpenAI 2023) to produce a total of ten similar textual messages for each condition. Autonomy-confirming language included phrases that implied parental authority over child health such as, "You can decide what's best for your child's health. Talk to your child's doctor about COVID-19 vaccines," and "Vaccinating your child against COVID-19 is a big decision. Your child's doctor is here to help you gather information." Authoritarian messages described the recommendations of a health agency (e.g., CDC or a state health department) or a physician as the authority figure–specifically not the parent. Examples included: "Your child's health is our [Alabama Department of Health] top priority. Speak with your family doctor…" and "CDC recommends COVID-19 vaccination for kids–it's one thing you can do to keep them safe." Sample messages are listed in Table 2. The messages also included images and logos, selected based on study condition.

2.4. Statistical analysis

We conducted all regressions in R (v4.4.1) using the *estimatr* package for robust standard errors to adjust for multiple comparisons [32]. We conducted adjusted and unadjusted regression models for each outcome, for both flu and COVID-19 vaccine messages, using autonomy-confirming message type and parental political ideology as independent variables of interest. Adjusted models controlled for demographics and recent vaccination history.

3. Results

3.1. Vaccine: COVID-19

3.1.1. Vaccine confidence

First, for the parents viewing COVID-19 vaccination messages, we found a significant interaction between the autonomy-confirming language condition and parent political ideology for both moderate ($b = 0.36$, 95 % CI = 0.05 to 0.67, $p = 0.024$) and liberal ($b = 0.34$, 95 % CI = 0.04 to 0.64, $p = 0.027$) compared to conservative parents. Fig. 1 shows

Table 2
The text from a sample of messages.

Sample Authoritarian Messages	Sample Autonomy-Confirming Messages
Wondering if the COVID-19 vaccine is safe for your child? Talk to your pediatrician today for personalized advice.	Wondering if the COVID-19 vaccine is safe for your child? Your pediatrician can offer personalized advice.
Don't miss out on reliable information about the COVID-19 vaccine for kids. Schedule a visit with your pediatrician today to gain the knowledge you need.	You can decide what's best for your child's health. Talk to your child's doctor about COVID-19 vaccines, so you can make an informed choice that suits your child's unique needs.
Your child's health is our top priority. Speak with your family doctor about the COVID-19 vaccine and make the best decision for your family.	Vaccinating your child against COVID-19 is a big decision. Your child's doctor is here to help you gather information, consider their specific health needs, and make a choice that is right for them.
The Department of Health Services protects you. They recommend vaccinating your child against COVID-19. Our collective health depends on it.	COVID-19 vaccination isn't just about health, it's about community. Protect your child and help keep our community safer.
In America, we prioritize the well-being of our children. CDC recommends COVID-19 vaccination for kids–it's one thing you can do to keep them safe.	Each shot arms our nation against a Fall outbreak. Choosing COVID-19 vaccination for your child is one way you can contribute to a brighter future.

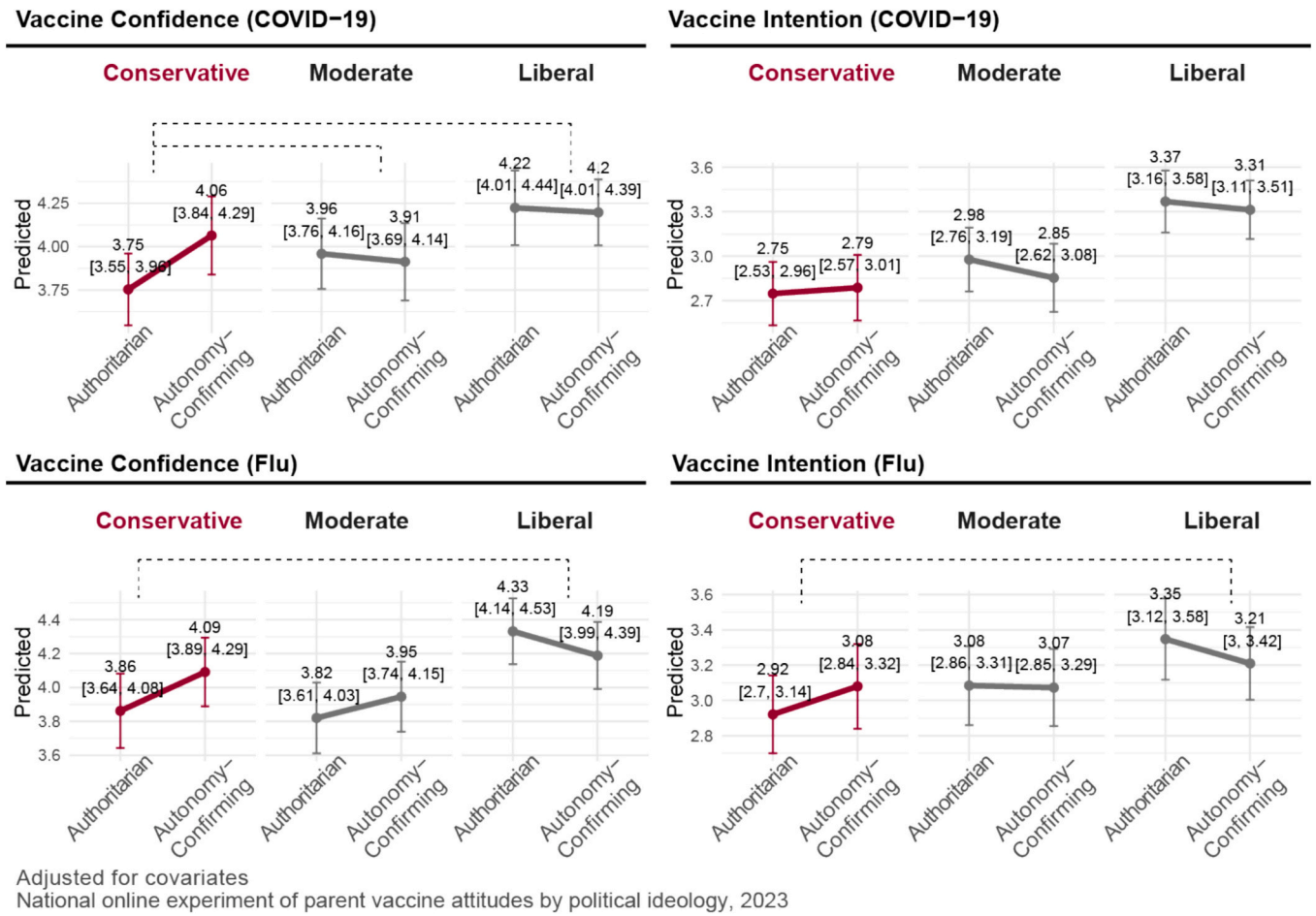

Fig. 1. Predicted point estimates and 95 % confidence intervals for COVID-19 and flu confidence and intention, by political ideology, adjusted for covariates. Dotted lines show significant interactions between political ideology and message language.

the significant interactions and their direction alongside predicted vaccine confidence, adjusted for covariates. Vaccine messages with autonomy-confirming language increased overall vaccine confidence for conservative parents more than for moderate or liberal parents. Other significant predictors of increased vaccine confidence were being a woman, having a college education, having an annual income over $20,000, and having themselves gotten COVID-19 or flu vaccinations. All adjusted regression interaction results can be seen in Table 3, and unadjusted results are reported in Supplementary Table B.

3.1.2. Intention to vaccinate

Among parents who saw the COVID-19 messages, regarding parents' intention to vaccinate their children, we did not observe significant differences between autonomy-confirming vs. authoritarian messages by parents' political ideology (conservative vs. moderate $p = 0.277$, conservative vs. liberal $p = 0.450$).

3.2. Vaccine: influenza (flu)

3.2.1. Vaccine confidence

When testing the interaction between autonomy-confirming vs. authoritarian language and parental ideology on vaccine confidence for parents who saw the flu vaccine message, we found a significant interaction. There were differences in the effect between liberal and conservative parents (b = 0.37, 95 % CI = 0.08 to 0.67, $p = 0.014$) but no significant differences between moderate and conservative parents ($p = 0.494$). Similar to COVID-19 messages, flu messages using autonomy-confirming language had a larger impact on vaccine confidence for conservative parents than for liberal parents. Overall, all parents viewing the autonomy-confirming flu vaccine message had a higher confidence in vaccinations (b = 0.23, 95 % CI = 0.45 to 0.01, $p = 0.04$). Other significant predictors were living in an urban area, being a woman, and being a parent with either a previous flu or COVID-19 vaccine.

3.2.2. Intention to vaccinate

There was a significant interaction between autonomy-confirming language (vs. authoritarian) and liberal parents (vs. conservative) on intention to vaccinate (b = 0.30, 95 % CI = 0.00 to 0.59, $p = 0.048$). Conservative parents responded more positively to autonomy-confirming messages than authoritarian messages; liberal parents responded similarly to both autonomy-confirming and authoritarian messages.

4. Discussion

In an attempt to better understand vaccine confidence and how public health agencies can message the importance of getting children vaccinated against flu and COVID-19 to parents across the political spectrum, we conducted a national online experiment in which parents received messages promoting pediatric flu or COVID-19 vaccination, written either in an authoritarian or autonomy-confirming tone. We found that overall, parents who self-identify as ideologically liberal were more likely to rate their confidence in vaccines, and their intention to vaccinate their children highly. However, we found interesting results in the interaction between political ideology and the autonomy-confirming

Table 3
Results of OLS regression predicting parental vaccine confidence and intention to vaccinate children.

	Covid-19 Vaccine Messages						Flu Vaccine Messages					
	Vaccine Confidence			Intention to Vaccinate			Vaccine Confidence			Intention to Vaccinate		
Predictors	*b*	*CI*	*p*	*b*	*CI*	*p*	*b*	*CI*	*p*	*b*	*CI*	*p*
Interaction												
Authoritarian × Moderate	0.36	0.05, 0.67	0.024	0.16	−0.14, 0.46	0.287	0.10	−0.19, 0.40	0.494	0.17	−0.14, 0.48	0.273
Authoritarian × Liberal	0.34	0.04, 0.64	0.027	0.1	−0.20, 0.39	0.529	0.37	0.08, 0.67	0.014	0.30	0.00, 0.59	0.048
Autonomy-Confirming Message												
Authoritarian	−0.31	−0.55, −0.08	0.009	−0.04	−0.26, 0.18	0.719	−0.23	−0.45, −0.01	0.040	−0.16	−0.39, 0.07	0.176
Ideology (vs Conservative)												
Moderate	−0.15	−0.39, 0.09	0.209	0.07	−0.15, 0.29	0.555	−0.15	−0.34, 0.05	0.151	−0.01	−0.23, 0.21	0.948
Liberal	0.13	−0.08, 0.35	0.222	0.53	0.31, 0.74	<0.001	0.10	−0.11, 0.31	0.367	0.13	−0.09, 0.35	0.249
Urban (vs Rural)	0.05	−0.08, 0.18	0.484	0.2	0.06, 0.34	0.005	0.16	0.03, 0.29	0.016	0.02	−0.10, 0.15	0.739
Gender (vs Man)												
Another gender	0.08	−0.37, 0.53	0.728	0.28	−0.29, 0.84	0.341	0.13	−0.33, 0.59	0.576	0.34	−0.20, 0.87	0.213
Woman	0.26	0.13, 0.38	<0.001	−0.15	−0.28, −0.02	0.026	0.20	0.07, 0.33	0.002	−0.03	−0.16, 0.09	0.593
Race (vs White)												
Another race	−0.3	−0.80–0.21	0.253	0.11	−0.49, 0.70	0.729	−0.42	−2.34–1.51	0.67	−0.26	−2.24–1.72	0.798
Black	−0.26	−0.43,-0.10	0.002	0.07	−0.12, 0.26	0.457	−0.13	−0.30, 0.04	0.131	0.02	−0.16, 0.19	0.859
Hispanic	−0.09	−0.36–0.18	0.518	0.18	−0.10, 0.46	0.206	−0.29	−0.59, 0.01	0.055	−0.09	−0.38, 0.20	0.538
NHPI/AIAN/Asian	−0.08	−0.32–0.15	0.487	0.09	−0.18–0.37	0.499	−0.29	−0.66,0.07	0.119	0.1	−0.15, 0.35	0.424
Education (vs College)												
HS or below	−0.28	−0.45, −0.11	0.001	−0.11	−0.29, 0.07	0.237	−0.08	−0.27, 0.11	0.397	0.10	−0.09, 0.29	0.304
Some college	−0.18	−0.34, −0.02	0.025	−0.2	−0.37, −0.03	0.023	−0.16	−0.32, 0.01	0.058	−0.07	−0.24, 0.09	0.365
Married	0.03	−0.11, 0.16	0.677	0.01	−0.13, 0.15	0.891	0.12	−0.03, 0.27	0.113	0.02	−0.12, 0.16	0.768
Income (vs under 20 k)												
20-60 k	0.20	0.01, 0.39	0.042	−0.11	−0.31, 0.09	0.277	0.02	−0.19, 0.23	0.843	−0.11	−0.31, 0.10	0.297
60 k to 150 k	0.33	0.12, 0.53	0.002	−0.21	−0.42, 0.00	0.055	0.03	−0.21, 0.27	0.795	−0.12	−0.35, 0.11	0.297
Over 150 k	0.53	0.29, 0.78	<0.001	0.17	−0.10, 0.44	0.206	0.19	−0.09, 0.47	0.188	0.05	−0.23, 0.34	0.702
Refused	−0.26	−0.83, 0.32	0.378	−0.18	−0.90, 0.55	0.637	−0.74	−1.47, −0.02	0.045	−0.20	−0.67, 0.27	0.403
Prev Parent Flu Vaccine	0.39	0.26, 0.53	<0.001	0.56	0.40, 0.72	<0.001	0.38	0.24, 0.52	<0.001	0.81	0.66, 0.95	<0.001
Prev Parent COVID Vaccine	0.68	0.52, 0.84	<0.001	0.85	0.69, 1.02	<0.001	0.49	0.33, 0.65	<0.001	0.52	0.36, 0.69	<0.001
(Intercept)	3.46	3.16, 3.75	<0.001	2.4	2.10, 2.71	<0.001	3.62	3.30, 3.95	<0.001	2.98	2.66, 3.31	<0.001

message language condition. While liberal parents had similar positive responses to seeing either autonomy-confirming or authoritarian language in vaccine messages, conservative parents did not. Conservative parents reported higher confidence in both pediatric vaccines after viewing messages that used autonomy-confirming language, and for flu vaccine also reported higher intention to vaccinate after viewing autonomy-confirming messages. The influence of message tone is small but comparable to effects of other vaccine messaging interventions [33,34].

This study builds upon past literature that finds increasing polarization of public health issues within the parental population, and the potential impacts of political ideology on vaccination. This study and past literature found significant correlations between political ideology and vaccine intention such that overall, caregivers with liberal political ideology are more likely to vaccinate their children against COVID-19 [18]. The polarization of the COVID-19 vaccination might lead to spillover effects that increase the influence of political ideology on likelihood of vaccinating against other diseases, or in other health topics, in the wake of the COVID-19 pandemic [35]. For example, researchers found significant negative COVID-19 vaccine attitude spillover onto attitudes toward vaccination overall, and flu vaccine intention [36], and a high correlation on specific, more controversial vaccines including HPV [37]. These results are consistent with this study, which also found that political partisanship influences flu vaccination intention.

There are also differences in our observed effects based on vaccine type. Parents respond differently to specific pediatric vaccine recommendations, and this study confirmed that these differences persist when viewing either flu or COVID-19 messaging. We found that autonomy-confirming pediatric COVID-19 vaccine promotion messages were able to increase conservative parents' stated confidence in vaccines overall, but did not specifically increase their stated intentions to get their children the COVID-19 vaccine when it was next available. Similar pediatric flu vaccine promotion messages, by contrast, were overall more effective, with the ability to increase stated vaccine confidence, with significantly stronger effects on stated vaccine confidence and intention to vaccinate for conservative parents specifically. For flu vaccinations, our findings suggest public health practitioners can utilize autonomy-confirming language in mass communication messages with positive effects for conservative parents' overall vaccine confidence in

pediatric vaccinations, and intention to vaccinate their children, confirming recently published findings [38].

Finally, in our unadjusted models we found that autonomy-confirming messages promoting pediatric flu vaccines were significant for changing vaccine confidence. Unadjusted models did not show significant effects of pediatric COVID-19 vaccine promotion messages on vaccine confidence or significant interactions between political ideology and autonomy-confirming messages in terms of intention for either flu or COVID-19 (see Supplementary materials, Table B). The adjusted models account for previous COVID-19 and flu vaccination history, as well as social and economic factors. People with a history of vaccinations likely have more positive baseline attitudes related to vaccines. In addition, conservatives (and liberals) are not homogeneous in their health beliefs or behaviors. So, for instance, if conservative participants who had previously been vaccinated reported high vaccine confidence, they may have been less influenced by our messages due to ceiling effects. In this case, adjusting for previous vaccine history could reveal a more accurate picture of the intervention's effect. Similarly, adjusting for socioeconomic status and education level accounts for heterogeneity in conservative (and liberal) parents. For COVID-19 vaccines, political ideology plays a significant role in pediatric vaccine uptake. Likewise, there may be other politically polarized health topics (e.g., topical or soluble fluoride [39], opioid harm reduction strategies [40], or others), for which autonomy-confirming language is more acceptable for conservative audiences [39]. We also found that more covariates (especially socioeconomic ones) were important in the COVID-19 vaccine context as compared to flu.

Future research could measure and adjust for additional politicized health topics such as fluoride applications, cannabis use, and abortion access. Adjusting for these covariates might help to disentangle the specific effect of our experimental manipulation from these broader influences, which were not equally relevant or powerful in the case of flu vaccination.

4.1. Limitations

Our sample is not representative of all parents in the U.S. People who responded to this online survey invitation may be systematically different from those who did not. We only included seven states in our sampling frame, so we should generalize to other states with caution. That said, the internal validity of our main conclusions remains intact given our randomization design. Another limitation is the use of self-reported vaccine status and intention to vaccinate measure outcomes. Ideally, we would be able to measure vaccine behavior. However, behavioral intentions are a strong predictor of vaccine behavior [41]. Future research should explore how these messages influence health intentions and the linked behavioral choices [38]. Another limitation is that we also used a one-dimensional scale of political ideology. In fact, political ideology may include economic, social, religious, and possibly other dimensions [42]. In future research, studies looking at political ideology as a key dimension of vaccine messaging could consider using a more robust measure of the different dimensions of political ideology, and aim to replicate our current findings of the interaction between ideology and autonomy-confirming language. Finally, additional research is needed to confirm that measured vaccine hesitancy and general vaccine confidence correlate with vaccine-specific confidence, and should consider using vaccine-specific confidence metrics, which were not used in this study but may additionally highlight the importance of vaccine messages.

5. Conclusions

As public health practitioners and medical providers acknowledge the growing politicization of public health issues, they must consider the role that government agency language choices play in exacerbating that politicalization [43]. As such, finding messages that can speak to all ideological stances will help build trust in health agencies. Autonomy-affirming health messages are one avenue to increase the public's feelings of control over their own health as they make health decisions for themselves and their families. We find that autonomy-confirming health messages are more effective for parents with conservative ideologies and is an equally effective message strategy for parents with liberal ideologies, for whom the message language was less important. Overall, practitioners should consider how they can include more autonomy-based language in their messages, affirming the role of the parent alongside providers.

CRediT authorship contribution statement

Lynne M. Cotter: Writing – original draft, Visualization, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Molecula Hopkins-Sheets:** Writing – original draft, Project administration. **Sijia Yang:** Writing – review & editing, Supervision, Resources, Methodology, Investigation, Conceptualization. **Susan R. Passmore:** Writing – review & editing, Supervision, Resources, Methodology, Investigation, Conceptualization. **Mahima Bhattar:** Writing – review & editing, Project administration, Investigation. **Emma Henning:** Writing – review & editing, Project administration, Investigation. **Dan Schultz:** Supervision, Resources, Investigation, Conceptualization. **Emily Latham:** Supervision, Resources, Investigation, Conceptualization. **Malia Jones:** Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.vaccine.2025.126947.

Data availability

The data that has been used is confidential.

References

[1] Savulescu J, Giubilini A, Danchin M. Global ethical considerations regarding mandatory vaccination in children. J Pediatr 2021;231:10–6. https://doi.org/10.1016/j.jpeds.2021.01.021.
[2] World Health Organization. Ten health issues WHO will tackle this year. https://www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019; 2019. Published January 10. Accessed November 6, 2022.
[3] CDC. Ten Great Public Health Achievements – United States, 1900–1999. *MMWR* - morbidity & mortality weekly Report48(12); 1999. p. 241–3.
[4] Azzari C, Diez-Domingo J, Eisenstein E, et al. Experts' opinion for improving global adolescent vaccination rates: a call to action. Eur J Pediatr 2020;179(4):547–53. https://doi.org/10.1007/s00431-019-03511-8.
[5] Krastev S, Krajden O, Vang ZM, et al. Institutional trust is a distinct construct related to vaccine hesitancy and refusal. BMC Public Health 2023;23(1):2481. https://doi.org/10.1186/s12889-023-17345-5.

[6] Kim DKD, Kreps GL. An analysis of government communication in the United States during the COVID-19 pandemic: recommendations for effective government health risk communication. World Med Health Policy 2020;12(4):398–412. https://doi.org/10.1002/wmh3.363.

[7] Pacheco J, Gollust SE, Callaghan T, Motta M. A call for measuring partisanship in US public Health Research. Am J Public Health 2024;114(8):772–6. https://doi.org/10.2105/AJPH.2024.307691.

[8] Gilkey MB, Brewer NT. It's time for a national surveillance system for vaccine confidence and hesitancy. Pediatrics 2023;152(5):e2023063169. https://doi.org/10.1542/peds.2023-063169.

[9] Helmkamp LJ, Szilagyi PG, Zimet G, et al. A validated modification of the vaccine hesitancy scale for childhood, influenza and HPV vaccines. Vaccine 2021;39(13):1831–9. https://doi.org/10.1016/j.vaccine.2021.02.039.

[10] Brewer NT, Chapman GB, Rothman AJ, Leask J, Kempe A. Increasing vaccination: putting psychological science into action. Psychol Sci Public Interest 2017;18(3):149–207. https://doi.org/10.1177/1529100618760521.

[11] Seither R. Coverage with selected vaccines and exemption rates among children in kindergarten — United States, 2023–24 school year. MMWR Morb Mortal Wkly Rep 2024:73. https://doi.org/10.15585/mmwr.mm7341a3.

[12] CDC. Flu vaccination coverage update. Centers for disease control and prevention. https://www.cdc.gov/flu/spotlights/2022-2023/flu-vaccine-update.htm; 2023. Published January 11. Accessed October 7, 2024.

[13] Nguyen KH, Levisohn A, McChesney C, Vasudevan L, Bednarczyk RA, Corlin L. Disparities in child and adolescent COVID-19 vaccination coverage and parental intent toward vaccinations for their children and adolescents. Ann Med 2023;55(1):2232818. https://doi.org/10.1080/07853890.2023.2232818.

[14] Seither R. Vaccination coverage with selected vaccines and exemption rates among children in kindergarten — United States, 2021–22 school year. MMWR Morb Mortal Wkly Rep 2023:72. https://doi.org/10.15585/mmwr.mm7202a2.

[15] Baumgaertner B, Carlisle JE, Justwan F. The influence of political ideology and trust on willingness to vaccinate. Rabinowitz M, ed. PLoS ONE13(1); 2018. https://doi.org/10.1371/journal.pone.0191728. e0191728.

[16] Jones DR, McDermott ML. Partisanship and the politics of COVID vaccine hesitancy. Polity 2022;54(3):408–34. https://doi.org/10.1086/719918.

[17] Levin J, Bradshaw M. Determinants of COVID-19 skepticism and SARS-CoV-2 vaccine hesitancy: findings from a national population survey of U.S. adults. BMC Public Health 2022;22(1):1047. https://doi.org/10.1186/s12889-022-13477-2.

[18] Durkin LK, Flynn EM, Johnson ML, Davies WH, Greenley RN. Vaccine attitudes mediate relationships between caregiver political ideology and likelihood of child vaccination for COVID-19. Matern Child Health J 2023;27(6):984–90.

[19] Baum MA. Red state, blue state, flu state: media self-selection and partisan gaps in swine flu vaccinations. J Health Polit Policy Law 2011;36(6):1021–59. https://doi.org/10.1215/03616878-1460569.

[20] Borah P, Austin E, Su Y. Injecting disinfectants to kill the virus: media literacy, information gathering sources, and the moderating role of political ideology on misperceptions about COVID-19. Mass Commun Soc 2023;26(4):566–92. https://doi.org/10.1080/15205436.2022.2045324.

[21] Del Ponte A, Gerber AS, Patashnik EM. Polarization, the pandemic, and public Trust in Health System Actors. J Health Polit Policy Law 2024;49(3):375–401. https://doi.org/10.1215/03616878-11075562.

[22] Salmon DA, Dudley MZ, Brewer J, et al. LetsTalkShots: personalized vaccine risk communication. Front Public Health 2023:11. https://doi.org/10.3389/fpubh.2023.1195751.

[23] Chan DKC, Yang SX, Mullan B, et al. Preventing the spread of H1N1 influenza infection during a pandemic: autonomy-supportive advice versus controlling instruction. J Behav Med 2015;38(3):416–26. https://doi.org/10.1007/s10865-014-9616-z.

[24] Moon K, Riege A, Gourdon-Kanhukamwe A, Vallée-Tourangeau G. The moderating effect of autonomy on promotional health messages encouraging healthcare Professionals' to get the influenza vaccine. J Exp Psychol Appl 2021;27(2):187–200.

[25] Dillard JP, Tian X, Cruz SM, Smith RA, Shen L. Persuasive messages, social norms, and reactance: a study of masking behavior during a COVID-19 campus health campaign. Health Commun 2023;38(7):1338–48. https://doi.org/10.1080/10410236.2021.2007579.

[26] Miller CH, Lane LT, Deatrick LM, Young AM, Potts KA. Psychological reactance and promotional health messages: the effects of controlling language, lexical concreteness, and the restoration of freedom. Human Comm Res 2007;33(2):219–40. https://doi.org/10.1111/j.1468-2958.2007.00297.x.

[27] McCright AM, Dentzman K, Charters M, Dietz T. The influence of political ideology on trust in science. Environ Res Lett 2013;8(4):044029.

[28] CDC N. Vaccination coverage among young children (0–35 months). November, https://data.cdc.gov/Child-Vaccinations/Vaccination-Coverage-among-Young-Children-0-35-Mon/fhky-rtsk/about_data; 2023.

[29] De Figueiredo A, Simas C, Karafillakis E, Paterson P, Larson HJ. Mapping global trends in vaccine confidence and investigating barriers to vaccine uptake: a large-scale retrospective temporal modelling study. Lancet 2020;396(10255):898–908. https://doi.org/10.1016/S0140-6736(20)31558-0.

[30] De Figueiredo A, Eagan RL, Hendrickx G, Karafillakis E, Larson HJ. State of vaccine confidence in the European Union. Luxembourg: European Commission; 2022. https://health.ec.europa.eu/document/download/98aff82c-af3a-4d9b-87fe-1ff3ab560642_en?filename=2022_confidence_rep_en.pdf [Accessed February 7, 2025].

[31] Passmore SR, Henning E, Margalit Cotter L, et al. Fostering trust in public health messaging: tailoring communication for rural parents. Am J Health Promot 2025;39(2):253–62. https://doi.org/10.1177/08901171241278886.

[32] Blair G, Cooper J, Coppock A, Humphreys M. Sonnet L. Estimatr: fast estimators for design-based inference. https://declaredesign.org/r/estimatr/; 2023.

[33] Liu S, Durantini MR, Calabrese C, Sanchez F, Albarracin D. A systematic review and meta-analysis of strategies to promote vaccination uptake. Nat Hum Behav 2024;8(9):1689–705.

[34] Parsons JE, Newby KV, French DP. Do interventions containing risk messages increase risk appraisal and the subsequent vaccination intentions and uptake? – a systematic review and meta-analysis. Br J Health Psychol 2018;23(4):1084–106. https://doi.org/10.1111/bjhp.12340.

[35] Fowler EF, Nagler RH, Banka D, Gollust SE. Chapter six - Effects of politicized media coverage: experimental evidence from the HPV vaccine and COVID-19. In: Bolsen T, Palm R, editors. Progress in molecular biology and translational science. Vol 188. Academic Press; 2022. p. 101–34. https://doi.org/10.1016/bs.pmbts.2021.11.008. Molecular Biology and Clinical Medicine in the Age of Politicization.

[36] Lunz Trujillo K, Green J, Safarpour A, Lazer D, Lin J, Motta M. COVID-19 spillover effects onto general vaccine attitudes. Public Opin Q 2024;88(1):97–122. https://doi.org/10.1093/poq/nfad059.

[37] Vraga EK, Brady SS, Gansen C, et al. A review of HPV and HBV vaccine hesitancy, intention, and uptake in the era of social media and COVID-19. Elife 2023;12:e85743.

[38] Murphy K, Graham D, Faries M. Integrating autonomy in public health messaging. Front Commun 2024:9. https://doi.org/10.3389/fcomm.2024.1346031.

[39] Saini SJ, Carle AC, Forsyth AR, Chi DL. Association between caregiver opposition to topical fluoride and COVID-19 vaccines. Vaccine 2023;41(5):1035–41. https://doi.org/10.1016/j.vaccine.2022.12.018.

[40] Reynolds G, Lindsay BL, Knaak S, Szeto ACH. Opioid use stigma: an examination of student attitudes on harm reduction strategies. Int J Ment Heal Addict 2022;20(6):3381–97. https://doi.org/10.1007/s11469-022-00756-7.

[41] McEachan R, Taylor N, Harrison R, Lawton R, Gardner P, Conner M. Meta-analysis of the reasoned action approach (RAA) to understanding health behaviors. Ann Behav Med 2016;50(4):592–612. https://doi.org/10.1007/s12160-016-9798-4.

[42] Feldman S, Johnston C. Understanding the determinants of political ideology: implications of structural complexity. Polit Psychol 2014;35(3):337–58. https://doi.org/10.1111/pops.12055.

[43] Zhou A, Liu W, Yang A. Politicization of science in COVID-19 vaccine communication: comparing US politicians, medical experts, and government agencies. Polit Commun 2024;41(4):649–71. https://doi.org/10.1080/10584609.2023.2201184.