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Understanding vaccine hesitancy: The role of fear and message framing in COVID-19 vaccination intention in adults in the UK

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ABSTRACT

Background: The coronavirus-19 (COVID-19) pandemic has significantly impacted public health, with vaccination being crucial in reducing disease severity and mortality. In the United Kingdom (UK), vaccine uptake, especially booster doses, has declined in part due to vaccine hesitancy driven by misinformation, distrust and safety concerns. Demographic factors, such as younger age, female gender and ethnic minority backgrounds are linked to lower vaccination intention. Emotional factors such as fear of COVID-19, and messaging strategies also influence decisions. The present study examined the impact of individualistic vs collectivistic message framing, fear of COVID-19, prior vaccination history and demographics on vaccination intentions.
Methods: The current study was a randomised experimental design including 200 adults (aged ≥18) in the UK. Participants were randomly assigned to either an individualistic or collectivistic message-framing condition. After exposure, they completed questionnaires measuring fear of COVID-19 and vaccine hesitancy. Data were collected cross-sectionally using Qualtrics. ANOVA was used to assess the effects of message framing and fear of COVID-19 on vaccination intentions. Logistic regression evaluated the predictive roles of demographics, vaccination history, fear of COVID-19 and message framing.
Results: No significant interaction between message framing and fear of COVID-19 was identified, however, higher levels of fear of COVID-19 were linked to greater vaccination intention. Fear of COVID-19, male gender and prior booster vaccination were found to be significant predictors, while message framing and age were not.
Conclusion: Fear of COVID-19, along with gender and booster vaccination history strongly predict vaccination intentions, while message framing has no significant impact. Public health campaigns should focus on addressing fear of the disease, using individuals past vaccination behaviour and adapting messaging for specific demographic groups to encourage future vaccinations.

1. Introduction

The coronavirus-19 (COVID-19) pandemic profoundly impacted public health, with ~25 million cases and 232,112 confirmed deaths reported in the United Kingdom (UK) as of 2024 [1]. Vaccinations have played a central role in reducing disease severity and mortality of COVID-19 since the UK rollout began in December 2020. However, vaccine efficacy diminishes over time, requiring booster doses to sustain immunity [2]. Despite an initial high uptake of 94 % of individuals >12 years old receiving a first dose, receipt of booster doses was low. By autumn 2022, only 15.5 million out of 26 million eligible individuals received a booster dose, leaving >10 million eligible individuals not fully vaccinated [3,4]. While vaccine hesitancy may have played a role, other factors likely contributed to this shortfall. These include shifting risk perceptions as restrictions eased, reduced urgency compared to earlier in the pandemic, lack of awareness of the necessity for ongoing COVID-19 booster doses and changes in eligibility criteria [5–7]. Having been recognised by the WHO as a top global health threat before the pandemic, vaccine hesitancy remains an ongoing barrier to achieving high vaccination rates as COVID-19 transitions into an endemic phase [8].

Misinformation and distrust in institutions have notably affected vaccination decisions [9,10]. With widespread reliance on social media for health information, exposure to misinformation was particularly high during the COVID-19 pandemic, contributing to vaccine hesitancy [11,12]. Public concerns about vaccine safety may have been influenced

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by widely reported suspensions of the AstraZeneca vaccine in several European countries before April 2021, as well as initial assurances from the Medicines and Healthcare products Regulatory Agency and the European Medicines Agency that the vaccine was safe. The UK's Joint Committee on Vaccination and Immunisation (JCVI) later advised against its use in those under 30 due to concerns about rare adverse effects. While this decision may have reassured some by offering alternative vaccines, it may also have reinforced doubts for others, potentially contributing to reduced booster uptake [13,14].

The role of fear of COVID-19 as an emotional predictor is complex. Higher levels of fear predict adherence to behaviours such as social distancing and working from home. However, the role of fear in encouraging vaccination is less clear, with higher levels associated with vaccine willingness [15], but excessive fear leading to avoidance behaviours, heightened vaccine anxiety, or even distrust in health authorities, potentially dissuading some individuals from getting vaccinated [16,17]. Protection Motivation Theory (PMT) provides a useful framework for understanding these effects by explaining how individuals' motivation to engage in protective behaviours (such as vaccination) depends on their appraisal of threat and their ability to respond. According to PMT, motivation to act increases when individuals perceive a high threat (vulnerability and severity) and believe in their self-efficacy (ability to address the threat), response efficacy (effectiveness of protective action), and manageable response costs (barriers to taking action) [18]. Thus, fear can motivate vaccination when combined with strong beliefs in personal and vaccine efficacy but may inhibit vaccination if perceived barriers or anxiety become overwhelming.

From the perspective of Prospect Theory [19], message framing may also influence vaccination intention by shaping how individuals perceive the consequences of non-vaccination. However, existing evidence on COVID-19 vaccination messaging is limited and mixed. For example, some studies suggest that gain-framed messages may be equally persuasive as loss-framed messages in encouraging COVID-19 vaccination while inducing less anxiety [20], though further research is needed. Similarly, for other vaccinations such as human papillomavirus (HPV), neither loss- nor gain-framed messaging has demonstrated consistently strong effects on vaccination intention, highlighting the need for continued investigation [21]. One potential factor that may account for these mixed findings is the cultural context in which messages are delivered. Message framing that aligns with individuals' cultural background may enhance vaccine willingness [22]. For instance, in individualistic societies like the UK, messages that emphasise personal responsibility and self-protection may be more effective, whereas collectivistic messaging tends to resonate more strongly in community-oriented cultures [23]. Individualistic messaging highlights personal needs and desires, which tends to be more persuasive for those who prioritise individual welfare over collective concerns. Moreover, when culturally salient messaging is combined with emotional factors such as fear of COVID-19, its persuasive power appears to increase [24]. Despite this theoretical rationale, to our knowledge, no studies have directly investigated the comparative effects of individualistic versus collectivistic message framing on COVID-19 vaccination intention within the UK context. Addressing this gap is crucial for tailoring public health messages that effectively motivate vaccination uptake in culturally diverse populations.

Individualistic messaging that promotes personal risk and benefit, combined with high fear of COVID-19, is likely to motivate stronger vaccination intention. Fear appeals which emphasise individualistic values have demonstrated significantly greater influence as motivators of vaccine intention than when combined with a collectivistic focus, suggesting fear elicits greater self-protection instincts [25]. Conversely, studies suggest that collectivistic messaging reduces fear of COVID-19 due to an increased sense of community protection and lowered social pressure, thereby decreasing each other's influence on vaccination intention [26,27]. Whilst individualistic messaging exerts greater influence on COVID-19 vaccination intention when combined with fear appeals, collectivistic messaging may be more influential when combined with prosocial messaging [28]. Although early pandemic campaigns, such as the 'Look Them in the Eyes' initiative in the UK [29] successfully evoked strong emotional responses, research suggests that prosocial messaging that highlights collective well-being, such as campaigns encouraging vaccination to protect vulnerable groups, tends to yield more positive outcomes [30,31]. However, other studies have suggested both individualistic and collectivistic messaging were equally effective at increasing influenza vaccination intention in both cultures, with individualistic messaging shown to be effective at increasing COVID-19 vaccination intention in the UK [32,33].

Given the dynamic nature of public health communication, understanding how message framing, fear of COVID-19 and prior vaccination history influence vaccination intention remains pertinent. Therefore, the aim of the present study, conducted in the UK in 2022, was to examine the way message framing (individualistic vs. collectivistic), fear of COVID-19 and prior vaccination history, alongside demographic factors, influence individuals' vaccination intention using continuous scores on the Oxford COVID-19 Vaccine Hesitancy Scale [34]. Based on previous evidence that fear appeals are more persuasive when aligned with self-focused motivations, it was hypothesised that: i) Individuals exposed to individualistic message framing combined with high levels of fear of COVID-19 would demonstrate the highest vaccination intention scores, reflecting an interaction between message framing and fear; and ii) higher levels of fear of COVID-19, demographic factors including age and gender, COVID-19 vaccination status and message framing would significantly predict willingness to vaccinate (willing vs. unwilling).

2. Materials and methods

2.1. Design

The present study employed a quantitative between-groups design to examine the differences in COVID-19 vaccination intention, measured as a continuous outcome. The study included two independent variables: i) Message framing (individualistic vs. collectivistic); and ii) fear of COVID-19 (high vs. low). Demographic variables – including gender, age, ethnicity, nationality, and COVID-19 vaccination status – were also collected and considered in subsequent logistic regression analysis predicting binary vaccination intention (willing vs. unwilling).

2.2. Participants

A total of 527 UK residents were initially recruited. Of these, 110 participants were excluded due to incomplete responses, 25 indicated residency outside the UK, 17 were classified as clinically vulnerable and 175 failed a manipulation check embedded in the message framing task. This resulted in a final cohort size of 200 participants (response rate, 46.83 %; age range: 18–73 years; mean $\pm$ SD, 41.71 $\pm$ 13.08).

Prospective power analysis was conducted using G*Power. For the primary ANOVA (fixed effects, main effects, and interactions) to detect a medium effect size ($f = 0.20$) with $\alpha = 0.05$ and 80 % power across 4 groups, a total sample size of 199 was required. Eligibility criteria included: i) $\geq$18 years old; ii) UK residency; and iii) fluency in English. Exclusion criteria applied to those classified as clinically vulnerable or likely to require ongoing COVID-19 booster vaccinations, as well as individuals with a previous or current mental health condition. Participants received no financial incentives. However, participants from the University of Derby received course credit. Recruitment was conducted via online platforms, including the University of Derby Research Participation Scheme, and social media platforms including Facebook, Reddit, LinkedIn, WhatsApp and Discord.

2.3. Demographic questionnaire

Participants were asked to state their COVID-19 vaccination status (unvaccinated, first dose, second dose, 1+ booster doses) age, which gender they identified with (male, female, non-binary/third gender, other, prefer not to say), country of residence, ethnicity and clinical vulnerability status.

2.4. Fear of COVID-19 scale (FCS)

The FCS [35] is a 7-item scale designed to assess fear of COVID-19 ('I am afraid of losing my life because of coronavirus-19'). This scale was included to quantify the degree of fear. The FCS has demonstrated strong internal consistency (0.87) across multiple countries, including the UK [36]. Participants rated their agreement with statements on a 5-point Likert scale ranging from 1 ('strongly disagree') to 5 ('strongly agree'), with total score range of 7–35. Higher scores indicate greater levels of fear of COVID-19.

2.5. Oxford COVID-19 Vaccine Hesitancy Scale (OCVHS)

The OCVHS [34] is a 7-item scale used to assess attitudes toward COVID-19 vaccination ('I would describe myself as [eager or willing or not bothered or unwilling or anti-vaccination] to get the COVID-19 vaccine'). It was selected to assess hesitancy as a significant barrier to vaccine uptake. Cronbach's α for this scale is reported as 0.97, indicating excellent internal consistency and a high degree of reliability in the measurement of vaccine hesitancy. Participants indicated their stance on vaccination using a 5-point Likert scale ranging from 1 ('strongly disagree') to 5 ('strongly agree'), with total score range of 7–35. Higher scores reflect higher vaccine hesitancy.

2.6. Message framing task

Two distinct passages were created by the lead author to test the effects of message framing on COVID-19 vaccination intentions. Each passage provided fact-based information on COVID-19 vaccines from trusted sources, including the WHO (World Health Organization), National Health Service (NHS) and UK Government [2,37,38], covering health risks, benefits, effectiveness and safety of the vaccine. Participants were randomly assigned to one of two experimental framing conditions, individualistic or collectivistic.

2.7. Individualist-framed condition

The following passage emphasised the personal health benefits of receiving the COVID-19 vaccine, aiming to appeal to individual self-interest:

'The World Health Organization, the NHS and the UK Government have published the following information about the COVID-19 vaccines. Please read the information carefully and answer the question which follows:

Anyone who gets COVID-19 can become seriously ill or have long-term effects (long COVID-19). The COVID-19 vaccines are the best way to protect yourself. Three COVID-19 vaccines have now been authorised for use in the UK by the Medicines and Healthcare products Regulatory Agency, after meeting strict standards of safety and effectiveness. The vaccines are very safe, very effective and having a vaccination when it is your turn will protect you. Research has shown the vaccines help:

- *Reduce your personal risk of getting seriously ill or dying from COVID-19*
- *Reduce your personal risk of catching COVID-19*
- *Protect yourself against COVID-19 variants*

COVID-19 vaccines provide strong protection against serious illness, hospitalisation and death. Getting vaccinated could save your life.'

2.8. Collectivist-framed condition

The following passage highlighted the community benefits of vaccination, focusing on how the vaccine protects family, friends and society:

'The World Health Organization, the NHS and the UK Government have published the following information about the COVID-19 vaccines. Please read the information carefully and answer the question which follows:

The COVID-19 vaccine is the best way to protect us from coronavirus and will save thousands of lives. Three COVID-19 vaccines have now been authorised for use in the UK by the Medicines and Healthcare products Regulatory Agency, after meeting strict standards of safety and effectiveness. The vaccines are very safe, very effective and having a vaccination when it is your turn will protect your friends, your family and your community against serious illness, hospitalisation and death.

Uptake is even more critical for those caring for patients and others in the population who are at a greater risk of serious outcomes from COVID-19.

High vaccine uptake is vital to the success of the vaccine programme in helping us defeat COVID-19. Without high uptake across our communities, our lives and those of our loved ones, will remain at high risk from this devastating virus. We need a collective effort to save as many lives as possible.'

After reading their assigned passage, participants completed a manipulation check to assess their understanding of the framing they were exposed to. They were asked to select one statement that best represented the message content:

i. The information highlighted the benefits of getting the COVID-19 vaccine **for me.**
ii. The information highlighted the benefits of getting the COVID-19 vaccine **for friends, family and communities.**

This manipulation check helped verify that participants accurately perceived the intended framing of the message content.

No control group (i.e., a no-message or neutral-message condition) was included in the study design, as the primary objective was to compare the relative effects of individualistic versus collectivistic framing on vaccination intentions. This approach aligns with previous research focusing on direct comparisons between active message framings [39,40].

2.9. Procedure

The current study adhered to the British Psychological Society (BPS) Code of Human Research Ethics and the BPS Ethics guidelines for internet-mediated research and was approved by the University of Derby College of Health, Psychological and Social Care Research Ethics Committee (approval no. ETH2122–3829). Participants accessed the study via a link or QR code leading to Qualtrics (Provo UT; version 15th June 2022 to 8th August 2022). After participants provided informed consent, they completed the demographic questionnaire. Eligible participants were then randomly assigned to either an individualistic or collectivistic message framing condition and were presented with their assigned message. After reading the message, participants then completed the manipulation check. Next, participants were asked to imagine a hypothetical scenario involving a new variant of COVID-19 that is more infectious and leads to worse health outcomes. This approach aimed to engage participants in a thoughtful exercise to consider the implications of vaccination without the urgency and emotional impact of current events. Participants then completed the FCS and OCVHS and were debriefed and thanked for their time. On average, participants took 25 min to complete the survey.

2.10. Data analysis

Data were analysed using SPSS (version 28, IBM Corp.). Prior to

analysis, all data were screened for accuracy, completeness and outliers. Descriptive statistics – including means, standard deviations and frequency distributions - were calculated for all study variables, including demographic characteristics, fear of COVID-19, vaccine hesitancy and vaccination intention.

To test the first hypothesis a two-way analysis of variance (ANOVA) was conducted to examine the main and interaction effects of message framing (individualistic vs. collectivistic) and fear of COVID-19 (high vs. low) on vaccination intention, which was treated as a continuous outcome measured by scores on the OCVHS. Fear of COVID-19 was treated as a categorical variable by dichotomising scores from the FCS using a median split, with scores >14 classified as 'high fear' and scores <14 as 'low fear'. This grouping approach facilitated examination of how differing levels of fear interact with message framing in influencing vaccination intention. While fear was a measured variable rather than manipulated, the median split enabled an interpretable two-way ANOVA consistent with the study's between-groups design

To test the second hypothesis, a binomial logistic regression analysis was conducted to identify predictors of binary vaccination intention (willing vs. unwilling). Predictor variables included age, gender, vaccination status (boosted vs. not boosted), fear of COVID-19 (continuous FCS scores) and message framing condition (collectivistic vs. individualistic). Vaccination intention was dichotomised based on participants' responses to Item 6 of the OCVHS:those who selected "eager" or "willing" were classified as 'willing', while those who selected "not bothered", "unwilling", or "anti-vax" were classified as 'unwilling'. Responses of "don't know" ($n = 3$) were excluded from the analysis to avoid conflating unwillingness with uncertainty. This binary classification allowed for clearer identification of the factors most strongly associated with vaccine hesitancy in the sample.

3. Results

3.1. Data screening

To ensure the robustness of the analyses, checks for outliers and multicollinearity were conducted. Potential outliers, identified by *Z*-scores $> \pm 3$, were observed for the fear of COVID-19 variable ($n = 4$). However, as these scores fell within the expected range for the survey scales and were deemed legitimate, no data removal was necessary.

Additionally, the data exhibited a non-normal distribution ($P < 0.05$), and the assumption of homogeneity of variances was violated ($P < 0.001$). Despite these violations, a 2 (fear of COVID-19) x 2 (message framing) independent measures ANOVA was considered appropriate for analysis due to its robustness against violations of normality [41]. Nonetheless, results should be interpreted with caution.

For the binomial logistic regression, multicollinearity was assessed using Pearson's correlation coefficient. The correlation coefficients were < 0.8, suggesting no significant issues with multicollinearity.

3.2. Sociodemographic characteristics

Although most participants identified as female (64.5 %), participants who identified as male showed a higher willingness to vaccinate compared with female participants (92.8 and 83.7 %, respectively). Among all age groups, vaccine willingness was generally high, with the 55–64 age range group having the highest rate (96.6 %). The ethnicity and nationality data revealed a strong vaccine willingness across most groups, with Asian (75 %) and Chinese (100 %) participants also reporting relatively high levels of COVID-19 fear. Finally, vaccination status was strongly correlated with levels of fear of COVID-19, as those with 1+ booster doses (77.5 %) showed balanced levels of high and low fear, while the unvaccinated participants displayed lower levels of fear of COVID-19 overall. Detailed sociodemographic details are presented in Table 1 below.

Table 1
Sociodemographic characteristics of study participants ($n = 200$).

Demographic characteristics	n (%)
Gender	
Male	69 (34.5)
Female	129 (64.5)
Non-binary	2 (1.0)
Age range	
18–24	20 (10.0)
25–34	51 (25.5)
35–44	44 (22.0)
45–54	46 (23.0)
55–64	29 (14.5)
65–73	10 (5.0)
Ethnicity	
White	181 (90.5)
Mixed	5 (2.5)
Asian	7 (3.5)
Black	4 (2.0)
Other	3 (1.5)
Nationality	
British	180 (90)
American	1 (0.5)
Chinese	2 (1.0)
Egyptian	1 (0.5)
Indonesian	1 (0.5)
Irish	2 (1.0)
Italian	2 (1.0)
Korean	1 (0.5)
Malaysian	1 (0.5)
Dutch	1 (0.5)
Polish	4 (2.0)
Serbian	1 (0.5)
South African	2 (1.0)
Other	1 (0.5)
COVID-19 Vaccination status	
Unvaccinated	10 (5.0)
1st Dose	1 (0.5)
2nd Dose	34 (17)
1+ Booster	155 (77.5)

COVID-19, coronavirus-19.

3.3. Examining the effects of fear of COVID-19 and message framing on COVID-19 vaccination intention

To test the first hypothesis which posited that individuals exposed to individualistic message framing and reporting high levels of fear of COVID-19 would demonstrate the highest intention to vaccinate, a 2×2 independent measures ANOVA was conducted. This analysis examined the main effects and interaction between message framing (individualistic vs. collectivistic) and levels of COVID-19 fear (high vs. low) on COVID-19 vaccination intention.

The ANOVA results revealed no significant interaction between message framing and fear of COVID-19 for vaccination intention $F(1, 196) = 1.489$; $P = 0.224$; $\eta_p^2 = 0.008$. However, a significant main effect of fear of COVID-19 was observed $F(1, 196) = 11.14$; $P = 0.001$; $\eta_p^2 = 0.054$, with participants experiencing high levels of fear showing greater vaccination intention (mean ± SD, 10.61 ± 3.62) compared with those with low fear (mean ± SD, 13.41 ± 7.19). By contrast, no significant main effect of message framing was found on vaccination intention, $F(1, 196) = 1.0$; $P = 0.319$; $\eta_p^2 = 0.005$, with similar levels of vaccination intention across both the individualistic (mean ± SD, 12.68 ± 6.13) and collectivistic (mean ± SD, 11.65 ± 5.90) message framing conditions.

3.4. Examining the predictors of COVID-19 vaccination intention

To test the second hypothesis which proposed that higher levels of fear of COVID-19, along with demographic factors including age, gender and COVID-19 vaccination status, and message framing would significantly predict intention to vaccinate, a binomial logistic regression was conducted. This analysis included participant age, gender, vaccination

status (one or more boosters vs. no boosters), fear of COVID-19 and message framing (collectivistic vs. individualistic) as predictors, with vaccination intention (willing vs. unwilling) as the outcome variable. Given the majority of the respondents were of white British origin (90 %), ethnicity and nationality were not included in the regression model. To investigate whether gender was a significant predictor of COVID-19 vaccination intention, this variable was transformed into a dichotomous predictor by excluding the small sample size of two participants who did not identify as either male or female ($n = 195$).

The binomial logistic regression model significantly predicted vaccination intention (χ^2, 68.810 %; $P < 0.001$), explaining 29.7–57.6 % of the variance in vaccination intention. Notably, the model correctly predicted 97.1 % of those individuals willing to vaccinate and 56.5 % of those unwilling to vaccinate, yielding an overall model accuracy of 92.3 %. This suggests the model's strong ability to predict vaccination intention, although the data were skewed toward individuals who were willing to vaccinate ('willing', $n = 172$ vs. 'unwilling', $n = 23$), which may contribute to a higher sensitivity but lower specificity. The −2 Log Likelihood value (−2LL, 72.689) suggested a poor model fit, but the Hosmer and Lemeshow test ($P = 0.424$) indicated that the model was still able to accurately predict the data. Key statistics can be found in Table 2.

Significant predictors of COVID-19 vaccination intention included gender ($P = 0.047$), vaccination status ($P < 0.001$) and fear of COVID-19 ($P < 0.001$). Higher levels of fear of COVID-19 were associated with a greater likelihood of vaccination intention, indicating that for each unit increase in fear, the odds of intending to vaccinate increased by ~45 %. Identifying as female, however, was associated with a decreased likelihood of vaccination intention, suggesting that females were ~ 77 % less likely to intend to vaccinate compared with males. Additionally, not having received any COVID-19 boosters was strongly associated with a decreased likelihood of vaccination intention with a ~ 97 % lower likelihood of intending to vaccinate compared with those who had received one or more boosters. Message framing ($P = 0.726$) and age did not emerge as significant predictors ($P = 0.642$).

3.5. Summary

The results indicated that while there was no significant interaction between message framing and fear of COVID-19, higher levels of fear of COVID-19 were associated with greater vaccination intention. Message framing, however, did not have a significant effect on vaccination intention. The binomial logistic regression analysis identified fear of COVID-19, gender and vaccination status as significant predictors of vaccination intention, with higher fear, male gender and receipt of one or more COVID-19 boosters linked to a higher likelihood of vaccination intention. By contrast, message framing and age were not significant predictors. Overall, these findings highlight the critical role of fear of COVID-19, gender and vaccination status in shaping vaccination intentions, while message framing was not a significant factor.

4. Discussion

The present study investigated the effects of message framing (individualistic vs. collectivistic) and fear of COVID-19 on individuals' intentions to receive the COVID-19 vaccine. The results revealed no significant interaction between message framing and levels of fear of COVID-19 on vaccination intention. Fear of COVID-19, vaccination status and gender were significant predictors of vaccination intention. Individuals with higher levels of fear of COVID-19, who had received at least one COVID-19 booster dose and identified as male exhibited higher vaccination intentions compared with those with lower levels of fear, in receipt of lower numbers of doses and identified as female. However, message framing did not emerge as a significant predictor. These findings highlight the importance of psychological and behavioural factors, such as fear and vaccination history [42–44], over specific messaging strategies in shaping vaccination intentions [21].

The absence of an interaction between message framing and fear of COVID-19 on vaccination intention invites further reflection. Prospect Theory [19] suggests that the effectiveness of message framing varies depending on whether the behaviour in question is perceived as preventive or risky. For instance, gain-framed messages, which emphasise the benefits of engaging in a health behaviour, are generally more effective in promoting preventive actions such as healthy eating [45]. Conversely, loss-framed messages which highlight the negative consequences of not acting are more effective in encouraging disease detection behaviours such as cancer screening [46]. While gain-framed messages may hold theoretical relevance for promoting vaccination, research on other vaccines, such as the HPV vaccine, has found that neither gain- nor loss-framed messaging consistently influences vaccination intentions [21]. This suggests that message framing, while effective in some contexts, may not always succeed as a determinant of vaccination intention. In the present study, the focus was on individualistic vs. collectivistic framing, rather than gain- or loss-framed messaging. Individualistic framing aligns with the cultural norms of countries such as the UK, where autonomy and personal responsibility are highly valued. However, research has also demonstrated that collectivistic framing, which appeals to group benefit and shared responsibility, can be effective even in individualistic cultures, especially when individuals are primed for collective thinking [47]. However, our findings suggest that neither individualistic nor collectivistic framing significantly influenced vaccination intention in the presence of stronger motivators, such as fear of COVID-19. This highlights the potential limitations of frame-based strategies, particularly when more compelling psychological or emotional drivers are at play. Exploring alternative approaches, such as gain vs. loss-framed messaging or appeals to moral responsibility, to identify the most effective strategies for influencing vaccination intentions remains an avenue worthy of future exploration.

The role of fear of COVID-19 as a key motivator for vaccination intentions was a significant finding of the present study. Participants who reported higher levels of fear of COVID-19 demonstrated stronger intentions to get vaccinated, corroborating the well-documented relationship between emotional responses to health threats and protective behaviours [16,17]. From the perspective of the Protection Motivation

Table 2
Binomial logistic regression predicting likelihood of vaccination intention based on age, sex, vaccination status, fear of COVID-19 and message framing.

	B	S.E.	Wald	df	Sig.	Exp(B)	95 % CI for Exp(B)	
							Lower	Upper
Age	−0.012	0.025	0.215	1	0.643	0.988	0.940	1.039
Gender	**−1.473**	**0.741**	**3.952**	**1**	**0.047***	**0.229**	**0.054**	**0.979**
Vaccination status	**−3.638**	**0.705**	**26.642**	**1**	**<0.001****	**0.026**	**0.007**	**0.105**
Fear of COVID-19	**0.370**	**0.101**	**13.427**	**1**	**<0.001****	**1.448**	**1.188**	**1.765**
Message framing	−0.221	0.632	0.123	1	0.726	0.802	0.232	2.765

B, unstandardised regression coefficient; S.E., standard error of the B coefficient; Wald, Wald statistic; df, degrees of freedom; Sig., significance level; Exp(B), odds ratio; 95 % CI for Exp(B), 95 % confidence interval for the odds ratio; COVID-19, coronavirus-19. *$P < 0.05$, **$P < 0.001$.

Theory [48], fear can act as a powerful motivator when combined with high response efficacy (belief in the effectiveness of the recommended action) and self-efficacy (confidence in the individual's ability to act). In this context, participants who feared contracting COVID-19 may have viewed vaccination as an effective and accessible means of mitigating this threat, transforming fear into a positive driver for health-protective behaviour. Notably, the low response cost of vaccination, characterised by ease of access and low risk of severe side effects, likely reinforced this relationship. The perceived accessibility and efficacy of the vaccine may have reduced barriers to action, making vaccination a more appealing option for those experiencing higher levels of fear. However, while fear can motivate protective behaviours, it is crucial to strike a balance in public health messaging. Excessive reliance on fear-based appeals risks fostering anxiety, mistrust, or vaccine hesitancy, particularly if concerns about safety and side effects are not adequately addressed [49].

Gender emerged as a significant predictor, with participants who identified as female demonstrating substantially lower vaccination intentions compared with those who identified as male. This finding aligns with prior research highlighting heightened vaccine hesitancy among females, often driven by misinformation and safety concerns [11,50]. Unfounded fears about the potential impact of COVID-19 vaccines on fertility and foetal health have been particularly influential, especially among females of reproductive age. In the present study, a substantial proportion of female participants were aged 18–44, making them particularly susceptible to these concerns. Additionally, females are more likely than males to experience vaccine side effects, which may reinforce safety fears and contribute to distrust [14]. While these side effects are real and may deter vaccination, it is important to acknowledge that the risk of severe disease for pregnant women and their unborn children is significantly greater. Public health campaigns should therefore emphasise the safety and protective benefits of vaccination for both maternal and foetal health, while providing clear, evidence-based information that addresses side effects in a transparent, supportive manner.

Vaccination history also played a pivotal role, with individuals who had received no boosters being significantly less likely to express vaccination intentions compared with those who had received one or more boosters. This finding aligns with research suggesting that past behaviour can influence future intentions, as individuals who have previously been vaccinated may be more likely to get vaccinated again [10,51]. Conversely, those hesitant to receive initial doses are more likely to resist subsequent boosters [43]. These findings highlight the potential benefits of building trust and fostering positive vaccination experiences early in the vaccine rollout process. Public health campaigns should focus on addressing the concerns of unvaccinated populations by providing transparent information about vaccine safety and efficacy while addressing mistrust in healthcare systems.

5. Future implications

While fear remains a potent motivator for vaccination, the public health landscape has evolved. In 2025, fear of COVID-19 may be less prominent than concerns about vaccine safety and side effects. Future research should explore the current emotional and psychological drivers of vaccine hesitancy, with particular attention to trust in vaccines and healthcare systems [9]. Public health campaigns should adapt to the shifting emotional climate by employing empowerment-based, transparent messaging that emphasises vaccine safety, accessibility and efficacy. Tailored strategies that address the specific concerns of hesitant populations, such as women of childbearing age and ethnic minorities, are essential for overcoming barriers to vaccination and sustaining high uptake rates. By focusing on building trust and addressing key psychological factors, future campaigns can effectively promote vaccination uptake and improve public health outcomes.

6. Limitations

The present study has certain limitations. Firstly, a large majority of the sample already intended to vaccinate. This high baseline level of vaccine intention may have resulted in a ceiling effect, reducing our ability to detect differences between message framing conditions. Therefore, the impact of message framing may be more pronounced in populations with greater vaccine hesitancy. Secondly, the sample predominantly consisted of White British participants, limiting the generalisability of the findings to other populations. Future research should aim to include a more diverse sample that encompasses underrepresented ethnicities, varying vaccination histories and different socioeconomic backgrounds to enhance the generalisability of the results. Thirdly, other important psychological factors that significantly influence vaccination behaviour, such as vaccine trust, were not addressed. Considering the findings of the present study, it is essential that future research explores vaccine trust and confidence, particularly among the more hesitant female population. Given that many vaccine-hesitant individuals distrust authorities, the message-framing passages may have failed to influence this cohort as it was communicated that the source of information was authorities such as the NHS, the World Health Organization and the UK government. Future research could present information from non-authority alternatives such as trusted community figures. Lastly, the study was conducted in 2022, and current perceptions of COVID-19 risk may have changed over time. Replicating this study in 2025 within the context of the shifting COVID-19 environment, public policy and current eligible cohorts would provide valuable insights into the way key factors influence vaccination intention have evolved. Moreover, future research should also explore a broader range of messaging types to better understand their impact on vaccination intention.

7. Conclusion

Understanding the key factors influencing COVID-19 vaccination intentions is essential for designing effective public health strategies. The current study identified fear of COVID-19, sex and vaccination history as significant predictors of vaccination intentions, with fear and prior vaccination experience serving as powerful motivators. However, message framing, individualistic or collectivistic, did not significantly impact vaccination intentions. As COVID-19 transitions to an endemic phase, fear of COVID-19 itself may diminish, but concerns about vaccine safety and side effects remain prevalent, particularly among women and unvaccinated populations. To address these evolving challenges, public health campaigns should focus on transparent, empowerment-driven communication that builds trust and addresses safety concerns. Future research should explore trust in vaccines and healthcare systems while developing strategies tailored to the needs of hesitant populations. By addressing these critical barriers, public health initiatives can sustain vaccination uptake, reduce disease severity and protect vulnerable populations against future COVID-19 variants.

CRediT authorship contribution statement

Sarah Chapman: Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing. **Michaela E. Christodoulaki:** Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Stephanie A. Davey:** Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Daniel Gaffiero:** Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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.

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Data availability

Data will be made available on request.

References

[1] World Health Organization. WHO COVID-19 dashboard [cited 2025 01/02/25]; Available from: https://data.who.int/dashboards/covid19/deaths; 2025.
[2] World Health Organization. Health topics: vaccines and immunisation [cited 2024 21/02/25]; Available from: https://www.who.int/health-topics/vaccines-and-immunization/; 2022.
[3] GOV.UK. Coronavirus (Covid-19) in the UK: vaccinations [cited 2025 21/02/25]; Available from: https://coronavirus.data.gov.uk/details/vaccinations?areaType=overview&areaName=United%20Kingdom; 2022.
[4] NHS England. NHS invites more than four million people for autumn booster as care homes set to get first jabs [cited 2025 21/02/25]; Available from: https://www.england.nhs.uk/2022/09/nhs-invites-more-than-four-million-people-for-autumn-booster-as-care-homes-set-to-get-first-jabs/; 2022.
[5] Neely SR, Scacco JM. Receptiveness of American adults to COVID-19 vaccine boosters: a survey analysis. PEC Innov 2022;1:100019.
[6] NHS England. *Flu and COVID-19 Seasonal Vaccination Programme: autumn/winter* 2024/25 [cited 2025 21/02/25]; Available from: https://www.england.nhs.uk/long-read/flu-and-covid-19-seasonal-vaccination-programme-autumn-winter-2024-25/; 2024.
[7] Schneider CR, Dryhurst S, Kerr J, Freeman AL, Recchia G, Spiegelhalter D, et al. COVID-19 risk perception: a longitudinal analysis of its predictors and associations with health protective behaviours in the United Kingdom. J Risk Res 2021;24(3–4):294–313.
[8] World Health Organization. *Ten threats to global health in* 2019 [cited 2025 21/02/25]; Available from: https://www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019; 2019.
[9] Davey, S.A. and D. Gaffiero, COVID-19 vaccination in children aged 5–11: a systematic review of parental barriers and facilitators in Western countries. Therap Adv Vacc Immunother, 2024. 12: p. 25151355241288115.
[10] Murphy J, Vallières F, Bentall RP, Shevlin M, McBride O, Hartman TK, et al. Psychological characteristics associated with COVID-19 vaccine hesitancy and resistance in Ireland and the United Kingdom. Nat Commun 2021;12(1):29.
[11] Ebrahimi OV, Hoffart A, Johnson SU. Physical distancing and mental health during the COVID-19 pandemic: factors associated with psychological symptoms and adherence to pandemic mitigation strategies. Clin Psychol Sci 2021;9(3):489–506.
[12] Pierri F, DeVerna MR, Yang K-C, Axelrod D, Bryden J, Menczer F. One year of COVID-19 vaccine misinformation on twitter: longitudinal study. J Med Internet Res 2023;25:e42227.
[13] Rzymski P, Pokorska-Śpiewak M, Jackowska T, Kuchar E, Nitsch-Osuch A, Pawłowska M, et al. Key considerations during the transition from the acute phase of the COVID-19 pandemic: a narrative review. Vaccines 2023;11(9):1502.
[14] Raw RK, Rees J, Kelly CA, Wroe C, Chadwick DR. Prior COVID-19 infection is associated with increased adverse events (AEs) after the first, but not the second, dose of the BNT162b2/Pfizer vaccine. Vaccine 2022;40(3):418–23.
[15] Mertens G, Lodder P, Smeets T, Duijndam S. Fear of COVID-19 predicts vaccination willingness 14 months later. J Anxiety Disord 2022;88:102574.
[16] Sekizawa Y, Hashimoto S, Denda K, Ochi S, So M. Association between COVID-19 vaccine hesitancy and generalized trust, depression, generalized anxiety, and fear of COVID-19. BMC Public Health 2022;22(1):126.
[17] Willis DE, Andersen JA, Bryant-Moore K, Selig JP, Long CR, Felix HC, et al. COVID-19 vaccine hesitancy: race/ethnicity, trust, and fear. Clin Transl Sci 2021;14(6):2200–7.
[18] Griffin B, Conner M, Norman P. Applying an extended protection motivation theory to predict Covid-19 vaccination intentions and uptake in 50–64 year olds in the UK. Soc Sci Med 2022;298:114819.
[19] Tversky A, Kahneman D. The framing of decisions and the psychology of choice. Science 1981;211(4481):453–8.
[20] Yang X, Xu Y, Guo Y, Li Y. An examination of the interplay of message framing and vaccine safety information sources on COVID-19 vaccination promotion. Curr Psychol 2024;43(19):17714–26.
[21] Luo C, He Y, Xu Y, Yang X, Wang H. How does loss-versus-gain message framing affect HPV vaccination intention? Mediating roles of discrete emotions and cognitive elaboration. Curr Psychol 2024;43(10):9443–56.
[22] Yuan S, Chu H. Vaccine for yourself, your community, or your country? Examining audiences' response to distance framing of COVID-19 vaccine messages. Patient Educ Couns 2022;105(2):284–9.
[23] Xiao WS. The role of collectivism–individualism in attitudes toward compliance and psychological responses during the COVID-19 pandemic. Front Psychol 2021;12:600826.
[24] Burkova VN, Butovskaya ML, Randall AK, Fedenok JN, Ahmadi K, Alghraibeh AM, et al. Factors associated with highest symptoms of anxiety during COVID-19: cross-cultural study of 23 countries. Front Psychol 2022;13:805586.
[25] Jiang L, Liu H, Jiang N. The effects of emotion, spokesperson type, and benefit appeals on persuasion in health advertisements: evidence from Macao. Behav Sci 2023;13(11):917.
[26] Huang F, Ding H, Liu Z, Wu P, Zhu M, Li A, et al. How fear and collectivism influence public's preventive intention towards COVID-19 infection: a study based on big data from the social media. BMC Public Health 2020;20(1):1707.
[27] Wang F, Zhang S, Lei L. Appealing to individual fears or social norms: how can the public be persuaded to accept COVID-19 vaccination through risk communication? Int J Environ Res Public Health 2022;19(21):13737.
[28] Liu J, Yang X, Lu Y, Zheng X. The joint effects of social norm appeals and fear appeals in COVID-19 vaccine campaign posters on self-perceived communication quality and vaccination intention. Front Psychol 2022;13:760146.
[29] Department of Health and Social Care. New hard-hitting national TV ad urges the nation to stay at home [cited 2025 21/02/25]; Available from: https://www.gov.uk/government/news/new-hard-hitting-national-tv-ad-urges-the-nation-to-stay-at-home; 2021.
[30] Heffner J, Vives M-L, FeldmanHall O. Emotional responses to prosocial messages increase willingness to self-isolate during the COVID-19 pandemic. Personal Individ Differ 2021;170:110420.
[31] Bacon AM, Krupić D, Caki N, Corr PJ. Emotional and behavioral responses to COVID-19. Eur Psychol 2022;26(4).
[32] Freeman D, Loe BS, Yu L-M, Freeman J, Chadwick A, Vaccari C, et al. Effects of different types of written vaccination information on COVID-19 vaccine hesitancy in the UK (OCEANS-III): a single-blind, parallel-group, randomised controlled trial. Lancet Public Health 2021;6(6):e416–27.
[33] Borah P. Message framing and COVID-19 vaccination intention: moderating roles of partisan media use and pre-attitudes about vaccination. Curr Psychol 2023;42(34):30686–95.
[34] Freeman D, Loe BS, Chadwick A, Vaccari C, Waite F, Rosebrock L, et al. COVID-19 vaccine hesitancy in the UK: the Oxford coronavirus explanations, attitudes, and narratives survey (Oceans) II. Psychol Med 2022;52(14):3127–41.
[35] Ahorsu DK, Lin C-Y, Imani V, Saffari M, Griffiths MD, Pakpour AH. The fear of COVID-19 scale: development and initial validation. Int J Mental Health Addict 2020:1–9.
[36] Lin CY, Hou WL, Mamun MA, Aparecido da Silva J, Broche-Pérez Y, Ullah I, et al. Fear of COVID-19 scale (FCV-19S) across countries: measurement invariance issues. Nurs Open 2021;8(4):1892–908.
[37] NHS. COVID-19 vaccine [cited 2025 21/02/25]; Available from: https://www.nhs.uk/vaccinations/COVID-19-vaccine/; 2022.
[38] GOV.UK. UK medicines regulator gives approval for first UK COVID-19 vaccine [cited 2025 21/02/25]; Available from: https://www.gov.uk/government/news/uk-medicines-regulator-gives-approval-for-first-uk-covid-19-vaccine; 2022.
[39] Betta S, Castellini G, Acampora M, Barello S. The effect of message framing on COVID-19 vaccination intentions among the younger age population groups: results from an experimental study in the Italian context. Vaccines 2022;10(4):559.
[40] Palm R, Bolsen T, Kingsland JT. The effect of frames on COVID-19 vaccine resistance. Front Polit Sci 2021;3:661257.
[41] Blanca MJ, Arnau J, García-Castro FJ, Alarcón R, Bono R. Datos no normales en el ANOVA de medidas repetidas: impacto en el error tipo I y potencia. Psicothema 2023;35(1):21–9.
[42] Soares P, Rocha JV, Moniz M, Gama A, Laires PA, Pedro AR, et al. Factors associated with COVID-19 vaccine hesitancy. Vaccines 2021;9(3):300.
[43] Paul E, Fancourt D. Factors influencing self-harm thoughts and behaviours over the first year of the COVID-19 pandemic in the UK: longitudinal analysis of 49 324 adults. Br J Psychiatry 2022;220(1):31–7.
[44] Davey SA, Hampson C, Christodoulaki ME, Gaffiero D. Investigating the predictors of COVID-19 vaccine decision-making among parents of children aged 5-11 in the UK. Vaccine 2024;42(22):126021.
[45] Binder A, Naderer B, Matthes J. The effects of gain-and loss-framed nutritional messages on children's healthy eating behaviour. Public Health Nutr 2020;23(10):1726–34.
[46] Ainiwaer A, Zhang S, Ainiwaer X, Ma F. Effects of message framing on cancer prevention and detection behaviors, intentions, and attitudes: systematic review and meta-analysis. J Med Internet Res 2021;23(9):e27634.
[47] Yu N, Shen F. Benefits for me or risks for others: a cross-culture investigation of the effects of message frames and cultural appeals. Health Commun 2013;28(2):133–45.
[48] Prentice-Dunn S, Rogers RW. Protection motivation theory and preventive health: beyond the health belief model. Health Educ Res 1986;1(3):153–61.
[49] Chou W-YS, Budenz A. Considering emotion in COVID-19 vaccine communication: addressing vaccine hesitancy and fostering vaccine confidence. Health Commun 2020;35(14):1718–22.
[50] Kassi LA, Lawson AK, Feinberg EC, Swanson A, Shah S, Pavone ME. Psychological distress, vaccine, and booster acceptance in women considering or undergoing fertility treatments during the omicron surge of the COVID-19 pandemic. J Assist Reprod Genet 2024:1–10.
[51] Lai X, Zhu H, Wang J, Huang Y, Jing R, Lyu Y, et al. Public perceptions and acceptance of COVID-19 booster vaccination in China: a cross-sectional study. Vaccines 2021;9(12):1461.