

Moral obligation, autonomous motivation and vaccine hesitancy: Highlighting moral obligation increases reactance in hesitant individuals

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Abstract

Vaccine hesitancy is widespread, and developing effective communication strategies that encourage hesitant individuals to choose vaccination is essential. This pre-registered research aimed to examine associations among moral obligation, autonomous motivation, vaccination intentions and reactance, and to test messages highlighting moral obligation and autonomy support. In Study 1, participants who had not received a Covid-19 vaccine ($N = 1036$) completed measures of autonomous motivation, moral obligation, reactance, intentions to vaccinate and vaccine hesitancy. Autonomous motivation and moral obligation emerged as strong independent predictors of lower reactance, lower hesitancy and greater vaccination intentions. In Study 2 ($N = 429$), the participants received a vaccination-promoting message that highlighted moral obligation versus personal protection and used autonomy supportive versus controlling language. Messages with autonomy-supportive language and highlighting personal protection elicited lower reactance and greater perceived legitimacy compared to messages with

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controlling language and highlighting moral obligation. All messages elicited greater reactance and lower perceived legitimacy compared to an information-only message, and there were no effects of message type on vaccination intentions or vaccine hesitancy. The research has implications for the design of communications encouraging vaccination in hesitant individuals and suggests caution should be taken when developing messages to encourage vaccination in hesitant individuals.

KEYWORDS

autonomy, health communication, message framing, public health, reactance, vaccine hesitancy

INTRODUCTION

Vaccine hesitancy refers to the spectrum of attitudes towards vaccination, ranging from vaccine refusal to vaccine acceptance (Larson et al., 2014). Individuals with high levels of vaccine hesitancy may delay, be reluctant towards but still accept, or refuse some or all vaccines. The ambivalence towards vaccines felt by vaccine hesitant individuals often reflects legitimate doubts and concerns about vaccines (Macdonald, 2015), and the attitudinal construct of vaccine hesitancy has been shown to be a strong predictor of behavioural vaccine refusal (Shapiro et al., 2018). In 2019, the World Health Organization identified vaccine hesitancy as one of the top 10 threats to global health (World Health Organisation, 2019) because of the number of preventable deaths that could be avoided if global coverage of vaccinations was improved. In the case of viral vaccines, high levels of vaccine uptake are needed to suppress the spread of a virus, increase herd immunity and reduce cases in the community (Leshem & Lopman, 2021). Without a large proportion of the population vaccinated, ongoing outbreaks are likely. People who are vulnerable, too young to receive a vaccine, unable to be vaccinated because of medical reasons, or immuno-compromised, are more likely to be infected, resulting in serious illness and death (Fontanet & Cauchemez, 2020).

The ethics of vaccine refusal and vaccine promotion are widely debated, and require consideration of morality, defined as ‘a system of rules to facilitate and coordinate group living’ (Janoff-Bulman & Carnes, 2013, p.219). Two relevant moral principles in the debate surrounding the encouragement of vaccination are moral obligation, defined as an obligation to minimise harm to other people and autonomy, described as the extent to which people have freedom to choose and have self-governance over their actions. Determining the combined and independent predictive effect of these two moral constructs on vaccine hesitancy and vaccination intentions could inform the development of more effective communication strategies, improving vaccine uptake and increasing both individual and collective protection.

Moral constructs and vaccination

Utilitarian and contractualist theories suggest that individuals have a moral obligation and collective responsibility to vaccinate to reduce the risk of harm to others, because of the benefits incurred to individuals and social groups from increased herd immunity (Giubilini et al., 2018). Utilitarianism suggests that where people can reduce the risk of harm to others (by incurring vaccination) they are obliged to do so, unless the individual cost of vaccination outweighs the expected negative contribution of non-vaccination to the well-being of others (Giubilini et al., 2018). Contractualism suggests that there is an unwritten social contract for the collective good of herd immunity which indicates that every person who receives protection from the vaccination of others owes a return for the benefit. Contractualist principles thus suggest that a prescription to vaccinate cannot be reasonably rejected, if rejecting it places greater burden on others' self-interest than on one's own self-interest, and if benefit to self from the collective good is received regardless of individual action (Scanlon, 2000). Although moral obligation concerns the obligation or sense of duty a person feels to conduct a behaviour, moral norms are construed as moral expectations and guidelines that have an influence on behaviour, based on normative ethical and moral principles. Social order and social justice motives (Janoff-Bulman & Carnes, 2013) may also influence decisions to vaccinate. Social order motives may influence vaccine acceptance as people believe that conformity to vaccination advice is necessary to protect wider social freedoms and health services. Social justice motives may influence vaccination intentions as people believe in a collective responsibility to protect vulnerable others from the health implications of a virus. In the current research, moral obligation, moral norms, social justice and social order beliefs are considered as predictors of vaccination outcomes.

Some scholars argue that the principle of individual liberty and autonomy has normative priority over moral obligation. This perspective suggests that people should not feel morally obliged to receive a vaccination regardless of the potential risks to the group (e.g. Kowalik, 2021), and that any violation of autonomy is unethical. Self-Determination Theory (SDT, Deci & Ryan, 2000) suggests that autonomy (the experience of acting in a manner that is congruent with one's self interests, values, beliefs and free from coercion) is one of three basic psychological needs, in addition to competence (having the means and abilities to achieve one's goals) and relatedness (feeling connected to others and belonging to a community). Autonomous motivation (being motivated to act because the person wants to and believes a behaviour is in line with their interests and values) is the motivation to act in accordance with autonomy. Autonomy is therefore satisfied when a person engages in autonomously motivated action. The motivation to retain autonomy is not in conflict with motivation to protect a collective good, and satisfying needs for autonomy and relatedness are congruent when a person acts authentically to protect the well-being of others. In the context of viral vaccination, satisfying needs for autonomy and relatedness could occur for both those who choose to vaccinate (e.g. people who autonomously decide to minimise harm to others by reducing the risk of virus transmission) and those who refuse vaccination (e.g. people who autonomously decide to minimise harm to others by avoiding the small but potential risk of adverse effects from vaccination, particularly relevant, for example, if the individual has caring responsibilities). Empirical research has successfully operationalised moral principles in a range of contexts and using a range of methodologies (Ellemers et al., 2019). One methodological approach posits morally relevant cognitions as social-cognitive variables that influence behaviour. Using this approach, moral norms have been shown to explain variance in HPV, (Juraskova et al., 2012), influenza (Godin et al., 2010) and Covid-19 vaccination intentions (Drażkowski & Trepanowski, 2021;

Matute et al., 2021). Moral cognitions have been associated with Covid-19 vaccine hesitancy (Schmidtke et al., 2022), and autonomous motivation has been found to be predictive of flu vaccination advocacy and uptake (Vallée-Tourangeau et al., 2018) as well as Covid-19 vaccination (Schmitz et al., 2022).

Promoting vaccination and the role of reactance

Previous research suggests that emphasising utilitarian and contractualist principles for vaccination could be an effective method for promoting vaccination (Korn et al., 2020) and that interventions which aim to increase understanding of herd immunity can be successful in increasing vaccination intentions (Hakim et al., 2019; Pfattheicher et al., 2022). Research has found that messaging which presents mass vaccination as a collective action problem evokes social image and reputation concerns from non-compliance and is effective at increasing vaccination intentions (James et al., 2021). These findings suggest that highlighting a moral obligation to be vaccinated may be effective in motivating vaccination intentions.

However, messages highlighting moral obligation to vaccinate may be ineffective if they are perceived as threatening or restricting freedom of choice and autonomy. This could elicit reactance, a motivational state in response to perceived threats to freedom, which can lead to belief or behaviour change designed to restore the threatened freedom (Brehm & Brehm, 1981). Reactance can result in a person responding to a persuasive attempt in the opposite way to that intended, inducing 'backfire effects' of the communication and reducing compliance (Ratcliff, 2021). Conversely, priming autonomy has been shown to increase compliance with persuasive messages (Pavey & Sparks, 2012), and interventions targeting autonomous motivation have been found to be effective in encouraging health behaviour change (Sheeran et al., 2021). Autonomy-supportive communications have been found to be effective for health-care workers who are hesitant to vaccinate against the flu (Moon et al., 2021b).

Greater reactance has been associated with lower perceived legitimacy of a persuasive attempt, with perceived legitimacy defined as the extent to which a person perceives a recommendation as fair, reasonable and appropriate (Pavey et al., 2022, 2023). Perceived threats to autonomy can result in reactance, resulting in lower compliance and willingness to vaccinate (Soveri et al., 2020). Injunctions which elicit feelings of moral obligation can increase reactance (Pavey et al., 2018, 2022), and perceived moral reproach predicted greater vaccine hesitancy (Rosenfeld & Tomiyama, 2022). Communicating a moral obligation may therefore hinder attempts to encourage vaccination intentions if autonomy is perceived to be undermined.

Research objectives

The Covid-19 pandemic, as confirmed by the World Health Organisation in March 2020, presented the most serious public health emergency of recent times, with over 770 million global cases and almost 7 million deaths recorded to date (World Health Organisation, 2023). One of the key solutions to the pandemic was the development of effective vaccines that offered individuals' protection against infection and reduced the likelihood of the Covid-19 virus causing serious illness and death. However, vaccine hesitancy and vaccine refusal are widespread for Covid-19 vaccines (Machingaidze & Wiysonge, 2021).

Although autonomous motivation has been found to be predictive of vaccination intentions, it has not been examined in conjunction with moral obligation, moral norms, social order and social justice. A more nuanced understanding of which of these moral constructs best independently predict Covid-19 vaccine hesitancy and vaccination intentions is lacking. By elucidating the relative predictive contribution of these constructs to vaccine hesitancy and vaccination intentions, researchers and practitioners will have a better understanding of which constructs could be usefully targeted either separately or in conjunction, within effective communications about Covid-19 vaccination. This novel approach will therefore lead to a deeper understanding of underlying resistance, better preparedness for future public health challenges, and could support governments, health organizations and communities to respond effectively and rapidly with strategies that are cognizant of deeply held moral beliefs and values.

The current research therefore had two broad aims: (i) to identify the extent to which moral constructs (i.e. moral obligation, moral norms, social order, social justice, autonomy and autonomous motivation to receive the Covid-19 vaccination) independently predict vaccination outcomes (i.e. vaccine hesitancy, reactance, perceived legitimacy and intentions to vaccinate), and (ii) to test messages about Covid-19 vaccination which highlight moral obligation (vs. personal protection) and are presented using autonomy-supportive (vs. controlling) language to determine their impact on vaccination outcomes. Two studies addressed these aims.

STUDY 1

Study 1 examined associations between moral constructs and vaccination outcomes. We hypothesised that higher moral norms, social order beliefs, social justice beliefs and moral obligations would be associated with lower vaccine hesitancy, higher perceived legitimacy of vaccination recommendations, lower reactance towards vaccination recommendations and greater intentions to vaccinate. We also hypothesised that higher autonomy, competence, relatedness, and greater autonomous motivation would be associated with lower vaccine hesitancy, higher legitimacy perceptions, lower reactance and greater intentions to vaccinate. Further to this, given previous research examining the importance of legitimacy perceptions for predicting reactance and intentions to comply, we hypothesised that higher legitimacy perceptions would be associated with lower vaccine hesitancy, lower reactance, and greater intentions to vaccinate. Given research showing the effect of reactance towards recommendations on intentions to comply, we hypothesised that higher reactance would be associated with lower intentions to vaccinate.

Study 1 method

We pre-registered this study at <https://osf.io/4a7yc>. Open data, materials and code can be found at <https://osf.io/5wmyc/>. A favourable ethical opinion from the Kingston University Research Ethics committee was received prior to data collection (application #2838).

Participants

The participants ($N = 1301$) were recruited via Prolific Academic and completed a 20-min online questionnaire about their thoughts and feelings about Covid-19 vaccination in July 2020,

one month after the Covid-19 vaccine was made available to all adults in the UK over the age of 18. At this time, registered UK deaths from Covid-19 had fallen because of earlier lockdown policies, restrictions had eased, and most businesses and schools had reopened. Full informed consent was obtained, and the participants were paid £2.50 for their participation. We restricted the participants to those located in the UK and who had not received any Covid-19 vaccine based on their Prolific profile information. However, when we asked a question to confirm vaccination status, 22.7% ($n = 295$) stated that they had been offered the vaccine but did not want to be vaccinated, 26.1% ($n = 339$) stated that they had been offered the vaccine but were undecided about whether they want to be vaccinated, 31.7% ($n = 412$) stated that they had not yet had the opportunity to be vaccinated, 19.1% ($n = 248$) noted that they had received one dose of the vaccine, and 0.5% ($n = 7$) of the participants stated that they had received two doses of the vaccine. In line with our pre-registered exclusion criteria, we excluded the 255 participants who had received at least one vaccine dose from our analyses. An additional 10 participants were excluded for quick responses (completed in less than 5 min), leaving a final sample size of 1036 participants (age 18–70; $M_{\text{age}} = 29.19$, $SD_{\text{age}} = 9.76$, 61.8% female, 36.3% male, 1.6% non-binary, 0.3% undisclosed). The majority of the sample identified as White (73.7%), followed by 10.8% Asian, 7.7% Black, 5.9% mixed ethnicities, and 1.6% Other.

Materials and procedure

The participants completed scales in the order presented below. Items from each scale were rated on a 7-point Likert scale (*strongly disagree* to *strongly agree*). The internal consistency of each scale was assessed to determine if the scale items were related in the present sample. All scales showed good internal reliability (all $\alpha > .75$), and we computed the mean scores for each variable.

Moral constructs

Social order and social justice beliefs were measured using two 5-item subscales of the Model of Moral Motives Scale (Janoff-Bulman & Carnes, 2013) (e.g. ‘Giving people the freedom to choose the way they live threatens the societal bonds that hold us together’); social order, $\alpha = 0.71$; and social justice, $\alpha = 0.80$. Moral obligation was measured using 11 items, with 7-items adapted from the scale constructed by Vilas and Sabucedo (2012) (e.g. ‘I feel an obligation to other people to get the Covid-19 vaccine’) and four additional items constructed by the authors, $\alpha = 0.98$. Three items assessed moral norms (Ajzen, 2012; Ravis et al., 2009) (e.g. ‘It is morally right to have the Covid-19 vaccine when next invited’), $\alpha = 0.96$. SDT basic needs satisfaction was assessed with nine items (La Guardia et al., 2000) (e.g. ‘I feel I have a sense of choice and freedom in my decision to get the Covid-19 vaccine’) assessing perceived autonomy, $\alpha = 0.78$, relatedness, $\alpha = 0.76$, and competence, $\alpha = 0.93$, in the choice to obtain the Covid-19 vaccine. Six items adapted from the Treatment Self-Regulation Questionnaire for flu vaccination (Moon et al., 2021a) assessed participants’ autonomous motivation to obtain the Covid-19 vaccine (e.g. ‘Having the Covid-19 vaccination is a choice I really want to make.’), $\alpha = 0.96$.

Vaccination outcomes

Perceived legitimacy of recommendations to get the Covid-19 vaccine was assessed using nine items (e.g. ‘It is legitimate for a doctor to recommend to me that I should have the Covid-19 vaccine’), adapted from the legitimacy scale used by Pavey et al. (2022, 2023), $\alpha = 0.96$. Eleven items assessed reactance towards recommendations to get the Covid-19 vaccine (e.g. ‘I feel like

resisting the attempts of other people to influence me to get the Covid-19 vaccine') adapted from the Hong and Faedda (1996) Trait Reactance Scale, $\alpha = 0.97$. The participants completed 10 items (e.g. 'I am concerned about serious adverse effects of the Covid-19 vaccine') adapted from the vaccine hesitancy scale (Shapiro et al., 2018) to measure Covid-19 vaccination hesitancy, $\alpha = 0.95$. Vaccination intentions were assessed with four questions adapted from the Theory of Planned Behaviour Questionnaire (Ajzen, 2012) (e.g. 'I intend to have the Covid-19 vaccine in the next 6 months'), $\alpha = 0.99$.

Additional scales excluded from analysis

Several additional scales were included in the questionnaire that were not included in our pre-registered hypotheses and not used in the analysis presented here (see supplementary information for details).

Study 1 data analysis strategy

Descriptive statistics for predictor and outcome variables were examined to understand the central tendencies and variabilities in our dataset. We explored the relationships between these variables by conducting correlation analysis to examine the strength and direction of their relationships. We estimated the extent to which each moral cognition independently predicted each outcome variable by conducting pre-registered linear regression analyses. In additional analyses, we explored whether the relationships between moral obligation and autonomous motivation on each outcome variable varied as a function of age and gender by conducting pre-registered moderated regression analyses.

Study 1 results

Descriptive statistics and bivariate correlations between measured variables

Means, standard deviations and correlation coefficients between measured variables are shown in Table 1. Greater moral norms, social order beliefs, social justice beliefs and moral obligation were associated with greater perceived legitimacy of recommendations, lower reactance towards vaccination recommendations, greater vaccination intentions and lower vaccine hesitancy. Higher autonomous motivation, autonomy and relatedness were associated with lower reactance, lower hesitancy, higher perceived legitimacy of recommendations, and greater vaccination intentions. Higher competence was related to lower hesitancy and reactance but was not associated with perceived legitimacy or intentions. Out of all moral constructs measured, moral obligation and autonomous motivation were most highly associated with vaccination outcomes. Higher legitimacy perceptions were associated with lower vaccine hesitancy, lower reactance and greater intentions to vaccinate, and higher reactance was associated with lower intentions to vaccinate.

Predicting vaccination outcomes

Results of the regression models are shown in Table 2. Autonomous motivation and moral obligation were the only two variables to consistently and independently predict each of the

TABLE 1 Study 1 means, standard deviations, and Pearson's correlation coefficients.

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Moral obligation	4.03	1.93											
2. Social justice	4.78	1.10	.46**										
3. Social order	2.98	1.07	.22**	.23**									
4. Moral norm	4.32	1.95	.93**	.46**	.23**								
5. Autonomy	4.86	1.36	.24**	.16**	.06	.26**							
6. Competence	5.91	1.14	.01	.03	-.16**	.01	.43**						
7. Relatedness	4.60	1.39	.60**	.34**	.16**	.58**	.47**	.28**					
8. Autonomous motivation	4.18	1.93	.92**	.43**	.22**	.90**	.31**	.07*	.63**				
9. Hesitancy	3.94	1.57	-.89**	-.44**	-.19**	-.89**	-.31**	-.07*	-.61**	-.92**			
10. Reactance	3.68	1.73	-.75**	-.35**	-.07*	-.72**	-.29**	-.13**	-.55*	-.75**	.78**		
11. Legitimacy	4.36	1.67	.79**	.38**	.19**	.79**	.27**	.04	.54**	.80**	-.82**	-.72**	
12. Intentions	4.33	2.30	.90**	.39**	.19**	.87**	.20**	.01	.58**	.90**	-.88**	-.72**	.75**

Note. M and SD are used to represent mean and standard deviation, respectively.
* $p < .05$ and ** $p < .01$.

TABLE 2 Study 1 linear regression analyses predicting reactance, hesitancy, and vaccination intentions, with standardised Beta coefficients.

Model summary Coefficients	Reactance $F(9, 1026) = 195.47$, $p < .001$			Hesitancy $F(12, 1027) = 656.6$, $p < .001$			Vaccination intentions $F(9, 1018) = 515.02$, $p < .001$		
	β	t	p	β	t	p	β	t	p
Autonomy	-0.02	-0.69	.486	-0.01	-1.06	.291	-0.07	-4.75	<.001
Competence	-0.06	-2.62	.008	-0.01	-0.92	.359	-0.01	-0.32	.750
Relatedness	-0.06	-2.22	.030	-0.02	-1.19	.236	0.05	2.72	.007
Autonomous motivation	-0.25	-4.67	<.001	-0.53	-16.66	<.001	0.43	11.83	<.001
Moral obligation	-0.26	-3.89	<.001	-0.12	-3.29	.001	0.45	10.89	<.001
Social justice	0.00	0.00	.992	-0.02	-1.84	.067	-0.04	-2.99	.003
Social order	0.10	4.84	<.001	0.03	2.30	.022	-0.01	-1.09	.276
Moral norm	-0.02	-0.43	.670	-0.14	-4.40	<.001	0.06	1.65	.098
Legitimacy	-0.27	-8.20	<.001	-0.18	-9.39	<.001	0.02	0.99	.324

Note: Significant predictors are highlighted in bold to facilitate comparisons across models.

outcome variables. Autonomous motivation and moral obligation were both negatively associated with hesitancy and reactance and positively associated with vaccination intentions. Competence, relatedness, and perceived legitimacy negatively predicted, and social order beliefs positively predicted, reactance; social order beliefs, moral norms, and perceived legitimacy negatively predicted hesitancy; autonomy and social justice beliefs negatively predicted intentions to vaccinate. Assessments of collinearity indicated that collinearity was acceptable, with only one variable having a high variance inflation factor (i.e. moral obligation; $VIF = 11.16$). Analyses excluding moral obligation produced similar patterns of results.

Moderation by demographic factors

There was a significant interaction between autonomous motivation and age on reactance, $F(1, 1032) = 4.37$, $p = .037$. Younger participants (-1 SD from the mean) showed a stronger relationship between autonomous motivation and reactance, $\beta = -.71$, $t = -25.97$, $p < .001$, compared to older participants ($+1$ SD from the mean), $\beta = -.62$, $t = -20.66$, $p < .001$. The interaction terms for autonomous motivation and age on vaccine hesitancy and intentions, and for moral obligation and age on reactance, hesitancy, and intentions, did not reach the threshold for significance (all $ps > .100$; full analysis can be found in the supporting information tables).

We examined moderation by gender after removing the participants who were identified as non-binary or did not respond to the gender identity question. Interaction terms for autonomous motivation and gender on reactance, vaccine hesitancy or vaccination intentions, and for moral obligation and gender on reactance, vaccine hesitancy, or vaccination intentions did not reach the threshold for significance (all $ps > .100$; full analyses can be found in the supporting information tables).

Study 1 discussion

In Study 1, we examined the extent to which moral obligation, moral norms, social order beliefs, social justice beliefs, basic need satisfaction, and autonomous motivation were associated with vaccine hesitancy, reactance, and intentions to vaccinate. The results supported all pre-registered hypotheses and, as expected, found moral constructs to be associated with vaccination intentions in those not yet vaccinated against Covid-19. Of the variables examined, moral obligation and autonomous motivation showed the strongest associations with the outcome variables and independently predicted vaccine hesitancy, reactance, and intentions to vaccinate. Other cognitions such as social order beliefs, social justice beliefs, moral norms, and satisfaction of the basic psychological needs of autonomy, competence and relatedness showed small or inconsistent independent predictive effects on the outcome variables. These findings support research showing that moral cognitions are associated with Covid-19 vaccine hesitancy (e.g. Drażkowski & Trepanowski, 2021, Matute et al., 2021, Schmidtke et al., 2022) but go beyond prior research findings by delineating the moral construct that best independently predicts Covid-19 vaccine hesitancy and vaccination intentions. The results suggest that encouraging autonomous motivation and highlighting moral obligation simultaneously within communication which recommends Covid-19 vaccination may therefore be one way to reduce reactance and hesitancy and to increase intentions to vaccinate. This is tested in Study 2.

STUDY 2

In Study 2, we aimed to examine the impact of highlighting autonomous motivation and moral obligation within messages encouraging vaccination. A challenge remains to develop research-informed communication strategies that highlight the importance of vaccination for individual risk reduction or collective benefit and encourage vaccination uptake without infringing on personal autonomy and liberty. One way to do this could be to highlight both moral obligation and autonomy simultaneously. Although previous research has indicated a positive effect of separately highlighting autonomy or a social contract, highlighting both at the same time may mitigate any reactance felt towards the moral message. Autonomy support may be particularly important for reducing reactance when the information highlights moral obligation to vaccinate, and for vaccine hesitant individuals.

We hypothesised that messages using autonomy-supportive language would elicit lower reactance, greater autonomous motivation and greater intentions to vaccinate than messages using controlling language. We also hypothesised that the differences between autonomy-supportive and controlling language messages on intentions, reactance, and motivation would be particularly pronounced when the message suggested that people are morally obligated to vaccinate, and that the participants who read the autonomy-supportive message targeting moral obligation would report higher intentions to vaccinate compared to the information-only control group.

Study 2 method

Study pre-registration can be found at <https://osf.io/34zn8> and open materials (i.e. data, survey, code) can be found at <https://osf.io/7pe29/>. A favourable ethical opinion from the Kingston University Research Ethics committee was received prior to data collection (application #2868).

Participants

A-priori power analysis using GPower was conducted and determined that a sample size of $N = 436$ would detect a minimum effect size of $f = 0.20$ using the standard criteria of $\alpha = 0.05$ with 95% power. Our target was to recruit 500 participants to allow contingency for exclusions and non-completions. In total, 502 participants were recruited via Prolific Academic to complete a 20-min study about their views on Covid-19 vaccination in August 2020. At this point in the pandemic, Covid-19 infection rates were low, and businesses had reopened. The participants were paid £1.88 for their participation. Only participants located in the UK and had not received any Covid-19 vaccine were eligible to participate. Full informed consent was obtained prior to participation in the study.

We excluded seven participants for completing the survey in less than 5 min and 66 participants who noted that they had received one or more doses of the vaccine, leaving a final sample size of 429 (age 18–79; $M_{\text{age}} = 29.65$, $SD_{\text{age}} = 10.34$, 68.1% female, 30.5% male, 1.4% non-binary/prefer not to say). Exclusions were independent of experimental group, $\chi^2 = 8.57$, $p = .072$. The majority of the samples were identified as White (76.0%), followed by 10.3% Black, 8.6% Asian, 3.5% mixed ethnicities, and 1.6% Other. Most of the participants had been offered the vaccine but did not want to be vaccinated (42.4%, $n = 182$), whereas 28% ($n = 120$) had been offered the vaccine but were undecided about whether to be vaccinated and 27.6% ($n = 118$) had not had the opportunity to be vaccinated. Some participants indicated that they had been advised not to have the vaccination because of a medical reason (1.9%, $n = 8$).

Materials and procedure

Each component is described in the order presented to participants in the online questionnaire. For each scale, internal scale reliabilities for the sample were examined, and the mean of scale items was calculated. Questions were rated on a 7-point Likert scale (*strongly disagree* to *strongly agree*). All scales showed excellent internal reliability for our sample (all $\alpha > 0.93$).

Message type

The participants were randomly assigned using the randomisation feature in Qualtrics software to view one of the five messages encouraging vaccination. Four of the messages were adapted to use either autonomy-supportive or controlling language that highlighted either the benefit of the vaccination for personal protection or for the protection of others (suggesting a moral obligation). The fifth message was neutral regarding autonomy-supportive language and moral obligation; this was used as a comparison condition.

Manipulation checks

The participants reported their agreement with statements about how the Covid-19 vaccine message they have just read (1) reflected a personal choice, (2) supported their freedom to make their own decision, (3) put pressure on for vaccination, (4) tried to persuade them to receive the vaccine, (5) suggested that the vaccine would offer personal protection, (6) suggested that the vaccine would protect others', (7) suggested that there is a moral obligation to receive the vaccine, and (8) that the message reflected an obligation to themselves to receive the vaccine.

Vaccination outcomes

The participants completed the same items to measure each construct as reported in Study 1. We used three items ($\alpha = 0.96$) to assess the perceived legitimacy of the Covid-19 vaccine messages, 11 items ($\alpha = 0.96$) to assess reactance to the messages, four items ($\alpha = 0.99$) to assess participants' intentions to receive the Covid-19 vaccination over the next 6 months, 11 items ($\alpha = 0.97$) to assess moral obligation, and six items ($\alpha = 0.95$) to measure participants' autonomous motivation to obtain the COVID-19 vaccine. The participants completed 10 items ($\alpha = 0.94$) to measure Covid-19 vaccine hesitancy (Shapiro et al., 2018).

Additional scales excluded from analysis

Several additional scales were included in the questionnaire that were not included in our analysis (see supplementary information 2 for details).

Study 2 data analysis strategy

To examine the central tendencies and variabilities in our dataset, we analysed descriptive statistics for our dependent variables, and conducted bivariate correlation analyses to examine the strength and direction of their relationships. We conducted *t*-test analyses and a one-way analysis of variance (ANOVA) to check the validity of our manipulations on participants' perceptions of the messages. We examined the effect of message type on vaccination outcomes by conducting a one-way ANOVA with planned contrasts to identify which of the five messages (autonomy-supportive and personal protection, autonomy supportive and moral obligation, controlling language and personal protection, controlling language and moral obligation, or neutral) elicited lower reactance, greater autonomous motivation to vaccinate, and greater vaccination intentions. Two-way additional ANOVAs excluding the information-only neutral message condition were conducted to test our hypotheses that the effect of moral obligation or personal protection messages would vary as a function of the language used (autonomy-supportive vs. controlling language). Finally, we tested the impact of the autonomy-supportive message targeting moral obligation on vaccination intentions using a one-way ANOVA with planned contrast, and we explored the impact of message type on moral obligation, vaccine hesitancy, and perceived legitimacy.

Study 2 results

Means and standard deviations of the measured variables and correlation coefficients between measured variables are shown in Table 3. Means and standard deviations of each variable in each message condition are shown in Table 4.

Manipulation checks

The participants who read an autonomy-supportive message felt that the message reflected a personal choice, $t(344) = 13.95$, $p < .001$, and supported their freedom to make their own decision, $t(343) = 12.62$, $p < .001$, more so than the participants who read a controlling language message. The participants who read a controlling language message felt that the message tried

TABLE 3 Study 2 overall means, standard deviations and Pearson's correlation coefficients.

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5
1. Moral obligation	3.47	1.86					
2. Autonomous motivation	3.70	1.91	.90**				
3. Hesitancy	3.36	1.91	-.88**	-.91**			
4. Reactance	3.90	1.64	-.59*	-.60**	.63**		
5. Legitimacy	3.96	1.78	.53**	.54**	-.55**	-.74**	
6. Intentions	3.71	2.33	.89**	.86**	-.83**	-.56**	.50**

Note. *M* and *SD* are used to represent mean and standard deviation, respectively.

* $p < .05$ and ** $p < .001$.

TABLE 4 Study 2 means and standard deviations of each variable in each message condition.

	Autonomy supportive, moral obligation		Autonomy supportive, personal protection		Controlling language, moral obligation		Controlling language, personal protection		Information-only control	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Reactance	3.92	1.61	3.42	1.57	4.59	1.54	4.35	1.54	3.15	1.51
Autonomous motivation	3.46	1.84	3.55	1.92	3.58	1.92	3.97	1.93	3.97	1.93
Vaccination intentions	3.42	2.31	3.60	2.20	3.42	2.31	3.71	2.52	4.14	2.28
Moral obligation	3.16	1.82	3.28	1.87	3.38	1.89	3.82	1.84	3.64	1.83
Legitimacy	4.08	1.64	4.84	1.48	2.91	1.77	3.11	1.56	4.97	1.37
Vaccine hesitancy	3.45	1.57	3.53	1.53	3.53	1.53	3.81	1.60	3.88	1.50

to persuade them to receive the vaccine, $t(344) = -2.83$, $p = .003$, and put pressure on them to accept vaccination, $t(343) = -6.36$, $p < .001$, more so than participants who read an autonomy-supportive message. The participants who read a personal protection message perceived that the message suggested that the vaccine would offer personal protection, $t(344) = -10.25$, $p < .001$, and that the message reflected an obligation to themselves to receive the vaccine, $t(344) = -6.67$, $p < .001$, more so than the participants who read a moral obligation message. The participants who read a moral obligation message perceived the message to suggest that the vaccine would protect other people, $t(343) = 14.32$, $p < .001$, and that they have a moral obligation to receive the vaccine, $t(343) = 9.58$, $p < .001$, more so than the participants who read a personal protection message.

Message effects

There was a significant effect of message type on reactance, $F(4,424) = 12.89$, $p < .001$. Planned contrasts showed that the autonomy-supportive messages elicited lower reactance compared to controlling language messages, $t(424) = -4.78$, $p < .001$, and that personal protection messages

elicited lower reactance compared to moral obligation messages, $t(424) = 2.21$, $p = .027$. However, there was greater reactance to all four messages compared to the information-only control, $t(424) = 4.76$, $p < .001$. There was no effect of message type on autonomous motivation, $F(4,424) = 1.42$, $p = .227$, and no effect of message type on vaccination intentions, $F(4,424) = 1.58$, $p = .178$.

Two-way ANOVAs excluding the information-only neutral message condition showed no interaction between the autonomy-supportive versus controlling language messages and between the moral obligation versus personal protection messages for reactance, $F(1,342) = 0.57$, $p = .449$, autonomous motivation, $F(1,342) = 0.52$, $p = .471$, or intentions, $F(1,341) = 1.18$, $p = .278$, indicating that the effect of moral obligation or personal protection messages did not vary as a result of whether autonomy-supportive versus controlling language was used. A planned contrast showed no difference between the autonomy-supportive, moral obligation message and information-only message for vaccination intentions, $t(423) = -1.58$, $p = .116$.

One-way ANOVA showed a significant effect of message type on perceived legitimacy, $F(4,424) = 30.88$, $p < .001$. Autonomy-supportive messages were perceived as more legitimate than controlling language messages, $t(424) = 8.56$, $p < .001$, and personal protection messages were perceived as more legitimate than moral obligation messages, $t(423) = -2.81$, $p = .005$. However, all messages were perceived as less legitimate than the information-only control, $t(494) = -6.21$, $p < .001$. There was no effect of message type on moral obligation, $F(4,424) = 1.80$, $p = .129$, or on vaccine hesitancy, $F(1,424) = 1.33$, $p = .256$.

Study 2 discussion

In Study 2, we examined the effect of manipulating the key predictor variables of moral obligation and autonomous motivation within messages encouraging vaccination on a range of outcome measures. The language and content of the messages had a significant effect on reactance and on perceived legitimacy. Autonomy-supportive messages (compared to controlling language messages) and personal protection messages (compared to moral obligation messages) elicited lower reactance and were perceived as more legitimate. However, all four messages elicited greater reactance and were perceived as less legitimate when compared to the information-only control group. There were no effects of the messages on autonomous motivation, moral obligation, vaccination intentions or vaccine hesitancy. The results of Study 2 therefore suggest that although it may be advantageous to consider using autonomy-supportive language within health communications, for vaccine hesitant participants, reactance may be inherently evoked by messages that have perceived persuasive content compared to information-only communications, even when they use autonomy-supportive language. In addition, although moral obligation was identified in Study 1 as a strong predictor of lower reactance, highlighting moral obligation in a message led to greater reactance in Study 2 compared to both personal protection messages and an information-only control, even when paired with autonomy supportive language, and had no effect on intentions or vaccine hesitancy. Caution should therefore be taken when considering using messages to encourage vaccination among vaccine hesitant individuals, particularly when messages highlight moral obligation or use controlling language, as this type of communication can lead to detrimental outcomes.

GENERAL DISCUSSION

Encouraging vaccination has both collective and individual benefits, such that successfully increasing uptake of vaccination provides a community with herd immunity and individuals with personal protection against illness. However, promoting vaccination also has potential costs (e.g. a loss of decision-making autonomy and subsequent feelings of reactance towards the request to vaccinate). The two moral principles of reducing harm to others and respecting individual autonomy underpin prominent arguments for and against promoting vaccination (e.g. Giubilini et al., 2018; Kowalik, 2021). These competing principles of autonomy and moral obligation have not previously been empirically and concurrently studied using psychological measures, and the two studies presented are the first to simultaneously consider the role of these variables in predicting and encouraging vaccination intentions.

In our cross-sectional study (Study 1), with a large sample of people who had not yet received a Covid-19 vaccine, measures of moral constructs were used to predict people's vaccine hesitancy, intentions to vaccinate, reactance towards vaccine recommendations, and the perceived legitimacy of vaccine recommendations. Autonomous motivation and moral obligation both emerged as strong independent predictors of vaccine hesitancy, vaccine intentions, reactance towards recommendations, and perceived legitimacy of vaccine recommendations. Thus, when people were motivated to vaccinate because they wanted to and because it fitted with their interests and values, and when they perceived a moral duty to others to vaccinate, they were more likely to perceive a request to vaccinate as legitimate, to intend to receive the vaccination, to display less reactance towards the recommendation and report lower vaccine hesitancy, compared to those with lower autonomous motivation and moral obligation. This provides insight into the correlates of vaccine hesitancy and suggests that considerations of moral obligation and autonomous motivation are both independently relevant to people's decision-making concerning vaccination. The results support previous research which found associations between autonomous motivation and vaccination uptake (Schmitz et al., 2022; Vallée-Tourangeau et al., 2018) and research showing associations between moral obligation and vaccine hesitancy (e.g. Drażkowski & Trepanowski, 2021; Matute et al., 2021), but go beyond these findings by showing that both constructs of autonomous motivation and moral obligation have independent predictive value in vaccine hesitant individuals.

In our experimental study (Study 2), we examined whether manipulating autonomy and moral obligation as key independent predictors of vaccine hesitancy would be effective in reducing hesitancy and reactance, and in increasing perceived legitimacy and vaccination intentions, relative to control conditions. There were significant effects of the type of message presented on participants' reactance and on the perceived legitimacy of the message. Autonomy-supportive messages elicited lower reactance and were perceived as more legitimate compared to controlling-language messages. This supports previous research which found beneficial effects of autonomy-supportive versus controlling language in messages on flu vaccination intentions (Moon et al., 2021b). However, we found no differences in the language used in the message on vaccination intentions or vaccine hesitancy. Messages highlighting moral obligation elicited greater reactance than those highlighting personal protection, supporting research by Pavey et al. (2018, 2022). The addition of autonomy-supportive language did not mitigate the detrimental effect of a moral message on reactance.

The inclusion of a control condition showed that all messages elicited greater reactance than an information-only communication. This suggests that all four messages fared no better than the presentation of information without persuasive intent. In some cases, messages were

detrimental compared to the information-only condition. These results suggest caution should be taken when designing campaigns that actively promote, encourage, and recommend vaccination uptake. Attempts to influence, by nature, can be construed as threatening autonomy, liberty and individual decision-making freedom, and as such can lead to irritation, anger and frustration that autonomy is being undermined. Presentation of facts and information about vaccination, with guidance on how and when a person can be vaccinated, could confer greater decision-making freedom to individuals compared to explicit recommendations and, therefore, may be more effective in encouraging vaccination uptake. However, it is often difficult to distinguish between messages that inform and those that persuade, and a range of principles should be examined before a messaging strategy implemented (Oxman et al., 2022).

The findings provide insight regarding the correlates of vaccine hesitancy, reactance, perceived legitimacy, and vaccination intentions, and regarding the effect of targeting these variables in communications concerning vaccination. However, there are some limitations to consider. For example, the participants included both those who had delayed vaccination (who had not yet had an opportunity to vaccinate) and those who had refused vaccination. The predictors of vaccination intentions and the relative contribution of autonomous motivation and moral obligation to the decision-making of these groups may differ. Additional variables may be important predictors for those who identify as vaccine refusers compared to those who delay vaccination, and these could be usefully explored in further research. In addition, the majority of our sample was White. As ethnicity has been found to be associated with attitudes towards vaccination (Khan et al., 2021), it would be worthwhile to explore predictors of reactance to vaccination communications with a larger participant sample of ethnic minority groups. The research also solely examined self-reported measures of reactance, legitimacy, intentions to vaccinate and vaccine hesitancy, which can be subject to self-presentational biases. The message effects were only observed for self-reported cognitive outcome variables which are not always assessed in public health campaign evaluations. Indicators of vaccination behaviour and physiological measures of reactance (e.g. Sittenthaler et al., 2015) are other methodological tools that could be used to examine the role of autonomy and moral obligation on reactance and vaccine uptake. The circumstances of the research should also be considered. The studies were conducted during a unique pandemic context, when the risk of infection had fallen, and restrictions had recently been eased. The generalisability of the findings to other contexts therefore requires further investigation.

In conclusion, this research is the first to show that moral obligation and autonomous motivation independently predict greater vaccination intentions, greater perceived legitimacy, lower vaccine hesitancy, and lower reactance towards health messages. However, although messages using autonomy-supportive language elicited less reactance than messages using controlling language and messages highlighting moral obligation resulted in greater reactance than those highlighting personal protection, all types of messages elicited greater reactance, compared to the information-only communication. Based on these findings, caution should be taken when designing campaigns that recommend and encourage vaccination, as these communications may present a threat to decision-making freedom and elicit reactance even when autonomy-supportive language is applied.

CONFLICT OF INTEREST STATEMENT

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial or nonfinancial interest in the subject matter or materials discussed in this manuscript.

DATA AVAILABILITY STATEMENT

The data reported in this research are openly available at osf.io/5wmyc/ (Study 1) and osf.io/7pe29/ (Study 2).

ETHICS STATEMENT

The review panel on behalf of the Kingston University Research Ethics Committee granted a favourable ethical opinion for application 2838 – COVID-19 Vaccine Hesitancy Project and for application 2868 – COVID-19 Vaccine Hesitancy Project Study 2.

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REFERENCES

- Ajzen, I. (2012). The theory of planned behavior. In P. A. M. Lange, A. W. Kruglanski, & E. T. Higgins (Eds.), *Handbook of theories of social psychology* (Vol. 1) (pp. 438–459). <https://doi.org/10.4135/9781446249215.n22>
- Brehm, S. S., & Brehm, J. W. (1981). *Psychological reactance: A theory of freedom and control*. Academic Press.
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01
- Drażkowski, D., & Trepanowski, R. (2021). Reactance and perceived disease severity as determinants of COVID-19 vaccination intention: An application of the theory of planned behavior. *Psychology, Health & Medicine*, 1–8.
- Ellemers, N., van der Toorn, J., Paunov, Y., & van Leeuwen, T. (2019). The psychology of morality: A review and analysis of empirical studies published from 1940 through 2017. *Personality and Social Psychology Review*, 23(4), 332–366. <https://doi.org/10.1177/1088868318811759>
- Fontanet, A., & Cauchemez, S. (2020). COVID-19 herd immunity: Where are we? *Nature Reviews Immunology*, 20(10), 583–584. <https://doi.org/10.1038/s41577-020-00451-5>
- Giubilini, A., Douglas, T., & Savulescu, J. (2018). The moral obligation to be vaccinated: Utilitarianism, contractualism, and collective easy rescue. *Medicine, Health Care, and Philosophy*, 21(4), 547–560. <https://doi.org/10.1007/s11019-018-9829-y>
- Godin, G., Vézina-Im, L. A., & Naccache, H. (2010). Determinants of influenza vaccination among healthcare workers. *Infection Control and Hospital Epidemiology*, 31(7), 689–693. <https://doi.org/10.1086/653614>
- Hakim, H., Provencher, T., Chambers, C. T., Driedger, S. M., Dube, E., Gavaruzzi, T., Giguere, A. M. C., Ivers, N. M., MacDonald, S., Paquette, J.-S., Wilson, K., Reinhartz, D., & Witteman, H. O. (2019). Interventions to help people understand community immunity: A systematic review. *Vaccine*, 37(2), 235–247. <https://doi.org/10.1016/j.vaccine.2018.11.016>
- Hong, S. M., & Faedda, S. (1996). Refinement of the Hong psychological reactance scale. *Educational and Psychological Measurement*, 56(1), 173–182. <https://doi.org/10.1177/0013164496056001014>
- James, E. K., Bokemper, S. E., Gerber, A. S., Omer, S. B., & Huber, G. A. (2021). Persuasive messaging to increase COVID-19 vaccine uptake intentions. *Vaccine*, 39(49), 7158–7165. <https://doi.org/10.1016/j.vaccine.2021.10.039>
- Janoff-Bulman, R., & Carnes, N. C. (2013). Surveying the moral landscape: Moral motives and group-based moralities. *Personality and Social Psychology Review*, 17(3), 219–236. <https://doi.org/10.1177/1088868313480274>
- Juraskova, I., O'Brien, M., Mullan, B., Bari, R., Laidsaar-Powell, R., & McCaffery, K. (2012). HPV vaccination and the effect of information framing on intentions and behaviour: An application of the theory of planned behaviour and moral norm. *International Journal of Behavioral Medicine*, 19, 518–525. <https://doi.org/10.1007/s12529-011-9182-5>

- Khan, M. S., Ali, S. A. M., Adelaine, A., & Karan, A. (2021). Rethinking vaccine hesitancy among minority groups. *The Lancet*, 397(10288), 1863–1865. [https://doi.org/10.1016/S0140-6736\(21\)00938-7](https://doi.org/10.1016/S0140-6736(21)00938-7)
- Korn, L., Böhm, R., Meier, N. W., & Betsch, C. (2020). Vaccination as a social contract. *Proceedings of the National Academy of Sciences*, 117(26), 14890–14899. <https://doi.org/10.1073/pnas.1919666117>
- Kowalik, M. (2021). Ethics of vaccine refusal. *Journal of Medical Ethics*.
- La Guardia, J. G., Ryan, R. M., Couchman, C. E., & Deci, E. L. (2000). Within-person variation in security of attachment: A self-determination theory perspective on attachment, need fulfilment, and well-being. *Journal of Personality and Social Psychology*, 79(3), 367–384. <https://doi.org/10.1037/0022-3514.79.3.367>
- Larson, H. J., Jarrett, C., Eckersberger, E., Smith, D. M., & Paterson, P. (2014). Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: A systematic review of published literature, 2007–2012. *Vaccine*, 32(19), 2150–2159. <https://doi.org/10.1016/j.vaccine.2014.01.081>
- Leshem, E., & Lopman, B. A. (2021). Population immunity and vaccine protection against infection. *The Lancet*, 397(10286), 1685–1687. [https://doi.org/10.1016/S0140-6736\(21\)00870-9](https://doi.org/10.1016/S0140-6736(21)00870-9)
- MacDonald, N. E. (2015). Vaccine hesitancy: Definition, scope and determinants. *Vaccine*, 33(34), 4161–4164. <https://doi.org/10.1016/j.vaccine.2015.04.036>
- Machingaidze, S., & Wiysonge, C. S. (2021). Understanding COVID-19 vaccine hesitancy. *Nature Medicine*, 27(8), 1338–1339. <https://doi.org/10.1038/s41591-021-01459-7>
- Matute, J., Palau-Saumell, R., Meyer, J., Derqui, B., & Jiménez-Asenjo, N. (2021). Are you getting it? Integrating theories to explain intentions to get vaccinated against COVID-19 in Spain. *Journal of Risk Research*, 1–20.
- Moon, K., Riege, A., Gourdon-Kanhukamwe, A., & Vallée-Tourangeau, G. (2021a). Development and validation of the treatment self-regulation questionnaire assessing healthcare professionals' motivation for flu vaccination (TSRQ-Flu). *Psychology & Health*, 1–20.
- Moon, K., Riege, A., Gourdon-Kanhukamwe, A., & Vallée-Tourangeau, G. (2021b). The moderating effect of autonomy on promotional health messages encouraging healthcare professionals' to get the influenza vaccine. *Journal of Experimental Psychology: Applied*, 27(2), 187–200. <https://doi.org/10.1037/xap0000348>
- Oxman, A. D., Fretheim, A., Lewin, S., Flottorp, S., Glenton, C., Helleve, A., Vestheim, D. F., Iversen, B. G., & Rosenbaum, S. E. (2022). Health communication in and out of public health emergencies: To persuade or to inform? *Health Research Policy & Systems*, 20(1), 1–9, 28. <https://doi.org/10.1186/s12961-022-00828-z>
- Pavey, L., Churchill, S., & Sparks, P. (2022). Proscriptive injunctions can elicit greater reactance and lower legitimacy perceptions than prescriptive injunctions. *Personality and Social Psychology Bulletin*, 48(5), 676–689. <https://doi.org/10.1177/01461672211021310>
- Pavey, L. J., & Sparks, P. (2012). Autonomy and defensiveness: Experimentally increasing adaptive responses to health-risk information via priming and self-affirmation. *Psychology & Health*, 27(3), 259–276. <https://doi.org/10.1080/08870446.2011.556251>
- Pavey, L., Sparks, P., & Churchill, S. (2018). Proscriptive vs. prescriptive health recommendations to drink alcohol within recommended limits: Effects on moral norms, reactance, attitudes, intentions and behaviour change. *Alcohol and Alcoholism*, 53(3), 344–349. <https://doi.org/10.1093/alcalc/agx123>
- Pavey, L., Churchill, S., & Sparks, P. (2023). Perceived legitimacy can moderate the effect of proscriptive versus prescriptive injunctions on intentions to comply with UK government COVID-19 guidelines and reactance. *Journal of Applied Social Psychology*, 53(5), 432–442. <https://doi.org/10.1111/jasp.12950>
- Pfattheicher, S., Petersen, M. B., & Böhm, R. (2022). Information about herd immunity through vaccination and empathy promote COVID-19 vaccination intentions. *Health Psychology*, 41(2), 85–93. <https://doi.org/10.1037/hea0001096>
- Ratcliff, C. L. (2021). Characterizing reactance in communication research: A review of conceptual and operational approaches. *Communication Research*, 48(7), 1033–1058. <https://doi.org/10.1177/0093650219872126>
- Rivis, A., Sheeran, P., & Armitage, C. J. (2009). Expanding the affective and normative components of the theory of planned behavior: A meta-analysis of anticipated affect and moral norms. *Journal of Applied Social Psychology*, 39(12), 2985–3019. <https://doi.org/10.1111/j.1559-1816.2009.00558.x>
- Rosenfeld, D. L., & Tomiyama, A. J. (2022). Jab my arm, not my morality: Perceived moral reproach as a barrier to COVID-19 vaccine uptake. *Social Science & Medicine*, 114699. <https://doi.org/10.1016/j.socscimed.2022.114699>
- Scanlon, T. M. (2000). *What we owe to each other*. Harvard University Press. <https://doi.org/10.2307/j.ctv134vmrn>

- Schmidtke, K. A., Kudrna, L., Noufaily, A., Stallard, N., Skrybant, M., Russell, S., & Clarke, A. (2022). Evaluating the relationship between moral values and vaccine hesitancy in Great Britain during the COVID-19 pandemic: A cross-sectional survey. *Social Science & Medicine*, 308, 115218. <https://doi.org/10.1016/j.socscimed.2022.115218>
- Schmitz, M., Luminet, O., Klein, O., Morbée, S., Van den Bergh, O., Van Oost, P., Waterschoot, J., Yzerbyt, V., & Vansteenkiste, M. (2022). Predicting vaccine uptake during COVID-19 crisis: A motivational approach. *Vaccine*, 40(2), 288–297. <https://doi.org/10.1016/j.vaccine.2021.11.068>
- Shapiro, G. K., Tatar, O., Dube, E., Amsel, R., Knauper, B., Naz, A., Perez, S., & Rosberger, Z. (2018). The vaccine hesitancy scale: Psychometric properties and validation. *Vaccine*, 36(5), 660–667. <https://doi.org/10.1016/j.vaccine.2017.12.043>
- Sheeran, P., Wright, C. E., Avishai, A., Villegas, M. E., Rothman, A. J., & Klein, W. M. (2021). Does increasing autonomous motivation or perceived competence lead to health behavior change? A meta-analysis. *Health Psychology*, 40(10), 706–716. <https://doi.org/10.1037/hea0001111>
- Sittenthaler, S., Steindl, C., & Jonas, E. (2015). Legitimate vs. illegitimate restrictions—a motivational and physiological approach investigating reactance processes. *Frontiers in Psychology*, 6, 632.
- Soveri, A., Karlsson, L. C., Mäki, O., Antfolk, J., Waris, O., Karlsson, H., ... Lewandowsky, S. (2020). Trait reactance and trust in doctors as predictors of vaccination behavior, vaccine attitudes, and use of complementary and alternative medicine in parents of young children. *PLoS ONE*, 15(7), e0236527. <https://doi.org/10.1371/journal.pone.0236527>
- Vallée-Tourangeau, G., Promberger, M., Moon, K., Wheelock, A., Sirota, M., Norton, C., & Sevdalis, N. (2018). Motors of influenza vaccination uptake and vaccination advocacy in healthcare workers: Development and validation of two short scales. *Vaccine*, 36(44), 6540–6545. <https://doi.org/10.1016/j.vaccine.2017.08.025>
- Vilas, X., & Sabucedo, J. M. (2012). Moral obligation: A forgotten dimension in the analysis of collective action. *Revista de Psicología Social*, 27(3), 369–375. <https://doi.org/10.1174/021347412802845577>
- World Health Organization. (2019). *Ten threats to global health in 2019*. WHO/Rada Akbar. <https://www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019>
- World Health Organisation. (2023). *WHO coronavirus (COVID-19) dashboard*. <https://covid19.who.int/>

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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