



# Attitudes toward mandatory vaccination and the COVID certificate as a function of vaccination status and risk perception: A vignette-based study

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## Abstract

In January 2022, several vaccination policies were debated to address the Omicron outbreak in Belgium. Considering variability in risk perception and vaccine uptake, this study aimed to understand differences in support and expectations for four scenarios, ranging from relaxed to restrictive vaccination policies, to inform policymakers. Using an online survey, 12,670 participants (46% female;  $M_{\text{age}} = 45.9$ ,  $SD = 13.38$ ) reported their risk perception, number of vaccination doses (0/1, 2, 3 doses) as well as their support and several anticipated psychological outcomes for each scenario. Mixed model ANCOVA showed a pattern of preferential support for the relaxed scenario and more

positive anticipated outcomes (general well-being and government appraisals) compared to the restrictive policies, that were treated equivalently. An exception to this pattern was found when people were vaccinated with three doses and perceived high risk. Taken separately, risk perception and vaccination status were not sufficient to drive positive attitudes toward restrictive policies; only their interaction had an effect. Limitations include the self-selected sample and the vignette methodology. The conjunct role of risk perception and vaccination status should be considered when discussing the introduction of restrictive vaccination policies. These findings inform vaccination strategies management during pandemics.

#### KEYWORDS

COVID-19, risk perception, support, vaccination policies, vaccination status, well-being

#### Public significance statement

Encouraging people to get vaccinated against COVID-19 has been crucially challenging in times of crisis. In a vignette-based study, we found that people tended to prefer a relaxed policy over three restrictive vaccination policies, including mandatory vaccination, except when they were vaccinated with a booster dose, and perceived high risk of getting ill. This study provided empirical evidence to inform the debate about mandatory vaccination.

## INTRODUCTION

During the Sars-Cov-2 pandemic, authorities all around the world have implemented various vaccination policies as levers to give sufficient protection against severe illness and contain the virus. In Belgium, along with the rolled-out vaccination campaign, national authorities adopted a COVID certificate (e.g., providing evidence of vaccination with at least two doses, a negative test, or recovery) called the COVID Safe Ticket (CST) in November 2021. In January 2022, considering that a non-negligible part of the population was not or partially vaccinated and that individuals varied greatly in their perception of risk, authorities decided to rethink the current policy. To this end, a debate was launched at the federal parliament involving experts hearing from various fields, including psychologists. Four policy scenarios were discussed during the debate, ranging from relaxations to restrictions: abolishing the CST (i.e., allowing public life without any restriction), maintaining the CST (i.e., a '3G' policy based on vaccination, test, or recovery), introducing a vaccine passport (i.e., a '1G' policy based on vaccination only, allowing public life for people

with three doses of COVID-19 vaccine), or introducing mandatory vaccination (i.e., compulsory vaccination with three doses for adults over 18 years old, COVID certificate being no longer necessary to access public life).

In light of this spectrum of vaccination policies, the present study examined public attitudes toward the four scenarios and the related role of risk perception and vaccination status in this regard. To our knowledge, no study has examined the conjoint role of risk perception and vaccination status to understand individuals' preferences toward vaccination policies in the context of a pandemic. Importantly, this study was executed 1 week before the parliamentary debate regarding policies, thus, providing evidence-based information to advise policymakers in times of pandemics. In the next sections, we address the current literature on these aspects, as well as the particular context in which the study occurred.

## Attitudes toward COVID-19 vaccination policies

Generally speaking, in democratic countries such as Belgium, forcing people to comply with measures they do not support may be ineffective and may subsequently have detrimental effects in other areas (Schmelz & Bowles, 2021). Making requirements on vaccination through COVID certificates or mandatory vaccination may be perceived as inherently intrusive and infringing on individual freedom, leading people to experience reactance (Betsch & Böhm, 2016; Sprengholz et al., 2021). When the latter occurs, some might oppose vaccination, thereby making the vaccination policy counterproductive in achieving its initial purpose (Sprengholz et al., 2021), especially among those unvaccinated or hesitant (de Figueiredo et al., 2021). To be effective, it was therefore of paramount importance that the vaccination policy benefited from public support.

The available evidence suggests that mandatory vaccination and COVID certificates gathered rather mixed and even polarized support. Although country-specific, research suggested that less coercive measures are more acceptable than more coercive ones (Schmelz & Bowles, 2022), particularly among women and younger people (Paul et al., 2021; Sprengholz et al., 2022). Studies also pointed out that support related strongly to vaccination intentions and its antecedents such as confidence in vaccine safety (Sprengholz et al., 2022) or trust in governmental and health institutions (Giannakou et al., 2022; Sprengholz et al., 2022).

But while research has primarily documented support for a mandatory policy or a COVID certificate in comparison to voluntary vaccination, few studies (Attwell et al., 2021; Goren et al., 2022; Kowalewski et al., 2021; Mouter et al., 2022) have compared the support for several restrictive vaccination policies with each other.

Alongside with support, the public may expect a range of psychological outcomes from vaccination policies. Over the course of the pandemic, research has shown that restrictive COVID-19 measures such as lockdowns and social contact limitations did come with costs for mental health. For instance, people expressed lower perceived autonomy, lower well-being, and more depressive and anxiety symptoms during the first lockdown (Schwinger et al., 2020). In a longitudinal survey of samples from 15 countries, more restrictive COVID-19 measures were found to be associated with poorer mental health, which was partially explained by perceived physical distancing and negative perceptions of the government management of the crisis (Aknin et al., 2022). Knowing that people's motivation to engage in specific behaviors is strongly influenced by their expectations regarding the outcomes of these behaviors (Wigfield et al., 2009), a study conducted among university students in Austria showed that weighing the perceived costs and benefits of COVID-19 measures played a role in adhering to the measures and getting vaccinated (Kulcar et al., 2022). Importantly, this balance between costs and benefits became increasingly important as the crisis

evolved (Kulcar et al., 2022). Considering that pandemic was ongoing for nearly 2 years, we may expect people's willingness to comply with vaccination policies to align with their expectations regarding the outcomes of these policies. We next consider two factors that may play a central role in determining people's attitude toward such policies: risk perception and vaccination status.

## The role of risk perception

It comes as no surprise that risk perception is a prime candidate to shape people's support for vaccination policies given that these policies aimed to reduce the health risk from COVID-19 and thus better protect the public. With respect to infectious diseases, risk perception involves two components: the likelihood of infection and the severity of the illness (Michalsen, 2003). It played a major role in explaining the adoption of preventive health behaviors (Brewer et al., 2007; Dryhurst et al., 2020). The COVID-19 crisis confirmed this, showing that greater risk perception was associated with greater compliance with government recommendations (Cipolletta et al., 2022), including the intention to accept the vaccine (Joshi et al., 2021; Schmitz et al., 2022). In Belgium, data collected during the 2021 Christmas period (Waterschoot et al., 2022) emphasized the role of risk perception in four scenarios ranging from relaxed to more restrictive COVID-19 measures regarding social gatherings. The results showed that people who perceived low risk were less inclined to adhere to stricter scenarios while perceiving a high risk was associated with lower adherence to a relaxed scenario. Such a pattern illustrates how one's attitude toward the restrictiveness of a scenario interacts with risk perception, which could also be true for the four vaccination policy scenarios debated.

More generally, citizens are likely to experience positive psychological outcomes and to adhere to health measures (including vaccination) to the extent that the stringency of the measures is consistent with the level of risk they perceive. Consistent with this view, Waterschoot et al. (2023) have found that the fit between risk perception and stringency of COVID-19 measures predicted greater well-being and an autonomous motivation to follow the measures. Conversely, lack of fit (due to measures perceived as too lenient or too strict compared to the level of risk) resulted in anxiety and depressive symptoms. These findings suggest that the psychological outcomes of well-calibrated or proportional policies may drive adhesion to sanitary measures.

## The role of vaccination status

Next to risk perception, vaccination status comes as another potential determinant of support for more or less restrictive policies. Although in every country a relative portion of the population was unvaccinated, a growing number of countries recommended a booster dose or a periodic dose in addition to the initial scheme to cope with the outbreak of new variants (Dolgin, 2021; Goren et al., 2022). This was also the case in Belgium which started its third-dose campaign in late November 2021. But not all individuals among the ones who had completed the initial scheme of two doses were willing to get a booster (Paul & Fancourt, 2022), which was also observed in Belgium. Vaccination status should therefore be appraised beyond the binary categorization of "non-vaccinated" versus "vaccinated" people to be operationalized in a more nuanced way, depending on whether individuals were unvaccinated, partially vaccinated, vaccinated with two doses or vaccinated with a booster dose. Knowing that the willingness to get vaccinated is positively related to mandatory vaccination policy (Sprengholz et al., 2022), we might then expect that a higher vaccination status

is associated with a higher support for more restrictive vaccination policies. In particular, people who received the booster dose may constitute a unique group as they fully complied with public health recommendations, committing to the “social contract” of vaccination (Korn et al., 2020): by engaging in vaccination, one expects other to do so as well for the benefit of all. This reasoning can be extended to other measures aimed at protecting public health (such as testing or certificates).

## **The interplay between risk perception and vaccination status**

Yet, risk perception and vaccination status may not be enough on their own to forecast greater support for restrictive policies. Indeed, on one hand, we know that risk perception, and especially perceived severity, is an important factor in adherence to health measures such as vaccination (Brewer et al., 2007; Waterschoot et al., 2024) because it fosters fuller internalization of reasons to follow these measures, including getting vaccinated. However, risk perception is also a rather fragile resource of internalization, which fluctuates with varying hospitalization numbers (Waterschoot et al., 2024) and, presumably, needs to surpass a certain level to increase support for restrictive policies. On the other hand, being vaccinated, even with a booster dose, may not be a sufficient condition to have higher support for restrictive policies. People may actually need to perceive a risk of getting ill, thus making the perception of risk a necessary condition for supporting more restrictive policies. This way, risk perception could constitute a catalyst for such support. This may be especially true to the extent that people have received several doses of the vaccine.

## **The present study**

Considering these theoretical elements, we aimed to investigate the role of risk perception and vaccination status in predicting a preferential support for the abolition of the CST, the maintenance of the CST, the introduction of a vaccine passport and the introduction of mandatory vaccination. Across this spectrum of policy scenarios ranging from relaxing to tightening restrictions, Hypothesis 1 posits that higher levels of perceived risk will be associated with increased support for more restrictive policies, together with lower support for the relaxed policy, that is the abolition of the CST. In the same vein, Hypothesis 2 postulates that being fully vaccinated will be associated with increased support for more restrictive policies, together with lower support for the relaxed policy, that is the abolition of the CST. That is, people who received a booster dose would express increased support for stricter policies compared to those vaccinated with zero, one, or two doses. Similarly, we shall examine whether people vaccinated with two doses have higher support compared to those vaccinated with zero or one dose. Besides the main effects of these two determinants, we also examined in a more explorative manner the interaction of risk perception and vaccination status together in predicting the support for the four policy scenarios. That is, we suggest that the effect of risk perception on support for restrictive policies will be especially high to the extent that people have received three doses of the vaccine.

A second important goal of the present study was to examine how risk perception and number of doses could interact with the nature of the policies in the prediction of anticipated positive or negative outcome associated with each policy. Hence, Hypothesis 3 posits that more positive psychological outcomes will be anticipated when the policy, whether more restrictive or relaxed, matches the level of risk and the number of doses received. In other words, if anticipated positive psychological outcomes drive adherence to policies, Hypotheses 1, 2 and the interaction effect would apply to psychological outcomes as well.

## METHOD

### Participants

The data from this study were part of the Motivation Barometer, a long-term online survey that started at the beginning of the pandemic (see Vansteenkiste et al. (2024), for an overview). The present sample comprised 12,670 participants who completed the survey between the 21<sup>st</sup> and 26<sup>th</sup> of January 2022, shortly before the start of the parliamentary debate that took place in Belgium. At this time, the number of new—mainly due to Omicron—confirmed cases, hospital admissions, and deaths increased respectively of 64%, 34%, and 13%, while intensive care occupancy decreased by 3%, in comparison with the previous 7-day period (Sciensano, 2022b). The mean age was 45.88 years (SD = 13.38), 54% were male, and 75% had a university degree (bachelor's degree or above). Moreover, 90% reported that they did not have any comorbidity factor related to COVID-19, 37% reported not having received a dose of the COVID-19 vaccine, 1% had received one dose, 22% had two doses, and 40% had three doses.<sup>1</sup> In the analyses, we grouped participants with zero or one dose to facilitate the comparison between the different numbers of doses given that only 1% of the participants had received a single dose.

### Measures

#### Support for the vaccination policies

Participants read about the four political COVID-19 policy options considered during the parliamentary debate. The descriptions of the four policies read as follows: “If the CST is abolished, anyone can participate in public life (e.g., catering, events) without the need for proof (vaccination, negative test, or recovery certificate).” (i.e., abolition of the CST); “Anyone with a CST (proof of at least two doses or a recent negative test or a recovery certificate) can participate in public life (e.g., catering, events).” (i.e., CST); “Any person with a valid vaccination certificate (three doses) can participate in public life (e.g., catering, events). A negative test or a certificate of recovery is no longer sufficient.” (i.e., 1G); and “a general vaccination obligation (three doses) is introduced for adults (excluding people with medical exemptions). Citizens do not have to present a CST, or a vaccine pass to participate in public life (e.g., catering, events) The government monitors whether a citizen complies with mandatory vaccination.” (Mandatory vaccination).

Participants were then asked to indicate their level of support for each policy on a scale ranging from 1 (“Not at all supportive”) to 5 (“Totally supportive”). For each policy, we specified that the protective measures effective at the time of the study would continue (e.g., ventilation, quarantine, mask-wearing, hand-washing).

#### Health predictors of risk perception and vaccination status

Risk perception was assessed by measuring the perceived severity of being infected by the coronavirus, in line with Waterschoot et al. (2024). The estimated severity related to the illness (“How

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<sup>1</sup> Three doses of vaccine refer to those who completed the full initial scheme of vaccine and received a booster dose.

serious do you think the consequences would be?") was assessed on a 5-point scale ranging from 1 ("Not serious at all") to 5 ("Very serious"). The facet was evaluated for both one's health and the general population's health (Wolff et al., 2019). Vaccination status was collected by asking the participants how many doses of COVID-19 vaccine they had received (from 0 to 3) along with the type of vaccine.

## Anticipated psychological outcomes

For each of the four policies described above, participants had to evaluate the potential consequences they would have on a series of outcomes, each rated on a scale ranging from 1 ("Totally disagree") to 5 ("Totally agree") and mainly assessed through single items to ensure appropriate survey completion time (Allen et al., 2022). Outcome variables were selected based on their high relevance during the pandemic (Sibley et al., 2020). In the result section, we grouped these outcomes into two broad categories to ease the analysis reading.

The first category (anticipated effect on well-being) deals with general well-being and comprises measures of well-being (one item; "It will be good for my well-being and that of the population"), of autonomy (two items; "I will experience a sense of choice and freedom in my daily life" and "It will be a positive step towards a life without restrictions,"  $r = .84$ ) and relatedness (one item; "It will be a long-term source of increased connection between people and groups") (Chen, Vansteenkiste et al., 2015), of cohesion (one item; "This will be a source of new tensions and conflicts between people", reversed item), and of lack of health concerns (one item; "I will worry about my health and that of my loved ones," reversed) (Chen, Van Assche et al., 2015).

The second category (anticipated effect on the appraisal of the government) comprised measures tapping message clarity (one item; "It will bring clarity"), government trust (two items; "I would consider the government's policy to be open and fair" and "I will lose my faith in the good intentions of the government," with the second item reverted,  $r = .79$ ) (Abele et al., 2021; Grimmelikhuijsen & Knies, 2017; Yzerbyt, 2016) and lack of conspiracy beliefs (one item self-developed relating to Big Pharma conspiracy, as one of the main conspiracy theories at that time in Belgium; "I would be more inclined to believe that the main objective of the vaccination campaign is to make private companies richer and more powerful," reversed) (Van Oost et al., 2022).

## Sociodemographic

We assessed participants' age, gender, and educational level (1 = "No diploma," 2 = "Bachelor's degree," 3 = "Master's degree or higher"). Participants also reported whether they suffered from any COVID-19 comorbidity factors (i.e., respiratory disease, diabetes, arterial hypertension, immunity deficiency, or any other comorbidity factor that may put them at risk).

## Procedure

We developed the questionnaire using the Qualtrics online survey software and targeted Belgian citizens aged 18 years and over. At the outset of the questionnaire, participants have received an informed consent form explaining that we guaranteed confidentiality, that we would anonymize all data, and that they had the right to stop the survey at any time without negative consequences.

In case of questions or if respondents needed psychological assistance, we provided contact information. After the completion of the survey, participants learned that they could ask for a summary of the results. Finally, we thanked them for their willingness to participate. We recruited participants through self-selection via advertisements in local newspapers, advertisements on social media, and the mailing list of the Motivation Barometer (which included e-mail addresses provided by participants during previous data collection waves allowing to contact them on future occasions). We provided a link to the questionnaire, inviting participants to indicate their preferences toward the different scenarios (i.e., CST, vaccine passport and mandatory vaccination) under discussion. To participate in the study, participants had to actively click on the link. We obtained ethical approval for this study protocol from the ethics committee of Ghent University (nr. 2020/37).

## RESULTS

### Plan of analyses

We submitted our different outcome variables to a  $4 \times 3$  mixed model ANCOVA with policy (4 levels; abolition vs. CST vs. 1G vs. mandatory) varying within participants and doses (3 levels; 0/1 dose vs. 2 doses vs. 3 doses) and perceived risk of infection (continuous) varying between them. To further probe the significant effects, we relied on mixed regression modeling using sets of (orthogonal) contrast codes following Judd et al. (2011) recommendations. Specifically, we created two contrasts for doses. In view of our theoretical framework, it did not seem appropriate to treat vaccination status via linear contrast considering that people who had three doses had fully complied with the public health recommendations contrary to the two other groups. The first contrast (012vs3) therefore opposed zero/one or two doses to three doses. The second contrast (01vs2) compared the two remaining groups, that is zero/one dose to two doses. As for policies, we decided to compare the relaxed scenario to the three other policies, given the restrictive nature of the latter. The first contrast (i.e., *Abolition*) opposed abolition against the other three policies, the second contrast (i.e., *CST*) compared CST on the one hand to 1G policy and mandatory vaccination on the other hand, and the third contrast (i.e., *1G*) compared 1G policy to mandatory vaccination. Because the very large sample size greatly increased the likelihood of significant results, we interpreted the results by capitalizing on both theoretical relevance and effect sizes instead of  $p$ -values only. In particular, we focused on findings that showed at least a small effect size ( $\eta_p^2 \geq .010$ ; Funder & Ozer, 2019). The full set of results is available in the online public repository: [https://osf.io/tdyfx/?view\\_only=43106539798d46c88698b59cc49e30e0](https://osf.io/tdyfx/?view_only=43106539798d46c88698b59cc49e30e0).

### Preliminary analyses

Before proceeding with the main analyses, we first examined differences in terms of gender and education in our study variables. Contingency table's Chi-square test (Table S1) revealed a significant association between gender and vaccination status, indicating that more women were not vaccinated or partially vaccinated compared to men, and more men had received two or three doses compared to women ( $\chi^2(2) = 160.69, p < .001$ ). Gender-based ANOVAs revealed small to medium differences in terms of anticipated lack of conspiracy from the policies ( $M_{\text{men}} = 3.07, M_{\text{women}} = 2.69, \eta_p^2 = .015$ ) whereas education-based ANOVAs showed small to large differences



**TABLE 1** Pearson correlations and descriptives of the study variables.

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	45.88	13.38	—											
2. Comorbidity	.11	.37	.20***	—										
3. Number of doses	1.65	1.33	.15***	.14***	—									
4. Risk perception	2.25	.76	.26***	.17***	.41***	—								
5. Support	2.45	1.73	.11***	.04***	.23***	.20***	—							
6. Wellbeing	2.44	1.65	.11***	.05***	.25***	.23***	.86***	—						
7. Autonomy	2.44	1.59	.10***	.05***	.25***	.22***	.87***	.91***	—					
8. Relatedness	2.36	1.51	.09***	.02***	.15***	.16***	.73***	.77***	.78***	—				
9. Cohesion	2.20	1.45	.08***	.04***	.12***	.11***	.73***	.75***	.77***	.70***	—			
10. Lack of health concerns	3.18	1.51	.01	.01**	.10***	-.04***	.42***	.43***	.43***	.35***	.40***	—		
11. Message clarity	2.65	1.61	.09***	.05***	.29***	.23***	.72***	.78***	.78***	.65***	.63***	.38***	—	
12. Government trust	2.32	1.43	.12***	.05***	.32***	.28***	.80***	.84***	.85***	.71***	.72***	.41***	.75***	—
13. Lack of conspiracy	2.90	1.57	.10***	.06***	.46***	.37***	.50***	.52***	.53***	.42***	.44***	.26***	.49***	.61***

Note: Education is coded “1 = Secondary at most,” “2 = Bachelor,” and “3 = Master or higher”.

\*\*\* $p < .001$ . \*\* $p < .01$ . \* $p < .05$ .

in terms of number of comorbidity factors ( $M_{\text{secondary}} = .15$ ,  $M_{\text{bachelor}} = .12$ ,  $M_{\text{master}} = .09$ ,  $\eta_p^2 = .021$ ), number of doses ( $M_{\text{secondary}} = 1.49$ ,  $M_{\text{bachelor}} = 1.52$ ,  $M_{\text{master}} = 1.84$ ,  $\eta_p^2 = .155$ ), risk perception ( $M_{\text{secondary}} = 2.24$ ,  $M_{\text{bachelor}} = 2.41$ ,  $M_{\text{master}} = 2.49$ ,  $\eta_p^2 = .016$ ), and anticipated lack of conspiracy from the policies ( $M_{\text{secondary}} = 2.60$ ,  $M_{\text{bachelor}} = 2.74$ ,  $M_{\text{master}} = 3.19$ ,  $\eta_p^2 = .025$ ).

In terms of relations, Table 1 showed small positive correlations between age and comorbidity, number of doses, risk perception, support, anticipated well-being, anticipated autonomy, and anticipated government trust. Likewise, comorbidity was positively related to the number of doses and risk perception. Importantly, support for policies was largely associated with all psychological outcomes, except for lack of health concerns which was medium. The number of doses had small to medium positive relationships with all the psychological outcomes. Similarly, risk perception had small to medium positive associations with all the psychological outcomes variables, except for lack of health concerns which was negligible. Finally, the psychological outcomes were all positively related to small to large effect sizes. The largest effect sizes were among psychological outcomes pertaining to the same category (e.g., General Well-being).

## Policy support

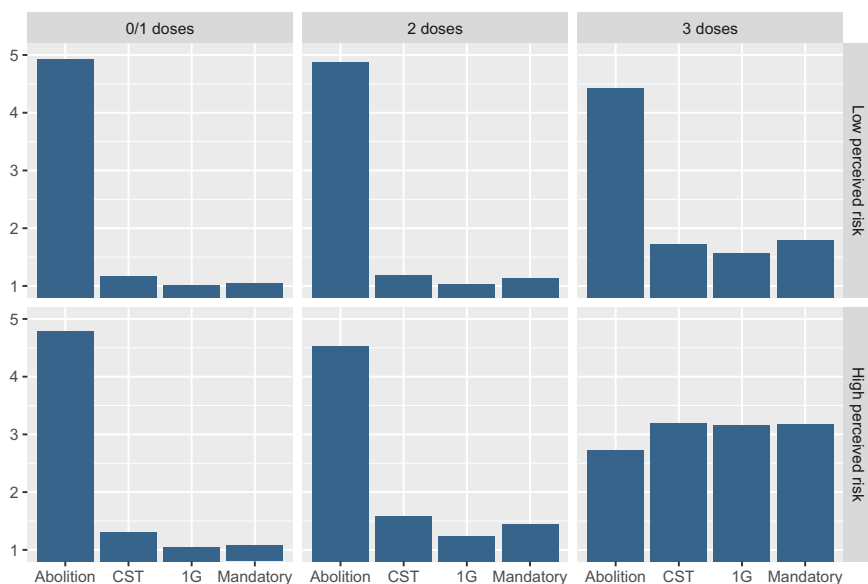
We first assessed participants' support for the policies as a function of risk perception and the number of doses. The ANCOVA analysis revealed the presence of small to large effect sizes for policy, the number of doses, and risk perception, as well as their two-way and three-way interactions. These results are shown in Table 2 and illustrated in Figure 1.

Further examining the data with the above-mentioned contrasts (Table S2) revealed the presence of a policy (abolition)  $\times$  risk  $\times$  doses (012vs3) three-way interaction ( $\eta_p^2 = .041$ ). Of interest, lower effects involving these specific contrasts proved significant.

**TABLE 2** ANCOVA table for support as a function of policy, risk, and doses.

	<i>F</i>	$\eta_p^2$	<i>p</i>
Policy	<b>13,852</b>	<b>.451</b>	<.001
Risk	<b>752</b>	<b>.015</b>	<.001
Doses	<b>2242</b>	<b>.081</b>	<.001
Policy × risk	<b>1242</b>	<b>.068</b>	<.001
Policy × doses	<b>2065</b>	<b>.196</b>	<.001
Risk × doses	<b>321</b>	<b>.013</b>	<.001
Policy × risk × doses	<b>448</b>	<b>.050</b>	<.001

Note: Predictors with small to large effect sizes ( $\eta_p^2 \geq .010$ ) are highlighted in bold.

**FIGURE 1** Level of support for each policy as a function of number of doses and level of risk perception.

Note: The risk levels (high vs. low) were created with a median split for illustration purposes. This variable was treated as continuous in the statistical analyses.

Specifically, there was a massive policy effect ( $\eta_p^2 = .449$ ), such that, on average, respondents supported abolition more than any other policy. There was also an effect of doses ( $\eta_p^2 = .076$ ), indicating that participants with three doses supported the policies more than those with less than three doses. An effect of risk perception also emerged ( $\eta_p^2 = .015$ ), showing that participants who perceived more risk supported the policies more than those who perceived less risk.

Decomposing this three-way interaction by risk perception revealed a policy (abolition) × doses (012vs3) interaction for participants with a lower risk perception ( $\eta_p^2 = .033$ ), such that the greater support for abolition than for the three other policies was more pronounced among participants with less than three doses ( $\eta_p^2 = .433$ ), than among the other respondents ( $\eta_p^2 = .094$ ). As for participants with a higher risk perception, a policy (abolition) × doses (012vs3) interaction ( $\eta_p^2 = .208$ ), revealed the presence of a stronger support for abolition than for the other three poli-

cies among participants with less than three doses ( $\eta_p^2 = .191$ ), whereas the opposite pattern was true among participants with three doses ( $\eta_p^2 = .038$ ). In sum, participants generally preferred abolition to any other policy except when they had received three doses and perceived the risk to be high. This pattern of findings suggests that level of vaccination status interacts with risk perception in the prediction of participants' attitude toward different restrictive scenarios. Note that the lower order interaction involving policy and risk perception and policy and vaccination status that were observed as well (in line with Hypotheses 1 and 2) are of limited interest as they are overshadowed by the three-way interaction (see Table 1 and Figure 1).

## General well-being

Next, we examined five outcomes related to the general anticipated well-being (i.e., well-being, autonomy, relatedness, cohesion, and the lack of health concerns) as a function of policy, number of doses, and risk perception. As can be seen in Table 3, Table S3, and Figure S1, the analyses revealed a major main effect of policy across all the outcomes such that respondents anticipated greater well-being ( $\eta_p^2 = .431$ ), autonomy ( $\eta_p^2 = .496$ ), relatedness ( $\eta_p^2 = .343$ ), cohesion ( $\eta_p^2 = .467$ ), but, to a much lesser extent, reduced health concerns ( $\eta_p^2 = .057$ ) with abolition than with the other policies. Likewise, but to a lesser extent in comparison to the main effect of policy, a main effect of doses indicated that participants with three doses anticipated more well-being ( $\eta_p^2 = .079$ ), autonomy ( $\eta_p^2 = .088$ ), relatedness ( $\eta_p^2 = .019$ ), cohesion ( $\eta_p^2 = .021$ ), and fewer health concerns ( $\eta_p^2 = .017$ ) than those with fewer doses. Also, a main effect of risk perception showed that individuals who perceived more risk anticipated somewhat more well-being ( $\eta_p^2 = .021$ ), autonomy ( $\eta_p^2 = .019$ ), and relatedness ( $\eta_p^2 = .011$ ) than those with lower risk perception.

Turning to the interactions, the policy (abolition)  $\times$  risk  $\times$  doses (012vs3) interaction for well-being ( $\eta_p^2 = .034$ ), autonomy ( $\eta_p^2 = .039$ ), relatedness ( $\eta_p^2 = .015$ ), and cohesion ( $\eta_p^2 = .014$ ) revealed that participants generally anticipated higher levels of these outcomes with abolition than with any other policy except when they had both received three doses and, at the same time, reported a high-risk perception. In that specific case, participants anticipated less well-being and autonomy from abolition than the other policies, while this difference was negligible for the relatedness and cohesion outcomes. Although this three-way interaction did not reach significance in the case of health concerns, the policy (abolition)  $\times$  risk interaction ( $\eta_p^2 = .074$ ) indicated that participants with low-risk perception anticipated a greater decrease in their health concerns from abolition than from the other policies, whereas this effect was negligible among those with high-risk perception. Likewise, the policy (abolition)  $\times$  doses (012vs3) interaction ( $\eta_p^2 = .099$ ) showed that participants with less than three doses anticipated a greater decrease in their health concerns from abolition than from the other policies, whereas this effect was negligible among those with three doses.

## Appraisal of the government

Based on the same analytical strategy, we examined the anticipated effects on the appraisal of the government for three aspects (i.e., message clarity, government trust, and lack of conspiracy) as a function of policy, the number of doses, and risk perception. As can be seen in Table 4, Table S4, and Figure S2, the analyses revealed a major effect of policy such that respondents anticipated greater message clarity ( $\eta_p^2 = .228$ ), government trust ( $\eta_p^2 = .341$ ), and were less inclined

**TABLE 3** ANCOVA table for outcomes associated with general well-being as a function of policy, risk, and doses.

	Well-being			Autonomy			Relatedness			Cohesion			Lack of health concerns		
	F	$\eta_p^2$	p	F	$\eta_p^2$	p	F	$\eta_p^2$	p	F	$\eta_p^2$	p	F	$\eta_p^2$	p
Policy	13,305	.431	<.001	17,722	.496	<.001	9684	.343	<.001	16,288	.468	<.001	1557	.063	<.001
Risk	972	.021	<.001	847	.019	<.001	433.6	.011	<.001	170	.004	<.001	231	.008	<.001
Doses	2198	.088	<.001	2299	.097	<.001	420.4	.021	<.001	448	.022	<.001	322	.023	<.001
Policy × risk	1225	.065	<.001	1237	.064	<.001	744.1	.039	<.001	864	.045	<.001	413	.017	<.001
Policy × doses	2100	.193	<.001	2224	.198	<.001	828.7	.082	<.001	906	.089	<.001	1031	.081	<.001
Risk × doses	327	.014	<.001	281	.013	<.001	144.5	.007	<.001	67	.003	<.001	24	.002	<.001
Policy × risk × doses	393	.043	<.001	458	.048	<.001	184.8	.020	<.001	176	.019	<.001	50	.004	<.001

Note: Predictors with small to large effect sizes ( $\eta_p^2 \geq .010$ ) are highlighted in bold.

**TABLE 4** ANCOVA table for outcomes associated with the governmental factors as a function of policy, risk, and doses.

	Message clarity			Government trust			Lack of conspiracy		
	<i>F</i>	$\eta_p^2$	<i>p</i>	<i>F</i>	$\eta_p^2$	<i>p</i>	<i>F</i>	$\eta_p^2$	<i>p</i>
Policy	<b>6166</b>	<b>.240</b>	<b>&lt;.001</b>	<b>10,468</b>	<b>.342</b>	<b>&lt;.001</b>	<b>4735</b>	<b>.115</b>	<b>&lt;.001</b>
Risk	<b>504</b>	<b>.014</b>	<b>&lt;.001</b>	<b>976</b>	<b>.028</b>	<b>&lt;.001</b>	<b>692.6</b>	<b>.034</b>	<b>&lt;.001</b>
Doses	<b>1814</b>	<b>.091</b>	<b>&lt;.001</b>	<b>2326</b>	<b>.120</b>	<b>&lt;.001</b>	<b>2128</b>	<b>.180</b>	<b>&lt;.001</b>
Policy × risk	<b>899</b>	<b>.044</b>	<b>&lt;.001</b>	<b>744</b>	<b>.036</b>	<b>&lt;.001</b>	193.6	.005	<.001
Policy × doses	<b>1413</b>	<b>.126</b>	<b>&lt;.001</b>	<b>1504</b>	<b>.130</b>	<b>&lt;.001</b>	<b>378.7</b>	<b>.020</b>	<b>&lt;.001</b>
Risk × doses	53	.003	<.001	<b>213</b>	<b>.012</b>	<b>&lt;.001</b>	51.51	.005	<.001
Policy × risk × doses	<b>180</b>	<b>.018</b>	<b>&lt;.001</b>	<b>360</b>	<b>.035</b>	<b>&lt;.001</b>	25.38	.001	<.001

Note: Predictors with small to large effect sizes ( $\eta_p^2 \geq .010$ ) are highlighted in bold.

to endorse conspiracy beliefs ( $\eta_p^2 = .114$ ) with abolition than with the other policies. Additionally, message clarity was anticipated to be greater for the CST than for the 1G or mandatory policies ( $\eta_p^2 = .013$ ). Compared to the main effect of policy, the main effects of doses and risk perception were found to a lesser extent. A main effect of doses indicated that participants with three doses anticipated greater message clarity ( $\eta_p^2 = .076$ ), government trust ( $\eta_p^2 = .109$ ), and reduced conspiracy ( $\eta_p^2 = .160$ ), than those with fewer doses. Furthermore, those with two doses anticipated greater message clarity ( $\eta_p^2 = .010$ ) and reduced conspiracy ( $\eta_p^2 = .014$ ) than those with fewer doses. Moreover, the main effect of risk perception showed that individuals who perceived more risk anticipated greater message clarity ( $\eta_p^2 = .014$ ), government trust ( $\eta_p^2 = .028$ ), and reduced conspiracy ( $\eta_p^2 = .034$ ) than those with lower risk perception.

Turning to the interactions, the policy (abolition) × risk × doses (012vs3) interaction for message clarity ( $\eta_p^2 = .013$ ) and government trust ( $\eta_p^2 = .027$ ) revealed that participants generally anticipated higher levels of these outcomes with abolition than with any other policy except when they had both received three doses and, at the same time, reported a higher risk perception, in which case they expected the opposite effect. Although this three-way interaction did not reach significance in the case of lack of conspiracy, the policy (abolition) × doses (012vs3) interaction ( $\eta_p^2 = .020$ ) indicated that the anticipated decrease in conspiracy from abolition than from the other policies was more pronounced for participants that had received three doses than fewer doses.

Note that the lower order interaction involving policy and risk perception and policy and vaccination status were observed on all outcomes (in line with Hypotheses 1 and 2). However, these are of limited interest as they are systematically overshadowed by the three-way interaction, in which those perceiving high risk and vaccinated with three doses consistently displayed different responses than all other groups.

## DISCUSSION

One year after the beginning of the vaccination campaign, the vast majority of the Belgian population had been vaccinated. The authorities faced two challenges: how to ensure continued protection through booster doses, and how to convince the yet unvaccinated, especially in the face of an apparently less aggressive variant, Omicron. Four vaccination scenarios were discussed by Belgian policymakers, proposing either to ease restriction by abolishing the CST, to maintain

restrictions while keeping the CST, to tighten restrictions by introducing a vaccine passport, or a mandatory vaccination. To provide input to this debate, this study aimed to explore the role of the policy, risk perception, and number of vaccination doses in predicting the support and anticipated psychological outcomes for each policy.

Drawing upon data from the Belgian population, the results are very straightforward. A recurring pattern emerges: People tend to prefer abolition of more restrictive measures over the three other scenarios, that tend to be treated equivalently. This is consistent with previous studies that have shown preferential support for voluntary rather than mandatory vaccination policies (Meier et al., 2019; Paul et al., 2021). However, an exception to this pattern occurs to the extent that people perceive a high risk of infection and have been vaccinated three times. In that case, abolition tends to be valued less compared to the other groups and slightly less than the three other policies that are rated equivalently. A striking aspect of our results is that this pattern is found in all outcomes. In a nutshell, participants expect more positive outcomes relating to well-being and appraisals of the government in the abolition scenario than in the three other scenarios unless risk perception is high and vaccination status is three doses.

Importantly, the interaction between risk perception and vaccination status overshadows Hypotheses 1 and 2 and deviates from the initial reasoning that postulated that higher risk perception would be associated with a more positive attitude toward restrictive policies, especially among people vaccinated with three doses. Instead, these outcomes are only true when high-risk perception is combined with having received three doses of vaccine. Hence, neither higher risk perception played a role among unvaccinated or those vaccinated with two doses, nor is being vaccinated with three doses sufficient when perceived risk is low. We discuss these findings in the next sections.

These results are compatible with the idea that the stringency of the measures needs to be tailored to the level of risk perceived by citizens (Waterschoot et al., 2023). Restrictive policies will be rejected by people who perceive the risk to be low whereas relaxed policies are likely to lack support among those who perceive a high risk. However, in the present research, and contrary to Hypothesis 1, risk perception in and of itself is not sufficient to drive support for more restrictive vaccination policies: only among people vaccinated with three doses does it have this effect. An explanation for this pattern could be that people vaccinated with fewer than three doses have a more pessimistic view of the efficiency of vaccination in protecting the population as, at this time in the pandemic, doubts were raised as to the capacity of the vaccine to limit the transmission of the virus (e.g., Ren et al., 2022).

Focusing on Hypothesis 2, the number of doses contrasts those vaccinated with three doses from the other groups. People who received a booster (i.e., 3 doses) clearly represent a distinct group when it comes to supporting restrictive policies while assessing serious risk of COVID-19 infection, which is in line with similar results from a study by Sprengholz et al. (2023). However, similar to Hypothesis 1, being vaccinated with three doses drives support for restrictive only when people perceived high risk, suggesting that even within an apparently homogenous group (i.e., vaccinated with three doses) outcomes differ. Furthermore, these results suggest that the number of doses received should not be treated linearly, especially in the context of a widely publicized campaign emphasizing the importance of “full” vaccination.

Further, the observation that participants anticipate more positive psychological outcomes associated with their preferred policy is compatible with the assumption that positive psychological outcomes drive adhesion to sanitary measures, including vaccination (Waterschoot et al., 2023). However, care should be taken in appraising this relationship given its cross-sectional nature.

The major difference in support and outcomes between individuals vaccinated with three doses and with high-risk perception and the others illustrates the societal polarization at that time. It is in line with a vignette study with the Belgian population on the social contact limitations during the Christmas period (Waterschoot et al., 2022) and with another study focusing on opinions about mandatory vaccination (Gagneux-Brunon et al., 2022), which showed how divided attitudes toward COVID-19 restrictions were within societies around the world. This comforts the idea that restrictive policies may fuel social polarization even among apparently homogenous groups (i.e., vaccinated people: Bardosh et al., 2022).

Further, a striking observation lies in the contrast of abolition with the three policies that have reached equivalent levels of support. This means that CST, vaccine passports, and mandatory vaccination do not stand out from each other. Presumably, this is due to the enforcing nature of the policy (contrasting with voluntary policies), which seems a more determining factor than the way they are enforced when it comes to evaluating attitudes toward different policies. Similar results were found in another study, showing that the type of restrictive policy did not matter (Sprengholz et al., 2023).

Of interest, one unexpected result lies in the main effect of risk perception on psychological outcomes, which had shown that the higher the risk was, the more positive the outcomes were anticipated. This is contrary to other moments in the pandemic when higher risk perception was related to higher concerns and lower well-being (Han et al., 2021), thus highlighting the contextual nature of risk perception. Looking more closely at the interaction between policy and risk, this positive association between perceived risk and expectations is only true for the restrictive scenarios, while lower anticipated outcomes are perceived for the abolition scenario when risk is high. This seems logical; people with higher risk perception expect less positive outcomes from abolition than from more stringent options, highlighting the protective function of the latter.

## Policy implications

Concretely, this study enables the psychology experts consulted as part of the parliamentary debate to provide advice to policymakers. In light of the polarization of the debate opposing the abolition of the CST to the three restrictive policies, policymakers were faced with a difficult choice that would necessarily entail costs. On the one hand, choosing one of the restrictive policies was likely to be met with strong resistance from those who needed most to be vaccinated. On the other hand, the relaxed choice of abolition is likely to reduce the positive assessment of public authorities and the well-being of people who considered the actual risk to be serious at that time and were vaccinated with three doses.

In view of these findings and knowing that the country's vaccination coverage reached 76.8% at that time (Sciensano, 2022a), the relaxed scenario was recommended to policymakers as the least costly and most reasonable choice. However, the option of introducing a restrictive policy such as mandatory vaccination should not be ruled out in the event of a new, more severe, variant, as it could increase risk perception and positively change support and anticipated outcomes, particularly among vaccinated individuals with three doses. Looking back at the situation in November 2021, the Delta variant was dominant and was associated with a rise in the severity of infections and intensive care occupancy (Sciensano, 2021). At the same time, a study among a representative sample of the Belgian population showed that a majority was in favor of mandatory vaccination (Test Achats, 2021). These observations contrast with the context in which the study took place which was dominated by a less aggressive variant, Omicron, and less supportive

of mandatory vaccination, suggesting that the results could have been different at another time during the pandemic.

Besides the choice of the policy, societal polarization toward restrictive policies renders efforts at crafting a unifying message particularly challenging. Indeed, a precondition for ensuring adhesion across the population regards the content of that communication about risk to be tailored to the current health situation in ways that can be understood and accepted by the public. Such tailored communication should include consistent and clear messages about the effectiveness of measures aimed at protecting the population (Dryhurst et al., 2020; Karafillakis et al., 2022). Should this condition be fulfilled, we can expect more pervasive and less polarized support for these measures.

Another notable aspect of these results highlights the highly contextual nature of public support for restrictive measures. For example, it is striking that people who have consented to being vaccinated once or twice may be very reluctant to accepting restrictive measures, which may reveal an evolution in their attitude toward vaccination. Similarly, even when they have received three doses, people who perceive low risk reject such measures as well. Presumably, this perception of risk was much higher in the past, when they received their doses, risk perception being a major drive of vaccination, over and above emotional concerns (Schmitz et al., 2022).

## Limitations and future directions

Several limitations require caution in the interpretation of the results. First, the recruitment process through social media and newspapers constrains the sample to a selective part of the population, mainly composed of highly educated people, men, and older people, who felt motivated to complete the survey. Also, vaccination rates in the sample were only 62% while the country's vaccination coverage reached 76.8% at that time of the pandemic, resulting in an overrepresentation of unvaccinated participants (38% in the study for 23.2% in actual data) and an underrepresentation of participants vaccinated with three doses (40% in the study for 55.8% in actual data) (Scienzano, 2022a). A specific part of the population may have felt motivated to complete the survey in the hope of seeing restrictive measures abolished. Although the preferential support for abolition in unvaccinated people is not surprising, there may be a bias in favor of people opposed to vaccination. In addition, the underrepresentation of people with three doses may have led to an underestimation of their support for vaccination policies, especially with regard to those with low-risk perceptions. Overall, the sample is not representative of the general population, requiring cautiousness in the interpretation of the results.

Second, this study includes a large sample of 12,670 participants which may have contributed to enhancing the likelihood of significant results, even for small effects. To mitigate this problem, we do not discuss very small effects. However, given that the effects remain small for the main effects of risk perception and vaccination status, as well as for their interaction with the nature of the policy, conclusions on the impact of these variables on support and anticipated psychological outcomes may have been overestimated.

In addition, the present study is a vignette study relying on self-report, which could have lacked realism as participants were asked to give their opinion on potential scenarios and psychological outcomes. Although we can reasonably assume that the gap with reality is minimized given that the four scenarios were real policy options discussed by policymakers, the experimental manipulation of government policies remains quite distinct from the actual implementation of these policies. In the same vein, we were not able to check the veracity of the statements regarding the



actual vaccination status of each participant. These pitfalls require caution in the interpretation of the results. To improve the ecological validity of this study, one could assess support and outcomes as a function of risk perception when the relevant policy is actually implemented, and compare the results across countries or time depending on the said policy. With regard to vaccination status, a solution could be to collect the vaccination profile of participants at the time the policy was implemented.

It should be noted that the order of presentation of the four scenarios is not counterbalanced. In the absence of randomization of the presentation, order effects might have occurred, which could have influenced the evaluation of support and expected outcomes for each policy scenario. However, order effects are more likely to be strong in the presence of complex and numerous vignettes (Auspurg & Jäckle, 2017), which is not the case here. In the future, vignette design on policy options should better control order effects.

Finally, people may also have sought to be consistent across outcomes, which may contribute to homogeneity in this regard.

## CONCLUSION

Through this study, we sought to examine how people's vaccination status and perception of risk influenced their support for a variety of vaccination-related policies at a very specific time of the COVID-19 pandemic. Importantly, this was done in response to solicitations from the Belgian parliament to receive scholarly advice on the appropriateness of these options. Indeed, at the time, there was a heated debate regarding the legitimacy and appropriateness of mandatory vaccination. The results are strikingly split between people perceiving high risk and vaccinated three times and the other subgroups, in contrasting support and outcomes of the relaxed policy from the restrictive ones, including mandatory vaccination. This sheds light on the core role of risk perception and vaccination status in predicting attitudes toward a wide spectrum of vaccination policies, as well as on the polarization of society on that matter, underlying the need for unifying messages to be conveyed by policymakers at that particular time.

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## CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

## DATA AVAILABILITY STATEMENT












The R script and the full set of results are publicly available on Open Sciences Framework: [https://osf.io/tdyfx/?view\\_only=43106539798d46c88698b59cc49e30e0](https://osf.io/tdyfx/?view_only=43106539798d46c88698b59cc49e30e0). The dataset is hosted in Zenodo (a

public repository) and is available upon request and for replication purposes only: <https://doi.org/10.5281/zenodo.10246561>.

## OPEN RESEARCH BADGES

 This article has earned Open Data Research Design badge. Data is available at [https://osf.io/tdyfx/?view\\_only=43106539798d46c88698b59cc49e30e0](https://osf.io/tdyfx/?view_only=43106539798d46c88698b59cc49e30e0).

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## SUPPORTING INFORMATION

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

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