Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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The relation between conspiracism, government trust, and COVID-19 vaccination intentions: The key role of motivation

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ABSTRACT

Rationale: Vaccination willingness is a critical step in the effort to reach herd immunity and control the COVID-19 pandemic. Nevertheless, many people remain reluctant to be vaccinated.
Objective: Integrating the literature on Self-Determination Theory, trust in authorities, and conspiracy theories, this research examines (a) the direct and indirect effect of government trust and conspiracism via underlying forms of motivations for (not) getting vaccinated against COVID-19 and (b) whether these associations differ across the two largely politically independent Belgian linguistic groups.
Methods: Using Structural Equation Modeling, we tested our models in two independent samples, in February 2021 (T1) and April 2021 (T2) (Total $N = 8264$).
Results: At T1 and T2, Government trust and conspiracism both predict COVID-19 vaccination intention, respectively positively and negatively. These relations are fully mediated by motivational factors, with identified motivations having a larger positive contribution. Looking at linguistic context, differences emerge at T2, with French-speaking Belgians showing lower levels of government trust and higher levels of conspiracism than Dutch speakers.
Conclusions: Results highlight the importance of integrating distal (trust in government, conspiracism) and proximal (motivational) variables to understand vaccination intentions.

1. Introduction

Attitudes towards vaccination are a fascinating object of study. Vaccination involves letting a stranger inject a substance into one's body, thereby impinging on one's physical integrity. Yet, a grand theater overshadows this intimate scene. The logistical efforts demanded by mass vaccination rely on the actions of large-scale institutions embedded in the political power of nation-states (Holmberg et al., 2017). Vaccination results from a collective ethos in which personal well-being is subsumed under collective health with the state as its guardian. This collective dimension materializes in the concept of "herd immunity" and in the idea that our capacity to freely engage in activities essential to our basic human needs (such as physical contact with close others) depends upon one's community being immunized against a threatening virus.

This state of affairs raises an important question: What makes people take the leap and get vaccinated? Here, we examine the trust people place in the authorities that organize vaccination campaigns as well as shared beliefs regarding the spread of the virus and the development and commercialization of vaccines (i.e., conspiracy theories). We consider especially how these distal factors may be associated with vaccination intentions via more proximal motivational dynamics in the case of

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COVID-19.

1.1. Vaccine hesitancy and motivations for vaccine uptake

Defined as "the delay in acceptance or refusal of vaccination despite the availability of vaccination services." (MacDonald, 2015, p. 4161), vaccination hesitancy is the prime obstacle in the campaign against COVID-19 and is more prevalent among youth, females, ethnic minorities, and individuals with low income, low education, low medical trust, low perceived risk from the disease, and high conspiracy beliefs (Bocquier et al., 2017; Milošević Đorđević et al., 2021; Wilson and Wiysonge, 2020).

Vaccination hesitancy is motivationally driven. Some motives drive people away from taking a vaccine while others increase the likelihood of vaccine uptake. Grounded in Self-Determination Theory (SDT; Ryan and Deci, 2017; Vansteenkiste et al., 2006), we adopted a differentiated viewpoint towards the motives (or lack thereof) that underlie people's vaccine hesitancy. Specifically, identified motivation represents a desirable form of motivation because it is volitional in nature, as citizens concur with the necessity and benefit of vaccination (e.g., to protect themselves and others; to collectively resolve the crisis). Yet, citizens may also be motivated for external reasons: They feel obliged to take up a vaccine, for instance, to avoid disapproval from others or feel seduced to obtain a reward in exchange for the effort made (e.g., being able to travel or to attend to large public events). Theoretically, with external regulation, some individuals may express the intention to engage in the pressured behavior, while others may react more defensively by reducing their intentions. Past research found external regulation to yield a variable effect on vaccination intentions, with some studies reporting a positive relation and others reporting no relation. In contrast, identified regulation yielded a more systematic and stronger positive contribution to vaccination intentions. These findings have been observed for a variety of vaccines, including the human papillomavirus vaccine (Denman et al., 2016), flu vaccination (Moon et al., 2021), the seasonal influenza vaccine (Fall et al., 2018) and the COVID-19 vaccine (Schmitz et al., 2022). Importantly, identified motivation does not only relate to greater intentions to accept a COVID-19 vaccine, but is a robust predictor of individuals' self-reported vaccine uptake over time (Schmitz et al., 2022). Fostering the full endorsement of vaccination is thus key for the smooth and successful development of vaccination campaigns.

Yet, not all individuals are motivated to accept a vaccine. Schmitz et al. (2022) also adopted a differentiated approach to the study of people's lack of motivation, thereby distinguishing between distrust- and effort-based amotivation. Clearly, distrust, or lack of confidence in the efficacy or the safety of the vaccine, is a chief driver of vaccine hesitancy (Brewer, 2021; MacDonald, 2015) and negatively predicts intentions to accept a COVID-19 vaccine (Schmitz et al., 2022). As to effort-based amotivation, it denotes the fact that citizens consider that they lack sufficient resources to engage in the behavior (Legault et al., 2006; Pelletier et al., 1999) or notice practical obstacles, including distance to a vaccination center or time needed to complete the vaccination plan. Effort-based amotivation relates to the concept of complacency used in the vaccine hesitancy literature (Schmid et al., 2017). Although it relates negatively to COVID-19 vaccination intentions at the correlational level, it failed to carry unique predictive validity when considering the shared variance with other (de)motivating factors (Schmitz et al., 2022).

1.2. Government trust and political context

Given their prominent role for vaccine uptake, a critical question is which factors feed into these different motivational factors. Here we considered the role of government trust as this factor appears to play a key role in individuals' hesitancy through feeding into citizens' motivation. Although the notion of trust has different facets (Liu et al., 2018), a common feature is individuals' readiness to willingly submit to the actions of the trusted party without desiring to control or monitor them (Mayer et al., 1995). This implies expectations of competence, benevolence, and integrity from this other party (Grimmelikhuijsen and Knies, 2017).

Responding to a pandemic demands the involvement of large swaths of the population (Jetten et al., 2020). In such a context, the role of government authorities is to organize and stimulate this collective response. We reasoned that without trust in these authorities, there is little hope of achieving an efficient response from the population. Although past work confirms that trust in government authorities is a major predictor of vaccination intention (e.g., Jamison et al., 2019) or vaccination (Miyachi et al., 2020) including in relation to COVID-19 (e.g., Milošević Đorđević et al., 2021; Trent et al., 2021), the underlying motivational mechanisms remain to be identified. We suggest that when citizens perceive that authorities (1) are not capable of delivering safe and efficient vaccines (lack of competence), (2) are indifferent to the possible adverse effects of vaccines (lack of benevolence), or (3) knowingly convey inaccurate information about the vaccine (lack of integrity), they may express lower intentions to get vaccinated. Because people distrust the vaccine more and concur less with its critical importance, their identified regulation is lacking. Also, if one has low trust in authorities, information campaigns come across as unreliable and unfit to form the basis of an informed decision and people are less likely to identify with the importance of vaccination (again undermining identified motivation). Finally, lack of government trust may also feed into effort-based amotivation. If one does not trust government's messages regarding the benefits of vaccination and the risk posed by COVID-19, taking the steps towards vaccination may come across as overly taxing.

1.3. Conspiracy theories

Conspiracy theories, i.e., "beliefs about a group of actors who join together in secret agreement and try to achieve a hidden goal that is perceived as unlawful or malevolent" (Zonis and Joseph, 1994, pp. 448–449) have been particularly visible during COVID-19 pandemic (for a review, see van Mulukom et al., 2020). In a survey on a representative sample of the UK population in May 2020, Freeman et al. (2020) found substantial agreement with many such theories. For example, 26.4% of the respondents agreed "moderately", "a lot" or "completely" that "the spread of the virus is a deliberate attempt to reduce the size of the global population". Some of these theories have targeted Chinese authorities while others have targeted "Big Pharma", believed to exaggerate virus severity to sell expensive vaccines and treatment. Note that these estimates may be inflated due to the response scales used (Garry et al., 2020). Similarly, in the US, Romer and Jamieson (2020) showed that 28.3% of participants believed that the virus was created by the Chinese government.

Interestingly, people who endorse one conspiracy theory tend to endorse others, illustrating a so-called "conspiracy mentality" (Imhoff and Bruder, 2014; Moscovici, 1987). This means that people's general tendency to adhere to a variety of conspiracy beliefs regarding COVID-19 may shape their motivations to get vaccinated. Unsurprisingly, endorsement of COVID-19 conspiracy beliefs emerged as a strong negative predictor of vaccination intentions (Bertin et al., 2020; Enea et al., 2022) and actual behavior (van Prooijen et al., 2021).

How would conspiracy beliefs influence the above motivations? Conspiracy theories are a counterpart to the "official" discourse proposed by authorities and health experts. For this reason, the associations between conspiracism and the four motivational bases of vaccination may mirror those of distrust in authorities. Because conspiracies tend to downplay the risks posed by COVID-19, conspiracy believers may not be motivated to devote the necessary effort to get vaccinated, leading to a positive relation of conspiracism with effort-based amotivation. Moreover, conspiracism is associated with a tendency to trust alternative

medicine, which typically rejects vaccination (Lamberty and Imhoff, 2018), producing a positive relation with distrust-based amotivation. The main basis for freely deciding to get vaccinated being undermined, conspiracism may also translate into lower levels of identified vaccination. Finally, conspiracy believers are less likely to be motivated by social rewards and sanctions (e.g, social approval, a sense of obligation to the community) than those who reject such theories (Hornsey et al., 2021).

1.4. Present research

The above analysis led us to postulate the following: We suggest that the two distal factors, namely government trust and conspiracy beliefs, will predict vaccine intentions via the four types of motivation highlighted above. Specifically, government trust should have a positive effect on identified and a negative effect on effort-based and distrust-based amotivations. The converse should hold for conspiracy beliefs. In turn, especially identified motivation should predict vaccination intentions positively whereas effort-based amotivation and distrust should show the opposite relation. We make no strong predictions as to direction of the effects between conspiracism and distrust in government on the one hand and external motivation on the other. While external regulation may be most effective for conspiracy believers and those who distrust the government, it may also align with their general amotivation to engage in vaccination. Finally, external motivation may yield a small positive contribution, although its contribution, and that of effort-based amotivation, may vanish when considering the two other motivations.

We investigate these questions in the Belgian context. The outbreak emerged when Belgium was without a governing majority since December 2018. Following the elections of May 2019, long political negotiations took place and a temporary minority government was set up to tackle the crisis (mostly due to divergences between parties representing the two main linguistic groups, i.e., Dutch- and French-speakers). In October 2020, a new government took full office, shortly after the start of a second peak of infections that some blamed on the mismanagement of the crisis by the minority government. Although Belgium administered the first vaccines end of December 2020, it is in March 2021 that the population was called on to get vaccinated, starting with the elderly. The announcement of the vaccination campaign thus came at a time of lingering mistrust of the authorities (Rigot, 2021). The COVID-19 vaccines soon became the target of conspiracy theories. As the vaccination campaign unfolded, many citizens showed reluctance towards or even rejected the vaccine (Schmitz et al., 2022).

Of importance, Belgium comprises two main linguistic groups (Dutch- and French-speaking) electing their representatives separately and having distinct media. The country is divided in three regions: the Flemish region (where people speak Dutch), the Walloon region (where people speak French, although a very small minority speaks German) and Brussels region (bilingual, French being predominant). Because the two distal predictors (government trust and conspiracy beliefs) are likely to fluctuate over time, in view of the differences between the two linguistic groups (e.g., in terms of media exposure, political orientation, institutions …), a powerful test of our model would involve showing that the model holds at different points in time. To be sure, we expect variations in government trust and conspiracy beliefs that result from contextual changes as the pandemic evolves to be associated with varying vaccination intentions. However, this should not change the nature of the links between the variables of our mediational model. In what follows, we will use language as a proxy for characterizing these two different political contexts. Thus, it should be clear that we do not consider it as an explanatory variable as such, but rather as an entry into these distinct sociopolitical worlds.

2. Methods

2.1. Participants

We rely on data from the Motivation Barometer, a long-term online panel study initiated on March 19, 2020, right after the first outbreak of COVID-19 in Belgium. More than 400,000 respondents completed questionnaires about psychological aspects of COVID-19. The questions included the motivation towards and adherence to sanitary behaviors, psychological needs, vaccination intentions, well-being, uncertainty, risk perception, self-efficacy, government communication, trust towards experts and authorities and conspiracy theories, for the most important variables.

For this study, we collected two independent samples at two different times for a total of $N = 8264$ non-vaccinated participants. The first sample (5008 participants) completed the online survey between February 2 and 10, 2021 (T1). The mean age was 50.58 ($SD = 14.09$), 55% were females, 70% had a higher degree (i.e., bachelor or more), 73% were French-speakers, and 67% reported no comorbidity factors. The second sample (3256 participants) completed the online survey between April 1 and 16, 2021 (T2). The mean age was 49.13 ($SD = 15.61$), 71% females, 61% with higher degree, 34% French-speakers, 69% reported no comorbidity factors. Sociodemographic differences between T1 and T2 samples were all significant ($ps < .010$). A total of 7.7% of participants took part in both studies. Note that, across the two time points, our sample included more women (61.71%) and fewer people over 65 (19.65%) than the general population (50.72% and 24.21% respectively: Statbel, 2022).

The present dataset is a subsample from a slightly larger original sample ($N = 8531$) and comprises only participants with no missing values on our measures of interest. Doing so offers the advantage that all analyses were based on the same set of participants, it also reduces complexity in the analyses, while losing a very small percentage of participants (about 3%). Moreover, listwise deletion is considered appropriate when data are Missing Completely at Random (see Paul, 2009), which is the case (missing data analyses available in the OSF repository).

2.2. Measures

2.2.1. Government trust

To assess government trust, participants rated the people who make decisions about the pandemic at the government level on 6 traits taken from the literature on social evaluation (Abele et al., 2021; Yzerbyt, 2016): competent, qualified, responsible, honest, just, and benevolent. Respondents answered on a scale ranging from 1 (Totally disagree) to 5 (Totally agree). Capturing the three aspects of trust in a government organization (competence, benevolence, integrity) highlighted by Grimmelikhuijsen and Knies (2017), this unidimensional scale (as suggested by factor analysis available in the OSF repository) showed excellent reliability ($\alpha_{T1} = 0.94$, $\alpha_{T2} = 0.95$).

2.2.2. Conspiracy

Given the number of conspiracy theories surrounding COVID-19, we selected theories bearing on three popular themes: The role of Chinese actors in triggering the pandemic, the collusion between the government and the pharmaceutical industry, and the use of the pandemic to increase surveillance of the population. Participants indicated how credible they found the following statements on a scale from 1 (Not at all credible) to 5 (Totally credible): “The coronavirus is a bacteriological weapon used by the Chinese communist party to create panic in the West”, “The coronavirus pandemic is a strategy of China to start a new economic crisis”, “Governments take advantage of the COVID-19 pandemic to monitor the population more closely”, “Politics is in cahoots with the pharmaceutical industry”. The scale reliability was good ($\alpha_{T1} = 0.81$, $\alpha_{T2} = 0.82$).

2.2.3. Motivation to get vaccinated

We assessed participants' motivations towards vaccination against COVID-19 on a 12-item scale that captured four types of motivation: identified, external, distrust, and effort. Participants answered on a scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). Identified motivation ($\alpha_{T1} = 0.95$, $\alpha_{T2} = 0.96$) denotes the degree to which one considers that vaccination is necessary and beneficial. A sample item was "I fully agree with getting vaccinated". External motivation ($\alpha_{T1} = 0.70$, $\alpha_{T2} = 0.69$) expresses the extent to which one feels obligated to get vaccinated. A sample item was "I will be criticized if I don't get vaccinated". Distrust motivation ($\alpha_{T1} = 0.90$, $\alpha_{T2} = 0.89$) refers to the degree to which one feels distrust towards the efficacy and secondary effects of the vaccine, e.g."I don't think the research on the vaccine's effectiveness is rigorous enough". Effort-based amotivation ($\alpha_{T1} = 0.78$, $\alpha_{T2} = 0.78$) conveys the degree to which one perceives the vaccination as an effortful process due to various practical obstacles (e.g., distance to the vaccination centers). One sample item was "The vaccine takes too much effort for me".

2.2.4. Vaccination intention

We measured participants' views on vaccination with three items: "If you had the opportunity to be vaccinated against COVID-19 next week, what would you decide?", "Would you encourage others to get vaccinated?", and "Would you participate in a vaccination campaign?". Participants responded on a scale ranging from 1 (Strongly disagree) to 5 (Strongly agree), except for the first item that had the options 1 (I would refuse without any hesitation), 2 (I probably would refuse), 3 (Doubting), 4 (I probably would accept), 5 (I would accept without any hesitation). The reliability was very good ($\alpha_{T1} = 0.91$, $\alpha_{T2} = 0.90$).

2.2.5. Sociodemographic variables

We asked participants' age, gender, education level (seven levels, from 1 = "No diploma" to 7 = "Master"), language (Dutch vs. French), and comorbidity factors associated with COVID-19.

2.3. Procedures

We recruited participants by reaching to local newspapers and organizations and via paid Facebook advertisements, providing a link to the Qualtrics questionnaire. All Belgian residents over 18 were eligible for participation. Participants received an invitation to participate in a study tapping several issues related to their experience with COVID-19, their well-being, and their motivation during the pandemic. The invitation made explicit the anonymous and confidential character of the data collection. After agreeing to the informed consent form, participants completed the survey, lasting about 15 min.

2.4. Data analyses

We conducted the analyses using R (R Core Team, 2013). We tested the various models with the *lavaan* package (Rosseel, 2012), using latent constructs in our structural equation models (SEM) whenever possible. We estimated the mediational indirect effects via the Delta method (the default method in *lavaan*). We used the following cut-offs to assess the goodness of fit of our SEM's: RMSEA <0.05, SRMR <0.08, CFI >0.90, and TLI >0.90 (Hu and Bentler, 1999; see also Marsh et al., 2004). We report unstandardized coefficients for the multigroup-SEM (MG-SEM), so that equally constrained coefficients between groups produce the same values. Of note, this equivalence does not materialize for standardized coefficients given that they rely on the specific standard deviation of each group. Given our large sample size, we decided to fix α at .001 (see Goodboy and Kline, 2017; Van de Schoot et al., 2012). The items list and R scripts to carry out the analyses are available on the Open Science Framework: https://osf.io/y5nkc/?view_only=fb625c41f4534f6aa8c92c82e754cfa9. 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.5913755.

3. Results

3.1. Preliminary analyses

Table 1 shows the correlations among the variables. Vaccination intention correlated positively with government trust and identified motivation, but negatively with conspiracism, external motivation, distrust, and effort-based amotivation. Government trust was positively associated with identified motivation, but negatively with conspiracism, external motivation, distrust, and effort-based amotivation. Identified motivation was negatively related to the other motivations, whereas the latter were positively related to each other. These results held up at both T1 and T2.

A MANOVA showed differences on the variables of interest as a function of language at both T1 (Wilks's $\lambda = 0.99$, $p < .001$, $\eta_p^2 < 0.01$) and T2 (Wilks's $\lambda = 0.93$, $p < .001$, $\eta_p^2 = 0.07$). Univariate analyses (see Table S1 in Supplementary Materials) revealed that Dutch-speakers reported more government trust, lower conspiracism, higher identified motivation, lower external motivation, lower distrust-based amotivation, lower effort-based amotivation, and a higher vaccination intention than French-speakers did at T2 (all $ps < .001$), whereas no significant differences emerged on these variables at T1 (see Table S1 for effects of gender and comorbidity).

We tested our structural equation model (SEM) with and without considering several control variables (i.e., age, gender, education, comorbidity). Their inclusion in the model did not affect our conclusions, which suggests that sociodemographic differences between French- and Dutch-speakers do not account for the observed differences between the two samples. For parsimony, the results presented here do not consider them.

3.2. Measurement model

Table 2 shows the fit indices of several nested confirmatory factor analyses (CFA) on the total sample (T1 and T2). We compared a seven-factor model for which each of our constructs loaded on a single factor to a six-, four-, and one-factor model. The seven-factor model outperformed all other models, confirming that our hypothesized constructs were distinct. To further improve this model, we allowed two within-factor error correlations (i.e., between two items of conspiracism, and between two items of government trust). The final measurement model provided good fit ($\chi^2 = 4369$, $df = 252$, $CFI = 0.977$, $TLI = 0.972$, $RMSEA = 0.044$, $SRMR = 0.041$). All standardized loadings exceeded 0.40 and no cross-loadings had to be tolerated.

3.3. Measurement invariance

We tested measurement invariance using Multigroup Confirmatory Factor Analysis (MG-CFA; Byrne et al., 1989; Meuleman and Billiet, 2012) to examine model invariance across T1 and T2. Table 3 presents the fit indices for each measurement invariance level that build on top of each other.

We relied on the criteria suggested by Chen (2007) to compare the measurement models. Specifically, "for testing loading invariance [i.e., weak invariance], a change of ≥ -0.010 in *CFI*, supplemented by a change of ≥ 0.015 in *RMSEA* or a change of ≥ 0.030 in *SRMR* would indicate non-invariance; for testing intercept or residual invariance [i.e., strong invariance], a change of ≥ -0.010 in *CFI*, supplemented by a change of ≥ 0.015 in *RMSEA* or a change of ≥ 0.010 in *SRMR* would indicate non-invariance" (Chen, 2007, p. 501). Although this author did not specify comparison criteria for the more stringent invariance models (strict and factor invariance), we relied on a more conservative criterion to test the following levels, namely that changes in $\Delta CFI \geq -0.010$ together with a $\Delta RMSEA \geq 0.010$ and $\Delta SRMR \geq 0.010$ would indicate

Table 1
Correlation matrix and descriptive statistics of the variables of interest.

			M	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
				49.13	–	–	5.01	–	3.37	2.31	2.36	3.51	2.75	3.20	1.71
	M	*SD*	*SD*	15.61	–	–	1.37	–	1.35	1.03	1.03	1.45	1.20	1.24	0.83
1. Age	50.58	14.09		–	.03	.00	-.27***	.36***	.10***	.12***	.05	.10***	-.19***	-.05	-.04
2. Gender	–	–		-.17***	–	-.05	-.01	-.02	.09***	.14***	-.04	.09***	-.02	.06***	-.03
3. Language	–	–		-.00	-.13***	–	.08***	.03	-.21***	-.22***	.13***	-.22***	.07***	.19***	.12***
4. Education	5.36	1.40		-.16***	-.00	.11***	–	-.17***	.08***	.08***	-.24***	.09***	-.01	-.13***	-.12***
5. Comorbidity	–	–		.33***	-.10***	.07***	-.15***	–	.10***	.05**	.03	.11***	-.09***	-.01	.03
6. Vaccination intention	3.63	1.33		.21***	-.11***	.02	.15***	.12***	–	.54***	-.55***	.90***	-.46***	-.72***	-.35***
7. Gov. trust	2.62	1.07		.24***	.00	-.02	.10***	.05***	.52***	–	-.53***	.55***	-.30***	-.50***	-.26***
8. Conspiracism	2.20	0.99		-.11***	.02	-.04	-.27***	.00	-.53***	-.52***	–	-.57***	.35***	.60***	.37***
9. Identified motv.	3.76	1.37		.22***	-.10***	.02	.14***	.13***	.91***	.52***	-.56***	–	-.49***	-.73***	-.38***
10. External motv.	2.54	1.14		-.22***	.02	-.03	.02	-.10***	-.45***	-.30***	.35***	-.47***	–	.48***	.28***
11. Distrust-based amotv.	2.87	1.25		-.24***	.18***	-.01	-.17***	-.08***	-.77***	-.48***	.57***	-.77***	.47***	–	.41***
12. Effort-based amotv.	1.67	0.81		-.16***	.08***	.01	-.13***	-.05***	-.40***	-.25***	.37***	-.42***	.32***	.46***	–

Note. T1 corresponds to the lower triangle and T2 to the upper triangle. Gov. = government. Motv. = Motivation, Amotv. = Amotivation. Gender was coded "Men" = -0.5 and "Women" = +0.5. Comorbidity was coded "Absent" = −0.5 and "Present" = +0.5. ***$p < .001$.

Table 2
Fit indices for measurement models.

Model		χ^2	*df*	*RMSEA*	*SRMR*	*CFI*	*TLI*	$\Delta\chi^2$	Δdf
1.	Seven-factor model	12843.55	254	.077	.106	.929	.916	–	–
2.	Six-factor model (ID & VA = 1 factor)	13175.18	260	.078	.106	.927	.916	331.62***	6
3.	Six-factor model (GO & CO = 1 factor)	22263.89	260	.101	.090	.876	.856	9420.33***	6
4.	Four-factor model (ID & EX & DI & EF = 1 factor)	28510.77	269	.113	.120	.840	.822	15667.22***	15
5.	One-factor model	66685.11	275	.171	.119	.624	.590	53841.56***	21

Note. Models 2–5 are compared to Model 1. RMSEA = Root Mean Square Error of Approximation, SRMR = Standardized Root Mean Square Residual, CFI = Comparative Fit Index, TLI = Tucker-Lewis Index, GO = Government Trust, CO = Conspiracism, VA = Vaccination intention, ID= Identified motivation, DI = Distrust-based amotivation, EX = External motivation, EF = Effort-based amotivation. ***$p < .001$.

Table 3
Levels of measurement invariances.

Levels of measurement invariance		χ^2	*df*	*RMSEA*	*SRMR*	*CFI*	*TLI*	Δ_{df}	Δ_{RMSEA}	Δ_{SRMR}	Δ_{CFI}	Δ_{TLI}
1.	Configural invariance (structure)	4708.66	504	.045	.043	.976	.972	–	–	–	–	–
2.	Weak invariance (loadings)	4853.15	522	.045	.044	.975	.972	18	.000	.002	-.001	.000
3.	Strong invariance (intercepts)	5518.70	540	.047	.046	.972	.969	18	.002	.001	-.004	-.003
4.	Strict invariance (residuals)	5977.65	565	.048	.046	.969	.967	25	.001	.001	-.002	-.001
5.	Factor invariance (variances and covariances)	6169.07	593	.048	.049	.968	.968	28	.000	.003	-.001	.001

Note. Each model is compared the one above (less restrictive).

non-invariance.

The data show the highest level of measurement invariance, namely factor invariance (see Table 3), i.e., participants from T1 and T2 display the same factorial structure (configural invariance), meaning of the latent constructs (weak invariance), levels of the underlying manifest variables (strong invariance), measurement reliability (strict invariance), and relations between constructs (factor variance and covariance invariance). This level of measurement invariance allows, among other things, for multigroup path analysis, i.e. comparing the regression paths between the latent variables across groups. The results discussed below rest on the most parsimonious measurement model (factor invariance).

3.4. Testing our integrated process model

We assessed the joint contribution of government trust and conspiracism on vaccination intention through vaccination motivations using latent variables. Moreover, we also examined if the regression paths significantly varied across both T1 and T2 by means of a multigroup structural equation model (MG-SEM). For each structural path, we compared a fully constrained model in which all regression coefficients were set equal across samples, to a partly constrained model in which only one path was free to differ between groups. A significant difference in χ^2 between the two models would indicate that the tested path should be free to vary across T1 and T2 (Byrne, 2009).

We first fitted the model independently for each sample. The model adequately fitted both the T1 ($\chi^2 = 2507$, $df = 252$, $N = 5008$, $CFI = 0.979$, $TLI = 0.975$, $RMSEA = 0.042$, $SRMR = 0.039$) and T2 ($\chi^2 = 2201$, $df = 252$, $N = 3256$, $CFI = 0.972$, $TLI = 0.967$, $RMSEA = 0.049$, $SRMR = 0.048$) samples. Next, we compared a fully constrained model (in which all regression coefficients were set equal between T1 and T2) to a fully unconstrained model (in which all regression coefficients were free to vary across time). The difference in chi-square between the two models did not reach significance ($\Delta\chi^2 = 34.26$, $p = .002$), suggesting that freeing the paths did not improve the model and that we could stick to the more parsimonious model with equal T1 and T2 regression coefficients. The model provided good fit (see Fig. 1).

As expected, examining the joint role of both government trust and conspiracism revealed that the former had a positive total effect (c_1; i.e., without controlling for motivations) on vaccination intention whereas the latter had a negative total effect (c_2). Moreover, government trust

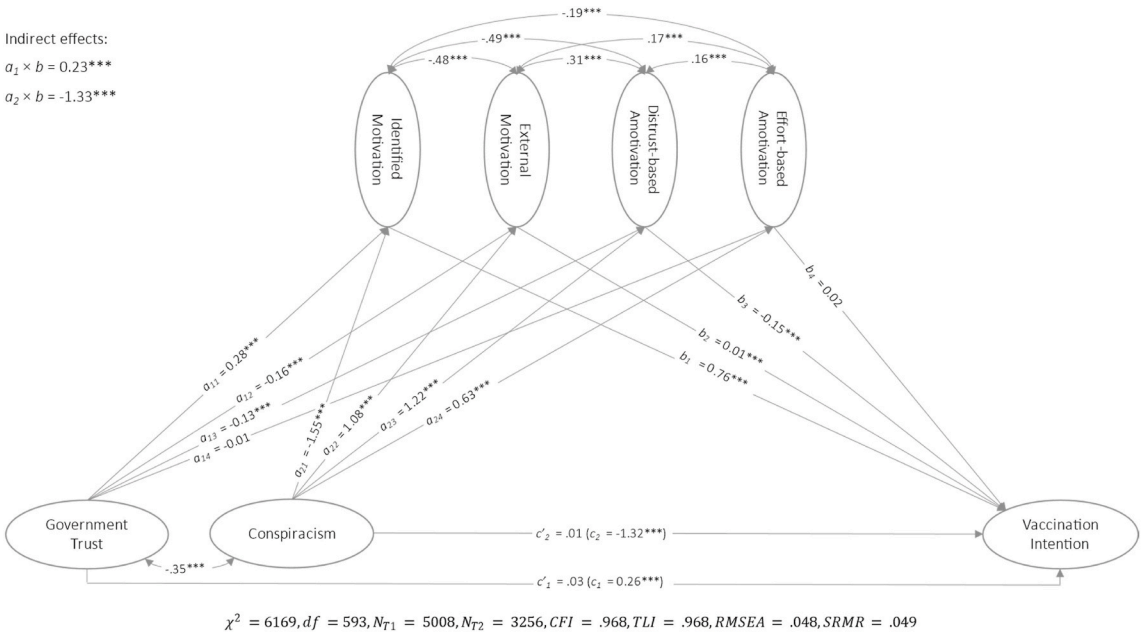

Fig. 1. Multigroup SEM of the mediated contribution of government trust and conspiracism on vaccination across T1 and T2 *Note.* Coefficients are non-standardized. Total effects are in parentheses. ***$p < .001$.

had a positive influence on identified motivation (a_{11}), but a negative one on external motivation (a_{12}) and distrust-based amotivation (a_{13}), whereas conspiracism had a negative effect on identified motivation (a_{21}), but a positive one on external motivation (a_{22}), distrust- (a_{23}), and effort-based amotivation (a_{24}). Interestingly, identified motivation (b_1), and to a lower extent external motivation (b_2) had a positive effect on vaccination intention when controlling for government trust and conspiracism, whereas distrust (b_3) had the opposite effect. The indirect effects on vaccination intention were significant for both government trust ($a_1 \times b$) and conspiracism ($a_2 \times b$). Finally, the direct influence of government trust (c'_1) or conspiracism (c'_2) on vaccination intention, i.e., after controlling for the motivation mediators, did not reach significance, suggesting full mediation in both cases. None of the coefficients differed significantly across T1 and T2, indicating that the model was stable across these two samples.

3.5. Differences between Dutch- and French-speakers

In line with the idea that government trust and conspiracism are context-dependent, we examined potential differences between the two Belgian linguistic groups. Indeed, as the vaccination campaign unfolded, there were growing indications that conspiracy theories received more attention in the French-speaking part of the country and that trust in the authorities suffered among the French-speaking population more so than among Dutch-speakers.

Several studies confirm that overall lower levels of political trust prevail among Walloons (French speakers), compared to Flemish (Dutch speakers) citizens (Hooghe and Dassonneville, 2018; Stiers et al., 2015). Distrust, dissatisfaction with democracy, and the feeling of not being considered are also higher among Walloons (Billiet et al., 2006). Similar trends emerge for conspiracy theories. A representative survey of 1057 Belgians conducted in January 2021 reveals that French speakers tended to adhere more to such theories (Casteels, 2021; Fiorilli, 2021). To map citizens' interest in conspiracy theories on both sides of the linguistic border, we used Google Trends to check how a number of relevant queries were used between January 1st, 2021 and April 30th. First, restricting the analysis to Belgium, the search for the topic "conspiracy theories" was more frequent in Brussels (a bilingual region with a large majority of French speakers) and Wallonia (the French-speaking region). Specifically, assigning Brussels a score of 100 (i.e., the Region with the highest percentage of use of this keyword in relation to the total number of local searches) resulted in a score of 29 for Flanders (the Dutch-speaking region), i.e., three times less. Similarly, the search for "Big Pharma conspiracy theory" revealed the highest number of searches for Brussels, with a baseline score of 100, and a comparative score of 86 for Wallonia and 62 for Flanders. Together, these elements strongly suggest that higher levels of conspiracism and lower levels of political trust prevailed in the French-speaking part of the country.

3.6. Role of linguistic group in the integrated process model

Given the potential role of "language" on some of our variables of interest (see also preliminary analyses), we assessed a more complex model that had language as a contextual antecedent of our mediational model. Again, we use language as a proxy to refer to the two regions and thus test the model across distinct political contexts. We examined the effect of language on vaccination intention through government trust, conspiracism, and motivations, while also considering potential discrepancies in structural paths between T1 and T2. Importantly, this expanded model allows us to test whether our initial model holds when controlling for this contextual variable. The statistical procedure was the same as above.

When fitting a model to each sample independently, the model provided adequate fit for T1 ($\chi^2 = 3170$, $df = 270$, $N = 5008$, $CFI = 0.973$, $TLI = 0.968$, $RMSEA = 0.046$, $SRMR = 0.040$) and T2 ($\chi^2 = 2570$, $df = 270$, $N = 3256$, $CFI = 0.967$, $TLI = 0.961$, $RMSEA = 0.051$, $SRMR = 0.049$) samples. The difference in chi-square between the fully constrained and unconstrained models was significant ($\Delta\chi^2 = 158.70$, $p < .001$), indicating that one needed to free at least one regression coefficient between T1 and T2.

To this end, we repeatedly compared, for each structural path, the fully constrained model to a partly constrained model in which we allowed a unique path to differ between groups (Byrne, 2009). These analyses revealed that the Language → Conspiracism ($\Delta\chi^2_{(1)} = 24.74$, $p < .001$), Language → Government trust ($\Delta\chi^2_{(1)} = 18.17$, $p < .001$), and Language → Identified motivation ($\Delta\chi^2_{(1)} = 15.18$, $p < .001$) paths should be free to vary across T1 and T2. We fitted a partly constrained model

simultaneously incorporating these variations across groups to the complete sample. For the sake of readability, we kept the same coefficient labels from the previous model. The model provided good fit (see Fig. 2).

The total effect of language on vaccination intention (*e*) did not reach significance at T1 but did at T2. Specifically, whereas there were no language differences in terms of vaccination intention at T1, French-speakers reported lower vaccination intention levels than Dutch-speakers at T2.

As for the effect of language on the mediators (*d* paths), the T1 data revealed that there was only a significant effect of language on external motivation (d_4), such that external motivation was lower among Dutch- than French-speakers. At T2 however, government trust (d_1) and identified motivation (d_3) were higher for Dutch-speakers, whereas conspiracism (d_2) was higher among French-speakers.

The rest of the model (i.e., *a*, *b*, *c'*, and *c* paths; as well as the $a_1 \times b$ and $a_2 \times b$ indirect effects) corresponds to the one tested in the previous section. The results were close to identical (with the exception that the -already very small-effect of external motivation on vaccination intention became non-significant). This suggests that the joint effect of conspiracism and government trust on vaccination intention through motivations holds (once again) across both samples even when considering an important contextual-based variable, namely language.

Turning to the direct effect of language on vaccination intention (*e'*), Dutch- and French-speakers showed no significant differences in terms of vaccination intentions. The indirect effect of language on vaccination intention ($d \times a \times b \times c'$) significantly differed between T1 and T2, such that it reached significance at T2. In other words, there was no effect of language on vaccination intentions at T1, whether controlling or not for the mediators. In sharp contrast, the total effect of language was highly significant at T2, an effect fully accounted for by our mediational model.

4. Discussion

In this research, we aimed to unveil the motivational underpinning of the link between two key aspects, i.e., government trust and conspiracism on the one hand and vaccination intentions on the other. We assumed that the positive relations between government trust and vaccination and the negative relation between conspiracism and vaccination intention are best understood by examining the way these antecedent variables materialize into underlying motivations that then relate to the intention to get vaccinated.

Building on Self-Determination Theory (SDT; Ryan and Deci, 2017; Vansteenkiste et al., 2006), we made a distinction between internal volitional motives and externally pressured motives, on the positive side of vaccine uptake, and between distrust-based amotivation and effort-based amotivation, on the negative side. Next, we drew on the literature on trust in authorities and the work on conspiracy theories. Specifically, we capitalized on recent evidence showing that these two constructs are intimately related to the degree to which people intend to get vaccinated. Combining these lines of work, we proposed a model whereby government trust and conspiracy beliefs predict vaccination intentions via the four forms of vaccination motivation.

We tested our model by means of two independent samples taken from a large-scale project, the Motivation Barometer, conducted in Belgium since the beginning of the pandemic. Our first sample relied on data collected at the very onset of the vaccination campaign (T1; Feb. 2021) whereas the second used data collected two months later (T2; Apr. 2021). The message emanating from the data is both solid and extremely encouraging. First, our measurement model proved very satisfactory, at both points in time. Moreover, our hypothesized mediational model provided a good fit to the data and confirmed the various postulated links between the distal factors and vaccination intention via our various motives. As predicted, government trust positively predicted vaccination whereas the opposite held for conspiracism. Moreover, both effects were fully mediated by vaccination motivations.

Interestingly, as the research unfolded, we noticed that the difference in the level of trust in authorities and the beliefs in conspiracy theories between the two linguistic regions of the country changed substantially, with the French-speaking respondents showing lower trust levels and higher conspiracism levels at T2 compared to T1. Still, as hypothesized, the relations between the components of the mediational model showed remarkable stability, providing strong support for it.

It should be noted that the specific relations between the motivations to (not) take a vaccine and their antecedents, as well as their consequences, provide invaluable insight into the role of certain factors when it comes to motivating a larger part of the population to get vaccinated. Indeed, our data suggest that factors increasing the degree to which people feel externally pressured or experience distrust with respect to the seriousness of the pandemic, the efficiency of the vaccine or even its

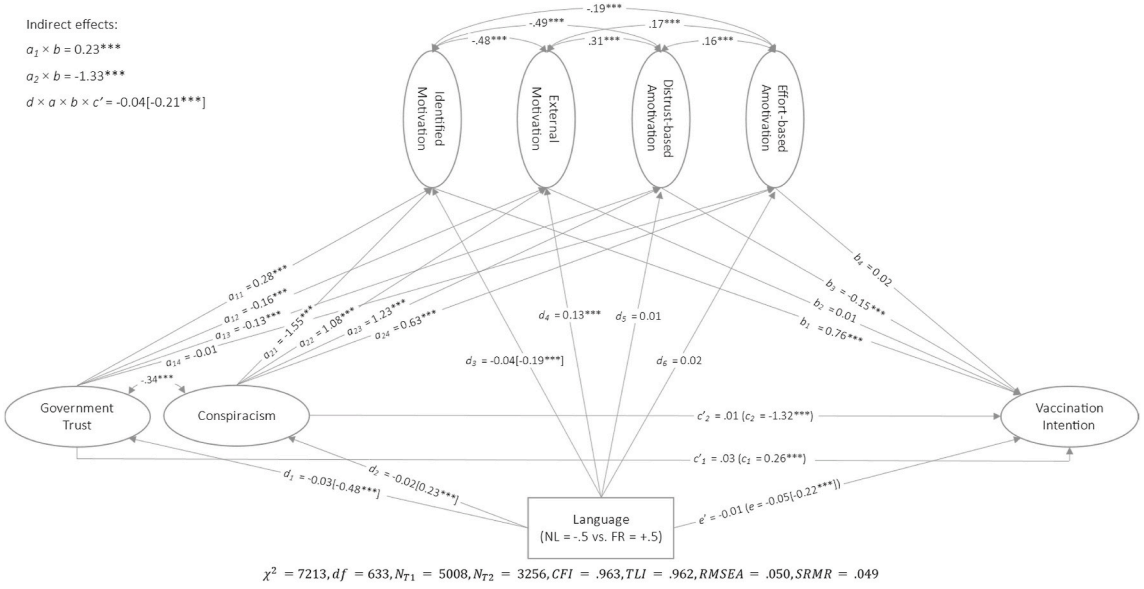

Fig. 2. Multigroup SEM of the mediated contribution of language on vaccination across T1 and T2 *Note.* Coefficients are non-standardized. Total effects are in parentheses. Coefficients with brackets indicate significant differences between groups, such that T1 coefficients are displayed outside the bracket and T2 coefficients are inside the brackets. ***$p < .001$.

harmlessness, may largely decrease their tendency to engage in vaccination. Our findings indicate that government trust plays a crucial role in this respect.

To the extent that government trust is strongly associated with belief in conspiracism (Abalakina-Paap et al., 1999; Goertzel, 1994), trusted authorities may buffer against the emergence of conspiracy theories while the converse holds as well (Bartlett and Miller, 2010; Mari et al., 2021; Milošević Đorđević et al., 2021). At the very least, transparent and clear communication regarding vaccine safety and security appear necessary and these need to target the various groups that comprise the population (e.g., in terms of language, education, family structure, socio-economic background, etc.). But transparent communication does not suffice. The decision process is also paramount. In this regard, evidence accumulates to suggest that scientific experts are among the most trusted sources in the investigated populations (see, e.g., Motivation Barometer, 2021; Pew Research Center, 2020), and that decisions should be seen as informed by their advices. Moreover, ensuring commitment from different segments of the population requires that they feel represented in the decision process leading to vaccination policies (Tyler and Blader, 2003). Indeed, one of the main determinants of conspiracism is a sense of powerlessness and disenfranchisement from the political decision process (Sullivan et al., 2010).

We found that conspiracy beliefs exert a detrimental impact on four motive types. A more indirect influence of government trust and conspiracism via the interrelations among the various motives accounts for their detrimental or beneficial impact on vaccination intentions. A fascinating outcome of the present research is that the contextual factors are of critical importance when it comes to our primary dependent measure, but this materializes via the relations evidenced in our mediational model.

These results challenge the idea that a central determinant of vaccination intention is the perception that the vaccine requires effort, an assumption that was notably discussed during the implementation of the vaccination campaign. Our results suggest that perceived effort (e.g., distance from the vaccination center) is not a key driver for vaccination intentions when accounting for the other motivations. As in Schmitz et al. (2022), the same holds for external motivation. This indicates that the presence of identified motivation compensates the influence of external regulation. Practically, this suggests that an autonomy-supportive campaign (a) adjusting to the rhythm of citizens (b) giving solid rationales focusing on the benefits for others (c) using inviting instead of forceful/guilt-inducing language, is highly efficient. Note also that external motivation shows a negative relation with conspiracism and distrust in authorities. Hence, using external rewards and sanctions may not prove effective to motivate "COVID-skeptics" and those who feel disenfranchised from the political process.

4.1. Limitations

Our research has limitations. First, the use of a cross-sectional design limits our capacity to establish causality. For example, one could argue that a form of preliminary distrust towards science can make an individual lean towards conspiracy theories in order to rationalize their initial position about vaccination (see Miller et al., 2016) rather than the reverse causal path hypothesized here. In a similar vein, and as mentioned above, distrust in the government may promote conspiracy beliefs (e.g., Kim and Kim, 2021) but the other direction has also been postulated (Mari et al., 2021). Future studies should help to gain a better understanding of the interplay between these constructs.

Second, several factors not measured here may play a role in predicting vaccination motivation and intention. For instance, focusing on the perception of health authorities (e.g., WHO), researchers, and science in general seems relevant. Indeed, the pandemic has put scientists as well as the many situations in which academic experts disagree under the spotlight. This may shake trust in scientists in some segments of the population (Agley, 2020; Kreps and Kriner, 2020) and, in turn, affect vaccination intentions (Rutjens et al., 2021).

5. Conclusions

Clearly, vaccination is critical in the fight against a lethal pandemic such as COVID-19, yet a sizable proportion of the public remains reluctant to get vaccinated. So, what makes people take the plunge? By expanding and bridging various strands of the social science literature, we examined how government trust and conspiracism shape different types of motivations towards (or away from) vaccination. The present data emphasize the pay-offs of approaching vaccination from a psychological perspective. Moreover, we believe that the integration of these results can contribute to effective health policy outcomes: For example, the minimal impact of external motivation on vaccination intentions questions the value of strategies based on rewards and incentives. By contrast, the substantial effect of government trust leads us to believe that the communication and educational tools put in place by authorities to inform about vaccines' effectiveness and reliability (despite the uncertainties inherent in science) are key to fostering motivation and deserve all the attention. As psychologists and scientists, we can only insist on the hugely important role of both more distal and more proximal psychological variables.

Data availability statement

The items list and R scripts to carry out the analyses are publicly available on Open Science Framework: https://osf.io/y5nkc/?view_only=fb625c41f4534f6aa8c92c82e754cfa9. Dataset is hosted in Zenodo (a public repository) and is available upon request and for replication purposes only: https://doi.org/10.5281/zenodo.5518879.

Credit author statement

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Declaration of competing interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.socscimed.2022.114926.

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