












## RESEARCH ARTICLE

# When views about alternative medicine, nature and god come in the way of people's vaccination intentions

Pascaline Van Oost<sup>1,2</sup>  | Mathias Schmitz<sup>1</sup>  | Olivier Klein<sup>2</sup>  | Marie Brisbois<sup>2</sup>  |  
 Olivier Luminet<sup>1,3</sup>  | Sofie Morbée<sup>4</sup>  | Eveline Raemdonck<sup>4</sup>  |  
 Omer Van den Bergh<sup>5</sup>  | Maarten Vansteenkiste<sup>4</sup>  | Joachim Waterschoot<sup>4</sup>  |  
 Vincent Yzerbyt<sup>1</sup> 

<sup>1</sup>Institute for Research in the Psychological Sciences, Université catholique de Louvain, Louvain-la-Neuve, Louvain-la-Neuve, Belgium

<sup>2</sup>Faculty of Psychological Sciences and Education, Université libre de Bruxelles, Brussels, Bruxelles, Belgium

<sup>3</sup>Fund for Scientific Research (FRS-FNRS), Brussels, Belgium

<sup>4</sup>Department of Developmental, Personality and Social Psychology, Universiteit Gent, Ghent, Gent, Belgium

<sup>5</sup>Health Psychology, Faculty of Psychology and Educational Sciences, Katholieke Universiteit Leuven, Leuven, Belgium

## Correspondence

Pascaline Van Oost, Institute for Research in the Psychological Sciences, Université catholique de Louvain, B-1348 Louvain-la-Neuve, Belgium.  
 Email: [pascaline.vanoost@uclouvain.be](mailto:pascaline.vanoost@uclouvain.be)

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## Abstract

In spite of the safety and efficiency of the COVID-19 vaccines and the many promotion efforts of political and expert authorities, a fair portion of the population remained hesitant if not opposed to vaccination. Public debate and the available literature point to the possible role of people's attitudes towards medical institutions as well as their preference for complementary and alternative medicine (CAM) on their motivations and intentions to be vaccinated. Other potential ideological factors are beliefs about environmental laissez-faire and divine providence insofar as they encourage people to let the pandemic unfold without human interference. In three cross-sectional samples (total  $N = 8214$ ), collected at successive moments during the Belgian vaccination campaign, the present research examines the distal role of these psychological and ideological factors on vaccination intentions via motivational processes. Study 1 gauges the relation between trust in medical institutions and preference for CAM on intentions to get vaccinated via motivations. Study 2 examined the role of beliefs in the desirability of letting nature take its course ('environmental laissez-faire beliefs') on vaccination intention via motivations. Study 3 tests whether people's adherence to environmental laissez-faire and beliefs about divine providence are linked to their motivations for vaccination via trust in the medical institutions and CAM. Results show that adherence to CAM has a deleterious effect on vaccination intentions, whereas trust in medical institutions has a positive effect. Both ideological factors pertaining to external control are only moderately related, with environmental laissez-faire beliefs having stronger effects on CAM, medical trust and vaccination motivations. We discuss the importance of this set of results in light of the growing interest in CAM and the increasing presence of messages appealing to the environment.

## KEYWORDS

alternative medicine, medical institutions, motivation, nature, religion, vaccination

## 1 | INTRODUCTION

In early 2020, the world faced a major pandemic that forced authorities to act swiftly. To curb the exponential transmission of COVID-19, many countries implemented a range of large-scale health measures and enforced lockdowns that affected people's lives in radical and intrusive ways. Within a few months of this outbreak, several pharmaceutical companies announced the development of effective vaccines. The ensuing vaccination campaigns offered the promise of limiting the deleterious consequences associated with COVID-19. However, it soon became clear that segments of the population were reluctant to accept these vaccines. Vaccine hesitancy refers to a delay in acceptance or refusal of vaccination despite the availability of vaccination services (Klein & Yzerbyt, 2023; MacDonald, 2015). Past research has identified numerous factors associated with COVID-19 vaccination hesitancy, both at individual and social levels. Specifically, vaccine hesitancy is more prevalent among young individuals (Malik et al., 2020), women (Malik et al., 2020; Zintel et al., 2023), members of racial minorities (Stoler et al., 2021) and individuals with low income (Stoler et al., 2022) or low education (Malik et al., 2020; Milošević Đorđević et al., 2021; Stoler, 2022). Psychological factors, including, higher conspiracy beliefs (Van Oost et al., 2022), lower risk perception of the disease (Caserotti et al., 2021; Schmitz et al., 2022) and lower anticipated regret (Wolff, 2021) also predict individuals' vaccination hesitancy. Thus, individuals' thoughts and beliefs, feelings but also the immediate and broader social context are important factors and levers to tackle vaccine hesitancy (see Brewer et al., 2017, for a summary on the psychology of vaccination).

In the present research, we focused on an under-researched predictor in the context of COVID-19 vaccination, that is, (dis)trust regarding health institutions and mainstream medical practices and a preference for complementary and alternative medicine (CAM), which prevalence has been increasing in the last decades (Ernst, 2001; Lamberty & Imhoff, 2018). Trust in medical institutions as well as in the more global health institutions has been repeatedly found to be an important predictor of vaccination intentions and uptake (Ahorsu et al., 2022; Kerr et al., 2021). In contrast, CAM use and positive attitudes towards CAM in general correlate negatively with vaccination acceptance with regard to various diseases (Bleser et al., 2016; Browne et al., 2015; Bryden et al., 2018; Downey et al., 2010; Hadjipanayis et al., 2020; Soveri et al., 2021; Wardle et al., 2016). Moreover, several authors (Attwell et al., 2018; Bryden et al., 2018; Lamberty & Imhoff, 2018; Wardle et al., 2016) highlight the close links between adherence to CAM and other ideological factors, such as the belief that, left to its own devices, nature produces optimal outcomes ('environmental laissez-faire beliefs') and the beliefs attached to spiritual or divine forces, which might also shape vaccination intentions.

In a series of three studies, we pursued two overarching aims. First, we explored how (dis)trust in medical institutions, support for CAM, and beliefs regarding the role that nature ('environmental laissez-faire beliefs') and God or a superior entity ('beliefs in divine providence') play in the unfolding of pandemic events are related to COVID-19 vaccination intentions. Second, we sought to understand how these effects

relationships emerge, thereby examining the underlying associated motivational mechanisms (Vansteenkiste et al., 2024).

### 1.1 | Trust in the medical institutions

Whether for monitoring the pandemic or for licensing vaccines, medical institutions were brought to the forefront during the entire COVID-19 pandemic. In Belgium and elsewhere, national and international health institutions took the lead in the deployment of vaccination campaigns. Internationally, the World Health Organization (WHO) and the European Medicines Agency (EMA; in charge of the evaluation and supervision of medicinal products for the European Union) were the most involved, while, nationally, Sciensano (national public health institute of Belgium) and the Management Strategy Expert Group (advisory body of experts for the government during the pandemic) played an important role.

Research shows that trust in health authorities is a critical factor in vaccine acceptance (MacDonald, 2015), especially during pandemic times (Badur et al., 2020; Jennings et al., 2021; Nera et al., 2022; Turhan et al., 2022). An analysis using data from 149 countries shows that trusting healthcare workers over your close ones for medical advice is associated with increased vaccination uptake (de Figu, 2020). Trust rests on the assumption that medical institutions possess the necessary expertise and put the population's best interests above their self-interest (Larson et al., 2018). This is important insofar as some evidence suggests a loss of trust in health authorities in Europe and the world (Badur et al., 2020), with authors pointing notably to scandals (e.g., see Tuskegee studies; Gamble, 1997) as well as historical partisanship and ideology (Bayram & Shields, 2021). Public trust towards medical institutions was also shaken in March 2021 as the EMA met to advise on the AstraZeneca vaccine, following reports of suspected links between AstraZeneca vaccination and stroke in the population. In a representative sample of U.S. citizens surveyed in 2020, 33% of the respondents (strongly) disagreed and 30% were neutral with respect to the idea that 'the WHO has acted independently of the political agendas of its members' (Bayram & Shields, 2021).

Although previous work examined the critical relation role of CAM and trust in predicting vaccination (Hornsey et al., 2020; Soveri et al., 2021), no study to our knowledge performed an in-depth analysis of the unique role of trust in medical institutions and attitudes towards CAM, and associated beliefs, as well as their association with COVID-19 vaccination intentions (before and after it had been made available to the general population). More importantly, no efforts to date considered the underlying motivational mechanisms of this relationship.

### 1.2 | Complementary and alternative medicine

CAM refers to medical treatments used instead of traditional (mainstream) therapies and relies on natural practices or products developed outside conventional medicine. CAM comprises three main categories: physical therapies (such as exercise, yoga, bright light, and

acupuncture), nutraceuticals (vitamins and minerals such as vitamin D, folic acid, magnesium, omega-3 fatty acids) and herbal remedies (Attwell et al., 2018; Bleser et al., 2016). Despite the general lack of evidence-based proof of efficacy attached to these practices (e.g., Bardia et al., 2006; Johnson et al., 2018; Verma & Thuluvath, 2007), they have become increasingly popular in recent decades, especially in high-income countries (Bleser et al., 2016; F. H. Fischer et al., 2014; Kemppainen et al., 2018) and during the COVID-19 pandemic (Paudyal et al., 2022). Indeed, whereas some CAM treatments rely on principles and evidence that the majority of scientists do not endorse, others have been proven to work for a limited number of health conditions. For example, there is evidence that chiropractic is effective in treating lower back pain (National Health Service, UK). In other cases, CAM use can cause damage, either directly or because CAM use is accompanied by a delay or an avoidance of conventional forms of treatments (e.g., Johnson et al., 2018).

Several sociodemographic factors are related to the use of CAM or to attitudes towards CAM such as being female, middle-aged, having received higher education and having a poorer health status (Eardley et al., 2012; Siahpush, 1999; Vincent & Furnham, 1999) although great disparities exist depending on the type of CAM with preferences for specific therapies depending on income and age levels (e.g., lower income individuals using more mind-body therapies such as hypnotherapy; Kemppainen et al., 2018). In addition, one should not disregard the role of psychological antecedents such as displaying a holistic philosophical orientation, and a preference for a more personalized approach to medicine (Eardley et al., 2012; Kemppainen et al., 2018; Siahpush, 1999) and a conspiracy mentality (Lamberty & Imhoff, 2018).

Apparently, people turn to CAM for a variety of reasons. CAM users often value the do-it-yourself or at least a participative health approach of CAM. They also perceive CAM practitioners as having greater freedom of thought and less commercial pressure from, for example, pharmaceutical companies (Attwell et al., 2018). CAM practitioners also typically draw on values such as purity, nature, authenticity and spirituality (Kaptchuk & Eisenberg, 1998; White et al., 2014), which they tend to oppose to the values carried by conventional medicine (Attwell et al., 2018), hereby appealing to ideological and social identity needs (Hornsey, 2020).

In practice, CAM use often comes in addition to the use of conventional medicine (Nahin et al., 2010) and one should thus not necessarily see CAM as an anti-vaccine approach (Wardle et al., 2016). At the same time, CAM practitioners often recommend not to vaccinate, delay vaccination, selectively vaccinate, offer 'homeopathic replacements' for vaccines or support anti-vaccine movements, and individuals who favour CAM could be more exposed to information discouraging vaccination (Busse et al., 2008; Caulfield et al., 2017; Ernst, 2001; Rieder & Robinson, 2015; Salmon et al., 2005; Wilson et al., 2004). Of course, the association between CAM and vaccination may be bidirectional, with individuals holding negative views towards vaccination being more easily attracted to CAM (Browne et al., 2015; Bryden et al., 2018). In this line, in a study on vaccination among Canadian patients who were seeing both a conventional physician and a naturopathic doctor (Busse

et al., 2011), it was found that the vast majority (75.6%) of patients reported having either equal confidence in both types of physicians or having even more confidence in the naturopath when it comes to information about vaccination. In addition, patients are often those who initiate the conversation in relation to vaccination (Wardle et al., 2016). As a consequence, it is hardly surprising that research documents the existence of a robust negative relation between the use of or preference for CAM and vaccination attitudes (Bleser et al., 2016; Browne et al., 2015; Bryden et al., 2018; Downey et al., 2010; Hadjipanayis et al., 2020), including vaccination against COVID-19 (Soveri et al., 2021).

Despite these robust findings, little is known about other factors involved in the relation between CAM and vaccine hesitancy. Indeed, Wardle et al. (2016) suggest that the link between CAM and vaccine hesitancy 'may be confounded by other factors associated with CAM use' (p. 4484). Specifically, these authors point to the possibility of deeper concerns about medicine and the body and distrust of health professionals, pharmaceutical companies and authorities covary with both CAM use and vaccine hesitancy. Except for Bryden and colleagues (2018), who found that magical beliefs about health and concerns regarding evidence-based conventional medicine may be confounding factors, uncertainty remains about the possible overlap of CAM with a host of psychological or ideological factors to explain the link with vaccine hesitancy. Supporting this conjecture, Hornsey et al. (2020) found that CAM use (measured dichotomously) predicted vaccine hesitancy much less when taking distrust towards conventional medicine into account, thus pointing out that both variables are related, although distinct. Surprisingly enough, no study to date has looked at the relations between COVID-19 vaccination and both CAM and trust in medical institutions, while also accounting for other potentially meaningful attitudinal stances in this context, namely environmental *laissez-faire* beliefs and beliefs about divine providence.

### 1.3 | Environmental *laissez-faire* beliefs

Throughout the period that saw the implementation of COVID-19 measures, the question of the trade-off between the freedom of the many and the protection of the weak has been at the heart of the debate. With this concern in mind, some argued that one should let nature take its course and learn to live with the virus rather than trying to fight it. Presumably, this would allow the virus to circulate, letting nature do its work with people gradually building up resistance to infections, even if this meant that the less resistant may get affected by the disease and possibly die. Similar rhetoric later emerged for vaccines. The claim was that vaccination 'unnaturally' prevents the normal course of the infection: because nature is fundamentally good, one should avoid interfering with it and thus refrain from relying on a vaccine (A. Fischer, 2020; Fitch Boribon, 2020; Reich, 2016). From this perspective, vaccines, pharmaceutical products in particular and technology, more generally, are a threat to the natural functioning of the body and this jeopardizes the natural balance that should prevail between infectious diseases and humans (Reich, 2016). In other words, vaccines are perceived as an unnatural mode of arming the

body against disease and, for this reason, provide weaker immunity than would be secured otherwise. Interestingly, this is a view that some paediatricians tried to challenge in their approach to vaccination, emphasizing how the vaccine allows for one's body's *natural* reaction (Reich, 2016). This general stance about vaccines and their impact on the body is nicely illustrated in the following quote from an expectant mother who expresses her doubts about the administration of vaccines to her child:

We say that nature works wonders, so why go against nature, nothing is lacking in our environment, it's just fine the way it is. For my part, I know when my child was born, we had the choice of having a little bit of cream in the eyes, a little bit of this, a little injection for that. Right from the moment of birth, and even before, there are various interventions that can be done.... I didn't accept any of them. I figure that my child is okay, everything is okay, there are no particular risk factors present, so no thanks, do not do anything, he's just fine. (Dubé et al., 2016, p. 415)

This naturalistic, anti-vaccine stance has had a resounding echo, often accompanied by fake news (e.g., pseudoscientific health therapies, pseudoscientific immune system 'boosters'; Naeem et al., 2021) and was highly prevalent in online social networks (A. Fischer, 2020). In this vein, Žeželj and colleagues (2023) found that participants who thought that COVID-19 could be beaten with natural remedies and is harmless for those with a strong immunity, tended to rely on pseudoscientific health practices more (such as having specific foods to protect oneself against COVID-19) and to get vaccinated less. Pre-COVID work by Reich. (2016) refers to the fact that parents who adhere to a natural versus artificial dichotomy (i.e., parents who prioritize natural living and believe that human-made creations are inherently less desirable and potentially dangerous) tend to refuse vaccination because they are in search of products that preserve the naturalness of their children's bodies (thus echoing CAM use). Yet, in spite of the widespread availability of the above arguments in the public debate, research investigating this posture is clearly lacking. We are aware of no research that investigated the joint effect of this ideological posture and CAM on COVID-19 vaccination.

#### 1.4 | Beliefs about divine providence

As is the case for environmental *laissez-faire* beliefs, a fair number of vaccine hesitants, if not opponents, voiced arguments in relation to the fact that a superior entity is in charge, this time referring to God, or some divine, supernatural, being. This 'divine control' means that God is 'the ultimate arbiter of life and death' (Upenieks et al., 2022, p. 660). According to these views, any human action aimed at fighting the virus interferes with these higher divine plans. Illness and even a pandemic can be understood as acts of God (Sinding Bentzen, 2019), thus ultimately challenging women and men with respect to their faith. For

example, an orthodox protestant religious leader in the Netherlands reports the following to Ruijs et al. (2013, p. 5):

(Vaccination is taught about) Primarily during the lesson on divine providence. It's talked about there. (...) That everything is in God's hands and that we should leave things up to God and that we cannot intervene. But, this is also sometimes touched upon in sermons. People know it, how things are, but in confirmation classes, it is explained in more detail.

Of note, however, this opposing posture is not necessarily the rule among any religious or spiritual community. Indeed, depending on subtle differences in interpretation, all religions and sects have been found to promote arguments in favour or, in contrast, against vaccination. For example, while some ultra-orthodox Jews reject vaccination (which has resulted in measles outbreaks), orthodox Jewish organizations, such as the Orthodox Union, support vaccination because of 'obligations to care for one's own health as well as to take measures to prevent harm and illness to others, and Jewish law defers to the consensus of medical experts in determining appropriate responses to illness and prevention' (in Keshet & Popper-Giveon, 2021, p. 1995).

Throughout the history of vaccination, religion has sometimes considered it imperative that human beings do whatever they can to save lives and, with this in mind, rely on the best of human abilities as well as the most advanced knowledge, including vaccination, to protect the weak and the sick (Grabenstein, 2013). Conversely, religion has also been interpreted in a radically different way. In this case, religion hangs together with a shift in responsibility towards higher forces, according to which any human intervention is useless and even runs against the will of the superior entity (Salvadori & Vignaud, 2019; Upenieks et al., 2022). The understanding here is that the outcome of the confrontation with the pandemic is something that escapes human control and can be seen as a true test of the depth of one's faith. To our knowledge, these aspects have been largely overlooked in the context of the COVID-19 pandemic. More importantly for the present endeavour, few efforts examined the unique role of this factor alongside that exerted by environmental *laissez-faire* beliefs and trust in medical institutions and attitudes towards CAM.

#### 1.5 | Motivations for vaccination

According to self-determination theory (Ryan & Deci, 2017; Vansteenkiste, 2006), motivations come in several forms. Contributing to increasing vaccination, autonomous motivation represents a desirable form of motivation insofar as it is volitional in nature. Indeed, citizens with autonomous motivation concur with the necessity and benefit of vaccination (e.g., to protect themselves and others; to collectively resolve the crisis). Yet, citizens may also report being pushed into vaccination for external reasons. For instance, they can feel obligated to take up a vaccine to avoid disapproval from others or they can feel enticed to obtain a reward in exchange for vaccination (e.g., being able

to travel or attend large public events). Theoretically, with controlled motivation, some individuals may express the intention to engage in the demanded behaviour, while others may react more defensively by reducing their intentions. In contrast to the more variable effect of controlled regulation on vaccination intentions, with some studies reporting a positive and others no relation, autonomous motivation was found to yield a systematic and positive effect on participants' vaccination intentions for flu and HPV (Denman et al., 2016; Fall et al., 2018; Moon et al., 2022) as well as COVID-19 concurrent vaccination intentions (Van Oost et al., 2022; Waterschoot et al., 2022), effective take up (Schmitz et al., 2022) and tendency to accept a booster or yearly dose (Waterschoot et al., 2023).

Not surprisingly, the lack of motivation (amotivation) also enters the picture regarding COVID-19 vaccination. Specifically, research distinguished between distrust- and effort-based amotivation (Schmitz et al., 2022; Van Oost et al., 2022). Distrust, or lack of confidence in the efficacy or the safety of the vaccine, is indeed a key driver of vaccine hesitancy (MacDonald, 2015) and negatively predicts intentions to accept a COVID-19 vaccine (Schmitz et al., 2022). In contrast, when individuals consider that they lack sufficient resources to engage in the behaviour (Legault et al., 2006; Pelletier et al., 1999) or notice practical obstacles, effort-based amotivation is at stake (Schmitz et al., 2022). Such obstacles can include long distances to a vaccination centre, language or disability barriers or considerable time needed to complete the vaccination plan (Brewer et al., 2017).

Given the prominent role of these different motivational factors in vaccine uptake, a critical question concerns the distal factors that shape people's motives. Risk perception (Schmitz et al., 2022) or trust in government and belief in conspiracy theories (Van Oost et al., 2022) were shown to predict vaccination motivations, and in turn, vaccine attitudes and uptake. In the present research, we examine how ideologico-philosophical beliefs regarding nature and a superior being are related to trust in medical institutions and to CAM, which in turn, might be associated with vaccinations (a) motivations.

## 1.6 | Overview of the present research

In the present series of studies, we built on earlier work showing the link between vaccination motivation and vaccination intentions (Schmitz et al., 2022; Van Oost et al., 2022). We also focused on the way psychological postures, namely, trust in health institutions and attitudes towards CAM, as well as ideological or even philosophical postures, namely beliefs in the primacy of nature or in the superior will of a divine being, account for vaccine hesitancy via underlying motivations. The theoretical model can be found in Figure 1. To test this multipath model, we relied on a step-by-step approach. Specifically, Study 1 examined how respondents' views about CAM and their trust in health institutions relate to the different motivations and amotivations for vaccination, and how these, in turn, predict vaccination intentions. In Study 2, we considered the link between people's beliefs with respect to nature, their vaccination (a) motivations and vaccination intention.

In Study 3, we looked at the viability of a comprehensive model in which the joint roles of CAM, trust in medical institutions and views about divine providence and the environment would predict people's vaccination motivation and, in turn, their vaccine hesitancy.

The data analysed in the present research comes from the Motivation Barometer, a long-term and large-scale online research program that began on 19 March 2020, at the outset of the COVID-19 pandemic in Belgium. We recruited participants via paid and unpaid social media advertisements, local newspapers and organizations, and mailing lists. All participants accepted the informed consent, which guaranteed the confidential character of the data collection. Although all Belgian residents over the age of 18 were eligible for participation, we only considered participants who were not yet vaccinated and had completed our measures of interest.

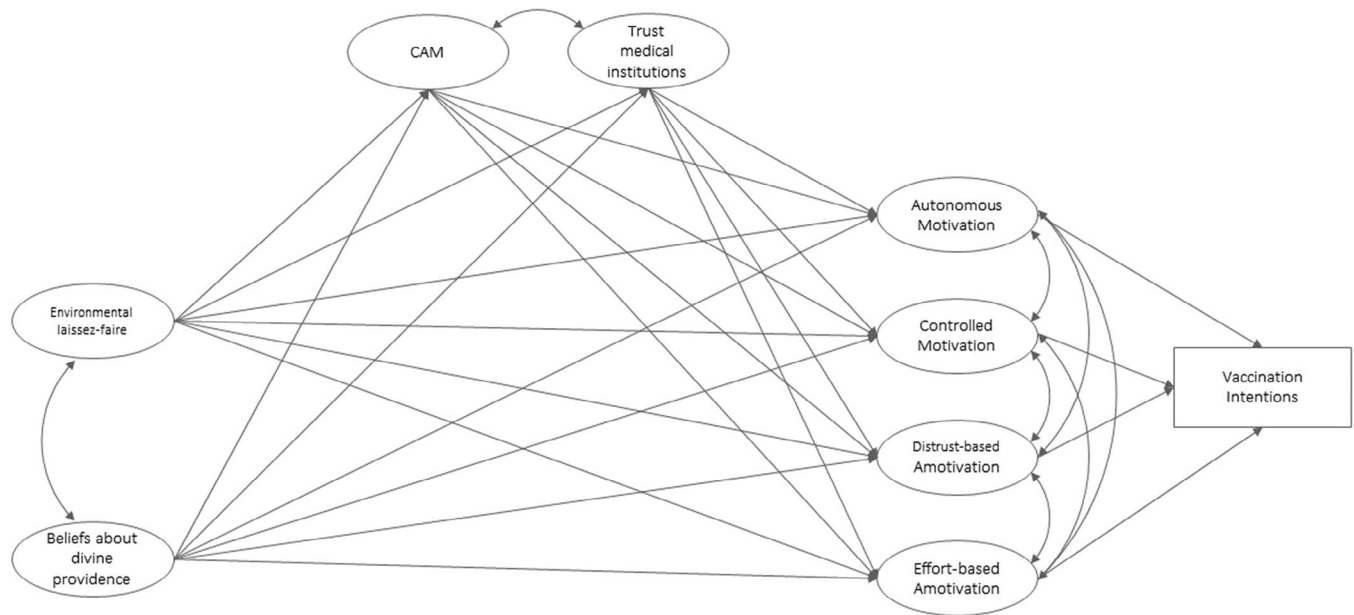
The cross-sectional samples from the studies covered three different periods during the pandemic, namely 8–19 April 2021 (Study 1), 12–19 August 2021 (Study 2) and 11–19 March 2022 (Study 3). Vaccination was only available to a small portion of the population during the first period (e.g., elderly, people with comorbidity factors), whereas it became widely available during the two other time frames. This explains the lower number of (non-vaccinated) participants in the last two studies. In terms of cross-sample comparisons, we would anticipate that over time, the average level of vaccine favourability (i.e., vaccine intentions and motivations) would decline. Indeed, as time passed, participants had more opportunities to receive the vaccine, thereby making the later samples of unvaccinated participants increasingly selective.

## 2 | STUDY 1

In Study 1, we examined how respondents' views about CAM and their trust in health institutions were related to vaccination via the motivations and amotivations for vaccination. The main aim of the study was to see how the trust in the medical institutions versus attitudes about CAM was related to vaccine hesitancy via people's motivations. Following past research, we hypothesized that CAM would yield a negative link with vaccination intentions, with this relation being mediated by a decrease in autonomous motivation, and an increase in effort-based and distrust-based amotivation. We expected that trust in medical institutions would mirror this relation, thus having a positive link with autonomous motivation and a negative one with distrust-based amotivation and effort-based amotivation. We made no prediction for the link of CAM or trust in medical institutions with controlled motivation and for the relation between controlled motivation and vaccination intentions.

### 2.1 | Method

Because the data presented in this study, as well as in the other two studies, were part of a larger research project (Vansteenkiste et al., 2024), the space available for measuring the constructs was limited.



**FIGURE 1** Theoretical model of the contribution of environmental laissez-faire beliefs and beliefs in divine providence on motivations to get vaccinated and vaccination intentions mediated by CAM and trust in medical institutions.

For this reason, we measured various constructs with a limited number of items.

### 2.1.1 | Participants

The sample comprised 6688 unvaccinated participants in Belgium, collected on 8–19 April 2021. The mean age was 51.72 years ( $SD = 13.80$ ), 54% were female, 60% had a higher degree (i.e., bachelor, master, or Ph.D.), and 64% reported no comorbidity factors associated with COVID-19. About 10% of the participants did not answer some of the sociodemographic questions.

### 2.1.2 | Measures

**Complementary and alternative medicine.** We assessed trust in CAM via a single item taken from Lie and Boker's (2004) Complementary and Alternative Medicine Health Belief Questionnaire (CHBQ), namely 'Alternative medicines include ideas and methods from which conventional medicine could benefit'. Response options ranged from 1 (totally disagree) to 5 (totally agree). We relied on this item because of its high validity and correlation with the rest of the scale.

**Trust in the medical institutions.** We assessed participants' degree of trust in national and international institutions from the medical institutions, namely Sciensano (national public health institute of Belgium), the Management Strategy Expert Group (advisory body of experts for the government during the pandemic), the EMA (in charge of the evaluation and supervision of medicinal products for the European Union) and the WHO, making for four items. Participants were asked 'How much do you trust the following institutions or groups?' with response options ranging from 1 (do not trust at all) to 5 (totally trust). Inspection

of the scree plot indicated the presence of a single underlying factor. The scale reliability was good (Cronbach's  $\alpha = .88$ ).

**Motivation to get vaccinated.** We assessed participants' motivations to get vaccinated against COVID-19 based on Schmitz et al.'s (2022) 12-item scale that captures four types of motivation. Participants answered on a 5-point scale ranging from 1 (totally disagree) to 5 (totally agree). Autonomous motivation ( $\alpha = .95$ ) conveys the degree to which one considers vaccination relevant and beneficial. A sample item was 'Getting vaccinated is in line with my personal values'. Controlled motivation ( $\alpha = .70$ ) denotes the extent to which one feels forced or obligated to get vaccinated. A sample item read 'I will be criticized if I don't get vaccinated'. Distrust-based amotivation ( $\alpha = .89$ ) expresses the degree to which one feels distrust towards the efficacy and secondary effects of the vaccine. A sample item was 'I doubt the research on the vaccine's effectiveness is rigorous enough'. Effort-based amotivation ( $\alpha = .77$ ) refers to the degree to which one perceives the vaccination as an effortful process due to various practical obstacles (e.g., distance to the vaccination centres). A sample item read 'The vaccine takes too much effort for me'.

**Vaccination intentions.** We measured participants' vaccination intentions by means of a single item: 'If you had the opportunity to be vaccinated against COVID-19 next week, what would you decide' with a 5-point scale ranging from 1 (I would refuse without any hesitation) to 5 (I would accept without any hesitation).

**Sociodemographic variables.** We asked participants' age, gender, education level (1 = 'Secondary or less', 2 = 'Bachelor's degree', or 3 = 'Master's degree or higher'), and the number of comorbidity factors associated with COVID-19 (ranging from 0 to 4; that is, chronic respiratory disease, diabetes, arterial hypertension, immune deficiency or another chronic health condition placing oneself in the 'at risk' COVID-19 vaccination group).

## 2.2 | Results

For all three studies, we conducted the analyses with R (R Core Team, 2013). We performed a principal component analysis (PCA) for each scale for which we had developed new items (e.g., trust in the medical institutions, CAM). To test our hypotheses, we estimated the various models with the *lavaan* R package (Rosseel, 2012), using latent constructs in our structural equation models (SEM) whenever possible. We estimated the indirect effects via the delta method (the default method in *lavaan*). The delta method is a statistical method allowing the estimation of expected values of a function of an asymptotically normal statistical estimator. We checked the goodness of fit of our SEMs with the following criteria:  $RMSEA < 0.05$ ,  $SRMR < 0.08$ ,  $CFI \geq 0.90$  and  $TLI \geq 0.90$  (Hu & Bentler, 1999; see also Marsh et al., 2004). Because the control variables (i.e., age, gender, education, comorbidity) were associated with the variables of interest, we probed our models with and without these control variables. Taking them into account in the models did not change the conclusions. For the sake of parsimony, we present the results without control variables. The items list, R scripts and additional analyses (i.e., scree plots, PCAs, factor loadings, measurement models, SEMs with control variables; see the Rmarkdown document) are available on the Open Science Framework: [https://osf.io/nb2t5/?view\\_only=981cd4a69ab24453a2e2a69b83f7128a](https://osf.io/nb2t5/?view_only=981cd4a69ab24453a2e2a69b83f7128a). Datasets are hosted in Zenodo (a public repository) and are available upon request and for replication purposes only: <https://doi.org/10.5281/zenodo.7726049>.

### 2.2.1 | Preliminary analyses

Table 1 presents the correlations among the study variables. Vaccination intentions were positively related to trust in the medical institutions and autonomous motivation, whereas it was negatively related to CAM as well as to controlled, distrust-based and effort-based (a)motivations. A similar pattern emerged between trust in medical institutions and CAM as well as (a)motivations. The opposite pattern materialized for CAM. Finally, autonomous motivation was negatively associated with the other three forms of (a)motivations, whereas the latter were positively correlated with each other.

### 2.2.2 | Measurement model

We compared several nested confirmatory factor analyses to ensure a good quality measurement model based on our latent constructs (i.e., trust in the medical institutions and the four types of (a)motivation). We compared a five-factor model (which specifies a single factor for each of our constructs) to a three-, two- or one-factor model. The five-factor model provided the best fit indices (see the osf link). All standardized loadings were larger than .40 (loadings > .30 were deemed acceptable, see Hair et al., 2006), and no cross-loadings or within-factor error correlations had to be tolerated.

### 2.2.3 | Integrated process model

We assessed the joint contribution of CAM and trust in the medical institutions on vaccination intentions through vaccination (a)motivations in an SEM. The mediation model provided good fit statistics.

As Figure 2 shows, CAM ( $c_1$ ) had a negative total contribution to vaccination intentions whereas trust in the medical institutions ( $c_2$ ) had a positive contribution. Upon including (a)motivations, the direct effect of CAM was reduced but remained significant ( $c'_1$ ), while the direct effect of trust became non-significant ( $c'_2$ ). Specifically, CAM was negatively related to autonomous motivation and was positively related to the other forms of (a)motivations, whereas it was the opposite pattern for trust in medical institutions. As for the contribution of the (a)motivations on vaccination intentions when controlling for CAM and trust in the medical institutions, autonomous motivation ( $b_1$ ) and effort-based amotivation ( $b_4$ ) had a positive relation, whereas distrust-based amotivation ( $b_3$ ) had a negative relation. The same pattern of correlation as in Table 1 was observed between the two exogenous variables and the four types of (a)motivation.

## 2.3 | Discussion

The findings of Study 1 provide the most useful information with respect to the link between trust in national and international institutions from the medical institutions and vaccine hesitancy on the other. Moreover, and in line with earlier work on the mediating role of motivations and amotivations in vaccination intentions (Schmitz et al., 2022; Van Oost et al., 2022), the data reaffirm the key role of autonomous motivation in vaccination intentions as compared to controlled motivation and the more limited yet significant role of distrust-based and effort-based amotivations. Of note, the positive association between effort-based amotivation and vaccination intention is likely due to the presence of collinearity with other motivations. More importantly, and this was the main goal of the present study, the data also stress the independently significant albeit slightly more modest link of the attitudes regarding CAM with vaccination intentions via motivational variables. Interestingly, although the pattern linking CAM and the various motivations pretty much comes as a mirror image of the one observed for trust in medical institutions, trust in the medical institutions and attitudes about CAM were only moderately negatively related. This first study carries important limitations with regard to measurement. Indeed, we measured participants' beliefs with regard to CAM with a single item. In Study 3, we rely on an extensive measure of the construct to overcome this limitation.

## 3 | STUDY 2

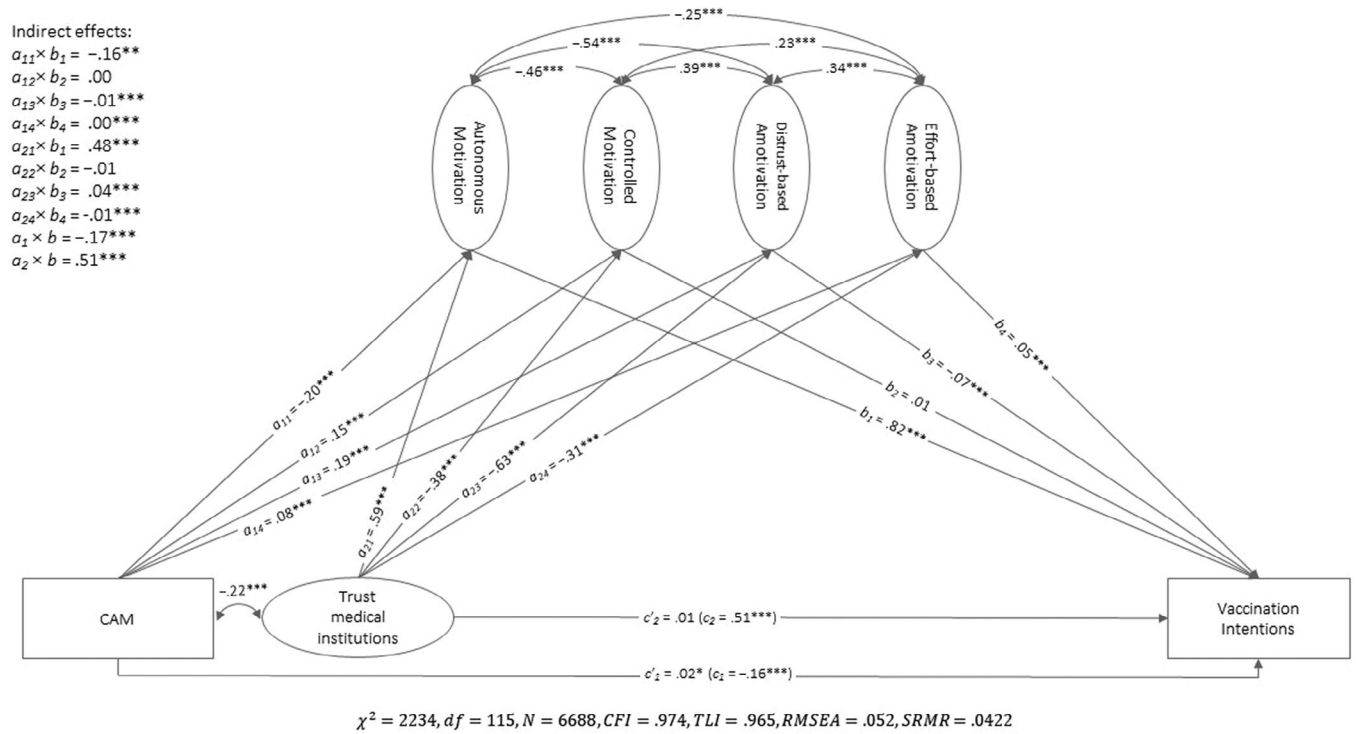
In Study 2, we wanted to consider a different distal attitudinal factor that many consider may be associated with people's vaccination

**TABLE 1** Descriptives and correlations between the study variables (Study 1).

Variable	M	SD	1	2	3	4	5	6	7	8	9	10
1. Age	51.72	13.80	—									
2. Gender (women)	0.61	0.49	-.15***	—								
3. Education	2.02	0.80	-.16***	.04***	—							
4. Comorbidity	0.36	0.63	.29***	-.09***	-.13***	—						
5. CAM	2.83	1.19	-.03*	.16***	.02	-.06***	—					
6. Trust medical institutions	3.52	0.91	-.08***	.04***	.13***	-.04**	-.20***	—				
7. Autonomous motivation	4.23	1.11	.03*	-.06***	.09***	.07***	-.33***	.60***	—			
8. Controlled motivation	2.53	1.02	-.16***	.03**	-.001	-.06***	.16***	-.27***	-.41***	—		
9. Distrust-based amotivation	2.68	1.13	-.01	.17***	-.11***	.01	.31***	-.56***	-.67***	.39***	—	
10. Effort-based amotivation	1.42	0.63	-.02	.03*	-.12***	.03*	.12***	-.28***	-.33***	.25***	.38***	—
11. Vaccination intentions	4.40	1.14	.05***	-.03*	.05***	.06***	-.27***	.53***	.82***	-.34***	-.60***	-.25***

Note: Composite scores were created from the mean of the items.

\* $p < .050$ ; \*\* $p < .010$ ; \*\*\* $p < .001$ .



**FIGURE 2** Contribution of CAM and trust on Vaccination intentions mediated by the motivations to get vaccinated (Study 1, 8–19 April 2021). Ovals represent latent variables and rectangles manifest variables. Coefficients are standardized. Total effects are in parentheses. \* $p < .050$ , \*\* $p < .010$ , \*\*\* $p < .001$ .



intentions via the underlying motivations. Specifically, we aimed to investigate the role of people's beliefs in the desirability of letting nature take its course (that we shall henceforth call 'environmental laissez-faire beliefs'). We, therefore, collected data that allowed us to test a mediational model using environmental laissez-faire beliefs as the predictor, motivations as the mediating variables and vaccination intentions as the criterion. We hypothesized that people's adherence to environmental laissez-faire beliefs would be associated with lower vaccination intentions. We reasoned that placing control of the pandemic in the hands of a higher entity (i.e., nature) might go hand in hand with a limitation of one's perceived responsibility and thus with a low motivation among participants, especially weak autonomous motivation, as well as with distrust towards those recommending vaccination (i.e., distrust-based amotivation) and a perception of increased effort required for vaccination (i.e., effort-based amotivation).

### 3.1 | Method

#### 3.1.1 | Participants

The sample comprised 818 unvaccinated participants from Belgium, collected on 12–19 August 2021. The mean age was 49.45 years ( $SD = 12.45$ ), 63% were female, 65% had a higher degree (i.e., bachelor, master, or Ph.D.), and 87% reported no comorbidity factors associated with COVID-19. About 6% of the participants did not answer some of the sociodemographic questions.

#### 3.1.2 | Measures

*Environmental laissez-faire beliefs.* We assessed participants' adherence to environmental laissez-faire beliefs by means of three items on a scale ranging from 1 (totally disagree) to 5 (totally agree). We created three items on the basis of an examination of several posts that appeared on social media, debates that took place on TV and opinion pieces published in national newspapers (e.g., Fitch Boribon, 2020). Specifically, these items were: 'Nature is basically good and should not be disturbed by vaccines' (item 1), 'We must always respect nature and learn to live with the virus rather than fight it' (item 2) and 'The pandemic is the price humanity pays for not respecting nature and biodiversity' (item 3). We dropped item 3 to improve reliability. And, indeed, this item captures the idea of 'retribution' that is philosophically distinct from a belief in the favourability of natural outcomes. The two-item scale reliability was good ( $\alpha = .76, r = .62$ ).

*Motivation to get vaccinated.* We relied on the same items as in Study 1 to assess participants' motivations to get vaccinated. All scales had good reliability (all  $\alpha$ s > .75).

*Vaccination intentions.* We measured participants' vaccination intentions by means of a single item: 'Suppose you received a new invitation to be vaccinated. How would you react to this invitation?' with a 5-point scale ranging from 1 (I would refuse without any hesitation) to 5 (I would accept without any hesitation).

*Sociodemographic variables.* We collected the same sociodemographic variables as in Study 1.

### 3.2 | Results

#### 3.2.1 | Preliminary analyses

Table 2 presents the correlations among the study variables. Vaccination intentions were positively related to autonomous, controlled and effort-based (a) motivations, whereas they were negatively related to distrust-based amotivation. Environmental laissez-faire beliefs were positively associated with distrust- and effort-based amotivations and negatively with autonomous and controlled motivation. The autonomous motivation was positively correlated with controlled motivation, and negatively with distrust-based amotivation. Also, effort- and distrust-based amotivations were positively associated.

#### 3.2.2 | Measurement model

We compared several nested confirmatory factor analyses to ensure a high-quality measurement model based on our latent constructs (i.e., environmental laissez-faire beliefs and the four types of (a) motivation). We compared a five-factor model (which specifies a single factor for each of our constructs) to three-, two- or one-factor models. The five-factor model provided the best fit indices (see the Supporting Information). All standardized loadings were larger than .40, and no cross-loadings or within-factor error correlations had to be tolerated.

#### 3.2.3 | Integrated process model

We assessed the contribution of the environmental laissez-faire beliefs on vaccination intentions through vaccination (a) motivations in an SEM. The mediation model provided good fit statistics.

As can be seen in Figure 3, environmental laissez-faire beliefs (c) had a negative total contribution to vaccination intentions. When taking motivations into account, this effect was reduced but remained significant (c'). Specifically, respondents' views about nature were negatively associated with autonomous motivation and controlled motivation, whereas they were positively associated with distrust- and effort-based amotivation. When controlling for these beliefs, autonomous ( $b_1$ ), controlled ( $b_2$ ) and effort-based ( $b_4$ ) (a) motivations remained positive predictors of vaccination intention.

### 3.3 | Discussion

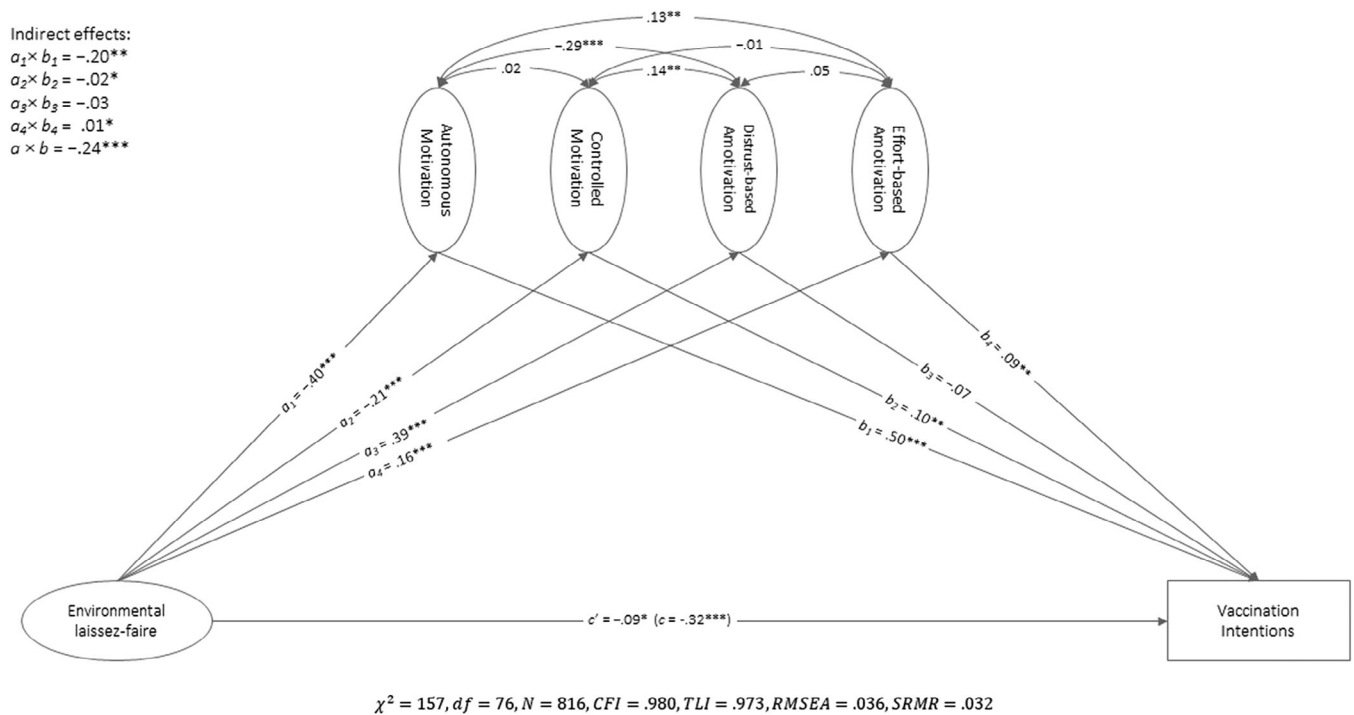
As expected, we found a strong relation between people's attitudes with respect to the primacy of nature and their vaccination intentions. Specifically, the more respondents thought that nature was fundamentally good and that nature had to be respected rather than fought

**TABLE 2** Descriptives and correlations between the study variables (Study 2).

Variable	M	SD	1	2	3	4	5	6	7	8	9
1. Age	49.45	12.45	–								
2. Gender (women)	0.63	0.48	-.04	–							
3. Education	1.96	0.75	-.12**	.04	–						
4. Comorbidity	0.16	0.47	.15***	.03	-.08*	–					
5. Environmental laissez-faire	3.35	1.15	.06	.06	-.16***	.01	–				
6. Autonomous motivation	1.40	0.71	-.002	.03	.02	.09**	-.34***	–			
7. Controlled motivation	3.40	1.18	-.25***	.05	.04	.04	-.17***	.11**	–		
8. Distrust-based amotivation	4.49	0.73	.03	.13***	-.05	.02	.31***	-.32***	.04	–	
9. Effort-based amotivation	1.79	0.96	.04	.003	-.13***	.05	.13***	.04	-.03	.11**	–
10. Vaccination intentions	1.47	0.75	-.02	.06	.03	.05	-.29***	.51***	.16***	-.24***	.08*

Note: Composite scores were created from the mean of the items.

\* $p < .050$ ; \*\* $p < .010$ ; \*\*\* $p < .001$ .



**FIGURE 3** Contribution of environmental laissez-faire beliefs on vaccination intentions mediated by the motivations to get vaccinated (Study 2, 12-19 August 2021). Ovals represent latent variables and rectangles manifest variables. Coefficients are standardized. Total effects are in parentheses. \* $p < .050$ , \*\* $p < .010$ , \*\*\* $p < .001$ .

against, the less they expressed the intention to get vaccinated. Similar to the findings of Study 1, the relation between this distal belief and vaccine hesitancy could be accounted for, at least partially, by a specific motivational pattern. Given the limited number of items (i.e., two) used to measure environmental laissez-faire beliefs, we made use of a more extensive measure in Study 3.

Of course, this study is not without limitations. Next to the time the fact that the environmental laissez-faire beliefs scale was not pretested, the study was also characterized by a rather selective sample. Indeed, unvaccinated participants in August 2022 were pre-

sumably more resistant to vaccination than unvaccinated participants in Studies 1 because they would have had time to receive the vaccine at that time. Indeed, at this period, Belgian citizens were already offered the second dose.

#### 4 | STUDY 3

We pursued several aims in Study 3. Our main goal was to combine and extend the messages emerging from Studies 1 and 2. Specifically,

we wanted to see whether vaccination motivations would be related to the environmental laissez-faire beliefs on the one hand and beliefs about divine providence on the other, via people's trust in the medical institutions and the attitudes about CAM. By 'beliefs about divine providence', we refer here specifically to the belief that one should not interfere with God's will (or a superior entity), which is inherently good. Additionally, we wanted to improve the measure of people's views about CAM as proposed in Study 1, and of environmental laissez-faire beliefs as proposed in Study 2 and relied here on multi-item scales. In light of the fact that, along with a number of previous efforts (Schmitz et al., 2022; Van Oost et al., 2022), Studies 1 and 2 clearly confirmed the finding that vaccination motivations are related to vaccination intentions, we did not consider intentions in the present study. We hypothesized that beliefs about divine providence and environmental laissez-faire beliefs would be associated with positive CAM attitudes and lower levels of trust in medical institutions, which would, in turn, be related to lower autonomous vaccination motivation and higher distrust-based amotivation.

## 4.1 | Method

### 4.1.1 | Participants

The sample comprised 708 unvaccinated participants from Belgium collected on 11–19 March 2022 (Study 3). The mean age was 49.31 ( $SD = 12.19$ ), 65% were females, 70% had a higher degree (i.e., bachelor, master, or Ph.D.), and 83% reported no comorbidity factors associated with COVID-19. About 5% of the participants did not answer some of the sociodemographic questions. Of note, participants' attitudes towards the vaccine were more negative, in comparison to the samples used in Studies 1 and 2. This is because, by the time we conducted Study 3, that is, 11–19 March 2022, Belgian residents had had ample opportunity to be vaccinated, making the unvaccinated sample inherently more selective.

### 4.1.2 | Measures

*Complementary and alternative medicine.* We assessed trust in CAM by means of 11 items with response options ranging from 1 (totally disagree) to 5 (totally agree). We relied on two items from the CHBQ and created the other nine items, tapping on aspects such as the perception that CAM is efficient, but also integrative (i.e., as a protective strategy emphasizing a comprehensive, long-term immunity), individualized (i.e., as a means to enhance personal agency in a form of do-it-yourself medicine) and provided by practitioners with more benevolence because these emerged in recent research on CAM (e.g., Attwell et al., 2018), but were not covered in other scales. A sample item read: 'Alternative medicines contain ideas and methods that conventional medicine could benefit from'. Inspection of the scree plot indicated the presence of a single underlying component. The scale reliability was good ( $\alpha = .91$ ). Before filling the CAM scale, we added a short

definition of CAM to improve the validity of measurement: 'By conventional medicine, we mean the medicine used in health institutions (for example hospitals). By alternative medicine, we refer to homeopathy, naturopathy, acupuncture, energy medicine, lithotherapy, etc.'

*Environmental laissez-faire beliefs.* We assessed participants' adherence to environmental laissez-faire beliefs using the same two items as in Study 2 and created three additional items. As before, participants answered on a scale ranging from 1 (totally disagree) to 5 (totally agree). A sample item was 'Nature is fundamentally good and should not be disturbed by vaccines'. The environmental laissez-faire beliefs scale reliability was good ( $\alpha = .73$ ).

*Beliefs about divine providence.* We assessed participants' beliefs about divine providence by means of five items on a scale ranging from 1 (totally disagree) to 5 (totally agree). As for environmental laissez-faire beliefs, we created these items on the basis of an examination of several posts that appeared on social media, a number of debates that took place on TV and opinion pieces that were published in national newspapers. A sample item was 'This pandemic is a punishment sent by the creator of all things'. The scale reliability was good ( $\alpha = .80$ ). Inspection of the scree plot in a PCA that included the items pertaining to environmental laissez-faire and beliefs about divine providence revealed the presence of a two-dimensional structure that matched our two conceptual scales. Again, we performed a PCA for this scale, which confirmed good scale construction.

*Trust in the medical institutions.* We relied on the same measure as in Study 1 to assess participants' degree of trust in national and international medical institutions. Inspection of the scree plot indicated the presence of a single underlying component. The scale reliability was good ( $\alpha = .82$ ).

*Motivation to get vaccinated.* We relied on the same scales as in Studies 1 and 2 to assess participants' (a) motivations to get vaccinated. All (a) motivation types had acceptable reliability indices (autonomous motivation  $\alpha = .62$ , controlled motivation  $\alpha = .73$ , effort-based amotivation  $\alpha = .65$ , and distrust-based amotivation  $\alpha = .73$ ).

*Sociodemographic variables.* We collected the same sociodemographic variables as in Studies 1 and 2.

## 4.2 | Results

### 4.2.1 | Preliminary analyses

Table 3 shows the descriptive statistics and correlations among the study variables for Study 3. Of note, the mean of beliefs about divine providence was rather low, preventing strong relations due to a lack of normal distribution and restriction of range. Environmental laissez-faire beliefs were only weakly associated with beliefs about divine providence,  $r = .20$ ,  $p < .001$ . Both environmental beliefs about laissez-faire and about divine providence were positively associated with CAM, distrust- and effort-based amotivation and negatively with trust in the medical institutions, autonomous motivation and controlled motivation. Beliefs about divine providence were positively correlated to CAM, and effort-based amotivation, but negatively to

**TABLE 3** Descriptives and correlations between the study variables (Study 3).

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Age	49.31	12.19	–										
2. Gender (women)	0.55	0.50	–.05	–									
3. Education	2.08	0.77	–.16***	.01	–								
4. Comorbidity	0.21	0.51	.22***	–.03	–.13***	–							
5. Environmental laissez-faire	3.64	0.74	.02	.07	–.15***	–.14***	–						
6. Beliefs about divine providence	1.31	0.57	–.03	.04	–.04	–.03	.20**	–					
7. CAM	3.82	0.72	.16***	.23**	–.03	–.08*	.36***	.17***	–				
8. Trust medical institutions	1.85	0.78	–.18***	.05	.13***	.004	–.39***	–.07*	–.27***	–			
9. Autonomous motivation	1.39	0.63	–.08*	–.08*	.04	.06	–.28***	–.03	–.28***	.40***	–		
10. Controlled motivation	2.95	1.27	–.23***	–.08*	.07	–.04	–.11**	–.02	–.11**	.17***	.25***	–	
11. Distrust-based amotivation	4.49	0.66	.06	.06	–.07	–.05	.26***	.07	.27***	–.46***	–.26***	–.01	–
12. Effort-based amotivation	1.53	0.76	–.06	.04	–.04	–.02	.13***	.21***	.11**	.00	.04	.02	.10**

Note: Composite scores were created from the mean of the items.  
\* $p < .050$ ; \*\* $p < .010$ ; \*\*\* $p < .001$ ;

trust in the medical institutions. CAM was positively correlated with distrust- and effort-based amotivation, but negatively with trust in the medical institutions, autonomous and controlled motivation. Trust in the medical institutions was positively related to autonomous and controlled motivation and negatively to distrust-based amotivation. Autonomous motivation was positively associated with controlled motivation and negatively with distrust-based motivation. Also, effort- and distrust-based amotivations were positively interrelated.

#### 4.2.2 | Measurement model

We compared several nested confirmatory factor analyses to ensure a good quality measurement model based on our latent constructs (i.e., environmental laissez-faire beliefs, beliefs about divine providence, CAM, trust in the medical institutions and the four types of (a)motivation). We compared an eight-factor model (which specifies a single factor for each of our constructs) to a six-, three- or one-factor model. The eight-factor model provided the best fit indices (see the Supporting Information). All standardized loadings were larger than .30, and no cross-loadings or within-factor error correlations had to be tolerated.

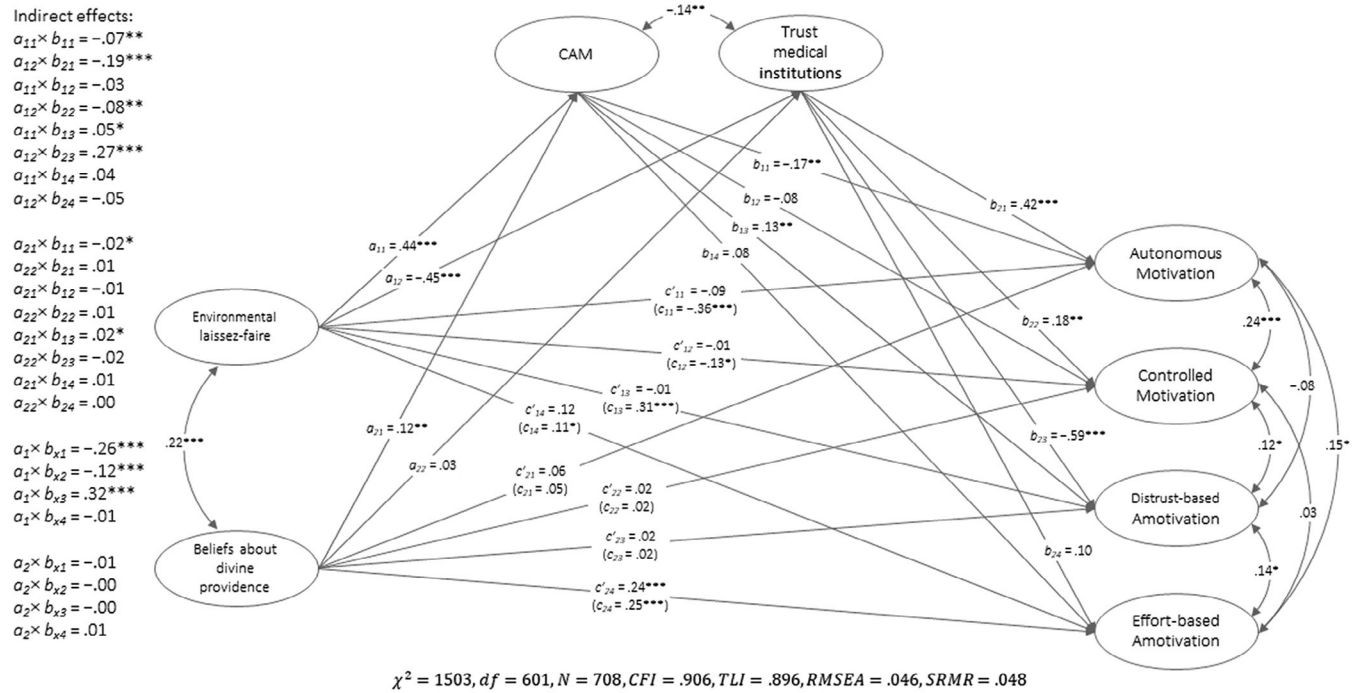
#### 4.2.3 | Integrated process model

We assessed the contribution of environmental laissez-faire beliefs on (a)motivations to get vaccinated through CAM and trust in the medical institutions in an SEM. The mediation model provided good fit statistics.

As Figure 4 reveals, environmental laissez-faire beliefs ( $c_{11}$ ) had a negative total contribution to autonomous motivation. This contribution ( $c'_{11}$ ) did not reach significance when taking CAM and trust in the medical institutions into account. Turning to the effect of beliefs about divine providence on autonomous motivation, both total ( $c_{21}$ ) and direct effects ( $c'_{21}$ ) failed to reach significance. Specifically, both beliefs about divine providence and about nature were positively related to CAM ( $a_{11}$  and  $a_{21}$ ), whereas only environmental laissez-faire beliefs were significantly associated with trust in the medical institutions ( $a_{12}$ ). Moreover, whereas CAM had a negative effect ( $b_{11}$ ) on autonomous motivation when controlling for beliefs in divine providence and environmental laissez-faire beliefs, trust in the medical institutions ( $b_{21}$ ) had a positive effect.

Turning to controlled motivation, environmental laissez-faire beliefs ( $c_{12}$ ) had a negative total contribution, which became non-significant when accounting for CAM and trust in the medical institutions ( $c'_{12}$ ). The total ( $c_{22}$ ) and direct ( $c'_{22}$ ) contributions of beliefs about divine providence did not reach significance. Specifically, while CAM was not significantly associated with controlled motivation when controlling for beliefs ( $b_{12}$ ), trust in the medical institutions ( $b_{22}$ ) was positively associated with it.

Regarding distrust-based amotivation, environmental laissez-faire beliefs ( $c_{13}$ ) had a positive total contribution to this type of motivation.



**FIGURE 4** Contribution of environmental laissez-faire beliefs and beliefs about divine providence on motivations to get vaccinated mediated by CAM and trust in the medical institutions (Study 3, 11–19 March 2022). Ovals represent latent variables. Coefficients are standardized. Total effects are in parentheses. \* $p < .050$ , \*\* $p < .010$ , \*\*\* $p < .001$ .

This direct effect became again non-significant when accounting for CAM and trust in the medical institutions ( $c'_{13}$ ). The total ( $c_{23}$ ) and direct ( $c'_{23}$ ) contributions of beliefs about divine providence did not reach significance. Specifically, CAM ( $b_{13}$ ) had a positive link with distrust-based motivation when controlling for environmental laissez-faire or divine providence beliefs, whereas trust in the medical institutions ( $b_{23}$ ) had a negative link.

As for effort-based amotivation, both beliefs about environmental laissez-faire and about divine providence ( $c_{14}$  and  $c_{24}$ ) manifested a positive total contribution to this type of motivation. The contribution of the former became non-significant ( $c'_{14}$ ) when taking CAM and trust in the medical institutions into account, whereas the contribution of the latter remained almost unaffected ( $c'_{24}$ ). Specifically, neither CAM ( $b_{14}$ ) nor trust in the medical institutions ( $b_{24}$ ) had a significant relation with effort-based motivation when controlling for environmental laissez-faire and divine providence beliefs.

Last but not least, the resulting model shows that both sets of beliefs (beliefs about divine providence and environmental laissez-faire) were positively associated, whereas CAM and trust in medical institutions were negatively associated. Table 4 displays the indirect association coefficients of 'environmental laissez-faire beliefs' and 'beliefs about divine providence' on the four types of motivations via CAM and trust in medical institutions.

#### 4.2.4 | Additional analyses across studies

Table 5 shows the comparisons between our variables of interest across the three studies. As can be seen, autonomous motivation lev-

els were significantly lower in the last two studies than in the first one, whereas the opposite pattern was observed for distrust-based amotivation. Controlled motivation was larger in Study 2, followed by Study 3, and then Study 1. The same trend was observed for effort-based amotivation.

### 4.3 | Discussion

In Study 3, we wanted to combine the insights from Studies 1 and 2 regarding the role of psychological and ideological postures on people's motivations regarding vaccination. We additionally wanted to examine the potential role of beliefs about divine providence as another distal variable, next to environmental laissez-faire beliefs, in shaping respondents' attitudes about medicine, that is, their trust in the conventional medical institutions, on the one hand, and their views on CAM, on the other. The data clearly supported and extended the message emanating from Studies 1 and 2, although the magnitudes of relations were smaller (likely due to the inclusion of additional predictors). The pattern linking preference for CAM, trust in medical institutions and vaccination (a) motivations replicated the one found in Study 1. In short, trust in medical institutions exerts a stronger, and indeed mirroring, effect on motivations compared to views about CAM, although CAM and trust in medical institutions were only moderately related.

Also, environmental laissez-faire beliefs exhibited the same global pattern of relations with motivations as in Study 2, with a strong negative relation with autonomous motivation and a strong positive relation with distrust-based motivation, a smaller negative link with controlled

**TABLE 4** Indirect effect of environmental laissez-faire beliefs and beliefs about divine providence on four types of motivations via CAM and trust in medical institutions (Study 3).

	Autonomous motivation	Controlled motivation	Distrust-based amotivation	Effort-based amotivation
Environmental laissez-faire via CAM	-.07**	-.03	.05*	.04
Beliefs about divine providence via CAM	-.02*	-.01	.02*	.01
Environmental laissez-faire via Trust in medical institutions	-.19***	-.08**	.27***	-.05
Beliefs about divine providence via Trust in medical institutions	.01	.01	-.02	.00

Note. \* $p < .050$ ; \*\* $p < .010$ ; \*\*\* $p < .001$ ;

**TABLE 5** Means comparisons across studies for the (a) motivations to get vaccinated.

(A)motivation	Study 1	Study 2	Study 3
Autonomous motivation	4.23 <sup>a</sup>	1.40 <sup>b,c</sup>	1.39 <sup>c</sup>
Controlled motivation	2.53 <sup>a</sup>	3.40 <sup>b</sup>	2.95 <sup>c</sup>
Distrust-based amotivation	2.68 <sup>a</sup>	4.49 <sup>b,c</sup>	4.49 <sup>c</sup>
Effort-based amotivation	1.42 <sup>a</sup>	1.79 <sup>b</sup>	1.53 <sup>c</sup>

Note: Values from the same row with different superscripts are statistically different ( $p < .001$ ). Multiple comparison tests were adjusted with the Bonferroni method. Composite scores were created from the mean of the items.

motivation and a positive link with effort-based motivation. Interestingly, the data revealed the presence of a moderate positive relation between the beliefs about divine providence and CAM, showing that reporting beliefs about divine control is related to positive attitudes towards CAM. Also, the relations between the beliefs about divine providence with motivation only concerned effort-based amotivation.

This study presents limitations. Again, next to the time the fact that various scales were not pretested, the sample was again selective. Thus, although our results depict a rather coherent picture across studies, it should be noted that the samples differ in their motivations for getting vaccinated.

## 5 | GENERAL DISCUSSION

As a set, the present studies send a very strong and coherent message. In a nutshell, the data clearly support our conjecture concerning the link between a number of psychological and ideological variables that relate to people's motivations for vaccination. In turn, and replicating the pattern observed in previous research, motivational factors also come out as important predictors of vaccination intentions. Crucially, we found that autonomous motivation and to a lesser extent distrust-based and effort-based amotivations predicted vaccination intentions.

The collected data allow for drawing a number of interesting lessons regarding people's attitudes with respect to the medical world. First, we find that preference for CAM and trust in medical institutions are only weakly negatively related, suggesting that attitudes towards CAM

are not simply a proxy of attitudes towards the various institutions associated with conventional medicine when it comes to accounting for vaccination intentions. This pattern reminds us that one should not necessarily equate the positive movement towards CAM and the negative movement away from medical institutions. Indeed, quite a number of health workers (physicians, pharmacists, nurses, etc.) come across as promoters of CAM. One factor that may have contributed to the discrimination of these two aspects is that our measure of trust in the medical institutions very much rested on people's attitudes towards institutions and not towards health workers per se. Nevertheless, our data dove well with earlier findings by Hornsey et al. (2020) who found a difference between attitudes towards CAM and distrust towards conventional medicine, which were uniquely predictive of vaccination intentions, also noting a stronger relation for the former than the latter. The relations between preferences for CAM and trust in the medical institutions with vaccination intentions are in line with expectations. Specifically, preferences for CAM are strongly negatively related to vaccination intentions whereas trust in medical institutions is positively, although less strongly, related to intentions. Again, this is reminiscent of the findings by Hornsey and colleagues (2020).

Second, the present research also sheds light on some of the antecedents of CAM and trust in medical institutions by looking at more distal constructs, like beliefs in nature and beliefs in divine providence. While all major religions have sometimes promoted and at other times discouraged vaccination, religion has long been one of the main factors driving scepticism towards science in general, and vaccination more specifically (see, e.g., Salvadori & Vignaud, 2019). Notably, the idea that a powerful deity or God chooses who lives and dies was mobilized during the COVID-19 pandemic to argue that humans should not get in the way of its design. In this sense, vaccines, or any other human action designed to fight the virus, would be interfering with God's will. In parallel, scholars have emphasized that as the influence of religion waned in many Western countries, a new set of beliefs, secular but spiritual, emerged (Rutjens & Van der Lee, 2020). These spiritual beliefs are rooted in the conviction that nature is inherently good and should not be tampered with. With this belief comes the idea that vaccines are an unnatural, sometimes even dangerous, technology and that the body should remain as devoid as possible from artificial contamination.

Although, to the best of our knowledge, the relation between such divine control and beliefs about the inherent virtue of nature had not been explored yet, we suspected that they were strongly related.

Indeed, both beliefs are rooted in the idea that diseases and pandemics are the work of an external entity that is good and righteous (whether it is nature or a higher deity), and that this entity should not be interfered with. Our findings suggest that, while these two constructs are only moderately related, environmental laissez-faire beliefs play a more important role in predicting the motivation to get vaccinated than do beliefs about divine providence. In particular, believing that nature should not be interfered with had a negative relation with autonomous and controlled motivation for vaccination and a positive relation with distrust and effort-based amotivation. In comparison, the beliefs about divine providence were only associated with a stronger perception of effort-based amotivation.

Going a step further, we looked at the factors underlying the relation between these spiritual beliefs and vaccination motivations, via the attitudes towards CAM and trust in medical institutions. After all, many practices grouped under the umbrella of CAM are both supposed to be 'natural' and have a spiritual component (e.g., they are related to Ayurveda or Buddhism) or are understood as a way to sustain or improve the *natural* state of the body. In fact, the very belief that nature produces desirable outcomes reflects a form of pantheism that is spiritual in nature. The present results show that CAM relates positively to both environmental laissez-faire beliefs and belief in divine providence, while distrust in the medical institutions was only related negatively to environmental laissez-faire beliefs. In turn, CAM and trust in medical institutions were predictive of vaccination motivations. Of note, again, although both constructs are interrelated, they have unique predictive value. In sum, and going beyond the usual reasons that come to mind when thinking about vaccine hesitancy, such as low-risk perception, our data thus stress the fact that more ideological influences are also at work.

The relations among the various vaccination (a)motivations as well as between the vaccination (a)motivations and vaccination intentions echo a series of recent findings by Schmitz et al. (2022) and Van Oost et al. (2022). Looking at how (a)motivations predict intentions, results show that autonomous motivation is positively related to vaccination intentions. Whereas distrust-based amotivation tends to be negatively associated with intentions, the link between effort-based amotivation and intentions is small but positive. Although somewhat surprising, the latter pattern may be a consequence of the joint presence of the two amotivations in the model.

Clearly, the variables that were examined in the present paper form a complex set of beliefs and attitudes, potentially having other consequences than the ones hypothesized here. For example, while we presented a model in which ideological beliefs regarding nature and God precede vaccination motivation and intentions, reverse causality is also possible. For example, ideological beliefs can also serve as justifications for pre-existing negative views on vaccination (van Prooijen and Böhm, 2023). This hypothesis, in terms of motivated reasoning (Kunda, 1990), could also apply to other antecedents to vaccination motivation in the model: for example, negative views about vaccination could precede attitudes towards CAM. In line with this idea, research has shown that vaccine-refusing participants sometimes seek anti-vaccination providers. They might turn to CAM providers

and subsequently develop positive attitudes towards alternative forms of medicine (Browne et al., 2015; Bryden et al., 2018; Frass et al., 2012). A reverse relation could also be hypothesized between trust in medical institutions and environmental laissez-faire beliefs. Forms of distrust in medical institutions might provide a fertile ground for laissez-faire environmental beliefs because the latter reject the 'artificiality' of conventional medicine. Most probably, some of the variables at hand co-evolve together or form a feedback loop. Future studies are needed to disentangle this complex set of interrelationships between ideologies and health practices.

Another limitation of this set of studies is the reliance on a general measurement of CAM, without distinguishing various forms of CAM. Indeed, CAM encompasses a large variety of practices and is being used for diseases ranging from benign to severe (e.g., Bardia et al., 2006). Future studies should better distinguish between types of CAM.

## 6 | CONCLUSION

Interestingly, the belief in some sort of duality between artificiality and naturality along with an essentializing vision of nature, has been challenged by the scientific community. It has been argued that nature is neither good nor bad. It creates all kinds of beauty as well as illness and destruction. At a time when environmental concerns are at the forefront of the public's mind, it may be important to emphasize that the protection of 'nature' can sometimes take on pseudo-scientific forms and can be translated into a rejection of medical progress such as vaccination. The present effort suggests that one may need to address more distal and indeed complex ideological considerations when trying to alleviate people's hesitation with respect to vaccination, notably in times of a pandemic.

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## CONFLICT OF INTEREST STATEMENT

The authors declare no conflicting interest.

## DATA AVAILABILITY STATEMENT

The items list and R scripts to carry out the analyses are publicly available on Open Science Framework: [https://osf.io/nb2t5/?view\\_only=981cd4a69ab24453a2e2a69b83f7128a](https://osf.io/nb2t5/?view_only=981cd4a69ab24453a2e2a69b83f7128a). 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.7726049>.

## ETHICS APPROVAL STATEMENT

The Ethics Committee of Ghent University approved the project (reference number 2020/174).

## ORCID

Pascaline Van Oost  <https://orcid.org/0000-0003-0297-9753>

Mathias Schmitz  <https://orcid.org/0000-0001-9272-5874>

Olivier Klein  <https://orcid.org/0000-0003-2737-8049>

Marie Brisbois  <https://orcid.org/0000-0003-1777-0813>

Olivier Luminet  <https://orcid.org/0000-0002-1519-2178>

Sofie Morbée  <https://orcid.org/0000-0002-0444-1917>

Eveline Raemdonck  <https://orcid.org/0000-0001-7541-1849>

Omer Van den Bergh  <https://orcid.org/0000-0001-6394-7363>

Maarten Vansteenkiste  <https://orcid.org/0000-0001-6983-3607>

Joachim Waterschoot  <https://orcid.org/0000-0003-0845-9310>

Vincent Yzerbyt  <https://orcid.org/0000-0003-1185-4733>

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