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To get vaccinated or not? Social psychological factors associated with vaccination intent for COVID-19

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Abstract

Pandemic control not only requires effective COVID-19 vaccines but also that they are accepted by at least 80% of the population. For this reason, understanding the social psychological variables associated with vaccination intent is essential to achieve herd immunity. Drawing on the theory of reasoned action, this study seeks to analyze vaccination intent using the beliefs about vaccine effectiveness, conspiracy theories, and injunctive norms as predictors. A non-probabilistic national online survey was conducted during December 2020. A sample of 1,033 people in Chile answered a questionnaire with the study variables. Using structural equation models, it was found that vaccination intent was explained in 62.1% by beliefs about vaccine effectiveness and injunctive norms, controlling for age, political orientation, socioeconomic status, educational level, and gender. Specifically, beliefs about vaccine effectiveness are based on people's experience with previous immunization processes, which predict vaccination intent. Regarding injunctive norms, they act by influencing and encouraging vaccination by seeking the approval of significant others. Contrary to expected, conspiracy beliefs were not directly associated with the intention to receive a COVID-19 vaccine but were highly related to lower beliefs about vaccine effectiveness. This study suggests that to enhance the vaccination intent, socio-psychological and structural variables need to be considered.

Keywords

vaccine hesitancy, conspiracy theories, beliefs, infection diseases, public health, vaccination intent

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Introduction

The World Health Organization (WHO) declared the COVID-19 pandemic as one of the greatest threats due to its high mortality rates and the considerable impact it has had on a psychological, economic, and social level (Harrison & Wu, 2020; World Health Organization, 2020). For this reason, various massive public health campaigns have been implemented to promote frequent handwashing, the use of face masks in public spaces, physical distancing, as well as the adoption of quarantines and isolation of infected people (Anderson et al., 2020; Anderson et al., 2020; Cavazos-Arroyo & Pérez de Celis-Herrero, 2020; Paterlini, 2020; Sabat et al., 2020). However, these preventive measures have been insufficient to stop the spread of the virus. So, to control the pandemic, the WHO made a call for the development of vaccines due to the positive impact on the control and prevention of infectious diseases in the past (Chan, 2017; Lurie et al., 2020).

Controlling the pandemic depends on a large proportion of the population becoming immune to the virus, either naturally or artificially, through mass vaccination. Achieving natural immunity would cause a huge burden on health systems and could lead to the death of 30 million people in the world (Randolph & Barreiro, 2020). Therefore, developing a vaccine and its massive application has become essential to achieve immunity with the lowest possible life cost. Under normal circumstances, the vaccine

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development process lasts approximately ten years (Pronker et al., 2013). However, given the current health emergency, resources have been mobilized and scientific collaboration networks have been activated, which have accelerated this process and allowed the simultaneous development of different vaccines for COVID-19 (Haynes et al., 2020). In this regard, various studies have reported that the vaccines against COVID-19 have produced a positive immune response and their potential risks are not higher than those of any other vaccine (Folegatti et al., 2020; Haynes et al., 2020; Zhu et al., 2020). Nevertheless, their rapid development has raised questions about whether a vaccine against COVID-19 could cause greater susceptibility for the body to acquire the virus or generate even more severe consequences (Arvin et al., 2020; Graham, 2020; Hotez et al., 2020; Iwasaki & Yang, 2020). Therefore, despite the great efforts made in the rapid and safe development of vaccines for COVID-19, the success of this immunization strategy depends on the acceptance of vaccination in at least 80% of the population (Randolph & Barreiro, 2020; Schaffer-DeRoo et al., 2020).

The achievement of this goal may be threatened because, in recent years, the confidence in and acceptance of vaccines have decreased (Lane et al., 2018; Larson et al., 2014, 2016). This trend is so worrying that in 2019 it was declared that vaccine hesitancy is one of the greatest threats to global health (World Health Organization, 2019). In at least 20 countries, including Chile, data have revealed COVID-19 vaccine hesitancy. These reports have shown that acceptance of the COVID-19 vaccine (67%–74%) is insufficient to achieve group immunity (Feleszko et al., 2020; IPSOS, 2020; Lazarus et al., 2020; Salazar-Fernández et al., 2021). Vaccine hesitancy puts at risk the hopes that the pandemic could be controlled. Therefore, it is relevant to examine the social cultural factors that will help to understand the intent to vaccinate against COVID-19.

Several models have been proposed to understand and explain health behaviors (e.g., sexual, risk-related, dietary, screening behaviors, and vaccination, among others), like the health belief model (Becker, 1974a, 1974b; Janz & Becker, 1984; Maiman & Becker, 1974; Rosenstock, 1974), the protection motivation theory (Rippetoe & Rogers, 1987; Rogers, 1975), and the integrative model adapted for health behaviors (Betancourt et al., 2010, 2011), among others. One of the health theories that has drawn more attention for predicting health behaviors is the theory of reasoned action (TRA). The TRA conceives that health behaviors are determined by the intentions of executing the specific behavior (e.g., vaccination), which is defined by the attitudes and the perception of significant others about performing the behavior (Fishbein, 1993). Drawing on TRA, this study seeks to analyze vaccine intention using social psychological variables such as the beliefs about vaccine effectiveness and conspiracy theories—as cognitive determinants of attitudes toward vaccination—and social norms.

Beliefs

According to the TRA, beliefs represent the cognitive component of attitudes and play a role in predicting health behaviors such as vaccination intent (Schulze & Wittmann, 2003). Beliefs are socially shared cognitions based on information learned through socialization that guides behavioral intent and behavior (Conner & Sparks, 2005). Individual beliefs are not necessarily widespread; instead, they reflect the intersubjective reality of socio-structural conditions like socioeconomic status, age, educational level, political orientation, gender, or ethnic groups (Betancourt et al., 2011; Chiu et al., 2010) That said, socio-structural variables could impact some specific beliefs toward behaviors. Regarding vaccination intent, research has found that lower socioeconomic status and educational level, as well as right-wing political orientation, are associated with greater beliefs in conspiracy theories and lower vaccination intent (van Mulukom et al., 2020). Furthermore, people who belong to minority groups (e.g., ethnic and religious) show greater adherence to conspiracy theories (Crocker et al., 1999; van Prooijen & Douglas, 2018). Although we did not directly evaluate the attitudinal component of the TRA in the present study, we considered two possible cognitive determinants (proxy) of attitudes toward vaccination: beliefs about vaccine effectiveness and conspiracy theories.

Beliefs about vaccine effectiveness. Vaccines have had a positive impact on the reduction and prevention of infectious diseases (Chan, 2017), avoiding at least 23 million deaths since 2011 (Lee et al., 2013) and controlling highly contagious diseases, like measles (Wellcome Global Monitor, 2018). Despite the irrefutable success of vaccination programs worldwide (e.g., reducing infant mortality), in recent years, the confidence and acceptance of vaccines have decreased (Larson et al., 2016), becoming one of the most significant threats to global health (World Health Organization, 2019). In this regard, it is crucial to investigate those salient and socially shared beliefs that sustain attitudes toward vaccination (Conner & Sparks, 2005), since global data indicate that only 63% of people believe that vaccines are effective (Wellcome Global Monitor, 2018). Various studies have reported that positive beliefs about vaccines and their effectiveness are associated with a greater intention to get vaccinated (Fisher et al., 2013; Wilson et al., 2016). Additionally, positive beliefs toward vaccines have shown associations with greater interest and confidence in science and the use of scientific evidence and scientific reasoning for decision-making (Čavojová et al., 2019; Eberl et al., 2020; Fasce & Picó, 2019; Joslyn & Sylvester, 2017; Plohl & Musil, 2021; Sallam

et al., 2020). In the present study we expect a positive association between beliefs about vaccine effectiveness and vaccination intent.

Conspiracy theories. Research has found a particular tendency to believe in conspiracy theories during periods of crisis, as people seek to make sense of reality (Fritsche et al., 2017; van Prooijen & Douglas, 2017). Conspiracy theories arise to explain a complex social or political event triggered by an uncertain context (van Mulukom et al., 2020). Thus, to the extent that people feel overwhelmed and threatened, they believe in theories seeking to diminish uncertainty (van Mulukom et al., 2020). According to Douglas et al. (2017), people are attracted to believe in conspiracy theories because they seek to satisfy psychosocial needs such as the need for certainty and understanding, desire for control and security, and desire to maintain a positive individual or group image (e.g., epistemic, existential, and social motives). Although most conspiracies are unsubstantiated and incorrect beliefs (see van Prooijen and Douglas (2017) for examples of real conspiracies that have occurred throughout history), they provide people with answers in the face of uncertainty and dictate who can be trusted, modeling the attitudes and behaviors of the people who believe in them (Fukuyama & Pipes, 1998; van Prooijen & Douglas, 2017).

In the current health crisis generated by the pandemic, the general uncertainty regarding the progression of the virus contagion and its consequences, access to information from unreliable sources, and the massive use of social networks have created a prolific scenario for the emergence and exponential spread of COVID-19 conspiracy theories (Allington et al., 2020). The existing conspiracy theories regarding COVID-19, as all conspiracy theories, share the idea that individuals or groups, regardless of their status (powerful or powerless; Nera et al., 2021; van der Linden, 2015), are trying to achieve a sinister goal aiming to destabilize or alienate people (Douglas et al., 2017). COVID-19 conspiracy theories are varied and often refer to the denial of the existence of the virus or that it is not severe, that mortality rates are not accurate but were invented to exert control over the population or to achieve political purposes (van Mulukom et al., 2020; Vega-Dienstmaier, 2020). Conspiracy theories also comprehend beliefs such as the virus being a biological weapon to control and destabilize the population (Ball & Maxmen, 2020) and spread through 5G cell phone technology (Evanega et al., 2020). Conspiracy theories have also permeated so Deeply into the population that the WHO declared that besides fighting an epidemic, we are fighting an infodemic because fake news spreads faster and is just as dangerous as the virus itself (World Health Organization, 2019).

Recent research has found that conspiracy theories and anti-vaccination attitudes are associated with higher skepticism toward science and scientists, higher reactance (the tendency for people to have a low tolerance for impingements on their freedoms), less reasoning and scientific knowledge, and lower trust in experts and scientific and health authorities (Dohle et al., 2020; Hornsey et al., 2018; Plohl & Musil, 2021). Furthermore, conspiracy beliefs are also related to a reduced willingness to engage in prosocial efforts to improve the current situation (e.g., pro-vaccination behaviors) and concern for the self and not others (Hornsey et al., 2021). Additionally, Biddlestone et al. (2020) found that vertical individualism (cultural orientation encompassing acceptance of competition and hierarchy) was associated with stronger COVID-19 conspiracy beliefs and reduced intentions to follow guidelines to avoid contagions (e.g., wearing a mask, maintaining social distance) (Pummerer et al., 2021; Romer & Jamieson, 2020), as well as the use of controversial medical treatments such as chloroquine (Bertin et al., 2020). Of most importance for the present research and following the TRA, conspiracy theories have shown associations with greater mistrust and negative beliefs toward the use of vaccines and lower intent to get vaccinated and vaccination behavior (Bertin et al., 2020; Čavojová et al., 2019; Getman et al., 2018; Hornsey et al., 2021; Jolley & Douglas, 2014; Pummerer et al., 2021; Soveri et al., 2021; Teovanović et al., 2021), putting the control of the pandemic at risk. This study expects a negative association between conspiracy theories and vaccination intent.

Social norms

Social norms are expectations about appropriate behavior in a group context (McDonald & Crandall, 2015). Cialdini et al. (1990, 1991) suggested that the norms considered in the TRA reflect those aspects that *should* be done (i.e., injunctive) and what *is* done (i.e., descriptive). Injunctive norms refer to the perception of which actions are approved or disapproved by others, and motivate conformity by social punishments or rewards; meanwhile, descriptive norms are associated with expected and conventional behaviors that encourage conformity by informing what is considered proper and foreseen (Cialdini & Trost, 1998; Conner & Sparks, 2005). Injunctive and descriptive norms highlight the relevance of significant others' guiding behaviors. Although they are complementary (Schultz et al., 2008, 2018), they are guided by different psychological processes (Jacobson et al., 2011). The descriptive norm influences the intention and behavior through education (e.g., informational social influence), generating genuine and voluntary behaviors. On the contrary, the injunctive norm develops impact through conformity due to group pressure (e.g., normative group pressure), causing ambivalent and forced behaviors (Kelman, 1961; McDonald & Crandall, 2015).

According to the TRA, the norms are determinants of behavioral intentions and behavior. Several studies have demonstrated the predictive power of social norms on health behaviors such as alcohol consumption, drug use, condom use, eating disorders, vaccination, among others (Conner & Sparks, 2005). In the current COVID-19 pandemic, social norms play a predominant role because we look to significant others to guide our conduct (e.g., wear masks, wash hands, maintain social distancing, get vaccinated). In this regard, Sturm et al. (2005) have reported that if significant others are vaccinated, or their children are vaccinated, it is more likely that there is acceptance of the vaccine, and this behavior is carried out. The social norm can enhance vaccination behavior through increased social responsibility (e.g., it is a duty to maintain collective immunity) or as social pressure to accept vaccination and be socially accepted (Dubé et al., 2013). Consequently, it has been shown that greater social pressure is associated with a greater intent to get vaccinated for H1N1 and Human Papilloma Virus (HPV) (Bish et al., 2011; Stout et al., 2020; Wong et al., 2020).

Vaccination processes have been organized by each country's health authority, which has implied that some countries have ensured the number of necessary doses for the population, while others are still in this process, generating immunization gaps. In the case of Chile, the vaccination process started massively on February 2021 and was prioritized by risk groups. Considering that the present study was executed in December 2020, there was no possibility of measuring descriptive norms correctly (no one had been vaccinated to date), thus we only evaluate the role of injunctive norms predicting vaccination intent against COVID-19.

In the light of the supporting evidence that TRA has in understanding health behaviors and the hope of control of the emergency situation offered by vaccination, this study proposed to examine the vaccination intent for COVID-19, using as predictors the following sociopsychological variables: beliefs about vaccine effectiveness, conspiracy theories, and injunctive norms.

Methods

Participants

Through a non-probability national online survey, 1,033 people participated. The inclusion criteria considered that the participants were of legal age and were living in Chile at the time of answering. The participants' age range was between 18 and 78 years ($M = 36.25$, $SD = 13.78$), 71.2% were female, most of the participants indicated that their political orientation was left-wing (specifically: 27.3% were far-left, 25.8% center-left, 25.7% center, 15.3% center-right, and 6.1% far-right). Regarding educational level, 11.5% reported secondary education, 60.8% reported tertiary level, and 22.7% informed postgraduate level. In relation to their perceived socioeconomic status, 14.3% reported belonging to a low status, 41.2% to a middle status, and 44.3% to a higher status.

Instruments

The participants had to answer a survey that contained different sociodemographic variables and scales about COVID-19.

Beliefs about vaccine effectiveness. This instrument by Salazar-Fernández et al. (2021) includes six items that assess beliefs about the effectiveness and usefulness of vaccines controlling diseases. To answer, the participants had to indicate, from 1 to 5, their degree of disagreement or agreement with the statements. High scores reflect higher beliefs about vaccine effectiveness. This one-dimensional scale reported a good level of reliability ($\omega = 0.864$).

Conspiracy beliefs about COVID-19. We used an instrument composed of four items translated and adapted from Brotherton et al. (2013) that evaluate adherence to conspiracy theories regarding COVID-19 (see Table 2). Following van Mulukom et al. (2021)'s classification, these items aim to explain what is happening (e.g., the virus is a bioweapon), suggest that groups seek to destabilize the world (e.g., some countries), and identify what the unclear causes might be (e.g., control people and population). To answer, the participants had to indicate their degree of disagreement (1) or agreement (5). High scores indicate a greater belief in conspiracy theories about the COVID-19 pandemic. This one-dimensional scale reported a good level of reliability ($\omega = 0.894$).

Injunctive norms. This scale included three items reflecting what significant others think the person should do about implementing self-care measures about COVID-19. To answer, the participants had to indicate, from 1 to 5, their degree of disagreement or agreement with each of the statements. A high score indicates a higher influence of the significant others in performing care behaviors. This one-dimensional scale reported a good level of reliability ($\omega = 0.879$).

Vaccination intent against COVID-19. This item sought to assess the probability of vaccinating against COVID-19. The participants assessed their intent using a scale that ranged from not likely (0) to extremely likely (4). A high score on this item reflected a high probability of vaccination.

Control variables. Age, political orientation (5-point scale), socioeconomic status (6-point scale), educational level (8-point scale), and gender (dummy coded, 1 = women)

Table 1. Correlation among the study variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Conspiracy beliefs COVID-19—i1	—													
(2) Conspiracy beliefs COVID-19—i2	0.353**	—												
(3) Conspiracy beliefs COVID-19—i3	0.326**	0.827**	—											
(4) Conspiracy beliefs COVID-19—i4	0.399**	0.822**	0.849**	—										
(5) Beliefs about vaccine —i1	0.251**	0.342**	0.385**	−0.416**	—									
(6) Beliefs about vaccine —i2	0.290**	0.314**	0.326**	−0.378**	0.626**	—								
(7) Beliefs about vaccine —i3	0.340**	0.452**	0.463**	0.489**	−0.493**	−0. 515**	—							
(8) Beliefs about vaccine —i4	0.367**	0.449**	0.497**	0.529**	−0.528**	−0.529**	0.752**	—						
(9) Beliefs about vaccine —i5	0.383**	0.434**	0.441**	0.493**	−0.498**	−0.500**	0.591**	0.632**	—					
(10) Beliefs about vaccine—i6	0.175**	0.175**	0.194**	−0.222**	0.348**	0.404**	−0.366**	−0.427**	−0.355**	—				
(11) Injunctive norms—i1	−0.155**	−0.101**	−0.087**	−0.122**	0.185**	0.200**	−0.140**	−0.142**	−0.137**	0.195**	—			
(12) Injunctive norms—i2	−0.143**	−0.051**	−0.042**	−0.067**	0.143**	0.201**	−0.123**	−0.105**	−0.099**	0.154**	0.760**	—		
(13) Injunctive norms—i3	−0.116**	−0.031**	−0.033**	−0.042**	0.149**	0.191**	−0.098**	−0.086**	−0.066**	0.127**	0.611**	0.750**	—	
(14) Vaccination intent	−0.355**	−0.427**	−0.446**	−0.493**	0.554**	0.644**	−0.564**	−0.596**	−0.625**	0.360**	0.168**	0.146**	0.120**	—
Mean	1.812	2.217	2.159	2.170	4.243	4.271	4.143	4.273	4.127	4.541	4.288	4.184	3.880	3.963
(Standard deviation)	(1.076)	(1.254)	(1.253)	(1.255)	(1.089)	(0.969)	(0.945)	(0.957)	(1.138)	(0.889)	(0.871)	(0.938)	(1.084)	(1.234)

Note. ** $p < 0.01$, * $p < 0.05$

were considered control variables. Higher scores reflect subscription of right-wing ideologies, higher perceived socioeconomic status, and higher levels of education, respectively.

Data collection

The Ethics Committee of the authors' affiliation university approved this study (Res. N° 65/20). The survey was applied through the online platform *QuestionPro* during December 2020. This format allowed access to a large number of participants while reducing the risk of contagion of COVID-19. It included an informed consent that indicated the study's objective, ensured anonymity and confidentiality, and provided the contact details of the responsible researchers. Answering the survey took approximately 15 min.

Statistical analysis

Preliminarily, the data were explored at a descriptive level. Asymmetry and kurtosis were found to be acceptable. The scales' internal consistency was evaluated using the McDonald omega (Revelle & Zinbarg, 2008). Then, using the *lavaan* package (Rosseel, 2012) of the *R* software (R Core Team, 2020), structural equation models were estimated using the DWLS (Diagonally Weighted Least Squares) estimation method, which is more suitable for ordinal data (Flora & Curran, 2004). The estimated models were evaluated according to the following global fit indices: χ^2, the comparative fit index (CFI), the Tucker Lewis index (TLI), the square root of the standardized mean residuals (SRMR), and the square root of the mean error of approximation (RMSEA) with its confidence interval at 90%. According to the conventional goodness of fit criteria, these indices were interpreted: CFI and TLI > 0.95 and SRMR and RMSEA $\leq$ 0.08 (Marsh et al., 2004).

Results

Correlations between the variables of the present study are shown in Table 1. This analysis revealed moderate and strong associations between predictors and vaccination intent.

Following the TRA, we tested a model evaluating COVID-19 vaccination intent through beliefs about vaccine effectiveness, conspiracy beliefs about COVID-19, and injunctive norms about self-care measures. In this model we added educational level, political orientation, socioeconomic status, gender, and age, as control for the two belief variables (beliefs about vaccine effectiveness and conspiracy beliefs about COVID-19). This model showed an excellent fit to the data, χ^2 (161) = 524.984, $p < 0.05$, CFI = 0.959, TLI = 0.951, SRMR = 0.062, RMSEA = 0.054 [90% CI: 0.049, 0.059]. The factor loadings associated with the measurement models and the regression coefficients of the proposed model are found in Table 2. In this model (Figure 1), when controlling for educational level, political orientation, socioeconomic status, gender, and age, greater beliefs about vaccine effectiveness were associated with greater COVID-19 vaccination intent. In the case of conspiracy beliefs about COVID-19, controlling for educational level, political orientation, socioeconomic status, gender, and age, there was no significant association with vaccination intent.[1] We also added a covariance between vaccine effectiveness and conspiracy beliefs about COVID-19 that showed a negative association ($\beta = -0.618$, $p < 0.05$), meaning that the greater the beliefs about vaccine effectiveness, the lesser conspiracy beliefs about COVID-19. Due to the high association between the belief variables we decided to inspect the indirect effect of conspiracy beliefs through beliefs about vaccine effectiveness to vaccine intentions. We found a significant indirect effect, b = −0.269, p < 0.001, 95% CI [−0.335, −0.200], which represents 73% of the total effect (b = −0.369, p < 0.001, 95% CI [−0.522, −0.206]).

Injunctive norms about self-care measures, which showed a positive and significant correlation with COVID-19 vaccination intent, indicated that a higher level of adherence to injunctive norms is associated with greater COVID-19 vaccination intent. Collectively, all these variables explain 62.1% of the variance of vaccination intent.

Discussion

This article aimed to use the TRA to predict COVID-19 vaccination intent. We found that beliefs about vaccine effectiveness and injunctive norms about self-care measures positively and significantly predicted vaccination intent, explaining 62.1% of its variance. Interestingly, conspiracy beliefs about COVID-19 were not directly significantly associated with vaccination intent. However, conspiracy beliefs about COVID-19 were highly associated with lower beliefs about vaccine effectiveness.

Regarding the beliefs about vaccine effectiveness, as measured in our study, they are based on the risk assessment built on the knowledge and previous experience that the individuals already have about the efficacy of the existing vaccines. This finding is consistent with the Chilean immunization history. Chile has a national immunization program (Ministerio de Salud de Chile, 2021) that has provided universal and systematic vaccines to children and adults since 1978, and has the aim of reducing the morbidity and mortality of immuno-preventable diseases (e.g., smallpox, polio, and measles have been eradicated). In our model, beliefs about vaccine effectiveness are the variable with a higher magnitude of association with vaccination intent. This variable is related to attitudes and trust toward science, which has been found to predict higher

vaccination intent (van Mulukom et al., 2020, 2021). As in attitudes and trust toward science, beliefs about vaccine effectiveness are supported by scientific reasoning that allows evaluating the quality of the evidence supporting vaccines, considering the confidence and rigor in each of the processes and stages involved in their development (Čavojová et al., 2019; Fasce & Picó, 2019). That said, beliefs about vaccine effectiveness are based on people's factual knowledge and experience with previous immunization processes, which predict vaccination intent.

On the other hand, when there is no recognition of the efficacy of vaccines, the current pandemic and infodemic have set a scenario that has allowed the emergence of conspiracy theories to find patterns and meanings to make sense of an uncertain world (Douglas, 2021; van Mulukom et al., 2021). According to van Mulukom et al. (2021), beliefs in COVID-19 conspiracy theories emerge as a way to satisfy the need for knowledge and security because they provide an explanation (e.g., the virus is a bioweapon), a reason (e.g., control of the population), and a responsible entity (e.g., some countries). Unexpectedly, in our model, beliefs in COVID-19 conspiracy theories were not associated with vaccination intent as suggested in previous studies (e.g., Bertin et al., 2020; Cislak et al., 2020; Hornsey et al., 2021; Salali and Uysal, 2020; Sallam et al., 2021; Soveri et al., 2021). A possible reason for this lack of association could be that our sample showed low adherence to conspiracy theories ($M_{Total} = 2.09$, $SD_{Total} = 1.21$, range from 1 to 5). However, other studies have found means similar to ours (e.g., Bertin et al. (2020)). Using statistical corrections in our model, such as bootstrapping, we found that the effect was not significant by replicating the analysis with 5.000 random samples [95% CI: −0.270, 0.070]. Presumably, as the conspiracy beliefs instrument used in our study was not related to vaccines specifically but to COVID-19, this could lead to this nonsignificant association. Another possible explanation is that mediating or moderating variables could interfere in the relationship between conspiracy theories and vaccination intent, such as trust in the authorities and the media (Miller et al., 2016) or the perception of risk associated with COVID-19 (Khubchandani et al., 2021). Although we found that "vaccine effectiveness" beliefs could mediate the relationship between conspiracy beliefs and vaccine intention (e.g., conspiracy beliefs could act as an underlying factor of vaccine effectiveness), our data are cross-sectional. Thus, future studies should test longitudinal mediations to clarify this possible mechanism.

Despite the nonsignificant association between COVID-19 conspiracy beliefs and vaccination intent, we did find a highly negative association between beliefs about vaccine effectiveness and conspiracy theories ($r = -0.618$, $p < 0.05$) (Chayinska et al., 2021; Constantinou et al., 2020). This association could be the starting point to encourage and promote vaccination, as it means that reducing conspiracy theory beliefs would help to increase vaccine effectiveness beliefs, promoting an increase in vaccination intent and future vaccination behavior. Future studies, using longitudinal data or experimental designs (e.g., exposure to conspiracy beliefs), should assess whether this association pattern occurs (from beliefs about vaccines effectiveness to conspiracy theories).

Consistent with previous research (Achimescu et al., 2020; Alper et al., 2020; Constantinou et al., 2020; De Coninck et al., 2021; Duplaga, 2020; Farias & Pilati, 2021; Georgiou et al., 2020; Hartman et al., 2020; Hornik et al., 2021; Kuhn et al., 2021; Pizarro et al., 2020; Romer & Jamieson, 2020; Sallam et al., 2020; Sallam et al., 2020; Sallam et al., 2021; van Mulukom et al., 2020; Zakharova et al., 2021), we found that sociostructural variables, such as age, educational level, political orientation, socioeconomic status, and gender are associated with conspiracy beliefs about COVID-19 and beliefs about vaccine effectiveness. As van Prooijen (2017) suggests, they are probably part of a complex interplay of socio-structural factors rather than individual predictors.

According to the TRA, norms are relevant predictors of intentions and health behaviors (Conner & Sparks, 2005; Fishbein, 1993). In our model, we found that greater perceptions that significant others support self-care measures were associated with higher vaccination intent (Chu & Liu, 2021). Consistent with Cialdini's work (1991), injunctive norms—which refer to the approval of health behaviors by significant others—encourage and influence people's confidence in getting vaccinated (Chu & Liu, 2021; Conroy et al., 2009; Fisher et al., 2013; Herman et al., 2003; Stout et al., 2020; Wong et al., 2020). Furthermore, Biddlestone et al. (2020) showed that higher concern for collective norms and the self (i.e., collectivism) is associated with higher intentions to follow guidelines to avoid COVID-19 contagions. Although the norms–vaccination intent association was significant, it was lower than the association between beliefs about vaccine effectiveness–vaccination intent, probably because injunctive and descriptive norms act synergistically (Schultz et al., 2008, 2018). Future studies should measure injunctive and descriptive norms in a complementary manner and account for the relationship between them with vaccination intent.

Substantial evidence supports the use of perceived behavioral control predicting health intentions and behaviors (e.g., theory of planned behavior, see Conner and Sparks, 2005; Schulze and Wittmann, 2003); however, we could not collect this type of data in this study. In Chile, the vaccination strategy was defined and organized by risk groups, prioritizing according to age ranges. This means that people did not control their vaccination behavior because the sanitary authority decided it for them (i.e., it is a constant and not a variable). Several studies have showed that lack of behavioral control is associated with conspiracy

Table 2. Factor loadings, standardized regression coefficients (and standard errors) for the model predicting COVID-19 vaccination intent

	Measurement models	Conspiracy beliefs about COVID-19	Beliefs about vaccine effectiveness	COVID-19 vaccination intent
Conspiracy beliefs about COVID-19				−0.043 (0.083)
1. COVID-19 is not as severe as they want us to believe	0.489**			
2. COVID-19 is a biological weapon created by some countries to destabilize the world	0.847** (0.166)			
3. COVID-19 was created to reduce the world population	0.895** (0.175)			
4. COVID-19 is a virus designed to implement control measures in the population	0.938** (0.168)			
Beliefs about vaccine effectiveness				0.741**(0.072)
1. By getting vaccinated, you protect others against diseases	0.686**			
2. If vaccines have been tested, we must use them	0.681** (0.041)			
3. Vaccines increase the probability of getting sick	0.784**(0.048)			
4. In general, vaccines have more negative consequences than the disease itself	0.840** (0.050)			
5. I think it is better to obtain immunity naturally than through a vaccine	0.779** (0.060)			
6. Vaccines have been an important mechanism for reducing the spread of infectious diseases	0.448** (0.042)			
Injunctive norms				0.173** (0.072)
1. My significant others value that I take care of COVID-19	0.783**			
2. My significant others motivate me to take care of COVID-19	0.964** (0.062)			
3. My significant others give me recommendations on how to take care of myself from COVID-19	0.768** (0.059)			
Control variables				
Socioeconomic status		−0.148** (0.019)	0.143** (0.025)	
Political orientation		0.144** (0.015)	−0.066* (0.020)	
Educational level		−0.160** (0.016)	0.170** (0.021)	
Gender		0.125** (0.036)	−0.032 (0.054)	
Age		0.126** (0.001)	−0.123**(0.002)	
R^2		0.069	0.093	0.621

Note. Items in italics were inverted for the analysis. ** $p < 0.01$

theories (Bruder et al., 2013; van Prooijen & Acker, 2015). However, the evidence is not conclusive (Douglas & Leite, 2017). Future studies should consider adding perceived behavior control as a variable when the vaccination process is available for all the population, and no restrictions are associated with the vaccination behavior.

The present study has shown empirical evidence of the variables associated with COVID-19 vaccination intent using the TRA (Fishbein, 1993) in a Chilean sample. It is relevant to mention that the present study conceptualized and operationalized the attitudinal component of TRA differently from what was initially proposed (Fishbein, 2008). Thus, future studies should consider the affective and instrumental aspects related to the intention to vaccinate in addition to the cognitive aspects. Despite the above, this model offers a comprehensive understanding of social psychological variables—such as beliefs in vaccine effectiveness, beliefs in conspiracy theories, and injunctive norms in predicting vaccination intent when controlling for socio-structural variables (i.e., educational level,

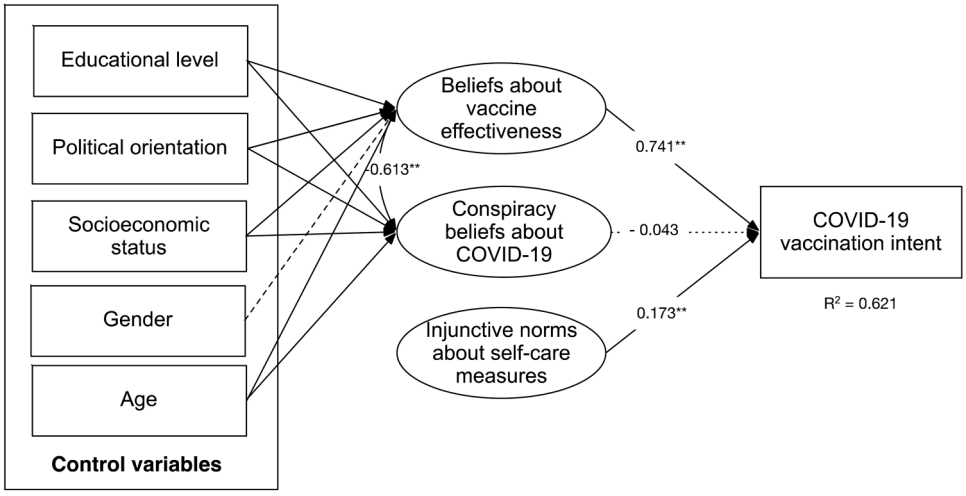

Figure 1. Model fit indices: $\chi^2(134) = 524.984$; $p < 0.05$; CFI = 0.959; TLI = 0.951, RMSEA = 0.054 (0.049, 0.059), SRMR = 0.062. Dashed lines indicate nonsignificant associations, ** $p < 0.05$.

political orientation, socioeconomic status, gender, and age). Chile has been the leading country with more people vaccinated in the Americas. Specifically, at the beginning of August 2021, 7.8% of the population have been partly vaccinated (i.e., one of two doses), and approximately 64.4% have been fully vaccinated against COVID-19 (Mathieu et al., 2021). In our study, in December 2020, 71.8% of the sample declared higher vaccination intent. These percentages confirm that behavioral intent appears to be a good predictor of vaccination (Conner & Sparks, 2005). Furthermore, when people declare their vaccinations intents (e.g., in a survey) and formulate a plan to execute them, this generates changes in their cognitive structure that guides them to fulfill those plans (Milkman et al., 2011; Williams et al., 2004).

Lastly, there are some limitations in the present study. The first of them is that our model is based on cross-sectional data. Relevant findings obtained experimentally (Jolley et al., 2020; Jolley & Douglas, 2014, 2017) and longitudinally (Hornsey et al., 2021) have shed light on how exposure to conspiracy theories affects healthcare behaviors. So, future studies should consider the use of these study designs. Second, online data collection excludes segments of the population that have little or no access to information and communication technologies. Thus, future studies should consider face-to-face data collection to diversify the sample's characteristics and increase the generalizability and external validity of the results to other contexts when the social and health situation allows it. Third, the results found in our study are limited to the particular characteristics of the sample, at the specific timeframe when the research was conducted, and the health strategy adopted by the country. These variables should be considered and controlled when analyzing vaccination behavior in others countries. And, fourth, literature has suggested that other variables involved, such as trust in government and health authorities, could play an essential role in predicting the vaccination behavior, especially when considering the social and political crisis occurring in Chile since October 2019 (Artaza-Barrios & Méndez, 2020). Thus, future studies should consider incorporating these variables because those who adhere to conspiracy beliefs usually doubt the motives of government authorities, believing they have colluded to reach malevolent goals (Hornsey et al., 2015; Hornsey & Fielding, 2020), and act in disregard of the health recommendations provided (i.e., reactance).

To conclude, this study suggests that to enhance the vaccination intent and the consequent execution of the behavior, a multi-causal perspective that considers social psychological (beliefs about vaccine effectiveness, beliefs in COVID-19 conspiracy theories and injunctive norms about self-care measures) and socio-structural variables (educational level, political orientation, socioeconomic status, gender) is needed.

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Note

1. We estimated a model without controlling for the socio-structural variables (educational level, political orientation, socioeconomic status, gender, and age), and the regression coefficients of conspiracy beliefs about COVID-19 and vaccine effectiveness on vaccination intent remained the same.

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