REVISTA PSICOLOGÍA DE LA SALUD

Vol. 11. Núm. 1. 2023. Artículo 15
DOI: 10.21134/pssa.v11i1.321

INFLUENCE OF FEAR ON ANTI-VACCINE CONSPIRACY THEORIES AND BEHAVIOUR AGAINST VACCINATION

INFLUENCIA DEL MIEDO EN LAS TEORÍAS DE CONSPIRACIÓN CONTRA LAS VACUNAS Y EL COMPORTAMIENTO FRENTE A LA VACUNACIÓN

Olga Malas
malas.tolsa@outlook.es

Abstract

Pandemics are a global threat, with vaccination being the main weapon of control. Fear, an unpleasant emotional state caused by a threatening stimulus perception, is known to be behind inhibitory behaviours; being, with mistrust, the basis of anti-vaccine conspiracy theories (CTs). It would be appropriate to know the fear influence on these theories. In this way, a cross-sectional online survey was applied to 2.987 subjects, in a COVID-19 context, characterized by high levels of uncertainty and mistrust, with the aims of analyse the relationship between some anti-vaccine CTs and vaccination intention (VI), also the influence of fear to vaccination (VF) on CTs and VI in this context. As result, all CTs were positive predictors of VF and negative predictors of VI. The correlations were significant ($p < 0.001$), from moderate to high, for all analysed variables, with a significant and moderate directionality and size of association. Regression analysis indicated a moderate and significant explained variance ($r2 = 0.54$) of CTs + VF in VI. The analysis also indicates that safety and security CTs were more strongly associated with VF ($r2 = 0.347$) and VI ($r2 = 0.46$) than other CTs. Obtained results were more significant than those found by other researchers. Knowing in each case the main anti-vaccine CTs and the associated fear can help to plan programs to increase vaccination levels.

Keywords: Fear, Conspiracy Theories, Vaccination avoidance, Vaccines, Anti-vaccines.

Resumen

Las pandemias son una amenaza global, siendo la vacunación la principal arma de control. Se sabe que el miedo, un estado emocional desagradable causado por la percepción de un estímulo amenazante, está detrás de las conductas inhibitorias; siendo, con la desconfianza, la base de las teorías de la conspiración antivacunas (CTs por sus siglas en inglés) Sería oportuno conocer la influencia del miedo en estas teorías. Con esta intención, se aplicó una encuesta transversal online a 2.987 sujetos, en un contexto COVID-19, caracterizado por altos niveles de incertidumbre y desconfianza, con el objetivo de analizar la relación entre algunas CTs antivacunas y la intención de vacunación (VI), así como la influencia del miedo a la vacunación (VF) en las CTs y la VI, en dicho contexto. Como resultado, todos las CTs fueron predictores positivos de VF y predictores negativos de VI. Las correlaciones fueron significativas ($p < 0{,}001$), de moderada a alta, para todas las variables analizadas, con una direccionalidad y tamaño de asociación significativa y moderada. El análisis de regresión indicó una varianza explicada moderada y significativa ($r2 = 0.54$) de CTs + VF en VI. El análisis también indica que los CTs de seguridad y eficacia estaban más fuertemente asociados con VF ($r2 = 0{,}347$) y VI ($r2 = 0{,}46$) que otras CTs. Los resultados obtenidos fueron más significativos que los hallados por otros investigadores. Conocer en cada caso los principales CTs antivacunas y el miedo asociado puede ayudar a planificar programas para aumentar los niveles de vacunación.

Palabras clave: Miedo, Teorías de la Conspiración, Evitación de la vacunación, Vacunas, Antivacunas**.**

Introduction

The conspiracy theories (CTs) can be defined as a set of false beliefs in which the ultimate cause of an event is believed to be due to a plot by multiple actors working together with a clear goal in mind, often lawfully and in secret (Swami et al., 2014). Research has linked CTs with the search for patterns and meaning even when such patterns do not exist (van Prooijen et al., 2018). It is a way of theorizing about a fact despite the available evidence, and not an alternative explanation of this fact as long as there is no evidence that reliably explains it Vicol (2020). Generally, CTs are produced as result of the search for an alternative explanation to the official one about historical or present phenomena, and they are based on the idea that there are hidden powers or secret manipulations to hide facts from the population (Gualda et al., 2019); explaining these events and circumstances as the malevolent acts of secret and powerful groups (Douglas et al., 2017; Douglas et al., 2019). Such theories can take several different forms, but one of the most common of these being the CTs which suggest the world is ruled by a small global elite, comprised of powerful groups, mysterious figures, or alien whose aim is to make a new world order (e.g., Swami & Coles, 2010), and to achieve this they manipulate and monitor the world, being behind of the major international events or crises (e.g., Swami et al., 2013); being the governments and some major international figures possible accomplices of these events (Georgiou et al., 2020).

The CTs can have negative repercussions for society (e.g., Gualda et al., 2019; Sallam et al., 2020; Swami et al. 2014) and this acquires great importance due to its high prevalence. As example, some representative surveys have shown that the 50% of the American citizen (Oliver and Wood, 2014), the 60% of the UK, 80% of Italian, the 85% of the Hungarian (de Waal, 2018), 81.6% in Arab countries (Sallam et a., 2020), and the 59% of Spanish (Gualda et al., 2019), believed in some CTs. In other hand, in general, the proposal of actions destined to avoid CTs is difficult, because are often multi-layered, nebulous, resistant to disconfirmation (Lewandowsky et al., 2013), very stable over time (Jolley & Duglas, 2014) and are often driven by strongly-held social and political identities (Uscinski et al., 2020). Another challenge is that believing people are likely to reject direct counterarguments from governments and authorities because they perceive these as part of the conspiracy (Nisbet, 2009).

As a preliminary measure to combat them, studies have been carried out to establish a pattern between those who believe in CTs and those who do not. As a result, the CTs has been related with underlying psychopathological traits, as schizotypy, which make a person more likely to develop erroneous beliefs (e.g., Georgiou, et al., 2019; Hart & Graether, 2018). Also has been related to people with low educational level (Douglas et al., 2016; Sallam et al., 2021); female gender (Sallam et al., 2021); that have high levels of anxiety or worry (Grzesiak-Feldman, 2013); lower monthly income (Sallam et a., 2021); that use social media sources of information (Earnshaw et al., 2020; Wilson & Wiysonge, 2020); that feel they have no power (Abalakina-Paap et al., 1999); that need to feel unique compared to others (Lantian et al., 2017); that feel the need to belong (Graeupner & Coman, 2017), or that feel that their group is underestimated (Cichocka et al., 2016), or threatened (Jolley et al., 2018). However, these data are not conclusive, since they are unstable and it is very influenced by cultural impact (Sallam, et al., 2020), and sociodemographic context of the sample (Vicol, 2020). Therefore, more studies on this subject are necessary.

Since the beginning of the COVID-19 pandemic, health authorities indicated the need to develop a vaccine and proceed to vaccinate the population for control its spread, a fact that has collided with the reluctance of a large number of people (Douglas, 2021; Sallam, 2021); generating a lot of CTs. As example, from early of the pandemic some people believed that this coronavirus was deliberately manufactured as a weapon of war; it was a hoax or an exaggeration designed to prevent the re-election of Donald Trump; it was a direct attack by powerful authorities on civil liberties (Douglas, 2021); or that vaccines were a way to implant microchips to control humans (Sallam et al, 2021); or to leading infertility for limiting the growth of the human population (Romer & Jamieson 2020; Uscinski et al., 2020).

In previous vaccination plans against influenza, measles or papilloma, it has been observed that, vaccine-related CTs are associated with a greater refusal to be vaccinated, compromising the success of these plans (Jolley and Duglas , 2014; Sallam, 2021). Therefore, although de-

clining vaccination rates are a product of many factors, it is important to consider the potential impact of CTs on vaccination intention (Jolley & Douglas, 2014).

The psychological literature explains the proliferation of CTs as a way to avoid uncertainty, and restore a threatened sense of security and control (Douglas, 2021). The emotional reaction to COVID-19, mainly of fear, is a marker of how the mind functions in conditions of affective activation related to heightened uncertainty and explain the observed reply, similar to this observed in other pandemics, that already proved to be drivers for conspiracy theories (Venuleo et al., 2020), as for instance shown by studies focused on the H1N1 influenza in 2009 (Smallman, 2015), or the AIDS spread blaming gays, users of intravenous drug, and prostitutes for its spread (Wagner-Egger et al., 2011).

This is consistent with what happened during the COVID-19 pandemic. In this period the uncertainty has been high, the economic crisis has worsened, and the information received by citizens was complex, frequently contradictory, and not responding to their concerns (Douglas, 2021); generating a lack of trust in governments, vaccine manufacturers and healthcare professionals (Blaskiewicz, 2013; Casiday et al., 2006; Freeman et al., 2020). This great uncertainty could explain that, for COVID-19, CTs began to emerge immediately after the first news of the pandemic outbreak (Van Bavel et al., 2020), playing an important predictive role in mistrust (Szczygielski et al., 2021), and in raising fears during pandemic outbreak (Gori et al., 2021; Wheaton et al., 2021).

In other hand, the studies investigating emotional reactions have found evidence of widespread fear and worry to coronavirus disease and their vaccination (Malas & Tolsa, 2021), and this fear may be behind inhibitory behaviours (Reynolds et al., 2018), and explain why the anticipation of possible side effects of vaccines drops intention of vaccinate (Mellers & McGraw, 2001; Sotiriadis et al., 2012). In fact, the fear of side effects or the occurrence of diseases caused by the vaccines, are frequent arguments of anti-vaccine groups (Hortal & Di Fabio, 2019), building around it the main CTs around vaccines.

Other CTs as hoax related also have been linked to vaccine refusal (Barua et al., 2020; Imhoff & Lamberty, 2020; Romer & Jamieson 2020; Sallam et al., 2021). In this case, it is common to believe that the population is deceived to hide the side effects (Karafillakis & Larson, 2017), the need or the true objectives of the vaccine (Romer & Jamieson 2020; Sallam et al, 2021: Uscinski et al., 2020). In this context, has been documented a common mistrust of pharmaceutical companies, politicians, and medical authorities considering them profit-making and irresponsible in their messages to citizens (Casiday et al., 2006). In fact, uncertainty and perceived threat increase when trust in politicians decreases (Lalot et al., 2021); and it has been observed, in the context of COVID-19, that uncertainty has played an important predictive role in mistrust (Lalot et al., 2021; Szczygielski et al., 2021), in levels of fear (Gori et al., 2021; Wheaton et al., 2021), in adherence to preventive measures, and in mental health indicators (Gori et al, 2021; Koçak, 2021; Nitschke et al, 2021).

Although negative correlations between the CTs on vaccination and vaccination intention have been repeatedly established (Lewandowsky et al., 2013; Jolley and Douglas, 2014; Bertin et al., 2020; Roozenbeek et al., 2020; Salali and Uysal, 2020), the effect size were modest, ranging between $r^2 = 0.05$ in a French sample (Bertin et al., 2020) and $r^2 = 0.27$ in a US sample (Lewandowsky et al., 2013). In other hand, much of the variance still needs to be explained and to the authors' knowledge, the topic has not been investigated within Spain before.

In summary, the information found and referenced in this introduction suggests that vaccination avoidance is related to uncertainty, mistrust, fear, and anti-vaccines CTs; being fear and mistrust the basis of these CTs. Therefore, the campaigns against fear and CTs will allow increasing vaccination levels. Unfortunately, direct action against CTs is difficult because they tend to be diffuse and stable over time. On the other hand, there are effective coping actions against fear. It would be appropriate to know the influence of fear in these theories. Knowing in each case the main anti-vaccines CTs and the associated fear can help to plan programs to increase vaccination levels

In this way, the aim of this study was to evaluate the relationship inter some anti-vaccines CTs, the vaccination fear (VF) and the vaccination

intention (VI), in Spanish citizens, in COVID-19 context which has been linked to high levels of uncertainty and mistrust. The ultimate goal is to know how fear influences CTs and VI in this context.

Method

Participants

Two thousand nine hundred eighty-seven (2.987) Spanish adults recruited online participated in the study, 37.4% men and 62.6% women, with a mean age of 34.82 (SD: 13.51). The sample was composed by teachers (46.8%), university students (35.3%), health personnel (10.8%) and other professionals (7.0%). Most of the sample was coupled or married (52.9%), followed by single living accompanied (36.1%), single living alone (7.5%), and divorced or widowed (3.6%). Regarding cohabitation, the vast majority live without dependents (57.9%).

Procedure and ethics

A cross sectional survey was applied in the COVID-19 context, from the beginning of December 2020 and January 2021, in the second wave of the pandemic, in the first phase of vaccination plan implementation, when the ease of access was close, the perceived risk of disease and the importance of immunization was maximum and the proximity to the vaccination campaign was forcing people to recognize and face their fears to vaccine, and the causes of its acceptance or rejection. The procedure is similar to that used by Bertin et al., 2020; Roozenbeek et al., 2020; Salali and Uysal, 2020. or Sallam et al. (2021), to analyse CTs and VI in the initial phase of the COVID-19 pandemic; and Mesch & Schwirian (2019) in their study of vaccination hesitancy, which used a context based on the expectation of upcoming exposure to assess the causes of fear and hesitancy against the Ebola vaccine.

Instruments were administered online. Recruitment was carried out with a message containing the study link, which was distributed via email to their educational or work centres. Participation was completely voluntary. A consent form was inserted at the beginning of the study to inform the participants of the aim of the research and the protection of privacy. To continue with the administration of the questionnaires, each participant had to accept the terms of the study that complied with the Helsinki declaration.

Measures

Sociodemographic questionnaire: For collected information about age, gender, marital situation, cohabitation and employment (To see Table-1).

Battery of CTs: The conspiratorial beliefs about vaccines and vaccination were evaluated through sentences of own design. Taking into account the sentences used by Gualda et al. (2019), Larson et al, (2018), and sentences includes in the *Vaccine Conspiracy Beliefs Scale* (VCBS) validated by Shapiro et al. (2016), two independent researchers extracted and made a list including the most used CTs. This sentence list was subsequently analysed, carrying out a final selection, by consensus, of most frequent sentences, related to usual CTs in Spain, ruling out the non-significant, such as theories linking vaccination to human sterilization or the insertion of microchips to control people. Finally, five sentences made up the CTs battery. Of these, two sentences refer to CTs on vaccines; and three sentences to CTs on hoax and mistrust. The translation of selected sentences is, for CTs on vaccines (CTVs): "I do not believe that the vaccines that will be used in Spain are safe for the population"; "I do not believe that the vaccines will be used in Spain are effectives to control COVID-19". For CTs on hoax and mistrust (CTHMs): "I do not believe that the disease is as deadly or serious as they say"; "I believes that vaccination is just a way to earn money from pharmaceutical companies"; and "I believes that vaccination is an invention of the governments to limit the freedoms of the population". The sentences were evaluated, using a Likert-type scale with five response options, ranging from 1 (strongly disagree) to 5 (strongly agree), with scores ranging from 5 to 25. Higher scores reflect higher levels of CTs. As Bertin et al. (2020), exploratory factor analysis (EFA) with Oblimin rotation was conducted for the sentences. As results, the scale yielded a satisfactory fit for a single factor structure. The Kaiser-Meyer-Olkin value was 0.786 and Bartlett's test of sphericity was significant (2 (df = 10) = 6495.93; p<0.001). Factor loadings were very good for all items (ranging between 0.749 and 0.818); and the Cronbach's alpha (= 0.84) indicated a satisfactory internal consistency.

Vaccination Intention: We adapted the single item used by Jolley and Douglas (2017), and Bertin et al. (2020) to assess behavioural intention to be vaccinated against COVID-19. Participants was asked what they would do if they had the opportunity to be vaccinated. They answered on a 5-points scale ranging from 1 ("I would definitely not be vaccinated under any circumstances") to 5 ("I would be vaccinated without any hesitation").

Vaccination Fear Scale (VFS-6): Has been used the Spanish version validated by Malas & Tolsá (2021). It is a six-item scale rated on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree) with scores ranging from 6 to 30. Higher scores reflect higher levels of fear. This scale present robust psychometric properties. Exploratory factor analysis (EFA) reveals a satisfactory fit for a bifactorial structure. The Kaiser-Meyer-Olkin value was 0.86 and Bartlett's test of sphericity was significant ($\chi 2$ (df = 21) = 5294.653; p<0.001). Factor loadings were very good for all items (<0.60); and the Cronbach's alpha (α = 0.88) indicated a satisfactory internal consistency in adult Spanish sample (Cronbach's alpha = 0.88). In our sample, α = 0.86.

Statistical analysis

For the univariate and descriptive analysis, frequencies and percentages were used for qualitative variables and measures of central tendency and dispersion for quantitative variables such as age. For this first analysis, CTs and VI, as Gualda et al. (2019), to calculate the frequencies, the scale ratios 1 & 2 and 4 & 5 were counted together. For VF, Median Split method for turning

Table 1. *Demographic characteristics and prevalence (%) of sample that not believe, hesitate, or believe in one or more CTs*

		One or more CTs (%)			
	f (%)	No	Hesitant	Yes	
Total Sample	2987 (100)	10.7	40.1	49.2	
Sex					
Males	1116 (37.4)	13.6	37.6	48.7	$X^2(2)$: 16.838 p<0.001
Females	1871 (62.6)	9.0	41.6	49.4	
Age (range)					
18-19	388 (13.0)	17.0	36.1	46.9	
20-29	978 (32.7)	11.3	35.0	53.7	
30-39	572 (19.1)	7.2	39.0	53.8	$X^2(10)$: 65.115 p<0.001
40-49	533 (17.8)	7.5	47.5	45.0	
50-59	456 (15.3)	11.4	46.3	42.3	
>60	60 (2.0)	16.7	48.3	35.0	
Civil state					
Married/coupled	1580 (52.9)	9.4	43.4	47.3	$X^2(4)$:25.683 P<0.001
Single	1300 (43.5)	12.7	35.5	51.8	
Widowed/divorced	107 (3.6)	6.5	48.6	44.9	
With dependents					$X^2(2)$:22.491 p<0.001
No	1729 (57.9)	12.6	37.3	50.1	
Yes	1258 (42.1)	8.1	44.0	47.9	
Group					
Student	1129 (37.8)	16.7	33.5	49.8	
Teachers	1399 (46.8)	7.8	44.5	47.7	$X^2(6)$:88.652 p<0.001
Health personnel	324 (10.8)	3.4	44.8	51.9	
Other	135 (4.5)	8.1	39.3	52.6	
Note: M: Mean, SD; Standard deviation					

Table 2. *CTs frequencies versus VF and VI*

	VF (%)			VI (%)		
	No	Yes		No	Hesi-tant	Yes
CTVs						
No (36.5%)	95.1	4.9		3.9	8.6	87.5
Hesitant (42.1%)	76.7	23.3		23.5	36.3	40.3
Yes (21.4%)	48.1	51.9		65.5	23.1	11.4
	$X^2(2)$ = 508.394, p<0.001			$X^2(4)$ = 1305.834, p<0.001		
CTHMs						
No (58.2%)	87.5	12.5		9.4	18.4	72.2
Hesitant (24.8%)	69.3	30.7		34.4	36.4	29.2
Yes (16.9%)	54.0	46.0		66.8	21.3	11.9
	$X^2(2)$ = 288.000, p<0.001			$X^2(4)$ =987.824, p<0.001		
Total CTs						
No (10.7%)	95.3	4.7		0.6	8.4	90.9
Hesitant (40.1%)	84.9	15.1		12.8	27.2	60.0
Yes (49.2%)	67.2	32.8		40.9	23.5	35.6
	$X^2(2)$ =184.118, p<0.001			$X^2(4)$ =517.087, p<0.001		

VF = Vaccination Fear. VI = Vaccination intention. CTVs: Conspiracy theories on vaccines and vaccination. CTHMs = Conspiracy theories on hoax and mistrust

the continuous variables into a categorical one was used (Iacobucci et al., 2015), obtaining a cut-off of ≥ 17. Following, correlation and regression analysis were carried out to confirm/deny the hypothesis raised in the study. The quantitative variables on ratio scale were subjected to the Kolmogorov-Smirnov normality tests (n> 50). None of the variables fulfilled the assumption of normality (p<0.05), so they were analysed through non-parametric inferential tests. Spearman's Rho Coefficient was used to evaluate the relationship between the main variables. The strength of the association and its directionality were determined by Gamma (Γ) and Summer's d statistics, respectively. Finally, the predictive capacity of CTs on VF and VI was determined by hierarchical regression analyses. Statistical analyses were performed using the SPSS v.27 package.

Results

At the time of study, the 49.2% of analysed sample declared to agree with one or more CTs, and 40.1% were hesitant. Frequency analysis and Pearson's X^2 test indicates significant differences (p<0.001). between all groups of sociodemographic variables analysed. Greater frequency of CTs believers is observed in women, in sample from 20 to 39 years old, in single, without dependents in their charge, and in health personnel. For hesitancy, is observed greater frequency in women, in more than 40 years old, in married/couple, widowed and divorced, with dependents in their charge, and not students.

The frequency analysis of the CTs analysed related to VF and VI (see Table-2) indicates a higher prevalence of those who believe or hesitate about CTVs (21.2% / 42.1%), compared to those who have CTHMs (16.9% / 24.8%). This frequency analysis also shows how people who doubt have more fear and less intention to vaccinate than those who do not hesitate, a fact that increases among those who believe in one or more CTs.

Spearman bivariate correlation analysis indicates significant but very low correlation values for sociodemographic variables versus CTs, VF or VI. (*rho*> 160, *p*> 0.05). But it does allow to establish, for VF, a positive and mean correlation for CTHMs (*rho*>0.3; p<0.01), and a positive and high correlation for CTVs (*rho*>0.6; p<0.01). For VI a high and negative correlation was obtained for all CTs; also, a mean and negative correlation with VF has been obtained (To see Table-3). These correlations showed (To see Table-4), an association strength and directionality moderate and significant inter CTs and VF (*Γ*= 0.508; *d*= 0.480), and between VF and VI (*Γ*= 0.500; d= 0.393). In turn, the strength of the association and the directionality of the cor-

Table 3. *Correlations between CTs, VF and VI*

	1	2	3	4	5
CTVs	1.000				
CTHMs	0.563**	1.000			
Total CTs	0.848**	0.904**	1.000		
VF	0.600**	0.512**	0.624**	1.000	
VI	-0.681**	-0.608**	-0.720**	-0.544**	1.000

**. The correlation is significant at the 0.01 level (two-tailed).
VF = Vaccination Fear. VI = Vaccination intention. CTVs: Conspiracy theories on vaccines and vaccination. CTHMs = Conspiracy theories on hoax and mistrust

Table 4. *Strength and directionality of the correlation between CTs, VF and VI.*

CTs belief	VF						VI				
	Rho	95% IC	*p*	[illegible]	*d*		*Rho*	95% IC	*p*	[illegible]	*d*
CTVs	0.600	0.576/0.623	<0.001	0.536	0.472		-0.681	-0.700/-0.660	<0.001	-0.706	-0.581
CTHMs	0.512	0.484/0.539	<0.001	0.440	0.392		-0.608	-0.631/-0.584	<0.001	-0.608	-0.506
Total CTs	0.624	0.601/0.646	<0.001	0.508	0.475		-0.720	-0.737/-0.701	<0.001	-0.691	-0.593
VF	---	---		---	---		-0.544	-0.569/-0.517	<0.001	-0.500	-0.429

VF = Vaccination Fear. VI = Vaccination intention. CTVs: Conspiracy theories on vaccines and vaccination. CTHMs = Conspiracy theories on hoax and mistrust

Table 5. *Hierarchical regression analysis for CTs versus VF and CTs plus VF versus VI*

	B	95% IC		t	*p*	r^2	Δr^2
CTVs versus VF	1.199	1.108	1.290	25.878	<0.001	0.347	0.347
CTVs + CTHMs versus VF	0.427	0.365	0.490	13.340	<0.001	0.384	0.037
CTVs versus VI	-0.298	-0.321	-0.276	-25.719	<0.001	0.459	0.460
CTVs + CTHMs versus VI	-0.14	-0.154	-0.125	-18.709	<0.001	0.529	0.070
CTVs + CTHMs + VF versus VI	-0.034	-0.043	-0.026	-8.33	<0.001	0.540	0.011

VF = Vaccination Fear. VI = Vaccination intention. CTVs: Conspiracy theories on vaccines and vaccination. CTHMs = Conspiracy theories on hoax and mistrust

relation between CTs and VI were moderate to high and significant (r= 0.691; d= 0.593).

To test our hypothesis, hierarchical regression analysis was carried out. As can be seen in Table-5, the hypothesis was corroborated. All CTs tested were negative predictors of VI; and positively predicted the VF. The results indicate that the CTVs were more strongly associated with the dependent variables than the CTHMs. Thus, the CTVs explain 34.7% of the variance of VF; and 46% of VI. The "intro" in the hierarchical regression analysis of the CTHMs and VF, allows increasing the explained variance to 38.4% and 54.0% respectively.

Discussion and conclusions

The objective of the study has been achieved. The sample is large and significant and makes it possible to establish a clear link between CTs, VF and VI.

In this study, 49.2% had one or more CTs. These data are aligned with those reported by Gualda et al. (2019) for a Spanish sample asked about a wide range of general CTs.

As Sallam et al. (2021), a higher frequency of belief in COVID-19 CTs was observed in women. Also in health personnel, where only the 38.3% of sample were women. Thus, the higher frequency in this group could be explained by the high levels of anxiety described for this population in relation to the COVID-19 pandemic (see: Tolsa & Malas, 2021); which has been described as a predictor of CTs (Grzesiak-Feldman, 2013). In this study, middle age appears as a predictor factor, but in the absence of references that confirm it, and taking into account the characteristics of the sample, all with a medium-high educational level and the irregular distribution of women between group, more studies are needed to confirm it.

Analysing obtained data, can see that, in accordance with the observations of Zeyer (2019), and Frayon (2020), three clearly differentiated groups have been obtained, some that believe in one or more CTs, others that do not, and a considerable group of hesitant (40.1%). This hesitant group is an optimal work group to promote the provaccination discourse; since, it is usually more influenced by the arguments in pro than by the arguments against (Zeyer (2019), and they tend to opt in one direction or another depending on the context, time, place, complacency, convenience and trust (Salmon, et al., 2020).

The results obtained in the correlation analysis were consistent with those found in the frequency analysis, showing a positive and medium correlation between VF and CTHMs, and high and positive with CTVs (safety and efficacy). In turn, a negative and high correlation between VI and all CTs has been obtained, but specially for CTVs. The strength of the association and the directionality of CTs versus VI is greater than versus VF, also between VF and VI. Obtained results were concordant with these obtained for Bertin et al., 2020, Jolley and Douglas, 2014, Lewandowsky et al., 2013, Roozenbeek et al., 2020 and Salali and Uysal, 2020, who also obtained negative correlations between the vaccination CTs and VI.

The regression analyses corroborate this data, showing that all types of conspiracy beliefs were positive predictor of VF and negative predictors of VI. Parallelly VF was negative predictors of VI. In other hand, regression analysis indicates a moderate and significative effect size ($r^{2=}$ 0.54) of CTs plus VF over VI; unlike Bertin et al., (2020) who obtained an effect size modest in a French sample (r2= 0.05); or Lewandowsky et al. (2013), in a US sample (r2= 0.27). Possibly, because the battery of CTs used includes specific sentences related to the safety and efficacy of vaccines. The analysis also indicates that the CTVs were more strongly associated with the dependent variables than CTHMs. The results were consistent with the contributions of Frayon (2020), Larson et al. (2018) or Salmon et al. (2015) according to which the rejection of vaccination is mainly due to fear in the safety and efficacy of vaccines.

Limitations

In any case, the results may be influenced by several limitations present in the study. First, the cross-sectional design does not allow for inference to be drawn regarding causality. And, although CTs may fuel negative attitudes toward vaccination, one could hypothesize a reverse causal path, where the mistrust on vaccination can be leading to CTs, as way to legitimize a view (Bertin et al., 2020). Second, the current study relied exclusively on self-report. The nature of the self-report measures does not allow us to objectively assess the associations between the study variables and they may be affected by factors of social desirability or another source of bias. Thirdly, unmeasured factors may influence attitude toward VF and VI. As other CTs, or other sociodemographic variables, such as other educational level or income, which have not been evaluated. Finally, used sample includes a high proportion of teachers or students; such not being representative of the general Spanish population. However, prevalence results were similarly with these obtained by Gualda et al. (2019) in a recent poll conducted on a Spanish representative sample. Thus, we can expect that the results of the present study might not be overestimated due to unrepresentative sampling. In any case, in future studies, it would be advisable to test other population groups, which will allow a more precise estimate of the prevalence of CTs and their relation with VF and VI.

Conclusion

As expected, anti-vaccines CTs and VF were

negative predictors of VI, with higher levels of fear of vaccination being observed in people who claim to believe in anti-vaccine theories. The analysis also indicates that safety and security CTs were more strongly associated with VF (r2 = 0.347) and VI (r2 = 0.46) than other anti-vaccine CTs. Therefore, in this case, focusing resources on campaigns aimed at counteracting the fear linked to the safety and efficacy of vaccines will be recommended to increase vaccination levels.

Appendix I

***Batería de CTs* / Battery of CTs**

1. No quiero vacunarme porque no creo que las vacunas que se van a utilizar en España sean efectivas para controlar el COVID-19.	1. I do not want to be vaccinated because I do not believe that the vaccines will be used in Spain are effectives to control COVID-19.
2. No quiero vacunarme porque no creo que las vacunas que se van a utilizar en España sean seguras para la población.	2. I do not want to be vaccinated because I do not believe that the vaccines that will be used in Spain are safe for the population.
3. No quiero vacunarme porque no creo que la enfermedad sea tan mortal ni tan grave como dicen.	3. I do not want to be vaccinated because I do not believe that the disease is as deadly or serious as they say.
4. No quiero vacunarme porque creo que la vacunación es solo una forma de ganar dinero con las compañías farmacéuticas.	4. I do not want to be vaccinated because I believe that vaccination is just a way to earn money from pharmaceutical companies.
5. No quiero vacunarme porque creo que la vacunación es un invento de los gobiernos para limitar las libertades de la población.	5. I do not want to be vaccinated because I believe that vaccination is an invention of the governments to limit the freedoms of the population

***Escala de Miedo a la Vacunación* Vaccination Fear Scale (VFS-6:** Malas & Tolsa, 2021**)**

1. *Le da mucho miedo vacunarse de [...]*	1. You are very afraid to get vaccinated against [...]
2. *Siente incomodidad al pensar en vacunarse de [...]*	2. You feel uncomfortable thinking about getting vaccinated against [...]
3. *Las manos se le humedecen o sudan cuando piensa en vacunarse de [...]*	3. Your hands get wet or sweaty when you think about getting vaccinated with [...]
4. *Tiene miedo de que la vacuna de [...] pueda causarle efectos secundarios*	4. You are afraid that the [...] vaccine could cause side effects
5. *No puede dormir porque le preocupa tener que vacunarse de [...]*	5. You cannot sleep because you are worried about having to get vaccinated against [...]
6. *El corazón se le acelera o palpita cuando piensa que tiene que vacunarse de [...]*	6. Your heart races or beats when you think you need to get vaccinated with [...]

References

Abalakina-Paap, M., Stephan, W.G., Craig, T., & Gregory, W.L. (1999). Beliefs in conspiracies. *Political Psychology*, *20*(3), 637-647. https://doi.org/10.1111/0162-895X.00160

Barua, Z., Barua, S., Aktar, S., Kabir, N., & Li, M. (2020). Effects of misinformation on COVID-19 individual responses and recommendations for resilience of disastrous consequences of misinformation. *Progress in Disaster Science*, *8*, 100119. https://doi.org/10.1016/j.pdisas.2020.100119

Bertin, P., Nera, K., and Delouvée, S. (2020). Conspiracy Beliefs, Rejection of Vaccination, and Support for Hydroxychloroquine: A Conceptual Replication-Extension in the COVID-19 Pandemic Context. Front. Psychol. 11, 565128. Article 565128. https://doi.org/10.3389/fpsyg.2020.565128

Blaskiewicz, R. (2013). The big Pharma conspiracy theory. *Medical Writing*, *22*(4), 259-261. https://doi.org/10.1179/2047480613Z.000000000142

Casiday, R., Cresswell, T., Wilson, D., & Panter-Brick, C. (2006). A survey of UK parental attitudes to the MMR vaccine and trust in medical authority. *Vaccine*, *24*(2), 177-184. https://doi.org/10.1016/j.vaccine.2005.07.063

Cichocka, A., Marchlewska, M., & Golec de Zavala, A. (2016). Does self-love or self-hate predict conspiracy beliefs? Narcissism, self-esteem and the endorsement of conspiracy theories. *Social Psychological and Personality Science*, 7(2), 157-166. https://doi.org/10.1177/1948550615616170

De Waal, J. R. (2018). *Brexit and Trump Voters Are More Likely to Believe in Conspiracy Theories*. YouGov. https://yougov.co.uk/topics/international/articles-reports/2018/12/14/brexit-and-trump-voters-are-more-likely-believe-co (Accessed 20 July 2021).

Douglas, K.M., Sutton, R.M., & Cichocka, A. (2017). The psychology of conspiracy theories. *Current Directions in Psychological Science*, 26(6), 538-542. https://doi.org/10.1177/0963721417718261

Douglas, K.M., Sutton, R.M., Callan, M., Dawtry, R., & Harvey, A. (2016). Someone is pulling the strings: Hypersensitive agency detection and belief in conspiracy theories. *Thinking and Reasoning*, *22*(1), 57-77. https://doi.org/10.1080/13546783.2015.1051586

Douglas, K.M., Uscinski, J.E., Sutton, R.M., Cichocka, A., Nefes, T., Ang, C.S., & Deravi, F. (2019). Understanding conspiracy theories. *Political Psychology*, 40(S1), 3-35. https://doi.org/10.1111/pops.12568

Douglas, K. M. (2021). COVID-19 conspiracy theories. *Group Processes & Intergroup Relations*, *24*(2), 270-275. https://doi.org/10.1177%2F1368430220982068

Earnshaw, V. A., Eaton, L. A., Kalichman, S. C., Brousseau, N. M., Hill, E. C., & Fox, A. B. (2020). COVID-19 conspiracy beliefs, health behaviors, and policy support. *Translational behavioral medicine*, *10*(4), 850-856. https://doi.org/10.1093/tbm/ibaa090

Frayon, S. (2020). New Caledonian biology teachers' opinions about vaccination: Preliminary findings. *Health Education Journal*, *79*(5), 594-606. https://doi.org/10.1177%2F0017896919898738

Freeman, D., Waite, F., Rosebrock, L., Petit, A., Causier, C., East, A., Jenner, L., Teale, A.L., Carr, L., Mulhall, S., Bold, E., & Lambe, S. (2020). Coronavirus conspiracy beliefs, mistrust, and compliance with government guidelines in England. *Psychological medicine*, 1-13. https://doi/10.1017/S0033291720001890

Georgiou, N., Delfabbro, P., & Balzan, R. (2020). COVID-19-related conspiracy beliefs and their relationship with perceived stress and pre-existing conspiracy beliefs. *Personality and individual differences*, *166*, 110201. https://doi.org/10.1016/j.paid.2020.110201

Gori, A., Topino, E., Craparo, G., Grotto, R. L., & Caretti, V. (2021). An empirical model for understanding the threat responses at the time of COVID-19. *Mediterranean Journal of Clinical Psychology*, *9*(1). https://doi.org/10.6092/2282-1619/mjcp-2916

Graeupner, D., & Coman, A. (2017). The dark side of meaning-making: How social exclusion leads to superstitious thinking. *Journal of Experimental Social Psychology*, 69, 218-222. https://

doi.org/10.1016/j.jesp.2016.10.003

Grzesiak-Feldman, M. (2013). The effect of high-anxiety situations on conspiracy thinking. *Current Psychology*, 32, 100-118. https://doi.org/10.1007/s12144-013-9165-6

Gualda, E., Castillo, J., González, T., Morales, E., Palacios, M. S., Rebollo-Díaz, C., Rodríguez-Pascual, I., Romero, A., & Rúas, J. Conspiracy Theories and Disinformation in Andalusia. Executive Report 2019. http://rabida.uhu.es/dspace/handle/10272/16291 (Accessed July 23, 2021)

Hart, J., & Graether, M. (2018). Something's going on here: Psychological predictors of belief in conspiracy theories. *Journal of Individual Differences*, *39*(4), *229*. https://org/doi/10.1027/1614-0001/a000268

Hortal, M., & Di-Fabio, J.L. (2019). Rechazo y gestión en vacunaciones: sus claroscuros. *Revista Panamericana de Salud Pública*, *43*. https://dx.doi.org/10.26633%2FRPSP.2019.54

Iacobucci, D., Posavac, S.S., Kardes, F.R., Schneider, M.J., & Popovich, D.L. (2015). Toward a more nuanced understanding of the statistical properties of a median split. *Journal of Consumer Psychology*, *25*(4), 652-665. https://doi.org/10.1016/j.jcps.2014.12.002

Imhoff, R., & Lamberty, P. (2020). A bioweapon or a hoax? The link between distinct conspiracy beliefs about the coronavirus disease (COVID-19) outbreak and pandemic behavior. *Social Psychological and Personality Science*. https://doi.org/10.1177/1948550620934692

Jolley, D., & Douglas, K.M. (2014). The effects of anti-vaccine conspiracy theories on VIs. *PloS one*, 9(2), e89177. https://doi.org/10.1371/journal.pone.0089177

Jolley, D., Douglas, K.M., & Sutton, R.M. (2018). Blaming a few bad apples to save a threatened barrel: The system-justifying function of conspiracy theories. *Political Psychology*, 39(2), 465-478. https://doi.org/10.1111/pops.12404

Karafillakis, E., & Larson, H.J. (2017). The benefit of the doubt or doubts over benefits? A systematic literature review of perceived risks of vaccines in European populations. *Vaccine*, *35*(37), 4840-4850. https://doi.org/10.1016/j.vaccine.2017.07.061

Koçak, L. (2021). Moral Outrage, Intolerance of Uncertainty and Relational Interdependence During the COVID-19 Pandemic: A Social Psychology Research. *Journal of Family Counseling and Education*, 6(1), 57-73. https://doi.org/10.32568/jfce.893324

Lalot, F., Abrams, D., & Travaglino, G.A. (2021). Aversion amplification in the emerging COVID-19 pandemic: The impact of political trust and subjective uncertainty on perceived threat. *Journal of Community & Applied Social Psychology*, *31*(2), 213-222. https://doi.org/10.1002/casp.2490

Lantian, A., Muller, D., Nurra, C., & Douglas, K.M. (2017). "I know things they don't know!": The role of need for uniqueness in belief in conspiracy theories. *Social Psychology*, 48(3), 160–173. https://doi.org/10.1027/1864-9335/a000306

Larson, H.J., Clarke, R.M., Jarrett, C., Eckersberger, E., Levine, Z., Schulz, W.S., & Paterson, P. (2018). Measuring trust in vaccination: A systematic review. *Human vaccines & immunotherapeutics*, *14*(7), 1599-1609. https://dx.doi.org/10.1080%2F21645515.2018.1459252

Lewandowsky, S., Gignac, G.E., & Oberauer, K. (2013). The Role of Conspiracist Ideation and Worldviews in Predicting Rejection of Science. PLoS ONE 8 (10), e75637. https://doi.org/10.1371/journal.pone.0134773

Malas, O., Tolsá, M.D. (2021). VF Scale (VFS-6): Development and Initial Validation. *Mediterranean Journal of Clinical Psychology*. https://doi.org/10.6092/2282-1619/mjcp-2972

Mellers, B.A., & McGraw, A.P. (2001). Anticipated emotions as guides to choice. *Current directions in psychological science*, *10*(6), 210-214. https://psycnet.apa.org/doi/10.1111/1467-8721.00151

Mesch, G.S., & Schwirian, K.P. (2019). Vaccination hesitancy: fear, trust, and exposure expectancy of an Ebola outbreak. *Heliyon*, 5(7), e02016. https://doi.org/10.1016/j.heliyon.2019.e02016

Nisbet, M. C. (2009). Communicating climate change: Why frames matter for public engagement. *Environment*, 51(2), 12-23. https://doi.org/10.3200/ENVT.51.2.12-23

Nitschke, J. P., Forbes, P. A., Ali, N., Cutler, J., Apps, M. A., Lockwood, P. L., & Lamm, C. (2021). Resilience during uncertainty? Greater social connectedness during COVID-19 lockdown is associated with reduced distress and fatigue. *British Journal of Health Psychology*, *26*(2), 553-569. https://doi.org/10.1111/bjhp.12485

Oliver, J. E., & Wood, T. (2014). Medical conspiracy theories and health behaviors in the United States. *JAMA internal medicine*, *174*(5), 817-818. https://doi.org/10.1001/jamainternmed.2014.190

Reynolds, G., Askew, C., & Field, A.P. (2018). Behavioral inhibition and the associative learning of fear. *In Behavioral inhibition* (pp. 263-282). Springer, Cham. https://doi.org/10.1007/978-3-319-98077-5_12

Romer, D., & Jamieson, K.H. (2020). Conspiracy theories as barriers to controlling the spread of COVID-19 in the US. *Social Science and Medicine*, 113356. https://doi.org/10.1016/j.socscimed.2020.113356

Roozenbeek, J., Schneider, C.R., Dryhurst, S., Kerr, J., Freeman, A.L., Recchia, G., Van Der Bles, A.M., & Van Der Linden, S. (2020). Susceptibility to misinformation about COVID-19 around the world. *Royal Society open science*, *7*(10), p.201199. https://doi.org/10.1098/rsos.201199

Salali, G. D., & Uysal, M. S. (2020). COVID-19 vaccine hesitancy is associated with beliefs on the origin of the novel coronavirus in the UK and Turkey. *Psychological medicine*, 1-3. https://doi.org/10.1017/S0033291720004067

Sallam, M., Dababseh, D., Eid, H., Al-Mahzoum, K., Al-Haidar, A., Taim, D., Yaseen, A.,Abadneh, N.A., Bakri, F.G., & Mahafzah, A. (2021). High rates of COVID-19 vaccine hesitancy and its association with conspiracy beliefs: A study in Jordan and Kuwait among other Arab countries. *Vaccines*, *9*(1), 42. https://doi.org/10.3390/vaccines9010042

Salmon, D. A., Dudley, M. Z., Glanz, J. M., & Omer, S. B. (2015). Vaccine hesitancy: causes, consequences, and a call to action. *Vaccine*, *33*, D66-D71. https://doi.org/10.1016/j.vaccine.2015.09.035

Shapiro, G. K., Holding, A., Perez, S., Amsel, R., & Rosberger, Z. (2016). Validation of the vaccine conspiracy beliefs scale. *Papillomavirus research*, *2*, 167-172. https://doi.org/10.1016/j.pvr.2016.09.001

Smallman, S. (2015). Whom do you trust? Doubt and conspiracy theories in the 2009 influenza pandemic. *Journal of International & Global Studies*. https://www.lindenwood.edu/files/resources/1-24.pdf (Accessed July 23, 2021).

Sotiriadis, A., Dagklis, T., Siamanta, V., Chatzigeorgiou, K., & Agorastos, T. (2012). Increasing fear of adverse effects drops intention to vaccinate after the introduction of prophylactic HPV vaccine. *Archives of Gynecology and Obstetrics*, *285*(6), 1719-1724. https://doi.org/10.1007/s00404-011-2208-z

Swami, V., & Coles, R. (2010). The truth is out there: Belief in conspiracy theories. *The Psychologist*, *23*(7), 560-563. https://psycnet.apa.org/record/2010-14112-003 (Accessed July 23, 2021)

Swami, V., Pietschnig, J., Tran, U.S., Nader, I.W., Stieger, S., & Voracek, M. (2013). Lunar lies: The impact of informational framing and individual differences in shaping conspiracist beliefs about the moon landings. *Applied Cognitive Psychology*, *27*(1), 71-80. https://doi.org/10.1002/acp.2873

Swami, V., Voracek, M., Stieger, S., Tran, U.S., & Furnham, A. (2014). Analytic thinking reduces belief in conspiracy theories. *Cognition*, *133*(3), 572-585. https://doi.org/10.1016/j.cognition.2014.08.006

Szczygielski, J.J., Bwanya, P.R., Charteris, A., & Brzeszczy-ski, J. (2021). The only certainty is uncertainty: An analysis of the impact of COVID-19 uncertainty on regional stock markets. *Finance research letters*, 101945. https://doi.org/10.1016/j.frl.2021.101945

Tolsa, M. D., & Malas, O. (2021). COVID-19: Impacto Psicológico, Factores de Riesgo e Intervenciones Psicológicas en el Personal Sanitario. Una Revisión Sistemática. *Revista iberoamericana*

de psicología y salud, *12*(2), 58-75. https://doi.org/10.23923/j.rips.2021.02.045

Uscinski, J.E., Enders, A.M., Klofstad, C., Seelig, M.; Funchion, J., Everett, C., Wuchty, S., Premaratne, K., & Murthi, M. (2020). Why do people believe COVID-19 conspiracy theories?. *Harvard Kennedy School Misinformation Review*, *1*(3). https://misinforeview.hks.harvard.edu/article/why-do-people-believe-covid-19-conspiracy-theories/ (Accessed July 23, 2021)

Van Bavel, J., Baicker, K., Boggio, P.S., Capraro, V., Cichocka, A., Cikara, M., Crockett, M. J., Crum, A.J., Douglas, K.M., Druckman, J.N., Drury, N., Dube, O., Ellemers, N., Finkel, E.J., Fowler, J.H., Gelfand, M., Han, S., Haslam, S. A., Jetten, J., ... Willer, R. (2020). Using social and behavioural science to support COVID-19 pandemic response. *Nature Human Behaviour*, 4, 460– 471. https://doi.org/10.1038/s41562-020-0884-z

van Prooijen, J.W., & Douglas, K.M. (2017). Conspiracy theories as a part of history: The role of societal crisis situations. *Memory Studies*, 10(3), 323-333. https://doi.org/10.1177/1750698017701615

van Prooijen, J.W., Douglas, K.M., & de Inocencio, C. (2018). Connecting the dots: Pattern perception predicts belief in conspiracies and the supernatural. *European Journal of Social Psychology*, 48(3), 320-335. https://doi.org/10.1002/ejsp.2331

Venuleo, C., Gelo, C.G.O., & Salvatore, S. (2020). Fear, affective semiosis, and management of the pandemic crisis: COVID-19 as semiotic vaccine. *Clinical Neuropsychiatry*, *17*(2), 117-130. https://doi.org/10.36131/CN20200218

Vicol, D.O. (2020). *Las creencias en teorías conspirativas*. Ed. Africa Check. Johannesburg. https://chequeado.com/wp-content/uploads/2020/10/Las-creencias-en-teorias-conspirativas.-Chequeado..pdf (Accessed July 23, 2021)

Wagner-Egger, P., Bangerter, A., Gilles, I., Green, E., Rigaud, D., Krings, F., Staerklé, C., & Clémence, A. (2011). Lay perceptions of collectives at the outbreak of the H1N1 epidemic: heroes, villains and victims. *Public Understanding of Science*, *20*(4), 461-476. https://doi.org/10.1177%2F0963662510393605

Wheaton, M. G., Messner, G.R., & Marks, J.B. (2021). Intolerance of uncertainty as a factor linking obsessive-compulsive symptoms, health anxiety and concerns about the spread of the novel coronavirus (COVID-19) in the United States. *Journal of Obsessive-Compulsive and Related Disorders*, *28*, 100605. https://doi.org/10.1016/j.jocrd.2020.100605

Wilson, S. L., & Wiysonge, C. (2020). Social media and vaccine hesitancy. *BMJ Global Health*, 5(10), e004206. http://dx.doi.org/10.1136/bmjgh-2020-004206

Zeyer A. Getting Involved with Vaccination. Swiss Student Teachers' Reactions to a Public Vaccination Debate. *Sustainability*. 2019, 11(23), 6644. https://doi.org/10.3390/su11236644