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What Influences Representations on Vaccines and Children's Vaccination? A Psychosocial Study on Mothers' Representations, Values, and Decision-Making Styles

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Although the complex reasons underlying parents' decision whether to vaccinate their children have been largely unraveled, a socio-cognitive perspective on the representational field of vaccination is missing. This study is a contribution to fill such a gap. A sample of 309 Portuguese mothers with children aged 0-6 years answered a self-administered questionnaire. Results show that psychosocial variables such as the number of children modulate mothers' representations of vaccination as a matter of freedom of choice and preference for natural immunity, while age of children and having (or not) searched for information influence their confidence in vaccines. Also, results show that representations related to freedom of choice, preference for natural immunity, and conspiracy theories are positively predicted by individualism values and a dependent decision-making style, whereas confidence in vaccines is positively associated with universalism values and a rational decision-making style. We discuss the implications of the socio-cognitive dynamics organizing mothers' representations about vaccines and vaccination for the understanding of behaviors about vaccines and the development of tailored measures for vaccination promotion.

Key words: vaccination, mothers, representational field, values, decision-making styles

Introduction

Vaccines are widely recognized by health authorities and the medical community as a major tool for achieving public health successes, such as the eradication of smallpox (Andre et al., 2008; European Commission, 2019). Nevertheless, critics and controversies have existed as long as vaccines themselves (Berman,

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2020) and have increased since the 1980s due to several reasons, including the rapid growth of social media, with the consequence of widespread dissemination of concerns and misconceptions – the so-called *myths.*

Vaccine hesitancy – i.e., the reluctance or refusal to vaccinate despite the availability of vaccines – has been indicated as a top ten threat to global health (WHO, 2021), and cited as a major threat to reverse the progress made in tackling vaccine-preventable diseases. The Vaccine Advisory Group (WHO, 2014) identified complacency, inconvenience in accessing vaccines, and lack of confidence as key reasons underlying hesitancy. Other reasons are listed as beliefs in conspiracy theories – i.e., "attempts to explain the ultimate causes of significant social and political events and circumstances with claims of secret plots by two or more powerful actors" (Douglas et al., 2019, p. 4) – and specific reviews are devoted to these issues (Berman, 2020; Pires, 2021).

Parents have been recognized as the primary decision-makers in vaccinating their children but, at the same time, targeted fence-sitters of the campaigns about preventing present and future waves of vaccine hesitancy and refusal on the part of doubting parents. Research has provided a good understanding of the complex reasons for parental fear and rejection of vaccines (Dubé et al., 2015; Selleri & Carugati, 2020; Ward et al., 2017). According to the mainstream individualistic approach, parents' social and virtual space on vaccines and vaccination seems to be inhabited by a plethora of myths, misconceptions associated with fears of autism, toxic chemicals, adverse effects, the weakening of the immune system, and beliefs in *conspiracy* theories. Within this perspective, many studies have taken a micro-social level of analysis, considering participants as mere objects of study within the mainstream cognitive approach to attitudes or beliefs (e.g., Yaqub et al., 2014).

However, in addressing a more theoretically founded approach, some researchers (Attwell & Smith, 2017) are moving away from the 'individualistic deficit model' (Nyhan et al., 2014). The deficit model contends that if vaccine refusers can only be exposed to facts they will change their minds (Leask, 2011). Scholars today recognize that the deficit model fails to take account of the socially mediated dynamics of vaccine hesitancy, and even refusal and decision-making (Lehner et al., 2021). Indeed, recent discussions on science communication strategies call attention to the different psychological mechanisms influencing the efficacy of vaccination-related campaigns (Swire-Thompson et al., 2020). Specifically, attention has been called upon the need to identify preferred cognitive decision-making styles and adopt educational strategies and message framing specific to each style (Poland & Poland, 2011). Also, it has been suggested that attitudes towards vaccines may indeed be set in deeper psychosocial roots that guide individual decisions, and associations between moral foundations and vaccine attitudes have been established (Amin et al., 2017; Kalimeri et al., 2019). As such, as "guiding principles in the life of a person or a group" (Schwartz, 1999, p. 665), values could be an important factor regarding vaccination attitudes and behaviors.

Some scholars argue that people and particularly parents are sensitive to these issues in the contexts of their social identities (Attwell et al., 2018; Selleri & Carugati, 2020). As stereotypical gender roles in caregiving are still quite present at least in Southern Europe (Távora, 2012), research should consider the mothers' role in the organization of daily care and their responsibility in salient decision-making about the health of their children (Blum, 2007), including vaccines and vaccination (Attwel et al., 2018). In such a context, although they may lack coherent

scientific knowledge on children's health-related issues, their positions and practices regarding vaccination will be influenced by other forms of knowledge (e.g., common-sense knowledge) and therefore they may be more prone to myths and fake news. Previous work on mothers' social representations of intelligence (Miguel et al., 2012, 2016; Mugny & Carugati, 1989) shows how psychosocial variables such as the shortage of information regarding the object of representation, coupled with the necessity of decision making, form the main socio-psychological dynamics of the mother's thinking process. A complementary role is played by the combination of the mother's social position that implies strong proximity to and a great salience of this social object (vaccination). Therefore, psychosocial repercussions can be expected in their representational field (Miguel et al., 2012, 2016).

The Current Study

In Portugal, the National Vaccination Plan (NVP) is a voluntary program that offers childhood vaccinations free of charge. As of 2020, it includes vaccination against thirteen vaccine-preventable diseases. Children aged 0-10 years receive the vaccines at primary health care centers, where they also get free-of-charge health check-ups during consults attended on a scheduled basis. Overall, Portugal experiences a high vaccination coverage, with more than 95% of children complying with the recommended vaccine schedules (DGS, 2020). A recent report on the beliefs, knowledge and behavior patterns towards vaccines in general of European Union citizens (European Commission, 2019) illustrates how Portugal shows a generally positive attitude towards vaccination. Despite this, the fact that recently several unvaccinated persons died from measles have activated public awareness and animated some debate in the national press (DN, 2018; Henriques & Borja-Santo, 2017). Even if anti-vaccination movements have not been so expressive in Portugal so far, this situation can change and it is being supervised by the Portuguese Technical Commission of Vaccination (Silva, 2019). Also, within the present context of the Covid-19 pandemic, inspite of a recent study showing that 94% of participants have already been or intend to be vaccinated (*Opinião Social*, 01-07-2021), attention must be paid to the resistance of specific categories of people, among which viruses are more likely to circulate freely.

The Portuguese situation allows for a better understanding of the above issues of vaccines and vaccination, benefitting from previous studies on mothers' social representations of intelligence (Miguel et al., 2012, 2016; Mugny & Carugati, 1989). These studies show that the subjective lack of information, coupled with the responsibilities for children's development and the necessity of decision-making, is key in organizing the content of mothers' representations about intelligence in a coherent socio-psychological field, labeled social representations of intelligence (Selleri & Carugati, 2013), where the notion of representational field, inspired by Lewin's field theory (Lewin, 1951), refers both to the content of what people think of some social issues (their everyday ideas) and the socio-cognitive organization of that content (Selleri & Carugati, 2013).

From a socio-cognitive perspective, the present paper aims to assess the following hypotheses: H1) Mothers' representational field on vaccines and vaccination is built around notions related to confidence, myths, and beliefs in conspiracy theories; H2) Mothers' representational field on vaccines and vaccination (e.g., confidence in vaccines) is modulated by dynamics related to psychosocial factors and mothering experience (i.e., mothers' age and educational level; number and age of children; searching for information on

vaccines and vaccinations; knowing children with adverse effects of vaccines); H3) Mothers' personal values modulate their representational field on vaccines and vaccination: H3a: Individualistic values are positively associated with representations of vaccination as freedom of choice and beliefs in conspiracy theories; H3b: Universalistic values are positively associated with confidence in vaccines; H4) Mothers' decision-making styles (rational, intuitive, dependent, avoidant) modulate their representational field on vaccines and vaccination: H4a: Confidence in vaccines is positively related to a rational decision-making style and negatively related to an avoidant decision-making style; H4b: Vaccination as a matter of freedom of choice is positively related to an intuitive decision-making style.

Method

Participants

A sample of 309 mothers[1] with children aged 0–6 years old (age of the preschool system in Portugal), living in the North and Center regions of Portugal participated in the study. The study protocol was approved by the Ethical Committee of the Alma Mater Studiorum University of Bologna (March 5, 2015) and by the Ethical Committee of the Faculty of Psychology and Educational Sciences of the University of Coimbra (November 3, 2016). All responses were anonymous, and confidentiality was guaranteed. Participation was entirely voluntary, and participants did not receive any type of compensation. Informed consent was obtained in written form. Inclusion criteria comprised being a mother of at least one child aged 6 years old or younger. A convenience sample was collected approaching mothers in nurseries and kindergartens and through informal social networks. Questionnaires were delivered to the participants in hard copy and mothers were requested to answer regarding their youngest child.

A total of 78 mothers (25.3%) were between 31 and 40 years old, 183 (59.2%) were between 41 and 50 years old, and 47 (15.2%) were 51 years old or older[2]. Only 1 (0.3%) mother was between 20 and 30 years old. Concerning education, 88 mothers (28.5%) completed compulsory education, 111 had a high school level of education (35.9%), and 110 (35.6%) had a higher education degree. There were 146 mothers with children aged 0-3 years old (attending nurseries), and 163 mothers with children aged 3-6 years old (attending kindergarten). As for the number of children, 160 mothers reported having only one child (51.8%), 107 reported having two children (34.6%), and 42 mothers had three or more children (13.6%). Most mothers (83.9%) reported not knowing children who suffered from negative effects of vaccines. A total of 164 mothers (53.1%) reported that they searched for information on vaccines and vaccination. Out of these, 88.4% reported having consulted the family pediatrician, 58.4% having had conversations with other parents, and 50.6% looked up information on the internet and social networks.

Study Instruments and Measures

The study instrument was the Portuguese version of the self-report questionnaire initially developed in the Italian study by Selleri and Carugati (2020), consisting of sections de-

[1] A sample of 309 was deemed large enough according to the rule of thumb of 10 participants for each predictor variable in linear regression, which in our study was 6 predicting variables (therefore, a minimum sample size of 60 participants was required). Also, a sample size of 309 is larger than the minimum sample size of 285, the recommended sample size considering the present study (population = 824.095; 90% CI; 5% error).

[2] In Portugal, mothers' mean age at birth of first child is 30.7 years old (PORDATA, 2021).

scribed below. Materials are available at the Open Science Framework (OSF)[3].

Sociodemographic questionnaire. Participants were asked to report children's age and gender, and also parents' age, educational level, profession, and number of children.

Vaccination history. Mothers reported on children's vaccination history by indicating which vaccines the child had received, their intent to complete the vaccination schedule, their participation in health authorities' activities, search for information concerning vaccination, their perceived level of knowledge on vaccines and vaccination, and their personal experience of adverse reactions to vaccines.

Representations of vaccination. To assess mothers' representational field concerning vaccination, a total of 54 items were listed. Items were presented in the form of statements, with responses on a 5-point Likert-type scale ranging from "*strongly disagree*" to "*strongly agree*." The items of the questionnaire, which had been previously used to assess mothers' representational field on vaccines and vaccination in the Italian context (Selleri & Carugati, 2020), were formulated so as to represent different aspects of the vaccination issues previously identified in literature (e.g., Dubé et al., 2015; Larson et al., 2014; Ward et al., 2017), namely: confidence in health authorities (e.g., "Professionals of the national healthcare system are prepared and updated on vaccination"), relations between vaccines and nature (e.g., "I think vaccinations are interventions against nature"), relations between vaccinations and health risks for children and peers (e.g., "If my child is not vaccinated, I put his/her health at risk"), myths about risks (e.g., "Vaccines cause autism"), belief in conspiracy theories (e.g., "Campaigns in favor of vaccination are financed by the Big Pharma"), freedom of choice (e.g., "Vaccinating children is a private choice of parents: healthcare authorities must not intervene").

Decision-making styles. An adapted version of the Decision-Making Styles Scale (Scott & Bruce, 1995) was used to assess rational, avoidant, intuitive, and dependent decision-making styles. Participants answered the 12 items using a 5-point Likert scale, ranging from 1 (*totally disagree*) to 5 (*totally agree*). In the present study, the four factors of decision styles presented adequate reliability, with Cronbach's alphas of .66 (rational, 3 items, e.g., "I make decisions logically and systematically"), .82 (intuitive, 3 items, e.g., "When I make a decision, I tend to trust my intuitions"), .86 (dependent, 3 items, e.g., "I often need help from other people to make important decisions") and .86 (avoidant, 3 items, e.g., "I postpone decisions whenever I can").

Values. A modified version of the original Triandis and Gelfand's (1998) questionnaire was used to assess individualism and universalism values. Participants answered the 8 items (e.g., "Every person must be able to live as he/she wants, independently of others"; "For a more just society, everyone must cooperate with others") using a 5-point Likert scale, ranging from 1 (*totally disagree*) to 5 (*totally agree*). Cronbach's alpha was .47 for individualism (4 items) and .70 for universalism (4 items).

Procedures

Data analysis. Descriptive statistics were used to detail the sample characteristics and summarize variables. Exploratory factor analysis was performed to examine the underlying components of mothers' representational field on vaccines and vaccination. To examine the association between categorical predictors and continual variables, either independent sample *t*-tests or analyses of variance (ANOVA)

[3] https://osf.io/4x2zk/?view_only=6f9731e8f92949f68be66260187f23ae

were performed. Tukey's HSD test was used for *post hoc* ANOVA comparisons. Predictor variables (values and decision-making styles) were used in hierarchical multiple regression to test whether they predicted mothers' representations towards vaccination (freedom of choice and preference for natural immunity, conspiracy and negative effects, and confidence in vaccines). The variance inflation factors (VIFs) of the independent variables were examined to test for potential multicollinearity among representational factors. The VIFs ranged from 1.082 to 2.26 and implied no significant problems regarding multicollinearity. Analyses were performed using the statistical program SPSS for Windows v.23 (SPSS v23, IBM Corp.), and results with $p < .05$ were retained as statistically significant. Materials are available at the Open Science Framework (OSF)[4].

Results

Measurement Model

Based on the Kaiser–Meyer–Olkin measure value (KMO = 0.88) and Bartlett's test of sphericity result ($\chi^2 = 3405.156$, $df = 595$, $p < .001$), an exploratory factor analysis using principal components factoring with varimax rotation was carried out for items assessing mothers' representational field concerning vaccination. Three factors retained by the scree plot were considered which, in combination, accounted for 41.80% of variance (26.22, 9.59, and 5.99, respectively). Items were retained if they loaded $\geq .40$. The first factor – *freedom of choice and preference for natural immunity* – retained items emphasizing parents' free decision in children's vaccination and the bodies' immunization by natural means (Cronbach's $\alpha = .879$; e.g., "There may be no mandatory vaccinations; it must be parents who decide"). Items clustering in the second factor suggest concerns about the commercial profiteering and worries about unforeseen future effects of vaccines – *conspiracy and negative effects* (Cronbach's $\alpha = .848$; e.g., "The long-term adverse effects of vaccines are not yet known"). The third factor highlights *confidence in vaccines* (Cronbach's $\alpha = .759$; e.g., "If children are no longer vaccinated, many diseases could return to circulation"). The identified factors provide an example of the varied but organized content of mothers' representational field on vaccines and vaccination, providing support for H1.

Preliminary Analysis

Table 1 presents the means, standard deviations, and intercorrelations of the measured variables. Mothers in the sample generally trust vaccines and vaccination, as this representation is the one with the highest average score. Participants showed high levels of universalism values and close to average levels on the four decision-making styles. Representations of vaccines and vaccination, values, and decision-making styles are generally correlated, with correlations ranging between .19 and .58, $p < .05$.

Representations about Vaccination: Group Comparisons and Predicting Factors

To explore the psychosocial variables modulating mothers' representational field on vaccines and vaccination, mean comparison analyses were performed. Results (Table 2) show that the number of children influences mothers' representations of vaccination as a matter of freedom of choice and preference for natural immunity, while the age of children and having searched for information influence their confidence in vaccines, partially supporting H2.

[4] https://osf.io/4x2zk/?view_only=6f9731e8f92949f68be66260187f23ae

Table 1 *Descriptive statistics and correlations between representations of vaccines and vaccination, values and decision-making styles*

	M	*SD*	1	2	3	4	5	6	7	8
1. Freedom of choice and preference for natural immunity	1.931	0.735								
2. Conspiracy and negative effects	2.576	0.716	.557**							
3. Confidence in vaccines	3.917	0.664	-.393**	-.188**						
4. Individualism	2.525	0.781	.406**	.195**	-.150*					
5. Universalism	4.118	0.696	-.218**	-.105	.420**	-.109				
6. Rational	3.339	0.685	.093	.147*	.229**	.014	.253**			
7. Intuitive	2.868	0.659	.255**	.126*	-.036	.235**	.052	.108		
8. Dependent	2.614	0.626	.394**	.241**	-.064	.282**	-.080	.391**	.256**	
9. Avoidant	2.495	0.724	.349**	.180**	-.118*	.256**	.029	.392**	.553**	.584**

Note. ** $p < .01$; * $p < .05$

Two-stage hierarchical multiple regressions were conducted to determine whether values and decision-making styles incrementally predicted representational factors of vaccination (Table 3). Overall, independent variables were associated with substantial variation towards representations of vaccination, supporting H3, and H4.

Discussion

While acceptance and resistance factors associated with vaccination have been recognized, fewer studies have explored the psychosocial basis underlying parental decision-making styles concerning vaccination. The current study aimed to contribute to this line of research, by investigating the contents and determinants of the representational field towards vaccination, in a sample of Portuguese mothers of children aged 0-6 years old. To the best of our knowledge, this is the first study ever conducted amongst mothers in Portugal under such a psychosocial perspective.

Overall, mothers who participated in the present study held positive representations towards vaccination. Although recognizing the possibility of unforeseen negative consequences of vaccination, mothers do not consider that vaccines may harm their child. Also, mothers do not support parents' freedom in deciding their children's vaccination routines and schedules and, therefore, agree on immunization as delivered by health care authorities and services. Such trust in immunization is further supported by the fact that it is confidence in vaccines that stands as the most highly scored factor amongst participants. Although a global survey conducted in 67 countries has reported the highest levels of vaccine-safety skepticism in Europe (Larson et al., 2016), results of the present study go in line with previous studies illustrating Portugal's positive attitudes towards vaccination.

Results of the present study show that mothers' educational level has no implications in their representational content. Previous research has shown, for example, that education increases confidence in vaccine importance and effectiveness, but not vaccine safety (Larson et al., 2016), showing a mixed set of results on the role of education level in the understanding of vaccines and vaccination. While this ambivalence does not allow for a complete confirmation of the relative strength of the influence of education level, it

Table 2 *Representations about vaccination: Descriptives and univariate tests*

	F1. Freedom of choice and preference for natural immunity	**F2. Conspiracy and negative effects**	**F3. Confidence in vaccines**
Variable/Levels	Mean (SD)	Mean (SD)	Mean (SD)
Age			
40 years old and younger	1.92 (0.72)	2.56 (0.69)	3.93 (0.60)
41 years old and older	1.94 (0.74)	2.58 (0.73)	3.91 (0.69)
	t (271) = -.143; *p* = .887 Cohen's *d* = 0.027	*t* (275) = -.145 *p* = .847 Cohen's *d* = 0.028	*t* (288) = .243; *p* = .809 Cohen's *d* = 0.029
Education level			
Compulsory	2.00 (0.85)	2.57 (0.82)	3.93 (0.76)
High school	1.80 (0.62)	2.51 (0.70)	4.00 (0.60)
Higher education	2.00 (0.73)	2.65 (0.65)	3.83 (0.66)
	F (2, 270) = 2.56; *p* = .079; η^2 = .019	*F* (2, 274) = .971; *p* = .380; η^2 = .007	*F* (2, 287) = 1.70; *p* = .184; η^2 = .012
Number of children			
Only child	1.83 (.067) a	2.49 (0.72)	3.94 (0.68)
Two children	1.98 (0.73) ab	2.62 (0.63)	3.90 (0.60)
Three or more children	2.21 (0.93) b	2.79 (0.86)	3.87 (0.76)
	F (2, 270) = 4.34; *p* = .014 η^2 = .031	*F* (2, 274) = 2.83; *p* = .061; η^2 = .020	*F* (2, 287) = 0.24; *p* = .791; η^2 = .002
Age of child			
0 – 3 years old (nursery)	1.87 (0.63)	2.53 (0.70)	4.02 (0.57) a
3 – 6 years old (kindergarten)	2.00 (0.84)	2.63 (0.73)	3.80 (0.74) b
	t (271) = 1.40; *p* = .162 Cohen's *d* = 0.175	*t* (275) = 1.12; *p* = .263 Cohen's *d* = 0.139	*t* (288) = -2.89; *p* = .004 Cohen's *d* = 0.333
Searched for information on vaccination			
Yes	1.88 (0.72)	2.59 (0.69)	4.01 (0.61) a
No	1.99 (0.75)	2.55 (0.75)	3.81 (0.71) b
	t (271) = -1.23; *p* = .218 Cohen's *d* = 0.149	*t* (275) = .47; *p* = .639 Cohen's *d* = 0.055	*t* (288) = 2.53; *p* = .012 Cohen's *d* = 0.302
Knowing children with negative effects of vaccines			
Yes	1.81 (0.57)	2.55 (0.61)	4.03 (0.61)
No	1.96 (0.76)	2.58 (0.74)	3.90 (0.67)
	t (271) = -1.42; *p* = .160 Cohen's *d* = 0.223	*t* (275) = -.217; *p* = .829 Cohen's *d* = 0.044	*t* (288) = 1.29; *p* = .197 Cohen's *d* = 0.202

Note. Different letters (a, b) mean statistically significant differences ($p < .05$) in post-hoc comparisons using the Tukey HSD test.

Table 3 *Representations, values and decision-making styles: Results of hierarchical regression analysis*

	F1. Freedom of choice and preference for natural immunity						F2. Conspiracy and negative effects						F3. Confidence in vaccines					
	B	*SE B*	β	R^2	$R^2\,\Delta$	F	*B*	*SE B*	β	R^2	$R^2\,\Delta$	F	*B*	*SE B*	β	R^2	$R^2\,\Delta$	F
Model 1				.195	.195	31.19***				.058	.065	9.13***				.205	.205	35.30***
Individualism	.363	.052	.391***				.198	.055	.216***				-.095	.046	-.112*			
Universalism	-.207	.062	-.188**				-.135	.063	-.127*				.434	.054	.432***			
Model 2				.301	.106	18.19***				.111	.046	5.38***				.263	.057	15.97***
Individualism	.256	.052	.275***				.148	.058	.161*				-.067	.048	-.079			
Universalism	-.206	.060	-.187**				-.167	.066	-.157*				.393	.055	.391***			
Rational	-.037	.067	-.035				.121	.076	.113				.232	.061	.237***			
Intuitive	.094	.072	.085				.074	.077	.069				.077	.065	.076			
Dependent	.276	.081	.234**				.151	.090	.132				.024	.074	.022	-		
Avoidant	.114	.078	.115				-.016	.085	-.016				-.243	.072	-.266**			

Note. *** $p < .001$; ** $p < .01$; * $p < .05$

suggests that variables cannot be considered in isolation, when multiple influences are at play (Larson et al., 2014).

Although generally positive, mothers' representational field seems to be modulated by psychosocial variables. The results suggest that there is an effect of mothering experience on the mothers' representational field concerning vaccination. As age (0-3 vs. 3-6 years old) and the number of children (1 vs. 3 children) increases, mothers tend to, respectively, have less confidence in vaccines, and hold more favorable ideas towards parents' freedom of choice and preference for natural immunity. In sum, greater adherence to scientific and official requirements of vaccination seems to exist when mothers have fewer and younger children. From there, orthodoxy seems to give way to a certain heterodoxy or socio-cognitive polyphasia (Jovchelovitch, 2007), as it seems that the intensification of mothering experience forges a relativization on their views concerning vaccination, expressed in two ways: first, while remaining positive, mothers show lower levels of confidence towards vaccines and normative health authorities' policies; second, a wider acceptance of different positions, especially considering the possibility of freedom of choice and preference for natural immunity. Such findings may be explained by the fact that transition to motherhood is characterized by important changes and adaptation that are not well-suited for an informed (free) decision on this issue which, in turn, may favor mothers' acceptance of health authorities' recommendations. However, when mothering experience increases – either in time or in the number of children, as was tested in the present study – different factors may modulate mothers' representational field such as, hypothetically, a bad reaction of the first child to vaccination, contact and conversations with family members and other mothers, and more confidence in their own knowledge and intuition as a mother. These factors could be explored by future studies. These results reinforce previous studies showing that variations in the representational content are generated by mechanisms linked to mothers' daily decision-making dynamics and shaped by important psychosocial factors such as their deep personal involvement and proximity to the object of representation (Miguel et al., 2012).

Vaccine acceptance is driven by a mix of scientific, psychological, sociocultural, economic, and political factors (Larson et al., 2011). Our results also indicate that individualism values predict mothers' freedom of choice, beliefs in conspiracy theories, concern about vaccines' negative effects, and their vision that the immune system is something that needs to be built up. Such findings are consistent with previous studies showing that parents consider the risk of vaccine-preventable disease or vaccines' side effects based on their individual perceptions of their own child's health and vulnerabilities (Poltorak et al., 2005). Yet, results also show that concern for and protection of the welfare of all people – i.e., universalism values – are positively associated with confidence in vaccines, and negatively related to freedom of choice and beliefs in conspiracy theories. While decreasing the personal risk of contracting a disease, vaccination reduces the number of potential hosts and carriers and contributes to the so-called "herd immunity". A more universalist-based perspective seems to be at stake when considering children's health and vulnerabilities.

Additionally, results further show that dependent decision-making style is a predictor of freedom of choice and preference for natural immunity and that an avoidant decision-making style negatively relates to confidence in vaccines. Overall, two scenarios seem to be at stake. One is the "trust scenario", espoused by more universalist and ratio-

nal decision-making mothers, which favors the benefits of vaccines and vaccination policies as delivered by health authorities. The other is the "distrust scenario" – as expressed by the conviction that the immunity system needs to be built by natural means, liberty for choice, concerns for vaccines' unforeseen side effects, and big pharma conspiracies – embraced by more individualist and dependent decision-making mothers. Once again, these two sides of the same coin illustrate the psychosocial dynamics at play in the construction of the mother's representational field of vaccines and vaccination.

As parental willingness to vaccinate children is crucial to high vaccination coverage, appropriately designed, executed, and evaluated interventions are needed as a high public health priority to promote vaccination. Building on a relatively large sample of mothers and taking a wide range of predictors of mothers' representational field on vaccines and vaccination (e.g., mothering experience, individual decision-making styles, and values), the present study presents important contributions which may translate into relevant implications. It has been suggested that representations of vaccinations are rooted in particular moral foundations (Amin, 2017) and that vaccine education and messaging needs new approaches to deliver pro-vaccination messages (Masaryk & Hatoková, 2017) and to build on a spectrum of preferred individual cognitive styles (Poland & Poland, 2011). By supporting these claims, the results reinforce the conviction that identifying with moral foundations and decision-making styles is associated with the representational field of vaccination. This would provide a promising direction for the development of a values-based and messaging intervention. Moreover, different stakeholders may benefit from the acknowledgment of these dynamics when approaching communication not generically devoted to public opinion but tailored to specific social categories as parents. Among stakeholders are health care local authorities and particularly health workers, pediatricians, pharmacists, who play a crucial intermediate role of interlocutors between governments and parents (Lin et al., 2021; Selleri & Carugati, 2020). This psychosocial perspective on the representational field of vaccination can prove to also be a promising window into even bigger issues in the evolving health landscape, especially when massive vaccination campaigns against COVID-19 are being launched worldwide, where supplementary issues are at stake, like children's and pregnant women's vaccination with new vaccines.

Limitations and Suggestions for Future Research

Caution needs, however, to be taken when generalizing the findings of the present study. First, as for all studies relying on voluntary participation, selection bias cannot be excluded. In a cultural context, such as the Portuguese, of a general positive attitude towards vaccination, mothers not complying with the vaccination schedule – e.g., due to vaccine hesitancy or rejection – might have chosen not to participate in the study. Second, and within such a context, the use of a self-administered questionnaire might have increased mothers' propensity to provide socially desirable responses. Third, the cross-sectional design of the present study does not allow to examine changes over time, which would be especially relevant for mapping the effects of mothering experience.

Despite such limitations, a wealth of data was provided from a psychosocial perspective, namely that mothers' representations encompass different factors such as past experiences, values, decision-making styles, and

probably other day-to-day concerns about their child's health and wellbeing. Yet, future research is needed on understanding what mix of factors is most likely to modulate mothers' representations. For example, further exploring the variety of mothers' experiences with children (single child vs. several children) and mothers' status (single vs. marital couple) may enable a deeper insight into the relative contribution of this network of factors (myths, decision-making styles, social values) in order to build and modulate the architecture of mothers' representations. Stakeholders and public health authorities should devote efforts to current vaccine safety concerns and misinformation amongst mothers, especially by understanding the psychosocial dynamics underlying their representations towards specific vaccines, for example. Moreover, the literature is missing a concluding interpretation of why people fear vaccines. Taking "fear of vaccination" as a second-order factor underlying mothers' representations of vaccine and vaccinations might prove fruitful for understanding the above. Also, future longitudinal research would provide better understanding of how specific psychosocial dynamics – e.g., mothering experience – influence the content of representations on vaccines and vaccination. Further, due to the growing recognition of the need to support fathers and male caregivers to assume a central parenting role alongside children's mothers or female caregivers, future studies should sample fathers and assess the psychosocial dynamics underlying their representations of vaccines and vaccination. Finally, future studies, using large integrated samples of specific social categories (e.g., mothers, fathers, health professionals), should analyze the relations between specific social dynamics and their representational field on vaccines and vaccination by means of more integrated theoretical and methodological models (e.g., path analysis).

Conclusion

In conclusion, the present study explored psychosocial factors underlying Portuguese mothers' representational field towards vaccines and vaccination. The interconnectivity of vaccine confidence and mothering experience, alongside the influence of individual values and decision-making styles, showed that a psychosocial perspective on the representational field of vaccination can be a valuable window into bigger issues in the evolving health landscape, suggesting tailored measures for vaccination promotion and maintenance. Of worth to different stakeholders, results of the present study stress that specific psychosocial dynamics should be considered when tailoring successful and accurate vaccination campaigns. A case also in point is our present time, when the worldwide massive vaccination campaign necessary to fight the COVID-19 pandemic (Dubé et al., 2021) is counteracted by worldwide fake-news propaganda against vaccination, eliciting a multiplicity of conflicts (confidence vs. conspiracy; freedom of choice vs. constriction of human rights). In this context, the present study pointed to the importance of targeting vaccination campaigns and information dissemination at different levels (e.g., public policies, health centers, advertising) taking into account mothering experience (e.g., age and number of children), and cognitive styles and values.

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