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ATTACHMENT AND INTELLECTUAL HUMILITY AS PREDICTORS OF ATTITUDES TOWARD VACCINATION AND VACCINES IN THE CONTEXT OF THE COVID-19 PANDEMIC

Abstract: *Health behavior, including attitudes toward vaccination, is affected by various personal, contextual and broader social factors. This paper focuses on attachment and intellectual humility as potential predictors of attitudes toward vaccination and predictors of vaccination status in the context of the COVID-19 pandemic. The starting hypothesis was that there is a significant correlation between attachment styles and intellectual humility and that attachment and intellectual humility can separately significantly contribute to explaining individual differences in attitudes toward vaccination and differences in vaccination status. The research was conducted in an online environment on a convenience sample of students (N = 247). Questionnaires and self-assessment scales were applied to collect general data, data on attachment styles, intellectual humility, attitudes toward vaccination and reasons for (non)vaccination. The results showed that secure attachment and intellectual humility (especially openness to change of mind, i.e., independence of ego and intellect) can partially explain positive attitudes toward vaccination, while significant predictors of vaccination status were age, fearful attachment, independence of ego and intellect and attitudes toward vaccination. The results confirmed some previous insights about the motivation for (non)vaccination and pointed to a small but significant role of attachment and intellectual humility in explaining both attitudes toward vaccination and health behavior in the context of the pandemic.*

Keywords: *attachment, attitudes toward vaccination, COVID-19, intellectual humility*

INTRODUCTION

We have witnessed very different COVID-19 pandemic-induced people's reactions – from paralyzing fear and great concern, through compliance with all the imposed rules, to refusing to accept the existence of such a disease and doubting the scientific data and achievements of modern science. Confronted with a new threat to human health and life as we knew it, people resorted to different strategies of thinking and behaving, depending on personal and contextual factors. Heated media and nonmedia debates about the existence of the disease, the effectiveness of medicine in preventing the severe consequences of the disease and the effectiveness of vaccination were everyday realities on a global scale for people of different ages, different education levels and different traits. As of June 2022, there have been 536.590.224 confirmed cases and 6.316.655 deaths reported to the WHO, and by 16 June 2022, nearly 12 billion doses of vaccine have been administered (https://covid19.who.int/). Data on attitudes toward COVID-19 vaccination differ depending on the source. For example, according to *Imperial College London YouGov Covid 19 Behaviour Tracker Data Hub* (2022), the period from January 2021 to February 2022 saw a significant increase in the number of people who have positive attitudes toward COVID-19 vaccination and in the share of the vaccinated population. On the other hand, cross-cultural research on attitudes toward the COVID-19 vaccine showed that from February 2021 (which saw the start of vaccination) to June 2021, positive attitudes declined at the level of the entire sample consisting of over 5000 participants (coming from Australia, Belgium, Germany, Great Britain, France, Italy, the Netherlands, New Zealand, South Africa and Spain), whereby this decline was not recorded only in the Netherlands and Belgium. The research authors concluded that information on vaccine safety and side effects is necessary for developing positive attitudes toward vaccination (Greyling & Rossouw, 2022). Attitudes toward vaccination in general, including attitudes toward vaccination against COVID-19, are affected by various factors, including personal, contextual and broader social factors. Very often, one of the main determinants of a negative attitude toward vaccination is precisely the fear of vaccine side effects and/or insufficient confidence in vaccine safety, which is also indicated by Greyling and Rossouw (2022).

Among the broader social factors relevant to attitudes toward vaccination, particularly important are culture and the value system. Cross-cultural research on a sample of over 400,000 participants showed that the acceptance of the COVID-19 vaccine and the intention to vaccinate are significantly higher in cultures that are collectivist and that cultivate collectivist values, which the authors interpreted in the context of showing more concern for others and empathy in these cultures, as confirmed by their results (Leonhardt & Pezzuti, 2022). Cross-cultural research involving participants from the USA, UK and

Turkey has shown that belief in COVID-19 conspiracy theories and the so-called conspiracy mentality are the most important predictors of vaccine hesitancy in the three countries, while confidence in science is the most important predictor of confidence in vaccines (Salali & Uysal, preprint). Moreover, the results of the research suggest that a lack of confidence in governing structures is a significant reason for refusing vaccination (Fisher et al., 2020; Soares et al., 2021).

For personal factors, it is worth highlighting sociodemographic factors; a systematic review of 209 surveys on attitudes toward COVID-19 vaccination has shown that women are significantly more reluctant to vaccinate compared to men; younger compared to elderly individuals; less educated compared to the more educated; lower-income earners compared to those with higher incomes; persons without health insurance are more reluctant as well as those living in rural areas and members of a racial or ethnic minority (Cascini et al., 2021). Research also suggests that negative attitudes toward vaccination are more common in individuals who believe in conspiracy theories, who hold individualistic worldviews (as opposed to communitarian), value hierarchy (as opposed to equality), and experience relatively high levels of disgust about blood and injections, etc. (Hornsey et al., 2018).

Attitudes toward vaccination are part of the broader concept of health attitudes and behaviors, and different theoretical models are being used to explain them. According to the oldest health beliefs model designed by Hochbaum, Kegeles, Leventhal and Rosenstock (Abraham & Sheeran, 2007), health behaviors are determined by a person's views on the risks of certain diseases and their views on the effectiveness of recommended health behaviors for the prevention of that disease. For example, if a person thinks that there is a risk of suffering from a malignant disease and at the same time considers preventive examinations to be an effective way of preventing the disease and/or its severe consequences, they are likely to undergo preventive examinations within the recommended time frame. Similarly, a positive attitude toward vaccination could be expected in individuals who believe there is a significant risk of contracting the disease and consider the vaccine to be effective in preventing the development of the disease and/or its severe consequences. On the other hand, research has shown that vaccination is less likely in individuals who do not think that the vaccine will help them, that the risk of contracting the disease is small and that the disease is mild and harmless (Betsch et al., 2018; Schmid et al., 2017).

Considering the various factors involved in forming and maintaining attitudes toward vaccination, in this paper, the emphasis is on personal factors from the socioemotional and cognitive domains, where the socioemotional domain is represented through the concept of attachment and the cognitive domain through the relatively recent concept of intellectual humility. For the purposes of this paper, attachment is conceptualized through the model of Bartholomew and Horowitz (1991), who assume the existence of four attachment styles in

interpersonal relationships in adulthood – secure, dismissive, preoccupied and fearful attachment. Attachment styles are based on two internal working models: a model of self that is associated with emotional dependence on others in the process of self-assessment and a model of others, i.e., an individual's beliefs about whether others are willing to help and support them (Bretherton, 1992). The assumption of a significant role of attachment in explaining attitudes toward vaccination relies on the basic trust that is an integral part of primary attachment (Bowlby, 1988; Erikson, 1959) and is reflected in the trust that an individual has in others and the surrounding world. It is possible to assume that this trust, in the case of secure attachment, is also manifested through trust in science, scientists and scientific achievements, which is an important determinant of attitudes toward vaccination. Furthermore, attachment theory can also be considered a theory of emotional regulation (Mikulincer et al., 2003), whereby secure attachment is a resource for high emotional regulation and the possibility of managing emotional processes in stressful and challenging situations. This enables a rational approach to problems and reasoning and possibly increases intellectual humility (Jarvinen & Paulus, 2017). Intellectual humility represents the value or virtue that allows individuals to recognize their own potential fallibility when forming and/or revising attitudes (Zmigrod et al., 2019). It refers to an individual's capacity to critically value information in nonbiased ways and helps them avoid the tendency to overlook evidence and confirm prior beliefs (Zmigrod et al., 2019). Individuals who are characterized by intellectual humility or modesty are willing to be reassured by evidence, are willing to change their opinion or attitude based on new evidence, are aware of their ignorance and have no problem admitting that they do not know something. Moreover, it was found that intellectual humility is associated with cognitive analytics but also with mental flexibility (Zmigrod et al., 2019). Unlike an intellectually arrogant individual, an intellectually humble individual is able to be flexible in thinking, overcome biased reasoning, find creative connections between past ideas and new information and adjust their attitudes to new evidence. It was found that intellectual humility is associated with openness, curiosity, tolerance of ambiguity and low dogmatism (Leary et al., 2017); cognitive flexibility and fluid intelligence (Zmigrod et al., 2019); tolerance toward other people (Krumrei-Mancuso & Rouse, 2016); and empathy, gratitude, altruism, benevolence and universalism (Krumrei-Mancuso, 2017). The latter research has shown that empathy and gratitude mediate the connection between intellectual humility and prosocial values. A study on a sample of children also confirmed the connection between intellectual humility and intelligence (Danovitch et al., 2019). Research on intellectual humility in the political context (Porter & Schumann, 2018) has shown that in hypothetical (imaginary) disputes, individuals with more intellectual humility are more open to learning about the attitudes and thoughts of opponents and are more exposed

to the opinion of their political dissenters. Furthermore, intellectual humility has attracted the attention of researchers of religious attitudes and behavior. Hook et al. (2017) found that intellectual humility is a significant predictor of religious tolerance, even when controlling for conservatism and religious commitment. The same research has shown that exposure to religious diversity is positively related to religious tolerance only for participants who reported a high level of intellectual humility.

Since this paper aims to examine the relationship between attachment, intellectual humility and attitudes toward vaccination in the context of COVID-19, it should be pointed out that Jarvinen and Paulus (2017), on a sample of adult participants (N = 1204), established a connection between secure attachment and cognitive openness to counterarguments as a feature of intellectual humility. The authors investigated the effect of the attachment condition (prompted by recalling appropriate childhood attachment patterns according to scenarios) on the possibility of changing the direction and valence of attitudes after listening to counterarguments. &One of the objectives of the research was to examine whether the participants with different self-assessed attachment conditions (three categories according to the Hazan and Shaver model, 1987) differ in the Big-five trait openness, and the results also showed that participants primed in a secure attachment condition exhibited significantly higher trait openness (Jarvinen & Paulus, 2017). The authors conclude that secure attachment represents the capacity to regulate emotions and consequently tolerate threats due to new information, which leaves the individual cognitively open, while insecure attachment patterns limit the individual's capacity for cognitive openness (Jarvinen & Paulus, 2017).

Very recent evidence on the correlation between attachment and attitudes toward vaccination is presented in the research by Lu et al. (2022), who showed on a sample of adult participants that dependency and closeness, as dimensions of adult attachment, significantly predict the intention to vaccinate against COVID-19. This relationship was mediated by the dependency-oriented help-seeking style (for example, when an individual seeks help even before attempting to solve the problem on their own). It was found that higher scores in the close dimension and lower scores in the anxiety dimension of attachment predict COVID-19 vaccination intention, and this relationship was mediated by different help-seeking styles (so-called autonomy-oriented, where priority is given to solving the problem independently, i.e., turning to experts) (Lu et al., 2022).

RESEARCH OBJECTIVE AND HYPOTHESES

The objective of this research was to examine whether attitudes toward vaccination and vaccines in the context of the COVID-19 pandemic can be predicted based on the dimensions of attachment in interpersonal relationships

and intellectual humility. The research started from the hypothesis that there is a significant correlation between attachment styles and intellectual humility and that attachment and intellectual humility can separately significantly contribute to explaining individual differences in attitudes toward vaccination in the context of the pandemic. Specifically, it was expected that secure attachment would be associated with higher scores on the subscales of intellectual humility and that both secure attachment and intellectual humility would contribute to positive attitudes toward vaccination.

The research also aimed to explore the importance of different motives for (not)vaccinating and to compare whether securely and insecurely attached individuals differ in the assessed importance of these motives. Finally, one of the research objectives was to translate and investigate the psychometric characteristics of the Intellectual Humility Scale since, as far as the authors of this paper are aware, there is still no instrument for testing this construct in the Croatian language.

RESEARCH METHOD

Participants

A total of N = 247 students aged 19–30 (M = 22.13 years; SD = 2.11) from different Croatian universities participated in the survey. The sample included significantly more female students (95%) than male students (5%), while four participants did not declare gender. The share of the population vaccinated against COVID-19 was 30.4%. All mandatory vaccines according to the vaccination calendar were administered to almost 92% of participants, and in addition to the mandatory ones, 39% of participants stated that they were vaccinated with at least one other optional vaccine (e.g., HPV, influenza, pneumococcus, etc.). The sample included 6.48% of participants who reported belonging to risk groups for the development of a more severe form of COVID-19.

Instruments

The following questionnaires or self-assessment scales were used in the research: General Data Questionnaire; Interpersonal Relationships Questionnaire (Bartholomew & Horowitz, 1991), Intellectual Humility Scale (Krumrei-Mancuso & Rouse, 2016), Attitudes Towards Vaccination and Vaccines Questionnaire, and a list of reasons for (non)vaccination that partly differed for vaccinated and nonvaccinated participants. The vaccinated assessed the importance of nine different motives for vaccination, such as information from the media and attitudes of family members, while the unvaccinated assessed ten motives, such as fear of side effects. The assessments were expressed on a 1–5 scale, where 1 meant no reason at all and 5 a very important reason.

The General Data Questionnaire consisted of five closed-ended questions that collected data on age, gender, mandatory vaccination, additional vaccination and vaccination against COVID-19.

Table 1

Descriptive parameters of the measures used

	N	M (SD)	range	Cronbach α	skewness	kurtosis
Secure attachment	1	3.85 (1.86)	1-7	-	-.05	-1.16
Fearful attachment	1	4.19 (2.00)	1-7	-	-.18	-1.26
Preoccupied attachment	1	3.81 (1.98)	1-7	-	.11	-1.22
Avoidant attachment	1	3.27 (1.90)	1-7	-	.41	-1.00
Independence of the intellect and ego	4	15.27 (3.76)	4-20	.86	-.73	.01
Openness to change of mind	5	20.36 (3.14)	10-25	.76	-.46	-.28
Respect for others' opinions	6	26.93 (3.10)	11-30	.81	-1.33	2.77
Lack of excessive intellectual self-confidence	6	16.40 (3.92)	7-26	.71	.07	-.43
Risk of vaccination and vaccines	5	13.44 (4.99)	5-25	.88	.07	-.77
Confidence in vaccination and vaccines	4	14.91 (4.12)	4-20	.86	-.71	-.17

The Interpersonal Relationship Questionnaire (Bartholomew & Horowitz, 1991) examines the attachment styles of romantic partners in adulthood and consists of descriptions of four attachment styles (secure, preoccupied, fearful and dismissive) based on two dimensions – anxiety (a model of self) and avoidance (a model of others). The task of the participants was to assess how many each of the descriptions (attachment styles) refers to them, whereby the higher number on a seven-degree scale indicates more agreement with the

description (1 – does not correspond at all to my style of behavior in close relationships; 7 – completely corresponds to my style of behavior in close relationships). Average values and other descriptive indicators are shown in Table 1.

The Intellectual Humility Scale (Krumrei-Mancuso & Rouse, 2016) examines four aspects of intellectual humility, i.e., independence of intellect and ego (five items, for example *When someone disagrees with ideas that are important to me, I feel like they are attacking me*); openness to change my mind (five items, for example *I am willing to change my position on an important issue if there are good reasons for doing so*); respect for someone else's opinion (six items, for example *I am glad that there are different ways of thinking about important topics*) and lack of excessive intellectual self-confidence (six items, for example *I prefer to rely on my knowledge on most topics rather than ask others for their opinions*). The authors of the original scale reported satisfactory predictive, convergent and discriminative validity of the scale determined on different samples (Krumrei-Mancuso & Rouse, 2016). Since the authors of this paper did not find a Croatian translation of the scale or its previous use on a Croatian sample, the double translation method was applied, and the structure of the scale was checked by confirmatory factor analysis (*GFI* =.87; *CFI* =.88; *NNFI* =.86; *RMSEA* =.07; relative chi-square = 2.07). Due to the extremely low reliability of the first factor, item 21 was omitted, which significantly contributed to the reliability of the subscale. With the omittance of this item and based on CFA data indicating acceptable compliance of the data with the four-factor model, four total results were formed in accordance with the instructions given by the authors of the original scale. Average values, reliability coefficients and other descriptive indicators are shown in Table 1.

The Attitudes Towards Vaccination and Vaccines Questionnaire was designed for the purposes of this research and consisted of nine items. The exploratory factor analysis of the items indicated the existence of two factors – confidence in vaccination and vaccines and low vaccination risk – that together explained 70% of the variance. The factor matrix is shown in Table 2. With respect to satisfactory reliability coefficients, after reverse scoring of negative items (so that higher values on both variables show a more positive attitude toward vaccination and vaccines), two total results were formed, the descriptive parameters of which are shown in Table 1.

Table 2

Matrix of factor saturation for The Attitudes Towards Vaccination and Vaccines Questionnaire

	F1 -low risk	F2 -confidence
Vaccines are useful.	.33	.83
I consider vaccines to be one of the greatest medical achievements.	.18	.85
Vaccines aren't safe enough.	.72	.42
Vaccines have a high risk of side effects.	.83	.29
The possible vaccine side effects are not sufficiently known.	.83	.21
Vaccines are primarily a source of income for pharmaceutical companies.	.72	.27
In the background of most vaccines, there are various conflicts of interest.	.74	.24
I vaccinated / I would vaccinate my children according to the mandatory vaccination calendar.	.27	.75
I have high confidence in scientists in the field of epidemiology and immunology.	.37	.74
% of explained variance	37%	33%

Procedure and Data Analysis

The research was conducted in autumn 2021 during the third wave of the COVID-19 pandemic. Vaccination in the Republic of Croatia began in early 2021, and most citizens started to get vaccinated in spring 2021. The survey was conducted in a virtual environment using a questionnaire transformed into an online form via Google Form software. Students were recruited via e-mails and notifications on the intranet sites of higher education institutions, thus forming a convenience, unrepresentative sample. They had three weeks to complete the questionnaire, after which it was no longer possible to access the document, and it was ensured that the questionnaire could only be completed once from one user profile. The data collected were analyzed using the statistical application STATISTICA 14.0 (TIBCO Software Inc.). Since kurtosis and skewness parameters fell within the range of -1.33 to +1.26 for almost all measures, parametric procedures were applied in the data analysis. In addition to measures of central values and data dispersion, Pearson's correlation coefficient r and procedures of hierarchical regression analysis were used in the analysis.

RESULTS

Table 3 presents the matrix of correlations of all variables in the survey. Although secure attachment was not correlated with measures of intellectual humility, insecure attachment styles were correlated with certain aspects of intellectual humility. Specifically, a significant negative correlation was found between fearful attachment and respect for others' opinions and between preoccupied attachment and independence of intellect and ego and respect for others' opinions. A positive correlation between preoccupied attachment and a lack of excessive intellectual self-confidence was also found. Confidence in vaccination and vaccines was positively correlated with secure attachment and openness to change of opinion, and the perception of low vaccination and vaccine risk was positively correlated with secure attachment and independence of intellect and ego.

Table 3

Matrix of correlations of the examined variables

	1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**
1. age										
2. secure	.14*									
3. fearful	-.06	-.36*								
4. preoccupied	-.13	-.19*	.16*							
5. dismissive	.00	-.21*	-.06	-.26*						
6. independence of ego and intellect	-.02	.08	-.09	-.15*	.06					
7. openness to change of mind	.10	.01	-.03	-.04	.04	.15*				
8. respect for others' opinion	.09	.09	-.13*	-.18*	-.02	.33*	.27*			
9. lack of excessive intellectual self-confidence	-.11	.02	-.01	.17*	-.23*	.06	.13*	-.04		
10. low vaccination risk	.14	.15*	-.02	-.11	-.11	.14*	.08	-.10	.05	
11. confidence in vaccination	.12	.18*	-.08	.00	-.10	.12	.19*	-.10	.09	.65*

*$p < .05$

To examine whether attachment characteristics and intellectual humility contribute to attitudes toward vaccination and vaccines, two hierarchical regression analyses (HRA) were conducted with confidence in vaccines and vaccination and low risk of vaccination and vaccines as criterion variables. The age variable was introduced in the first step, attachment styles in the second, and aspects of intellectual humility in the third. The results of these analyses are shown in Tables 4 and 5.

Table 4

Hierarchical regression analyses results with confidence toward vaccination and vaccines as a criterion

Step	**1**	**Step 2**		**Step 3**	
Age	.11	Age	.09	Age	.09
R (R^2)	.11 (.01)	Secure attachment	.16*	Secure attachment	.15*
F (df)	3.01 (1.245)	Fearful attachment	-.02	Fearful attachment	-.02
		Preoccupied attachment	.03	Preoccupied attachment	.02
		Avoidant attachment	-.06	Avoidant attachment	-.07
		R (R^2)	.21 (.05)	Independence of intellect and ego	.12
		ΔR^2	.03*	Openness to change of mind	.20**
		F (df)	2.29* (5.241)	Respect for others' opinions	-.13
				Lack of excessive intellectual self-confidence	.04
				R (R^2)	.32 (.10)
				ΔR^2	.06**
				F (df)	3.06** (9.237)

*p < .05 **p < .01

The results with confidence as a criterion variable showed that secure attachment, introduced in the second step of the analysis, is a significant predictor of confidence in vaccines and vaccination, and it remained significant after the introduction of aspects of intellectual humility in the third step. Intellectual

humility increased the percentage of explained variance by a significant 6%, and the selected predictors explained a total of 10% of the variance. Among the aspects of intellectual humility, the only significant independent predictor was openness to change of mind.

Table 5

Hierarchical regression analyses results with low risk of vaccination as a criterion

Step 1		**Step 2**		**Step 3**	
Age	.15*	Age	.13	Age	.14*
R (R^2)	.15 (.02)	Secure attachment	.10	Secure attachment	.09
F (df)	5.70* (1.245)	Fearful attachment	.04	Fearful attachment	.04
		Preoccupied attachment	-.12	Preoccupied attachment	-.13
		Avoidant attachment	-.11	Avoidant attachment	-.11
		R (R^2)	.24 (.05)	Independence of intellect and ego	.15*
		ΔR^2	.03	Openness to change of mind	.06
		F (df)	2.96* (5,241)	Respect for others' opinions	-.11
				Lack of excessive intellectual self-confidence	.05
				R (R^2)	.30 (.09)
				ΔR^2	.03*
				F (df)	2.59** (9.237)

*p < .05 **p < .01

Older age and independence of intellect and ego proved to be significant predictors for perceiving vaccines and vaccination as being low-risk. The predictors together explained the 9% variance, and the attachment styles did not prove predictive.

Table 6

Hierarchical regression analyses results with vaccinated – nonvaccinated as a criterion

Step 1		Step 2		Step 3		Step 4	
Age	-.21**	Age	-.20**	Age	-.20**	Age	-.13*
R (R^2)	.21 (.04)	Secure attachment	-.11	Secure attachment	-.11	Secure attachment	-.05
F (1.245)	11.40**	Fearful attachment	-.14*	Fearful attachment	-.13	Fearful attachment	-.12*
		Preoccupied attachment	.01	Preoccupied attachment	.02	Preoccupied attachment	-.02
		Avoidant attachment	-.02	Avoidant attachment	-.01	Avoidant attachment	-.07
		R (R^2)	.25 (.06)	Independence of intellect and ego	.06	Independence of intellect and ego	.14*
		ΔR^2	.02	Openness to change of mind	-.05	Openness to change of mind	.10
		F (5.241)	3.31**	Respect for others' opinions	.04	Respect for others' opinions	-.02
				Lack of excessive intellectual self-confidence	.02	Lack of excessive intellectual self-confidence	.05
				R (R^2)	.27 (.07)	Confidence in vaccines	-.21**
				ΔR^2	.01	Low risk of vaccination	-.32**
				F (9.237)	2.05*	R (R^2)	.53 (.28)
						ΔR^2	.21**
						F (11.235)	8.26**

*p < .05 **p < .01

Table 6 shows the HRA results with the criterion variable vaccinated – nonvaccinated against COVID-19. In the first step, the age variable was introduced, which remained significant until the final step. In the second step, attachment styles were introduced, among which only fearful attachment achieved a significant predictive coefficient. Nevertheless, the difference in the percentage of explained variance was not significant, nor was the difference in the third step in which the variables of intellectual humility were introduced. In the last step of the analysis, with the introduction of attitudes toward vaccination, the percentage of explained variance increased by a significant 21%, and all predictors together explained 28% of the variance criteria. In the last step, significant predictors were age, fearful attachment, independence of ego and intellect, and attitudes toward vaccination. It is more likely that vaccinated individuals were those of older age, less fearfully attached, with more independence of ego and intellect, higher confidence in vaccines and vaccination, and those who perceive a lower risk of vaccination.

Tables 7 and 8 show the average results of motivation for vaccination/nonvaccination, as well as the differences between securely and insecurely attached participants in assessing the importance of different reasons for (non) vaccination. Among the vaccinated, the most important reason for vaccination against COVID-19 is their personal desire to protect someone close to them from developing a serious disease (M = 4.29, SD = 1.29); this is followed by a personal desire to contribute to the eradication of the disease (M = 4.09, SD = 1.37) and a personal desire to protect themselves from a serious disease (M = 4.00, SD = 1.41). As the least important reason, participants cited being conditioned by their employer (M = 1.97, SD = 1.45) and receiving information from the media (M = 2.09, SD = 1.28). The most important reason for not getting vaccinated, as stated by the participants who have not been vaccinated, is that not all experts agree on the benefit/harm of the vaccine (M = 4.18, SD = 1.14). This reason is followed by the fear of side effects (M = 4.09, SD = 1.30), imposing the vaccine primarily for reasons other than health (M = 3.98, SD = 1.31) and not seeing the point in vaccinating that will not eradicate the disease (M = 3.86, SD = 1.32). Regarding the reasons for vaccination, a difference was found between securely and insecurely attached participants in only one variable, namely, the attitudes of friends/colleagues that those securely attached assessed more important than those with insecure attachment patterns. Among the unvaccinated, for a number of reasons, a difference was found with regard to attachment. Thus, the securely attached, in relation to the insecurely attached, among less important reasons for their nonvaccination list information from the media, the noncompliance of experts on the benefits/harms of the vaccine, indecisiveness and health contraindications.

Table 7

Importance of different motives for COVID-19 vaccination (1–5) and differences between securely and insecurely attached participants

	M_{sec}	SD_{sec}	M_{insec}	SD_{insec}	t
information from the media	2.44	1.50	1.98	1.20	-1.35
information from professional and scientific literature	3.61	1.42	3.60	1.38	-.02
attitudes of family members	3.50	1.34	3.09	1.43	-1.09
attitudes of friends/colleagues	3.28	1.32	2.52	1.30	-2.16*
personal desire for protection against a serious form of the disease	4.35	1.06	3.90	1.48	-1.18
personal desire to protect a close person from developing a serious form of the disease	4.67	0.59	4.18	1.43	-1.42
personal contribution to disease eradication	4.56	0.98	3.95	1.44	-1.66
being conditioned by their employer or conditioning their workers' rights	2.28	1.60	1.88	1.40	-1.02
being able to perform certain activities (travel, etc.)	3.50	1.76	3.59	1.53	.21

*$p < .05$

Table 8

Importance of different motives for COVID-19 nonvaccination (1–5) and differences between securely and insecurely attached participants

	M_{sec}	SD_{sec}	M_{insec}	SD_{insec}	t
fear of the vaccine side effects	3.97	1.26	4.13	1.31	0.65
this is a disease that should not be prevented with the vaccine	3.49	1.24	3.40	1.47	-0.34
I do not see the point in vaccination that will not eradicate the disease	4.11	1.24	3.79	1.33	-1.28
this vaccine was imposed primarily for reasons other than health	3.70	1.33	4.06	1.29	1.48
attitudes of family members	1.65	1.06	1.77	1.15	0.58
attitudes of friends/colleagues	1.46	1.02	1.50	0.92	0.21
information from the media	1.73	1.07	2.22	1.29	2.09*
experts disagree on the benefit/harm of the vaccine	3.81	1.27	4.28	1.09	2.25*
I still can't make up my mind	1.73	1.17	2.45	1.66	2.48*
I cannot get vaccinated because of health contraindications	1.22	0.82	1.73	1.31	2.26*

*$p < .05$

DISCUSSION

We will first comment on the reasons for (non)vaccination and the difference between securely and insecurely attached participants in their motivation for (non)vaccination. Although one of the most important reasons for our participants' nonvaccination was the fear of side effects, which corresponds to the findings of previous studies (Greyling & Rossouw, 2022), the lack of experts' agreement about the benefits/harms of the vaccine proved to be the key reason. This indicates the need for more direct and clear communication of medical evidence to the public in situations that require responsible health behavior, such as the COVID-19 pandemic. Experts who received media attention saturating the media with vague information, encouraging citizens' suspicions about the scientific evidence for the usefulness of the vaccine and its side effects, as well as suspicions related to information about the disease, certainly contributed to creating negative attitudes toward vaccination among some Croatian citizens. Given the relatively low confidence of Croatian citizens in state institutions, especially political ones (Bovan & Baketa, 2022), negative attitudes toward vaccination and the still relatively small share of the vaccinated population compared to EU countries (https://vaccinetracker.ecdc.

europa.eu/public/extensions/covid-19/vaccine-tracker.html#uptake-tab) are not surprising. In fact, previous research has shown that a lack of trust in governing structures is a significant reason for refusing vaccination (Fisher et al., 2020; Soares et al., 2021). The reason number three for nonvaccination, according to participants, is because they believe that the vaccine was imposed primarily for reasons other than health. This answer can be associated with conspiracy theories that have developed around the disease itself but also around vaccines. Earlier research has already shown that belief in conspiracy theories and the so-called "conspiracy" mentality is associated with negative attitudes toward vaccination or vaccine hesitancy, i.e., refusal of vaccines (Salali & Uysal, preprint; Hornsey et al., 2018).

Although the vaccinated and the unvaccinated do not differ significantly in the share of securely and insecurely attached, the results of regression analyses showed that attachment contributes to the intention of vaccination but also to attitudes toward vaccination. In the analysis with vaccination status against COVID-19 as the criterion, significant predictors in the last step were age, fearful attachment, independence of ego and intellect, and attitudes toward vaccination. More people are vaccinated at an older age, which is in line with the expectations and results of previous studies (Cascini et al., 2021) and is probably due to a higher probability of suffering from a more severe disease in older age. Although the sample was relatively homogeneous in terms of age, even in such a small age range (19–30), a higher probability of vaccination was reported in slightly older young people. Fearful attachment was a negative predictor of vaccination, which means that people with a fearful attachment pattern are less likely to be vaccinated. Fearful attachment is determined by a negative model about the self and others, i.e., high anxiety and high avoidance as fundamental dimensions of attachment. It is possible that both dimensions, which are highly pronounced in fearfully attached participants, increase distrust in the vaccine and vaccination, i.e., they represent a kind of barrier to the acceptance of information from the environment. The result according to which attitudes toward vaccination (confidence and low risk) are significant predictors of vaccination is expected since attitudes are important proximal determinants of behavior. These results are also in line with the model of health beliefs according to which health behaviors are also determined by views on the effectiveness of recommended health behaviors for disease prevention (Abraham & Sheeran, 2007). Finally, a significant predictor of vaccination is the higher level of independence of ego and intellect as an aspect of intellectual humility. Individuals who feel less at risk if someone disagrees with their ideas or who in communication with others do not perceive opposing ideas and opinions as attacking their personality and integrity are more likely to be vaccinated. In regard to attitudes toward vaccination, i.e., confidence in vaccines and vaccination, significant predictors were secure attachment and

openness to change of opinion as a feature of intellectual humility. Secure attachment involves positive models about self and others, and securely attached individuals achieve low scores on both anxiety and avoidance dimensions. In the context of a psychoanalytic approach, the securely attached approach others with confidence and have no difficulty with either dependence on others or autonomy. Given the better emotional regulation of the securely attached, earlier research has shown that they are more prone to cognitive openness, willingness to listen to counterarguments, appreciation of others' opinions, etc. (Jarvinen & Paulus, 2017). Although this research has not found a significant correlation between aspects of intellectual humility and secure attachment, the established correlations between patterns of insecure attachment and, for example, respect for the opinions of others or the independence of ego and intellect suggest the need for further detailed research into the relationship between these concepts. Moreover, the significant independent contribution of secure attachment and openness to changing the opinion on confidence in vaccines and vaccination confirms the initial hypothesis according to which secure attachment and intellectual humility are relevant determinants of attitudes toward vaccination and health behavior in the context of the pandemic. In a new and unfamiliar situation such as the pandemic, especially at its beginnings, it was probably easier for securely attached individuals to cope with it and to develop more positive attitudes toward vaccination considering this a realistic plan to overcome the new situation. Earlier research has shown that securely attached individuals are more positive toward seeking new information and tend to revise their own cognitive schemes in the face of new information, which makes them cognitively more flexible and helps them adapt to changes (Mikulincer, 1997). In this context, it is worth mentioning the research on the relationship between attachment and sense (Dewitte et al., 2019), which showed that it is secure attachment that represents a coherent set of representations on which the individual relies and thus can maintain or re-establish a sense of order and sense in challenging circumstances such as the pandemic.

Finally, perceiving vaccination as low-risk can be predicted by older age and independence of ego and intellect. In this regression equation, attachment did not prove to be a relevant factor. As stated earlier, although the research included a relatively homogeneous age sample, older participants, compared to younger ones, believe that the risk of vaccination is small, which can be attributed to their better knowledge and greater experience. A higher level of independence of ego and intellect as an aspect of intellectual humility also contributed to forming this attitude.

CONCLUSION

In the end, several shortcomings of the conducted research should be addressed. The first refers to a biased and relatively homogeneous sample (student population), and thus, the research hypotheses should be tested on a more heterogeneous sample of young people and adults. Furthermore, the sample consisted of mostly female students, which presents a limitation when drawing conclusions, especially considering the possibility of differences in attachment between men and women and results showing that females are more reluctant to vaccinate than men (Cascini et al., 2021). Furthermore, attachment was examined by a short measure consisting of a description of each attachment pattern in romantic relationships, and since the participants are students, it is possible that some lack the experience of romantic relationships on the basis of which they could assess attachment patterns. The concept of intellectual humility used in this research is relatively new, as well as the accompanying measuring instrument that needs to be further validated on samples of our participants. Despite these shortcomings, the results of the research have confirmed some previous findings on motivation for (non)vaccination and pointed to a small but significant role of attachment and intellectual humility in explaining attitudes toward vaccination and health behavior in the context of the pandemic.

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