



Dark Triad and COVID-19 vaccine hesitancy: the role of conspiracy beliefs and risk perception

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Abstract

With the spread of the Coronavirus Disease-2019 (COVID-19) pandemic, the mass vaccination plan represents the primary weapon to control the infection curve. Unfortunately, vaccine hesitancy also spread out worldwide. This led to exploring the critical factors that prevent vaccination from improving the efficacy of vaccine campaigns. In the present study, the role of the Dark Triad (psychopathy, Machiavellianism, and narcissism) in vaccine hesitancy was investigated, considering the sequential mediating effects of conspiracy beliefs and risk perception. Via a cross-sectional design, the study was conducted with 210 participants surveyed using an online questionnaire to assess the Dark Triad, vaccine hesitancy, conspiracy beliefs, risk perception, and a set of demographic and socio-cultural control variables. Results showed that conspiracy beliefs and risk perception fully mediated the association between the Dark Triad and vaccine hesitancy. This finding suggested that albeit personality accounts for individual differences in human behaviour, vaccine hesitancy is also affected by irrational and false beliefs that, in turn, weaken the risk perception associated with COVID-19. Implications and future research directions were discussed.

Keywords Personality · Pandemic · Vaccination · Conspiracy theories · Risk perception · Mediation

Introduction

Since its outbreak, the Coronavirus Disease-2019 (COVID-19) has deeply affected worldwide populations. Due to its highly contagious nature, the World Health Organisation – WHO (2020) and government agencies have provided different recommendations and issued policies for reducing the spread of the virus, including using masks and social distancing. Although these recommendations can help flatten the COVID-19 infection curve, the long-term control of the COVID-19 pandemic depends on the public acceptance of vaccination (Zheng et al., 2022). Nevertheless, anti-vaccination movements have heavily fought back against vaccination campaigns, mainly during the COVID-19 pandemic (Lin & Wang, 2020), representing one of the ten most

prominent health threats (WHO, 2020). Past research suggested that vaccine hesitancy depends on different causes, including demographics, knowledge about the virus and vaccine, past infection, religious and political interests as well as individual dispositions, such as personality (e.g., Murphy et al., 2021; Shachman et al., 2021). This latter has been widely conceptualised as a hard-core and relatively stable variable involving biological, social (i.e., norms, values, roles, and authority), and intrapsychic factors determining, causing, and explaining people's behaviours (DeYoung, 2010; Dwaairy, 2002), including protective practices against the COVID-19 (Reagu et al., 2023). For instance, Abdelrahman (2022) found that Conscientiousness and Neuroticism were positively associated, while Agreeableness was negatively related to personal hygiene practices and social distancing. It is worth noting that research on the association between personality and healthy behaviours against COVID-19 has been overwhelmed by the Big Five model (Reagu et al., 2023; Abdelrahman, 2022), whereas little empirical evidence has been collected on other personality taxonomies, such as the Dark Triad (DT). This personality model reflects a constellation of three theoretically distinctive yet interconnected personality traits (i.e., psychopathy,

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Machiavellianism, and narcissism), underpinning inappropriate, unethical, and aversive behaviours (Paulhus & Williams, 2002). Previous studies showed that DT negatively affects people's disposition in engaging healthy behaviours against COVID-19, including the willingness to be vaccinated (e.g., Howard, 2022; Konc et al., 2022). However, the key mechanism involved in this association has not been explored so far. In order to fill the gap, drawing upon the Health Belief Model (Janz & Becker, 1984), this study advanced the idea that the relationship between psychological dispositions (i.e., DT) and COVID-19 vaccine adherence results from a sequential effect of conspiracy beliefs and COVID-19 risk perceptions.

The dark triad

The DT construct has been introduced by Paulhus & Williams (2002) and entails three subclinical personality traits. First, psychopathy involves emotional/interpersonal and behavioural deviances (e.g., Hare, 1993), including interpersonal manipulation (e.g., grandiosity, lying, superficial charm); callous affect (e.g., lack of empathy, lack of remorse); erratic lifestyle (e.g., impulsivity, irresponsibility, sensation seeking); and criminal tendencies (e.g., antisocial or counterproductive behaviours) (Paulhus & Williams, 2002). Second, Machiavellianism entails “a strategy of social conduct that involves manipulating others for personal gain” (Christie & Geis, 1970, p. 285; Dahiling et al., 2009; Wilson et al. 1996). According to Paulhus and Williams (2002), people with high Machiavellianism also show callousness, disagreeableness, exploitativeness, and manipulateness (Furnham et al., 2013) but are less impulsive and aggressive and more able to adopt cynical tactics to reach their own goals. Third, narcissism relies on harbour feelings of superiority, a dysfunctional need for excessive attention and admiration, a propensity for engaging in exploitive behaviours, and, ultimately, a lack of empathy and callousness (Paulus & Williams, 2002; O'Boyle et al., 2012; Raskin & Hall, 1979; Wright et al., 2013).

Following Dinić and Jevremov (2021), the main research trends regarding DT can be summarised in four directions: (1) evolutionary-based life history theory; (2) psychometric validity of the construct, including empathy, emotional intelligence, and revenge; (3) basic personality models (e.g., Big Five and HEXACO); and (4) gender differences, evolutionary psychology, and deception. Notably, given the focus of the present study, DT was found to be negatively associated with pro-social practices, including equity and altruism (Giancola et al., 2022a), as well as adherence to prevention guidelines and unwillingness to be vaccinated during the

COVID-19 pandemic (e.g., Giancola, 2022; Konc et al., 2022).

Dark triad and hesitancy toward COVID-19 vaccine

Overall, DT was found to be associated with risky practices, which weaken mental and physical health (Malesza et al., 2016), mainly in terms of financial (Sekścińska et al., 2020), and driving behaviours (Endriulaitienė et al., 2018), substance use (Stenason & Vernon, 2016), problematic social media use (Kircaburun et al., 2018), bullying and cyberbullying (van Geel et al., 2017), as well as unprotected sex (Malesza & Kaczmarek, 2021). In this vein, people with high levels of DT usually show an individual profile characterised by a low-risk perception and a misinterpretation of the informative and adaptive value of affective states, leading them to underestimate the entity and the dangerousness of threats (Giancola, 2022). Indeed, DT was found to be negatively associated with fear of COVID-19 as well as compliance with prevention guidelines against the virus (Giancola, 2022). Particularly, Machiavellianism and psychopathy were found to be negatively correlated with healthy behaviours and positively associated with the tendency to continue living one's own life “as nothing happened” (Triberti et al., 2021; Howard, 2022) argued that narcissism and psychopathy were positively associated with vaccine hesitancy, negatively with pro-vaccination outcomes, and positively with anti-vaccination outcomes. Furthermore, Konc and colleagues (2022) found that deviousness, a key aspect of Machiavellianism, contributed to the unwillingness to be vaccinated against COVID-19 regardless of an individual's risk-taking tendencies. Overall, these findings yielded evidence of the key role of DT in neglecting protective and healthy behaviours against the spread of the virus, calling theoretical basis on the positive association between DT and COVID-19 vaccine hesitancy.

Therefore, the first hypothesis of the current study was formulated as follows:

H1 The DT is directly and positively associated to COVID-19 vaccine hesitancy.

Dark triad and conspiracy beliefs

Conspiracy reasoning lies in non-random patterns, intentional agency, coalitions or groups of (non) human actors, hostility in pursuing evil goals, and continued secrecy (Karić & Mededović, 2021). It involves false beliefs in which the

ultimate cause of an event relies on a group of agents (e.g., a government body or secret societies), which secretly work together to achieve a hidden and malevolent goal (Swami & Furnham, 2014). Some widespread instances of conspiracy theories include believing that elements within the American government planned the Tween Towers attacks or that Princess Diana was deliberately killed, or even that the COVID-19 pandemic is the result of electromagnetic waves transmitted by 5G technology (Jolley & Paterson, 2020), or that COVID-19 is artificially and deliberately generated in a laboratory for military porpoises (Chayinska et al., 2021). Conspiracy beliefs rise mainly during a societal crisis, an “impactful and rapid societal change that calls existing power structures, norms of conduct, or even the existence of specific people or groups into question” (van Prooijen & Douglas, 2017, p. 324). The spread of conspiracy beliefs can help people to manage the chaos and get the illusion of control (Imhoff & Lamberty, 2020), also providing the reason why a given event happens, who could be blamed, and who benefits from it and how (Karić & Mededović, 2021).

Studies on the impact of DT on conspiracy theories reveal that the manipulative, cynical, and exploitative nature of this cluster fosters the inclination to believe in conspiracy theories (Lukić & Živanović, 2021; March & Springer, 2019). For example, primary psychopathic people were found to believe in conspiracy theories because they assume that others are manipulative as they are (Douglas & Sutton, 2011). Moreover, antisocial facets of psychopathy were associated with higher conspiracist ideation (Kay, 2021). Narcissism also predicted an increased belief in COVID-19 conspiracy theories (Blanchard et al., 2023; Gligorić et al., 2021; Sternisko et al., 2021) and intentional dissemination of COVID-19-related conspiracy theories (Sternisko et al., 2021). Interestingly, Cichocka and colleagues (2016; 2022) suggested that people with high narcissism endorse conspiracy theories due to their heightened paranoia, which makes them believe that others are intentionally malicious. In this vein, both high and moderate scores on narcissism and high scores on Machiavellianism were found to weaken the power of scepticism on conspiracy theories in COVID-19 (Ahadzadeh et al., 2021). Furthermore, collective narcissism, Machiavellianism, as well as primary and secondary psychopathy were found to be associated with general COVID-19 conspiracy beliefs and COVID-19 conspiracy dissemination (Hughes & Machan, 2021). Finally, Uscinski and colleagues (2022) found that amongst different psychological and political variables (e.g., populism, support for violence), DT was strongly associated with conspiracy theory beliefs.

Given this evidence, the second hypothesis of the study states that:

H2 The DT is positively related to conspiracy beliefs.

Conspiracy beliefs and risk perception

Risk perception is based on the subjective calculation of outcomes or accidents and their probabilities (Jia et al., 2008). Different factors can affect the people’s risk perception, including not only numeric information about a threat people are exposed to (Reyna et al., 2009) but also contextual factors (e.g., the immediacy and the controllability of the threat), general affect (Ferrer & Klein, 2015), and individual beliefs (Slovic et al. 2007). Risk perceptions are threat-specific and rely on deliberative, affective and eund that conspiracy ideationes (Slovic et al., 2007; Ferrer & Klein, 2015).

Different studies explored the disease risk perception of COVID-19 and its perceived impact on health (Cerami et al., 2020; Lanciano et al., 2020). Surprisingly, risk perception during the COVID-19 pandemic was not as high as expected (Commodari & La Rosa, 2020), although it correlated to preventative health behaviours (Dryhurst et al., 2020). Research revealed that conspiracy beliefs negatively predicted COVID-19 health risk behaviours (Hughes et al., 2022; Maftai & Holman, 2022). In this vein, Imhoff and Lamberty (2020) found that when the COVID-19 virus was conceived as a hoax rather than as a bioweapon, people tended to show less compliance with infection-reducing measures. However, Marinthe et al. (2020) found that conspiracy mentality was a significant and positive predictor of a greater perception of COVID-19 risk of contamination and risk of death. Additionally, Chayinska et al. (2021) showed that the individual disposition toward conspiracy beliefs on COVID-19 was positively associated with optimistically biased risk perceptions (i.e., underestimating the likelihood of given events) in Ukraine and with optimistically biased public risk meta-perceptions (i.e., individuals’ perception that others overestimate the severity of COVID-19) in Turkey and Germany.

Given this misleading evidence, the third hypothesis of the research was non-directional:

H3 Conspiracy beliefs are related to COVID-19 risk perception.

H4 Risk perception is negatively associated to hesitancy toward the COVID-19 vaccine.

Risk perception and hesitancy toward COVID-19 vaccine

Vaccine hesitancy, one of the ten threats to global health in 2019, reflects people's indecision and reluctance to receive specific safe and recommended vaccination despite the availability of vaccination services (Troiano & Nardi, 2021; WHO, 2021). The 3Cs model, first proposed to the WHO EURO Vaccine Communication Working Group 2011 (WHO, 2011), posits that vaccine hesitancy relies on a complex decision-making process involving three main determinants: (1) *confidence* defined as trust in the vaccine, providers, and policymakers; (2) *convenience*, which entails the access to vaccination campaigns; (3) and *complacency*, which refers to perceived risks of vaccine-preventable diseases.

In terms of complacency, as suggested by the risk-as-feeling hypothesis (Chapman & Coups, 2006), risk perception, and specifically its emotional side, plays a pivotal role in motivating people toward healthy and protective behaviours against health threats (e.g., pandemics), including vaccination (Floyd et al., 2000; İkişik et al., 2021; Rudisill, 2013). For instance, affective risk perceptions were found to account for over half of the indirect association between intuitive thinking and the likelihood of being vaccine-hesitant (Martinelli & Veltri, 2021). Fadel and colleagues (2022) revealed that risk perception positively correlated with people's vaccine intentions against COVID-19. Moreover, Soares et al. (2021) argued that people who perceive a low/non-existing risk of COVID-19 infection are highly likely to refuse vaccination. Similarly, risk perception was associated with COVID-19 vaccine hesitancy (Du et al., 2021; Qin et al., 2022). Furthermore, in the Italian context, Caserotti and colleagues' study (2021) highlighted that people were more willing to get vaccinated during the lockdown phase as the risk perception of the virus increased. These findings were also confirmed in cross-cultural research (e.g., Savoia et al., 2022), suggesting that people weigh the severity of a threat (e.g., perceived risk of getting infected and sick from COVID-19) as well as the perceived benefits or harms of getting vaccinated. Thus, low levels of COVID-19 risk perception modulate people's disposition toward vaccine hesitancy.

Overall, this evidence leaves room for the fourth hypothesis of the study:

The sequential mediating effect of conspiracy beliefs and COVID-19 risk perception

As previously mentioned, past studies suggested that DT and COVID-19 risk perception are roughly associated. People with low-risk perception and high psychopathy and Machiavellianism demonstrate low engagement in behaviours to prevent COVID-19 spread (Giancola, 2022; Zajenkowski et al., 2020) and high vaccine hesitancy (e.g., Konc et al., 2022), generally adopting the tendency of "as nothing happened" (Triberti et al., 2021). Yet, conspiracy beliefs and hesitancy toward the COVID-19 vaccine were also demonstrated (Romer & Jamieson, 2020; Sallam et al., 2021, 2022). For instance, Sallam and colleagues (2021) argued that a higher rate of belief in conspiracy, in addition to dependence on social media platforms to obtain information about the vaccine, can explain the lower acceptance rate for COVID-19 vaccine.

This evidence shows that the interrelationships between the variables under investigation in the present study are well-grounded in the literature, allowing for hypothesising different mediation models. However, given that the current research draws upon the idea that COVID-19 vaccine hesitancy results from a blend of individual dispositions (i.e., personality traits), subjective beliefs (i.e., conspiracy beliefs), and cognitions (i.e., risk perceptions about health), a sequential mediating effect of conspiracy beliefs and risk perception was advanced on the association between the DT and people's hesitancy toward the COVID-19 vaccine. The model hypothesised that Machiavellianism, psychopathy, and narcissism enhanced the hesitancy to get vaccinated and that such a hesitancy involved people's false beliefs in conspiracy, which inevitably affected the evaluation of COVID-19 risk perception.

The last hypothesis of the study was:

H5 Conspiracy beliefs and COVID-19 risk perception sequentially mediate the interplay between the DT and hesitancy toward the COVID-19 vaccine.

Method

Participants and procedure

The sample consisted of 210 Italian adults from 18 to 71 years old ($\text{mean}_{\text{age}} = 31.89$; $\text{SD}_{\text{age}} = 13.90$; 50% females). The minimum required sample was evaluated by an a-priori sample size analysis using G*Power 3.1.9.7 software (Faul et al., 2007) with the following parameters: mean effect size $f^2 = 0.15$, power = 0.95, $\alpha = 0.05$, and maximum of predictors = 11. The software revealed that the recommended minimum sample size was $N = 178$. The research sample of 210 met and exceeded the required sample size. The data collection proceeded from November 2021 to January 2022 through an online survey disseminated through different social media. Subjects were informed about the research's purpose and then asked to participate. No rewards were provided, and total anonymity was guaranteed.

Measures

In the current study, a set of brief instruments were selected: (1) Dark Triad Dirty Dozen, (2) Generic Conspiracy Belief Scale, (3) COVID-19 Risk Perception Scale, and (4) COVID-19 Vaccination Attitudes Examination Scale. Although some criticism concerning brief measures (Smith et al., 2000), these scales bypass the issue of time-consuming assessment, which could cause response fatigue in some participants. Indeed, even though large-scale surveys can provide a plethora of data, they may come at the cost of response errors resulting from participant fatigue (Jonason & Webster, 2010). By contrast, concise self-report questionnaires can prune redundant items, save time and effort, and generally reduce participant fatigue and frustration (Saucier, 1994). Notably, concise self-reports do not sacrifice precision, demonstrating high efficiency and adequate reliability (Jonason & Webster, 2010).

1. *Dark Triad Dirty Dozen* (DTDD; Schimmenti et al., 2019) consists of 12 items along a 5-points Likert-type response scale (0 = not at all; 4 = very much). The questionnaire is organised into three different areas tapping psychoticism, Machiavellianism, and Narcissism. As in previous studies, a composite score of the DT was computed by averaging the standardised values of each trait (e.g., Grover & Furnham, 2021). In this research,

the internal consistency reliabilities were as follows: Machiavellianism ($\alpha = 0.92$); psychopathy ($\alpha = 0.82$); narcissism ($\alpha = 0.85$); DT total score ($\alpha = 0.91$). Also, previous studies showed high psychometric properties as well as acceptable reliability (Nowak et al., 2020), and similar results were obtained in the Italian version of the questionnaire (Schimmenti et al., 2019). The DTDD has been widely used in research addressing the key role of DT in different domains of human behaviour, for instance, cyber behaviours, pro-social practices, and problematic social media use (Giancola et al., 2022a; Kircaburun et al., 2018). Giancola and colleagues (2022a) found that DT was negatively associated with pro-social behaviours, as captured in terms of altruism and equity. Kircaburun et al. (2018) revealed that DT was a main determinant of malevolent online practices, including cyberstalking, cyberbullying, and cyber-trolling.

2. *Generic Conspiracy Belief Scale* (GCBS; Brotherton et al., 2013) consists of 15 items along a 5-point Likert type response scale (1 = definitely not true; 5 = definitely true). This scale aims to identify the primary aspects of conspiracy, focusing on abstract, overarching thematic concepts without referring to specific theories. Exploratory and confirmatory factor analyses showed good fit for a five-factor solution: 1) Government malfeasance; 2) Extra-terrestrial cover-up; 3) Malevolent global conspiracies; 4) Personal well-being; 5) Control of information (see Drinkwater et al., 2020). Nevertheless, the GCBS total score has been used to measure conspiracy beliefs (e.g., Georgiou et al., 2020; van der Tempel, & Alcock, 2015). In the current study, the internal consistency reliability was $\alpha = 0.96$. As shown in previous studies, this scale demonstrated high content, criterion-related, convergent and discriminant validity, and reliability (Brotherton et al., 2013), and it has been widely used to detect conspiracy beliefs across cultures (Burdur et al., 2013), within a wide range of psychological fields, including the key role of emotion dysregulation (Molenda et al., 2023). Additionally, the GCBS has also been associated with COVID-19-related behaviours. For example, Plohl and Musil (2021) found that conspiracy ideation, as captured by the GCBS, predicted people's compliance with prevention guidelines, such as washing hands, practising social distancing, and frequently cleaning touched surfaces.
3. *COVID-19 Risk Perception Scale* (COVID-19-RPS; Plohl & Musil, 2021) consists of 6 items along a 7-point Likert type response scale (1 = strongly disagree; 7 = strongly agree). This measure is an adapted version of similar questionnaires assessing HIV or SARS risk perception (e.g., Brug et al., 2004; Napper et al.,

2012). According to Plohl and Musil (2021), an overall score of COVID-19 risk perception was computed. In this research, the internal consistency reliability was $\alpha=0.83$. Notably, although the COVID-19-RPS has not been validated, it has been widely used in specific research addressing risk perception during the pandemic (e.g., Schneider et al., 2021), showing good psychometric properties (see, Plohl and Musil, 2021).

4. *COVID-19 Vaccination Attitudes Examination Scale* (COVID-VAX; Shacham et al., 2021) is a modified version of the VAX scale (Martin & Petrie, 2017), which is widely used for assessing general antivaccination attitudes. As the VAX scale, the COVID-VAX consists of 12 items along a 6-point Likert type response scale (1 = strongly disagree; 6 = strongly agree). In this study, an overall score was computed. A higher overall score implies more hesitancy toward COVID-19 vaccination. In this study, the internal consistency reliability was $\alpha=0.95$. Notably, the COVID-VAX showed good psychometric properties and high internal consistency (see, Shacham et al., 2021).
5. *Control variables*. To control for the effect of demographics, age, gender (0 = female; 1 = male), and years of education were considered as potential covariates. Furthermore, since vaccine hesitancy could also be affected by situational as well as socio-cultural factors (Shacham et al., 2021), people's self-declared knowledge of COVID-19 and vaccine (from 1 = very low to 5 = very high), past infection (1 = affected; 0 = non-affected by COVID-19), religious and political interests (from 1 = very interested to 5 = very interested) were also considered as potential control variables.

Statistical analysis

Data were analysed by SPSS Statistics version 24 for Windows (IBM Corporation, Armonk, New York, USA). The mediating role of conspiracy beliefs and risk perceptions on the association between the DT and people's hesitancy to get vaccinated was tested by the PROCESS macro for SPSS (version 3.5; Hayes, 2017). Figure 1 shows the sequential

model advanced in the current research (Model 6; Hayes, 2017). The significance of the mediating effects was analysed using 5,000 resamples of bootstrapped estimates with 95% bias-corrected confidence intervals-CIs (Preacher & Hayes, 2008). The 95% CIs must not cross zero to satisfy the criteria of mediation (Preacher & Hayes, 2008). Bootstrapping is a non-parametric method allowing an accurate evaluation of the indirect effect in small-medium sized samples (e.g., Giancola et al., 2021; Giancola et al., 2022b; Giancola et al., 2022c). All significance was set to $p < 0.05$.

Results

To verify the common method bias (CMB), we used Harman's single-factor test (Podsakoff et al., 2012). Therefore, we computed the variance explained by a single-factor exploratory model, including all the study's variables. The single factor explained 25.68% of the variance, revealing that the data showed no CBM problems (critical test threshold $\geq 50\%$). Table 1 shows descriptive statistics and correlations among all variables of the study. Based on correlations, four mediation analyses were computed. First, we performed three preliminary mediation analyses using each DT trait and as the focal predictor, vaccine hesitancy as the outcome, and conspiracy beliefs as well as risk perception as sequential mediators. Furthermore, we computed a final mediation analysis in order to evaluate the sequential mediating effect of conspiracy and risk perception in the association between the overall DT and vaccine hesitancy. Age, knowledge of vaccine, past infection, and political interest were entered as covariates in all mediations. Analysis with psychopathy as focal predictor revealed that the direct effect on COVID-19 vaccine hesitancy was not significant ($B=0.01, p=0.81$), whereas the indirect effect ($B=0.03, CIs\ 95\% = [0.008, 0.057]$) and the total effect ($B=0.47, CIs\ 95\% = [0.298, 0.645]$) were significant. Using Machiavellianism, results revealed that the direct effect on COVID-19 vaccine hesitancy was not significant ($B=0.02, p=0.72$), while the indirect effect ($B=0.02, CIs\ 95\% = [0.007, 0.057]$) and the total effect ($B=0.48, CIs\ 95\% = [0.317, 0.656]$) were

Fig. 1 The theoretical sequential model hypothesised in the current research

Note. Covariates are omitted for presentation purposes.

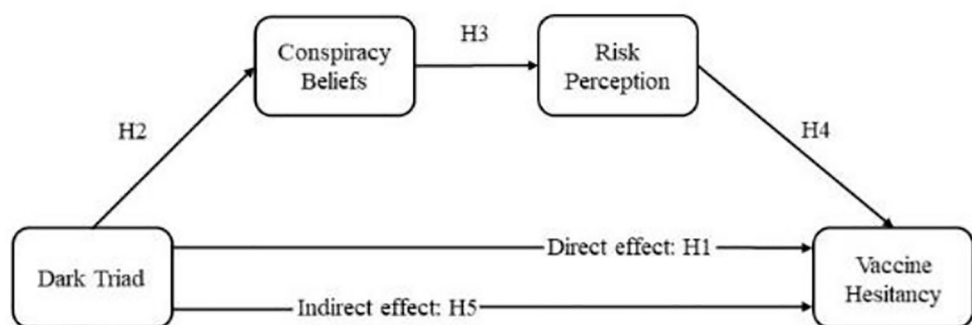


Table 1 Means, standard deviations, and inter-correlations amongst all variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
<i>M</i>	0.61	1.04	1												
<i>SD</i>	0.89	1.00	0.51**	1											
1. Machiavellianism		1.11	0.59**	0.38**	1										
2. Psychopathy			0.81**	0.48**	0.81**	1									
3. Narcissism				0.42**	0.42**	0.48**	1								
4. Dark Triad					-0.34**	-0.54**	-0.41**	1							
5. Conspiracy						0.43**	0.75**	-0.49**	1						
6. Risk perception							0.15*	-0.08	0.17*	1					
7. Vaccine hesitancy								0.14*	-0.20**	0.07	1				
8. Age									0.11	1					
9. Gender										-0.09	1				
10. Education										-0.14	0.08	1			
11. Knowledge of virus										-0.11	0.09	0.81**	1		
12. Knowledge of vaccine										0.03	-0.16*	0.05	0.04	1	
13. Past Infection										0.01	-0.16*	0.05	0.00	-0.04	1
14. Religious interest										-0.19**	-0.04	0.07	-0.04	0.07	0.07
15. Political interest										0.00	0.22**	0.11	0.14*	0.01	0.07

Note. *N* = 210, gender was dummy coded (0 = F; 1 = M), **p* < 0.05 (two tailed), ***p* < 0.01 (two tailed)

significant. Entering narcissism, the direct effect of narcissism on COVID-19 vaccine hesitancy was not significant ($B = -0.01, p = 0.80$), whereas the indirect effect ($B = 0.03, CIs\ 95\% = [0.012, 0.073]$) and the total effect ($B = 0.39, CIs\ 95\% = [0.231, 0.551]$) were significant. Finally, using the composite score of the DT as the focal predictor (Fig. 2), results showed that the direct effect of DT on COVID-19 vaccine hesitancy was not significant ($B = 0.01, p = 0.87$). Conversely, DT was positively related to conspiracy beliefs ($B = 0.48, p < 0.001$). The latter was negatively associated with COVID-19 risk perception ($B = -0.28, p < 0.001$), which, in turn, was negatively related to COVID-19 vaccine hesitancy ($B = -0.24, p < 0.001$). The indirect effect was significant ($B = 0.03, CIs\ 95\% = [0.007, 0.069]$) as well as the total effect ($B = 0.59, CIs\ 95\% = [0.403, 0.782]$) (see Table 2).

Discussion

The present study aimed to examine the effect of the DT on hesitancy toward the Coronavirus Disease-2019 (COVID-19) vaccine and the serial mediating role of conspiracy beliefs and risk perception. According to previous research (Malesza et al., 2016), the first hypothesis (H1) postulated that the DT was directly and positively associated with the COVID-19 vaccine hesitancy. Nevertheless, H1 was not confirmed. This result suggested that the impact of the DT on the hesitancy toward the COVID-19 vaccine depends on an indirect sequential effect of false beliefs in conspiracy and risk perception. Therefore, the present research supported the evidence that DT traits are more prone to conspiracy theories (H2) (Christoffersen & Stamp, 1995). Psychopathy is associated with the tendency to believe in a conspiracy (Hughes & Machan, 2021; March & Springer, 2019) because the higher odd beliefs/magical thinking strengthens the sense of control (Swami et al., 2011). Machiavellianism is associated with conspiracy theories because of paranoia, feelings of lack of control in life, and high distrust of others as well as elite organisations (Kay, 2021). Machiavellians usually identify themselves with people with power in the government and tend to act like them, that is, using the same manipulative tactics (Douglas & Sutton, 2011). Narcissism is related to conspiracy theories based on the desire to retain a positive impression of others and be the centre of attention (Ahadzadeh et al., 2021; March & Springer, 2019).

In support of H3, conspiracy beliefs negatively affected people’s risk perception, confirming previous studies (Hughes et al., 2022; Imhoff & Lamberty, 2020; Maftai & Holman, 2022). Probably this negative effect is due to the barriers to treatment adherence represented by conspiracy beliefs (Westergaard et al., 2014). Indeed, during the

Fig. 2 Summary of the results of the sequential model advanced in the current research
 Note. Covariates are omitted for presentation purposes.

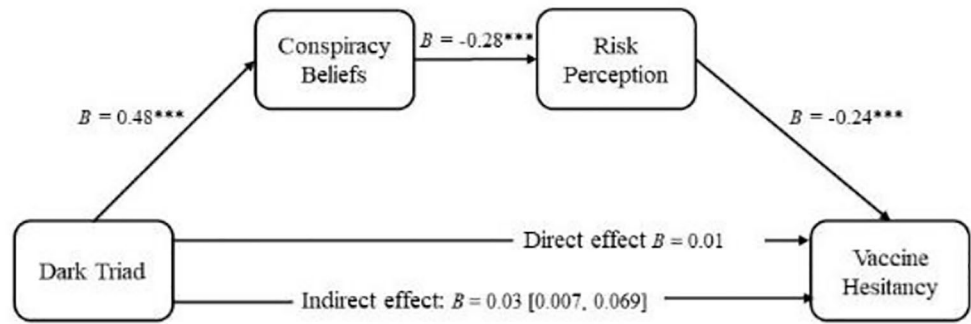


Table 2 Summary of the path analysis of the sequential model of the current research

Path	B	SE	95% CI	
			LL	UL
DT → CB	0.48	0.07	0.336	0.623
CB → RP	-0.28	0.08	-0.453	-0.111
RP → VH	-0.24	0.05	-0.340	-0.131
Direct effect	0.01	0.08	-0.149	0.175
Indirect effect	0.03	0.01	0.007	0.069
Total effect	0.59	0.09	0.403	0.782

$R^2=0.63$
 $F(7,202)=48.68***$

Note. N=210. SE=Standard error; CI=Confidence interval; LL=Lower limit; UL=Upper limit; DT=Dark triad; CB=Conspiracy belief; RP=Risk perception; VH=Vaccine hesitancy. *** $p < 0.001$

COVID-19 pandemic, conspiracy beliefs offered alternative explanations of uncertainty (Miller, 2020), bringing lower credibility of official and scientific information and lower risk perception, which, in turn, involved scarce compliance to official norms for containing the virus.

According to H4, recent research on the interplay between risk perception and COVID-19 protective behaviours (Dryhurst et al., 2020) was confirmed, given the negative association between risk perception and COVID-19 vaccine hesitancy. This result supported previous research and the 3Cs model (WHO, 2011), suggesting the pivotal role of complacency (that is, perceived risks of vaccine-preventable diseases) as a motivator factor toward healthy and protective behaviours during the COVID-19 pandemic (Rudisill, 2013).

Therefore, the indirect sequential effect of beliefs in conspiracy and risk perception on the DT-vaccine hesitancy link (H5) suggested that the malevolent personality traits alone are not sufficient to explain the aversion to the vaccine.

Summary

The current research aimed to deepen the main mechanisms underpinning unhealthy behaviours related to COVID-19, giving some insight into the determinants of getting vaccinated and, ultimately, into health-promoting behaviours. Results rejected H1, given that DT was not associated with hesitancy toward the COVID-19 vaccine, and confirmed the other hypotheses. Overall, this scenario suggests that other factors could mediate the relationships between the two constructs. Regarding H2, DT was positively related to conspiracy beliefs, extending the view that malevolent and aversive personality traits foster the inclination to believe in conspiracy theories (Lukić & Živanović, 2021; March & Springer, 2019). Regarding H3, conspiracy beliefs were negatively related to COVID-19 risk perception, supporting the view that generally misleading beliefs lead people to less compliance with infection-reducing measures (Hughes et al., 2022; Maftai & Holman, 2022). Compared with previous literature, this finding provides additional evidence of the critical role of conspiracy beliefs in shaping perception about a threat, such as the pandemic. Regarding H4, COVID-19 risk perception was negatively related to hesitancy toward the COVID-19 vaccine, supporting that low perceptions about the risk modulate people’s dispositions toward unhealthy behaviours (Du et al., 2021; Qin et al., 2022). This finding extends the evidence that the underestimation of the severity of the pandemic leads people to be not compliant with healthy practices such as vaccination. Together, these results confirmed the fifth hypothesis (H5): conspiracy beliefs and COVID-19 risk perception sequentially mediated the association between DT and hesitancy toward the COVID-19 vaccine.

Theoretical implications

Overall, the current study demonstrated a comprehensive and integrated model that the hesitancy toward the COVID-19 vaccine results from the indirect effect of the antisocial, unethical, and aversive personality dispositions (i.e., DT) via subjective beliefs in conspiracy as well as cognitions about the perception of risk of the virus. From a theoretical perspective, these results yielded promising evidence on individual COVID-19-related practices, shedding light on the key mechanisms underpinning people's reactions to unique and unpredictable global threats, such as the COVID-19 pandemic. Accordingly, our study stressed that vaccine hesitancy could be better understood if different variables are simultaneously investigated, opening to the idea that the impact of personality can be addressed in conjunction with other mechanisms potentially affecting hesitancy toward a vaccine. For instance, previous studies showed that vaccine hesitancy also relies on the inclination to favour inaction over action (Baron & Ritov, 2004), lower levels of knowledge in a given area (e.g., Motta et al., 2018), and lower general intelligence (e.g., Halstead, et al., 2022), and so forth.

Practical implications

From the situational perspective (Miller, 2020), policy-makers and public health authorities should consider the evidence provided by this research to manage vaccine campaigns and citizens' motivation. For example, knowing the association between personality traits, conspiracy beliefs, and general anxiety caused by threat perception may better support short-term and long-term political goals, including adherence to vaccine campaigns. Remarkably, these results could be helpful to plan and build trust in the vaccine, ensuring not only the enhancement of individuals' engagement in future vaccines but also guaranteeing high levels of quality of life. In this vein, efforts should be mainly targeted towards specific personality dispositions, which entail antisocial, unethical, and aversive features, also focusing on people's misleading conceptions, which can weaken compliance with vaccination, with severe and adverse implications for community well-being. Overall, this strategy might help reduce the impact of exposure to traumatic and unpredictable events, such as the pandemic.

Limitations and future research directions

This study has some limitations. First, a cross-sectional design was adopted. This research design is used when the purpose of the study is descriptive, often in the form of a survey to detect the relationships between risk factors and the outcome of interest (Bland, 2015) at a specific time point or over a short period, providing only a snapshot of the outcome and the main variables associated with it (Levin, 2006). Furthermore, this method does not allow for making cause-and-effect inferences. Given these disadvantages, future research should consider other research designs (e.g., longitudinal design) to clarify better the mediation model advanced (e.g., Robertson et al., 2021). Second, we evaluated the DT using a brief self-report questionnaire, such as the DTDD. Although this scale bypasses the issue of time-consuming assessment and response fatigue in participants, it allows only a unidimensional evaluation of psychopathy, Machiavellianism, and narcissism. As shown in previous research (Kay, 2021), DT can be evaluated considering a fine-grained approach to the internal structure of the DT, including primary and secondary psychopathy, grandiose and vulnerable narcissism, as well as a more granular evaluation of Machiavellianism (Volmer et al., 2019). Furthermore, future research could extend the impact of other personality taxonomies, such as the Light Triad, HEXACO and proactive personality. Finally, we assessed conspiracy beliefs using a generic scale. Although this latter has been widely used in previous research on conspiracy (e.g., Bonetto et al., 2018), future research should consider the role of specific conspiracy beliefs or misconceptions (Bodner et al., 2020), according to which the COVID-19 vaccine causes infertility or contains 5G-nanochip.

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Data Availability The data of the current research are available from the corresponding author upon reasonable request.

Declarations

Ethical approval All procedures performed in the current research were in accordance with the ethical standards of the 1964 Helsinki declaration.

Informed consent Informed consent was obtained from all participants involved in this study.

Conflict of Interest The authors declare that they have no conflict of interest.

References

- Abdelrahman, M. (2022). Personality traits, risk perception, and protective behaviors of Arab residents of Qatar during the COVID-19 pandemic. *International Journal of Mental Health and Addiction*, 20(1), 237–248. <https://doi.org/10.1007/s11469-020-00352-7>
- Ahadzadeh, A. S., Ong, F. S., & Wu, S. L. (2021). Social media skepticism and belief in conspiracy theories about COVID-19: The moderating role of the dark triad. *Current Psychology*, 1–13. <https://doi.org/10.1007/s12144-021-02198-1>
- Baron, J., & Ritov, I. (2004). Omission bias, individual differences, and normality. *Organizational Behavior and Human Decision Processes*, 94(2), 74–85. <https://doi.org/10.1016/j.obhdp.2004.03.003>
- Blanchard, A. E., Keenan, G., Heym, N., & Sumich, A. (2023). COVID-19 prevention behaviour is differentially motivated by primary psychopathy, grandiose narcissism and vulnerable Dark Triad traits. *Personality and Individual Differences*, 204, 112060. <https://doi.org/10.1016/j.paid.2022.112060>
- Bland, M. (2015). *An introduction to medical statistics*. Oxford University Press.
- Bodner, J., Welch, W., & Brodie, I. (2020). *COVID-19 conspiracy theories: QAnon, 5G, the New World Order and other viral ideas*. McFarland.
- Bonetto, E., Troian, J., Varet, F., Lo Monaco, G., & Girandola, F. (2018). Priming resistance to persuasion decreases adherence to conspiracy theories. *Social Influence*, 13(3), 125–136. <https://doi.org/10.1080/15534510.2018.1471415>
- Brotherton, R., French, C. C., & Pickering, A. D. (2013). Measuring belief in conspiracy theories: The generic conspiracist beliefs scale. *Frontiers in Psychology*, 279. <https://doi.org/10.3389/fpsyg.2013.00279>
- Bruder, M., Haffke, P., Neave, N., Nouripanah, N., & Imhoff, R. (2013). Measuring individual differences in generic beliefs in conspiracy theories across cultures. *Conspiracy Mentality Questionnaire Frontiers in psychology*, 4, 225. <https://doi.org/10.3389/fpsyg.2013.00225>
- Brug, J., Aro, A. R., Oenema, A., De Zwart, O., Richardus, J. H., & Bishop (2004). G. D. SARS risk perception, knowledge, precautions, and information sources, the Netherlands Emerging infectious diseases, 10(8), 1486. <https://doi.org/10.3201/eid1008.040283>
- Caserotti, M., Girardi, P., Rubaltelli, E., Tasso, A., Lotto, L., & Gavaruzzi, T. (2021). Associations of COVID-19 risk perception with vaccine hesitancy over time for Italian residents. *Social Science & Medicine*, 272, 113688. <https://doi.org/10.1016/j.socscimed.2021.113688>
- Cerami, C., Santi, G. C., Galandra, C., Dodich, A., Cappa, S. F., Vecchi, T., & Crespi, C. (2020). *Covid-19 outbreak in Italy*. are we ready for the psychosocial and the economic crisis? Baseline findings from the PsyCovid study. *Frontiers in Psychiatry*, 11, 556. <https://doi.org/10.3389/fpsyg.2020.00556>
- Chapman, G. B., & Coups, E. J. (2006). Emotions and preventive health behavior: Worry, regret, and influenza vaccination. *Health Psychology*, 25(1), 82. <https://doi.org/10.3389/fpsyg.2020.00556>
- Chayinska, M., Uluğ, Ö. M., Ayanian, A. H., Gratzel, J. C., Brik, T., Kende, A., & McGarty, C. (2021). Coronavirus conspiracy beliefs and distrust of science predict risky public health behaviours through optimistically biased risk perceptions in Ukraine, Turkey, and Germany. *Group Processes & Intergroup Relations*, 1–19. <https://doi.org/10.1177/1368430220978278>
- Christie, R., & Geis, F. L. (1970). *Studies in Machiavellianism*. New York: Academic.
- Christoffersen, D., & Stamp, C. (1995). Exploring the relationship between Machiavellianism and Paranoia. *Psychological Reports*, 76(1), 67–70. <https://doi.org/10.2466/pr0.1995.76.1.67>
- Cichočka, A., Marchlewska, M., & Biddlestone, M. (2022). Why do narcissists find conspiracy theories so appealing? *Current Opinion in Psychology*, 101386. <https://doi.org/10.1016/j.copsyc.2022.101386>
- Cichočka, A., Marchlewska, M., & De Zavala, A. G. (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>
- Commodari, E., & La Rosa, V. L. (2020). Adolescents in quarantine during COVID-19 pandemic in Italy: Perceived health risk, beliefs, psychological experiences and expectations for the future. *Frontiers in Psychology*, 2480. <https://doi.org/10.3389/fpsyg.2020.559951>
- Costa, P. T., & McCrae, R. R. (1992). The five-factor model of personality and its relevance to personality disorders. *Journal of Personality Disorders*, 6(4), 343–359. <https://doi.org/10.1521/pedi.1992.6.4.343>
- Dahling, J. J., Whitaker, B. G., & Levy, P. E. (2009). The development and validation of a new Machiavellianism scale. *Journal of Management*, 35, 219–257. <https://doi.org/10.1177/0149206308318618>
- DeYoung, C. G. (2010). Personality neuroscience and the biology of traits. *Social and Personality Psychology Compass*, 4(12), 1165–1180. <https://doi.org/10.1111/j.1751-9004.2010.00327.x>
- Dinić, B. M., & Jevremov, T. (2021). *Trends in research related to the Dark Triad*. A bibliometric analysis. *Current Psychology*, 40, 3206–3215. <https://doi.org/10.1007/s12144-019-00250-9>
- Douglas, K. M., & Sutton, R. M. (2011). Does it take one to know one? Endorsement of conspiracy theories is influenced by personal willingness to conspire. *British Journal of Social Psychology*, 50(3), 544–552. <https://doi.org/10.1111/j.2044-8309.2010.02018.x>
- Drinkwater, K. G., Dagnall, N., Denovan, A., & Neave, N. (2020). Psychometric assessment of the generic conspiracist beliefs scale. *PloS one*, 15(3), e0230365. <https://doi.org/10.1371/journal.pone.0230365>
- Dryhurst, S., Schneider, C. R., Kerr, J., Freeman, A. L., Recchia, G., Van Der Bles, A. M., ... & Van Der Linden, S. (2020). Risk perceptions of COVID-19 around the world. *Journal of Risk Research*, 23(7-8), 994–1006. <https://doi.org/10.1080/13669877.2020.1758193>
- Du, M., Tao, L., & Liu, J. (2021). The association between risk perception and COVID-19 vaccine hesitancy for children among reproductive women in China: An online survey. *Frontiers in Medicine*, 8, 741298. <https://doi.org/10.3389/fmed.2021.741298>
- Dwairy, M. (2002). Foundations of psychosocial dynamic personality theory of collective people. *Clinical Psychology Review*, 22(3), 343–360. [https://doi.org/10.1016/S0272-7358\(01\)00100-3](https://doi.org/10.1016/S0272-7358(01)00100-3)
- Endriulaitienė, A., Šeibokaitė, L., Žardeckaitė-Matulaitienė, K., Markšaitytė, R., & Slavinskienė, J. (2018). Attitudes towards risky driving and Dark Triad personality traits in a group of learner drivers. *Transportation and Research Part F: Traffic Psychology and Behaviour*, 56, 362–370. <https://doi.org/10.1016/j.trf.2018.05.017>
- Fadel, T., Travis, J., Harris, S., & Webb, G. (2022). The roles of experiences and risk perception in the practice of preventative behaviors of COVID-19. *Pathogens and Global Health*, 116(1), 30–37. <https://doi.org/10.1080/20477724.2021.1957595>
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175–191. <https://doi.org/10.3758/BF03193146>
- Ferrer, R. A., & Klein, W. M. P. (2015). *Risk perceptions and health behavior*. *Current Opinion in Psychology*, 5, 85–89. <https://doi.org/10.1016/j.copsyc.2015.03.01>

- Floyd, M. F., Gibson, H., Pennington-Gray, L., & Thapa, B. (2004). The effect of risk perceptions on intentions to travel in the aftermath of September 11, 2001. *Journal of Travel & Tourism Marketing*, 15(2–3), 19–38. https://doi.org/10.1300/J073v15n02_02
- Furnham, A., Richards, S. C., & Paulhus, D. L. (2013). The Dark Triad of personality: A 10 year review. *Social and Personality Psychology Compass*, 7(3), 199–216. <https://doi.org/10.1111/spc3.12018>
- 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>
- Giancola, M. (2022). Who complies with prevention guidelines during the fourth wave of COVID-19 in Italy? An empirical study. *Personality and Individual Differences*, 199, 111845. <https://doi.org/10.1016/j.paid.2022.111845>
- Giancola, M., Palmiero, M., & D'Amico, S. (2022a). Social sustainability in late adolescence: Trait Emotional Intelligence mediates the impact of the Dark Triad on Altruism and Equity. *Frontiers in Psychology*, 13, 257. <https://doi.org/10.3389/fpsyg.2022.840113>
- Giancola, M., Palmiero, M., & D'Amico, S. (2022b). Exploring the interplay between fluid intelligence and creativity: The mediating role of the field-dependent-independent cognitive style. *Thinking Skills and Creativity*, 45, 101047. <https://doi.org/10.1016/j.tsc.2022.101047>
- Giancola, M., Palmiero, M., & D'Amico, S. (2022c). Divergent but not convergent thinking mediates the trait Emotional Intelligence-Real-World Creativity Link: An empirical study. *Creativity Research Journal*, 1–9. <https://doi.org/10.1080/10400419.2022.2092338>
- Giancola, M., Palmiero, M., Piccardi, L., & D'Amico, S. (2021). The contribution of planning to real-world creativity: The moderating role of agreeableness. *Thinking Skills and Creativity*, 41, 100890. <https://doi.org/10.1016/j.tsc.2021.100890>
- Gligorić, V., da Silva, M. M., Eker, S., van Hoek, N., Nieuwenhuijzen, E., Popova, U., & Zeighami, G. (2021). The usual suspects: How psychological motives and thinking styles predict the endorsement of well-known and COVID-19 conspiracy beliefs. *Applied Cognitive Psychology*, 35(5), 1171–1181. <https://doi.org/10.1002/acp.3844>
- Grover, S., & Furnham, A. (2021). Does emotional intelligence and resilience moderate the relationship between the Dark Triad and personal and work burnout? *Personality and Individual Differences*, 169, 109979. <https://doi.org/10.1016/j.paid.2020.109979>
- Halstead, I. N., McKay, R. T., & Lewis, G. J. (2022). COVID-19 and seasonal flu vaccination hesitancy: Links to personality and general intelligence in a large, UK cohort. *Vaccine* 40(32), 4488–4495. <https://doi.org/10.1016/j.vaccine.2022.05.062>
- Hare, R. D. (1993). *Without conscience: The disturbing world of the psychopaths among us*. New York: Guilford Press.
- Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford publications.
- Howard, M. C. (2022). The good, the bad, and the neutral: Vaccine hesitancy mediates the relations of Psychological Capital, the Dark Triad, and the big five with vaccination willingness and behaviors. *Personality and Individual Differences*, 190, 111523. <https://doi.org/10.1016/j.paid.2022.111523>
- Hughes, J. P., Efstratiou, A., Komer, S. R., Baxter, L. A., Vasiljevic, M., & Leite, A. C. (2022). The impact of risk perceptions and belief in conspiracy theories on COVID-19 pandemic-related behaviours. *PloS one*, 17(2), e0263716. <https://doi.org/10.1371/journal.pone.0263716>
- Hughes, S., & Machan, L. (2021). It's a conspiracy: Covid-19 conspiracies link to psychopathy, Machiavellianism and collective narcissism. *Personality and Individual Differences*, 171, 110559. <https://doi.org/10.1016/j.paid.2020.110559>
- İkişik, H., Akif Sezerol, M., Taşçı, Y., & Maral, I. (2021). COVID-19 vaccine hesitancy: A community-based research in Turkey. *International Journal of Clinical Practice*, 75(8), e14336. <https://doi.org/10.1111/ijcp.14336>
- 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*, 11(8), 1110–1118. <https://doi.org/10.1177/1948550620934692>
- Janz, N. K., & Becker, M. H. (1984). The health belief model: A decade later. *Health Education Quarterly*, 11(1), 1–47. <https://doi.org/10.1177/109019818401100101>
- Jia, J., Dyer, J. S., & Butler, J. C. (2008). Axiomatic models of perceived risk, in *Encyclopedia of Quantitative Risk Analysis and Assessment*, Vol. 1, eds L. Melnick and B. S. Everitt (Chichester: John Wiley & Sons, Inc.), 94–103.
- Jolley, D., & Paterson, J. L. (2020). Pylons ablaze: Examining the role of 5G COVID-19 conspiracy beliefs and support for violence. *British Journal of Social Psychology*, 59(3), 628–640. <https://doi.org/10.1111/bjso.12394>
- Jonason, P. K., & Webster, G. D. (2010). *The dirty dozen*. A concise measure of the dark triad. *Psychological Assessment*, 22(2), 420–432. <https://doi.org/10.1037/a0019265>
- Karić, T., & Mededović, J. (2021). Covid-19 conspiracy beliefs and containment-related behaviour: The role of political trust. *Personality and Individual Differences*, 175, 110697. <https://doi.org/10.1016/j.paid.2021.110697>
- Kay, C. S. (2021). *Actors of the most fiendish character*. Explaining the associations between the Dark Tetrad and conspiracist ideation. *Personality and Individual Differences*, 171, 110543. <https://doi.org/10.1016/j.paid.2020.110543>
- Kircaburun, K., Jonason, P. K., & Griffiths, M. D. (2018). The Dark Tetrad traits and problematic social media use: The mediating role of cyberbullying and cyberstalking. *Personality and Individual Differences*, 135, 264–269. <https://doi.org/10.1016/j.paid.2018.07.034>
- Konc, I., Petrović, K., & Dinić, B. M. (2022). Dark tetrad and COVID-19 protective measures: Mediating effects of risk-taking tendencies. *Personality and Individual Differences*, 186, 111341. <https://doi.org/10.1016/j.paid.2021.111341>
- Lanciano, T., Graziano, G., Curci, A., Costadura, S., & Monaco, A. (2020). Risk perceptions and psychological effects during the Italian COVID-19 emergency. *Frontiers in Psychology* 11:2434. <https://doi.org/10.3389/fpsyg.2020.580053>
- Levin, K. A. (2006). Study design III: Cross-sectional studies. *Evidence-based dentistry*, 7(1), 24–25. <https://doi.org/10.1038/sj.ebd.6400375>
- Lin, F. Y., & Wang, C. H. (2020). Personality and individual attitudes toward vaccination: a nationally representative survey in the United States. *BMC Public Health*, 20(1), 1–8. <https://doi.org/10.1186/s12889-020-09840-w>
- Lukić, P., & Živanović, M. (2021). *Shedding light on the light Triad*. Further evidence on structural, construct, and predictive validity of the Light Triad. *Personality and Individual Differences*, 178, 110876. <https://doi.org/10.1016/j.paid.2021.110876>
- Maftai, A., & Holman, A. C. (2022). Beliefs in conspiracy theories, intolerance of uncertainty, and moral disengagement during the coronavirus crisis. *Ethics & Behavior*, 32(1), 1–11. <https://doi.org/10.1080/10508422.2020.1843171>
- Malesza, M., & Kaczmarek, M. C. (2021). Dark side of health-predicting health behaviors and diseases with the Dark Triad traits. *Journal of Public Health*, 29(2), 275–284. <https://doi.org/10.1007/s10389-019-01129-6>
- Malesza, M., & Ostaszewski, P. (2016). Dark side of impulsivity—Associations between the Dark Triad, self-report and behavioral

- measures of impulsivity. *Personality and Individual Differences*, 88, 197–201. <https://doi.org/10.1017/S0008423920000517>
- Malesza, M., & Ostaszewski, P. (2016). The utility of the Dark Triad model in the prediction of the self-reported and behavioral risk-taking behaviors among adolescents. *Personality and Individual Differences*, 90, 7–11. <https://doi.org/10.1016/j.paid.2015.10.026>
- March, E., & Springer, J. (2019). Belief in conspiracy theories: The predictive role of schizotypy, Machiavellianism, and primary psychopathy. *PLoS ONE*, 14(12), e0225964. <https://doi.org/10.1371/journal.pone.0225964>
- Marinthe, G., Brown, G., Delouée, S., & Jolley, D. (2020). Looking out for myself: Exploring the relationship between conspiracy mentality, perceived personal risk, and COVID-19 prevention measures. *British Journal of Health Psychology*, 25(4), 957–980. <https://doi.org/10.1111/bjhp.12449>
- Martinelli, M., & Veltri, G. A. (2021). Do cognitive styles affect vaccine hesitancy? A dual-process cognitive framework for vaccine hesitancy and the role of risk perceptions. *Social Science & Medicine*, 289, 114403. <https://doi.org/10.1016/j.socscimed.2021.114403>
- Martin, L. R., & Petrie, K. J. (2017). Understanding the dimensions of anti-vaccination attitudes: The vaccination attitudes examination (VAX) scale. *Annals of Behavioral Medicine*, 51(5), 652–660. <https://doi.org/10.1007/s12160-017-9888-y>
- Miller, J. M. (2020). Do COVID-19 conspiracy theory beliefs form a monological belief system? *Canadian Journal of Political Science/Revue canadienne de science politique*, 53(2), 319–326. <https://doi.org/10.1017/S0008423920000517>
- Molenda, Z., Green, R., Marchlewska, M., Cichočka, A., & Douglas, K. M. (2023). Emotion dysregulation and belief in conspiracy theories. *Personality and Individual Differences*, 204, 112042. <https://doi.org/10.1016/j.paid.2022.112042>
- Motta, M., Callaghan, T., & Sylvester, S. (2018). *Knowing less but presuming more: dunning-Kruger effects and the endorsement of anti-vaccine policy attitudes*. *Social Science & Medicine*, 211, 274–81. <https://doi.org/10.1016/j.socscimed.2018.06.032>
- Muris, P., Merckelbach, H., Otaar, H., & Meijer, E. (2017). The malevolent side of human nature: A meta-analysis and critical review of the literature on the dark triad (narcissism, Machiavellianism, and psychopathy). *Perspectives on Psychological Science*, 12(2), 183–204. <https://doi.org/10.1177/1745691616666070>
- Murphy, J., Vallières, F., Bentall, R. P., Shevlin, M., McBride, O., Hartman, T. K., & Hyland, P. (2021). Psychological characteristics associated with COVID-19 vaccine hesitancy and resistance in Ireland and the United Kingdom. *Nature Communications*, 12(1), 29. <https://doi.org/10.1038/s41467-020-20226-9>
- Napper, L. E., Fisher, D. G., & Reynolds, G. L. (2012). Development of the perceived risk of HIV scale. *AIDS and Behavior*, 16, 1075–1083. <https://doi.org/10.1007/s10461-011-0003-2>
- Nowak, B., Brzóska, P., Piotrowski, J., Sedikides, C., Żemajtė-Piotrowska, M., & Jonason, P. K. (2020). Adaptive and maladaptive behavior during the COVID-19 pandemic: The roles of Dark Triad traits, collective narcissism, and health beliefs. *Personality and Individual Differences*, 167, 110232. <https://doi.org/10.1016/j.paid.2020.110232>
- O’Boyle, E. H. Jr., Forsyth, D. R., Banks, G. C., & McDaniel, M. A. (2012). A meta-analysis of the Dark Triad and work behavior: A social exchange perspective. *Journal of Applied Psychology*, 97(3), 557–579. <https://doi.org/10.1037/a0025679>
- Paulhus, D. L., & Williams, K. M. (2002). The dark triad of personality: Narcissism, Machiavellianism, and psychopathy. *Journal of Research in Personality*, 36(6), 556–563. [https://doi.org/10.1016/S0092-6566\(02\)00505-6](https://doi.org/10.1016/S0092-6566(02)00505-6)
- Plohl, N., & Musil, B. (2021). Modeling compliance with COVID-19 prevention guidelines: The critical role of trust in science. *Psychology Health & Medicine*, 26(1), 1–12. <https://doi.org/10.1080/13548506.2020.1772988>
- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology*, 63, 539–569. <https://doi.org/10.1146/annurev-psych-120710-100452>
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40(3), 879–891. <https://doi.org/10.3758/BRM.40.3.879>
- Qin, C., Yan, W., Tao, L., Liu, M., & Liu, J. (2022). The association between risk perception and hesitancy toward the booster dose of covid-19 vaccine among people aged 60 years and older in China. *Vaccines*, 10(7), 1112. <https://doi.org/10.3390/vaccines10071112>
- Raskin, R. N., & Hall, C. S. (1979). A narcissistic personality inventory. *Psychological Report*, 45, 590. <https://doi.org/10.2466/pr0.1979.45.2.590>
- Reagu, S., Jones, R. M., & Alabdulla, M. (2023). COVID-19 vaccine hesitancy and personality traits; results from a large National Cross-Sectional Survey in Qatar. *Vaccines*, 11(1), 189. <https://doi.org/10.3390/vaccines11010189>
- Reyna, V. F., Nelson, W. L., Han, P. K., & Dieckmann, N. F. (2009). How numeracy influences risk comprehension and medical decision making. *Psychological Bulletin*, 135, 943–973. <https://doi.org/10.1037/a0017327>
- Robertson, E., Reeve, K. S., Niedzwiedz, C. L., Moore, J., Blake, M., Green, M., & Benzeval, M. J. (2021). Predictors of COVID-19 vaccine hesitancy in the UK household longitudinal study. *Brain Behavior and Immunity*, 94, 41–50. <https://doi.org/10.1016/j.bbi.2021.03.008>
- Romer, D., & Jamieson, K. H. (2020). Conspiracy theories as barriers to controlling the spread of COVID-19 in the US. *Social Science & Medicine*, 263, 113356. <https://doi.org/10.1016/j.socscimed.2020.113356>
- Rudisill, C. (2013). How do we handle new health risks? Risk perception, optimism, and behaviors regarding the H1N1 virus. *Journal of Risk Research*, 16(8), 959–980. <https://doi.org/10.1080/13669877.2012.761271>
- Sallam, M., Dababseh, D., Eid, H., Al-Mahzoum, K., Al-Haidar, A., Taim, D., & 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>
- Sallam, M., Ghazy, R. M., Al-Salahat, K., Al-Mahzoum, K., AlHadidi, N. M., Eid, H., & AlAwaidy, S. T. (2022). The role of psychological factors and vaccine conspiracy beliefs in influenza vaccine hesitancy and uptake among jordanian healthcare workers during the COVID-19 pandemic. *Vaccines*, 10(8), 1355. <https://doi.org/10.3390/vaccines10081355>
- Saucier, G. (1994). Mini-Markers: A brief version of Goldberg’s unipolar big-five markers. *Journal of Personality Assessment*, 63(3), 506–516. https://doi.org/10.1207/s15327752jpa6303_8
- Savoia, E., Harriman, N. W., Piltch-Loeb, R., Bonetti, M., Toffolutti, V., & Testa, M. A. (2022). Exploring the association between misinformation endorsement, opinions on the government response, risk perception, and COVID-19 vaccine hesitancy in the US, Canada, and Italy. *Vaccines*, 10(5), 671. <https://doi.org/10.3390/vaccines10050671>
- Schimmenti, A., Jonason, P. K., Passanisi, A., La Marca, L., Di Dio, N., & Gervasi, A. M. (2019). Exploring the dark side of personality: Emotional awareness, empathy, and the Dark Triad traits in an Italian sample. *Current Psychology: A Journal for Diverse Perspectives on Diverse Psychological Issues*, 38(1), 100–109. <https://doi.org/10.1007/s12144-017-9588-6>
- Schneider, C. R., Dryhurst, S., Kerr, J., Freeman, A. L., Recchia, G., Spiegelhalter, D., & van der Linden, S. (2021). COVID-19 risk perception: A longitudinal analysis of its predictors and associations with health protective behaviours in the United Kingdom.

- Journal of Risk Research*, 24(3–4), 294–313. <https://doi.org/10.1080/13669877.2021.1890637>
- Sekścińska, K., & Rudzińska-Wojciechowska, J. (2020). Individual differences in Dark Triad Traits and risky financial choices. *Personality and Individual Differences*, 152, 109598. <https://doi.org/10.1016/j.paid.2019.109598>
- Shacham, M., Greenblatt-Kimron, L., Hamama-Raz, Y., Martin, L. R., Peleg, O., Ben-Ezra, M., & Mijiritsky, E. (2021). Increased COVID-19 vaccination hesitancy and health awareness amid COVID-19 vaccinations programs in Israel. *International Journal of Environmental Research and Public Health*, 18(7), 3804. <https://doi.org/10.3390/ijerph18073804>
- Slovic, P., Finucane, M. L., Peters, E. M., & MacGregor, D. G. (2007). The affect heuristic. *European Journal of Operational Research*, 177, 1333–1352. <https://doi.org/10.1016/j.ejor.2005.04.006>
- Smith, G. T., McCarthy, D. M., & Anderson, K. G. (2000). On the sins of short-form development. *Psychological Assessment*, 12(1), 102–111. <https://doi.org/10.1037/1040-3590.12.1.102>
- Soares, P., Rocha, J. V., Moniz, M., Gama, A., Laires, P. A., Pedro, A. R., & Nunes, C. (2021). Factors associated with COVID-19 vaccine hesitancy. *Vaccines*, 9(3), 300. <https://doi.org/10.3390/vaccines9030300>
- Stenason, L., & Vernon, P. A. (2016). The Dark Triad, reinforcement sensitivity and substance use. *Personality and Individual Differences*, 94, 59–63. <https://doi.org/10.1016/j.paid.2016.01.010>
- Sternisko, A., Cichocka, A., Cislak, A., & Van Bavel, J. J. (2021). National narcissism predicts the belief in and the dissemination of conspiracy theories during the COVID-19 pandemic: Evidence from 56 countries. *Personality and Social Psychology Bulletin*, 1–8. <https://doi.org/10.1177/01461672211054947>
- Swami, V., & Furnham, A. (2014). 12 Political paranoia and conspiracy theories. *Power, politics, and paranoia: Why people are suspicious of their leaders*, 218.
- Swami, V., Pietschnig, J., Stieger, S., & Voracek, M. (2011). Alien psychology: Associations between extraterrestrial beliefs and paranormal ideation, superstitious beliefs, schizotypy, and the big five personality factors. *Applied Cognitive Psychology*, 25(4), 647–653. <https://doi.org/10.1002/acp.1736>
- Triberti, S., Durosini, I., & Pravettoni, G. (2021). Social distancing is the right thing to do: Dark Triad behavioral correlates in the COVID-19 quarantine. *Personality and Individual Differences*, 170, 110453. <https://doi.org/10.1016/j.paid.2020.110453>
- Troiano, G., & Nardi, A. (2021). Vaccine hesitancy in the era of COVID-19. *Public Health*, 194245–251. <https://doi.org/10.1016/j.puhe.2021.02.025>
- Uscinski, J., Enders, A., Diekman, A., Funchion, J., Klofstad, C., Kuebler, S., & Wuchty, S. (2022). The psychological and political correlates of conspiracy theory beliefs. *Scientific reports*, 12(1), 21672. <https://doi.org/10.1038/s41598-022-25617-0>
- van der Tempel, J., & Alcock, J. E. (2015). Relationships between conspiracy mentality, hyperactive agency detection, and schizotypy: Supernatural forces at work? *Personality and Individual Differences*, 82, 136–141. <https://doi.org/10.1016/j.paid.2015.03.010>
- van Geel, M., Goemans, A., Toprak, F., & Vedder, P. (2017). Which personality traits are related to traditional bullying and cyberbullying? A study with the big five, Dark Triad and sadism. *Personality and Individual Differences*, 106, 231–235. <https://doi.org/10.1016/j.paid.2016.10.063>
- Van Prooijen, J. W., & Douglas, K. M. (2017). Conspiracy theories as part of history: The role of societal crisis situations. *Memory Studies*, 10(3), 323–333. <https://doi.org/10.1177/1750698017701615>
- Volmer, J., Koch, I. K., & Wolff, C. (2019). Illuminating the ‘dark core’: Mapping global versus specific sources of variance across multiple measures of the dark triad. *Personality and Individual Differences*, 145, 97–102. <https://doi.org/10.1016/j.paid.2019.03.024>
- Westergaard, R. P., Beach, M. C., Saha, S., & Jacobs, E. A. (2014). Racial/ethnic differences in trust in health care: HIV conspiracy beliefs and vaccine research participation. *Journal of General Internal Medicine*, 29(1), 140–146. <https://doi.org/10.1007/s11606-013-2554-6>
- Wilson, D. S., Near, D., & Miller, R. R. (1996). Machiavellianism: A synthesis of the evolutionary and psychological literatures. *Psychological Bulletin*, 119(2), 285–299. <https://doi.org/10.1037/0033-2909.119.2.285>
- World Health Organization. (2020). Coronavirus disease (COVID-19) advice for the public. Available online at: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public>
- World Health Organization (WHO). (2011). EURO Working Group on Vaccine Communications. Istanbul, Turkey, October, 13–14.
- Wright, A. G. C., Pincus, A. L., Thomas, K. M., Hopwood, C. J., Markon, K. E., & Krueger, R. F. (2013). Conceptions of narcissism and the DSM-5 pathological personality traits. *Assessment*, 20(339–52). <https://doi.org/10.1177/1073191113486692>
- Zajenkowski, M., Jonason, P. K., Leniarska, M., & Kozakiewicz, Z. (2020). Who complies with the restrictions to reduce the spread of COVID-19? Personality and perceptions of the COVID-19 situation. *Personality and Individual Differences*, 166, 110199. <https://doi.org/10.1016/j.paid.2020.110199>
- Zheng, H., Jiang, S., & Wu, Q. (2022). Factors influencing COVID-19 vaccination intention: The roles of vaccine knowledge, vaccine risk perception, and doctor-patient communication. *Patient Education and Counseling*, 105(2), 277–283. <https://doi.org/10.1016/j.pec.2021.09.023>

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