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Pro-vaccination subjective norms moderate the relationship between conspiracy mentality and vaccination intentions

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Objectives. Increasing vaccination hesitancy threatens societies' capacity to contain pandemics and other diseases. One factor that is *positively* associated with vaccination intentions is a supportive subjective norm (i.e., the perception that close others approve of vaccination). On the downside, there is evidence that *negative* attitudes toward vaccinations are partly rooted in conspiracy mentality (i.e., the tendency to believe in conspiracies). The objective of this study is to examine the role of subjective norms in moderating the association between conspiracy mentality and vaccine hesitancy. We examined two competing predictions: Are those high in conspiracy mentality immune to subjective norms, or do subjective norms moderate the relationship between conspiracy mentality and vaccination intentions?

Methods. We conducted five studies (total $N = 1{,}280$) to test these hypotheses across several vaccination contexts (some real, some fictitious). We measured conspiracy mentality, vaccination intentions, subjective norms, attitudes toward vaccination, and perceived behavioural control.

Results. A merged analysis across the studies revealed an interaction effect of conspiracy mentality and subjective norm on vaccination intentions. When subjective norm was high (i.e., when participants perceived that close others approved of vaccines) conspiracy mentality no longer predicted vaccination intentions. This was consistent with the moderating hypothesis of subjective norms and inconsistent with the immunity hypothesis.

Conclusions. The typical negative relationship between conspiracy mentality and vaccination intentions is eliminated among those who perceive pro-vaccination subjective norms. Although correlational, these data raise the possibility that pro-vaccination views of friends and family can be leveraged to reduce vaccine hesitancy.

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Statement of contribution

What is already known on this subject?

- Conspiracy beliefs contribute to lower vaccination intentions
- Pro-vaccination subjective norms increase vaccination intentions

What does this study add?

- Subjective norms moderate the negative relationship of conspiracy mentality and vaccination intentions
- When close others approve of vaccinations, conspiracy mentality no longer predicts vaccination intentions

Background

Vaccinations help to contain the dissemination of serious diseases and pandemics – as has become obvious with the spread of COVID-19. Already before the current pandemic, the WHO (World Health Organization, 2019) termed vaccine hesitancy a global health threat. Anti-vaccination communities that facilitate vaccination hesitancy draw heavily upon conspiracy beliefs in framing their arguments (Kata, 2010; Smith & Graham, 2019) – and this was, in particular, true in the COVID-19 pandemic (Pullan & Dey, 2021). Exposure to anti-vaccine conspiracy theories has been demonstrated to have a negative impact on vaccination intentions (Chen, Zhang, Young, Wu, & Zhu, 2020; Jolley & Douglas, 2014, 2017). This is backed by recent research that links conspiracy beliefs about COVID-19 to lower vaccination intentions (Freeman et al., 2020; Hornsey et al., 2021).

Empirical survey research on the psychological roots of anti-vaccination sentiments has corroborated the role of conspiracy beliefs. People who endorse conspiracy beliefs to a stronger extent have more negative attitudes toward vaccination (Hornsey, Finlayson, Chatwood, & Begeny, 2020; Hornsey, Harris, & Fielding, 2018; Lewandowsky, Gignac, & Oberauer, 2013). The size of these relationships is relatively large, which is troubling given that researchers have not yet identified a robust strategy for reducing conspiracist thinking. At the same time, this finding is largely unconnected to the existing literature on the predictors of vaccination attitudes and intentions. To close this gap, the current research aims at integrating research on conspiracy beliefs with one of the dominant models in this realm, the theory of planned behaviour (TPB; Ajzen, 1991).

To be more precise, we sought to highlight the extent to which the relationship between conspiracy mentality and vaccination intentions is dependent on the perceptions of what close others think about vaccination (the subjective norm in terms of TPB). Drawing on extant theory and research, we examine two competing predictions: Are those high in conspiracy mentality immune to subjective norms, or do subjective norms mitigate the role of conspiracy mentality in predicting vaccination intentions?

By contributing to understanding the role of conspiracy beliefs in the formation of low vaccination intentions, the current research provides information relevant to counteract the impact of these beliefs in the context of vaccination. It should be noted that in the current research we are targeting people who are hesitant to get vaccinated rather than people who are in principle against vaccination, as the former are by far more frequent and the latter might be too deeply entrenched in their attitudes to be successfully targeted by prevention approaches to be derived from the current research.

Conspiracy beliefs and vaccination: The role of subjective norms

Conspiracy theories are 'explanations for important events that involve secret plots by powerful and malevolent groups' (Douglas, Sutton, & Cichocka, 2017, p. 538; Goertzel, 1994). Examples of *anti-vaccination* conspiracy theories include the argument that vaccination promoters profit from illnesses caused by vaccinations, or that vested interests are exaggerating the benefits of vaccinations while minimizing the dangers (Kata, 2010). Building on the observation that the belief in one conspiracy theory predicts believing in other unrelated conspiracy theories (Swami, Chamorro-Premuzic, & Furnham, 2010), researchers have postulated that some people have a 'conspiracist worldview,' 'conspiracy mindset,' or 'conspiracy mentality'; that it is commonplace for groups of elites with vested interests and malevolent intentions to conduct elaborate hoaxes on the public (Imhoff & Bruder, 2014). There is compelling evidence that this conspiracy mindset predicts more negative attitudes toward vaccination in general. Not only is this effect relatively large, it is also robust cross-nationally (Hornsey et al., 2018; Lewandowsky et al., 2013). Thus, to counteract declining vaccination rates, it is necessary to find ways to reduce or attenuate the effects of people's general propensity to endorse conspiracy beliefs.

People are social animals, heavily influenced by their perceptions of the beliefs and attitudes of close others (e.g., friends and family). These perceptions are often referred to as a 'subjective norm.' The notion of subjective norms plays a central role in many theories of decision making, including TPB (Ajzen, 1991), social identity theory (Turner, 1991), and norm focus theory (Cialdini, Kallgren, & Reno, 1991). Although subjective norms are referred to in multiple theories of behaviour, we frame the current paper within the language of TPB, which argues that behavioural intentions are driven by three components: the subjective norm (i.e., whether one perceives important others to expect one to perform the behaviour), the attitude toward the behaviour (i.e., whether one thinks that the behaviour is favourable or unfavourable), and perceived behavioural control (whether one perceives performing the behaviour to be under one's volitional control, similar to self-efficacy). The role of subjective norms has been extensively studied with regard to health-related behaviours generally (e.g., Hamilton, van Dongen, & Hagger, 2020) as well as vaccination intentions specifically, often based on TPB. Overall, there is evidence that the perception that close others approve of vaccination is a powerful predictor of one's own vaccination intentions (Chen et al., 2020; Gerend & Shepherd, 2012; Yang, 2015). Indeed, a recent meta-analysis of 17 studies showed that subjective norms were a strong predictor of vaccination intentions ($\beta = .35$) even after controlling for one's own attitudes toward vaccination and one's perceived control over the behaviour (Xiao & Wong, 2020).

One question that has not been examined in the literature – and the question that forms the focus of the current paper – is whether subjective norms can moderate the relationship between a conspiracy mentality and vaccination intentions. Analysis of extant theory and research suggests two competing possibilities.

First, it is possible that those high in conspiracy mentality will be particularly *un*affected by the attitudes of close others. Believing in conspiracy theories usually goes hand in hand with believing non-normative explanations for events and with challenging widely accepted knowledge (Sternisko, Cichocka, & Van Bavel, 2020). Thus, conspiracy theories seem to be especially appealing to people who want to stand out from the masses. Accordingly, a more pronounced conspiracy mentality relates to higher need for uniqueness (Imhoff & Lamberty, 2017; Lantian, Muller, Nurra, & Douglas, 2017) as well as to non-normative behaviour both in terms of political engagement (Imhoff, Dieterle, &

Lamberty, 2021) and health-related issues. For instance, those high in conspiracy mentality are less likely to adopt governmental safety guidelines to prevent the spread of COVID-19 such as physical distancing (Hornsey et al., 2021; Imhoff & Lamberty, 2020; Kowalski, Marchlewska, Molenda, Górska, & Gaweda, 2020; Marinthe, Brown, Delouvée, & Jolley, 2020; Pummerer et al., in press). Thus, there is good evidence to assume that people with a stronger conspiracy mentality are less affected by norms surrounding them. Based on this notion, we predict (and preregistered) that the positive relationship between the subjective norm to get vaccinated and vaccination intentions should be weaker the stronger the conspiracy mentality (Hypothesis A).

Although Hypothesis A provides a reasonable fit to existing theory, it is possible to make the case for the opposite effect: that subjective norms will moderate the negative relationship between conspiracy mentality and vaccination intentions. The subjective norm relates to opinions of close others such as friends and family and does not necessarily represent widely accepted knowledge. While believing in conspiracy theories is related to rejection of mainstream explanations and majorities (Imhoff, Lamberty, & Klein, 2018), it does not rule out other sources of social validation such as one's close social environment (i.e., friends and family). Thus, contrary to Hypothesis A, it is possible that a vaccine-supportive subjective norm will attenuate or eliminate the relationship between conspiracy mentality and vaccination intentions (Hypothesis B).

Overview of the current research

We conducted five studies to test whether the positive relationship between the subjective norm to get vaccinated and vaccination intention is weaker the stronger people's conspiracy mentality (Hypothesis A) or whether subjective norms moderate the negative relationship between conspiracy mentality and vaccination intentions (Hypothesis B). In line with TPB, our analysis of subjective norms is conducted after controlling for attitudes and perceived behavioural control.

Our data also allow us to test a third independent prediction, namely, that subjective norms mediate the relationship of conspiracy mentality and vaccination intentions. This seems plausible given that those strongly endorsing conspiracy beliefs might be surrounded by others sharing their views. As we are mainly interested in the question whether subjective norms could be the starting point for a potential intervention against the negative correlation between conspiracy mentality and vaccination intentions, the mediation prediction was neither our initial hypothesis nor is it the focus of the current contribution. Still, we provide the results of the mediation analyses in the Appendix S1.

We decided to present a merged analysis of the data for the following reasons: (1) all studies used the same design and measures, (2) combining all studies increases our statistical power to detect the true effect of interest with smaller confidence intervals, and (3) we wanted to be transparent as well as efficient in presenting all studies we conducted to test this research question (note that we have conducted no additional studies beyond the ones reported here testing the present research question). We preferred this approach over conducting one large study, because we wanted to achieve more heterogeneity with regard to the occasions and vaccinations. Studies 3–5 were preregistered (Study 3: https://aspredicted.org/m2y7v.pdf, Study 4: https://aspredicted.org/ht937.pdf, Study 5: https://aspredicted.org/dh6np.pdf). For the sake of consistency across studies, we deviated from the preregistered analysis plans in some minor respects, which will be explained in the Method and Results sections.

Method

Design and participants

All five studies were cross-sectional with a correlational design. Studies 1 and 2 were conducted in the lab, while Studies 3–5 were online studies. In Study 1, 195 German undergraduates were recruited via a local participant pool. In Study 2, 200 participants from the same pool participated. Both studies were part of larger study packages lasting approximately one hour for which participants received eight Euros as reward. A total of 405 German undergraduates took part in Study 3 (N = 355 via the university's mailing list, N = 50 via Prolific Academic). Participants recruited via the mailing list got the chance to win one out of 35 vouchers each worth 10 Euros, while participants on Prolific Academic received £1.10 each. In Studies 2 and 3, unrelated experimental manipulations were applied before collecting the data for the current research question, but in both cases the manipulations did not moderate the results of the analyses reported below. Study 4 was conducted via Prolific Academic among participants from the general German population as part of a longer questionnaire containing constructs unrelated to the current research question. Two hundred and twenty-two German adults completed the questionnaire (N = 37 undergraduates, N = 128 employed, N = 33 both, and N = 24 neither). Participation was remunerated with £1.40. For Study 5, we collected data from 446 German undergraduates (via the university's mailing list) who got the chance to win one out of 40 vouchers each worth 10 Euros.

Applying our preregistered exclusion criteria reduced the initial sample of N = 1,468 by 188 participants (for participant flow, see Figure 1). Thus, the sample used in the merged analysis consisted of N = 1,280 participants (851 female, 414 male, 15 other, age: M = 24.71, SD = 6.15, range = 18-74). This sample size would allow us to find a small effect (f^2 = 0.01) of a single regression coefficient in a linear multiple regression with five predictors and a power of .80 (α = .05, two-tailed). Demographic information about the subsamples is presented in Table 1.

Procedure and measures

The procedure and measures of all five studies were similar (a complete list of measures is provided in the Appendix S1). In all studies, we assessed participants' general *conspiracy mentality* with 12 items (Imhoff & Bruder, 2014). The items (e.g., 'There are many very important things happening in the world about which the public is not informed,' 'A few powerful groups of people determine the destiny of millions,' 'Secret organisations can manipulate people psychologically so that they do not notice how their life is being controlled by others') were assessed on a 7-point scale (1 = *does not apply* to 7 = *does apply*; α = .92).

Across the five studies, we tested our predictions regarding a row of different vaccinations and diseases: vaccination against an unspecified disease in a foreign country one wants to travel to (from now on called 'travel vaccination'; Studies 1, 2, and 5), vaccination of one's own (imagined) child against hepatitis B (from now on called 'child vaccination'; Studies 1, 2, and 5), vaccination against COVID-19 once a vaccine becomes available (Studies 3 and 5), seasonal vaccination against influenza[1] (Study 4), and vaccination against the tick-borne encephalitis virus (TBEV; Study 5). The area in which study participants were living is an official risk area of an infection with TBEV transmitted

[1] *Study 4 was conducted at the beginning of the current seasonal influenza vaccination cycle in October 2020.*

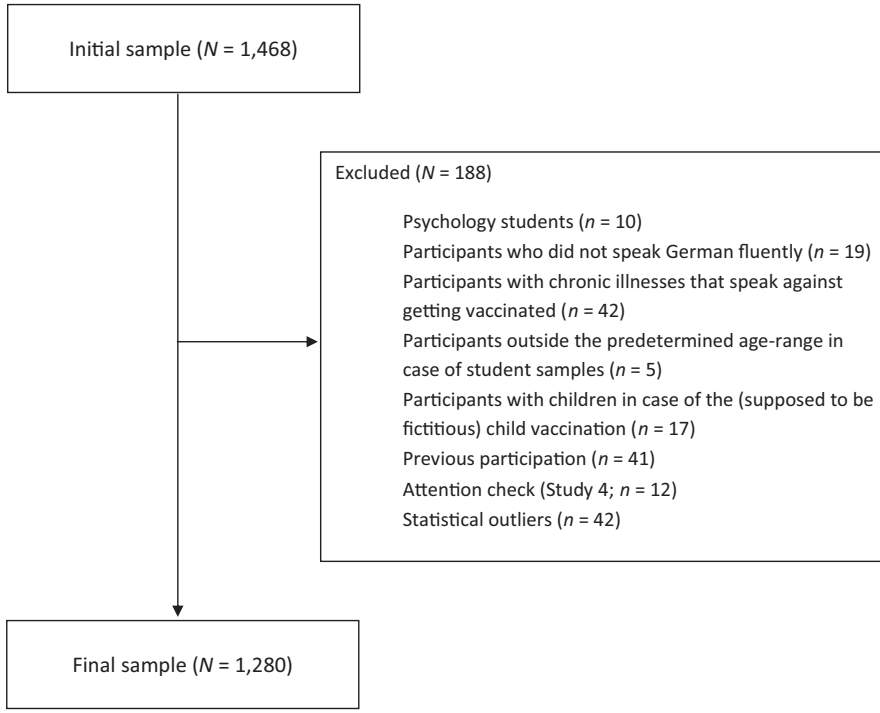

Figure 1. Participant flowchart

Table 1. Number of participants and demographic information across the five studies

	N	Gender	Age *M* (*SD*)	Age range
Study 1	168	123 female, 43 male, 2 other	22.47 (3.06)	18–35
Study 2	145	104 female, 38 male, 3 other	23.92 (3.30)	19–35
Study 3	378	256 female, 116 male, 6 other	23.46 (3.16)	18–34
Study 4	197	94 female, 103 male	32.33 (10.70)	18–74
Study 5	392	274 female, 114 male, 4 other	23.35 (3.72)	18–35

through tick bites. In Studies 1 and 2, the travel vaccination was always presented before the child vaccination. In Study 5, we included order of presentation as an additional between-subjects factor in our design. However, as this factor did not moderate the predicted effect, we removed it from the analysis (which is in accordance with our preregistration).

Subjective norm, behavioural control, attitudes toward the respective vaccination, and vaccination intentions were all measured with items following the recommendations of the TPB (Ajzen, 1991; Schifter & Ajzen, 1985). For each vaccination, we measured the *subjective norm* ('People I care about probably think I should get vaccinated against [name of the disease]' from 1 = *do not agree at all* to 7 = *fully agree*) and behavioural control. The *behavioural control* items slightly differed across studies, because the items we originally employed did not form an internally consistent scale. One of these items ('Whether I get vaccinated or not depends solely on me' from 1 = *do not agree at all* to

7 = *fully agree*) was used in all studies. Thus, we included only this item in our analyses for the sake of comparability (which is a deviation from the preregistration of Study 3).

In all studies, except Study 3, we measured the *attitudes toward the specific vaccinations* with three items per vaccination ('For me the vaccination against this disease would be. . .,' e.g., from 1 = *undesirable* to 7 = *desirable*; α = .90–.94). We decided not to assess the specific attitude in Study 3, because for the fictitious vaccinations in the preceding studies, attitude and intention were barely distinguishable concepts due to their high correlation (r >.83 for the child vaccination). In all studies, we measured the *general attitude toward vaccinations* with five items (taken from Lewandowsky et al., 2013; e.g., 'I believe vaccines are a safe and reliable way to prevent the spread of preventable diseases' from 1 = *do not agree at all* to 7 = *fully agree*; α = .77). For the sake of consistency across studies, we used the general attitude for our main analyses (although deviating from the preregistrations of Studies 4 and 5, where we preregistered to use the specific attitude).

The *intention to get vaccinated* was captured with one item per vaccination (using a slider from 0% = 'I would definitely not get vaccinated' to 100% = 'I would definitely get vaccinated'). In the case of influenza and TBEV, we first asked participants whether they already had been vaccinated against the particular disease and counted 'yes' responses as an intention of 100%.

Analytic plan

To test the hypothesis that conspiracy mentality weakens the relationship between subjective norm and vaccination intentions, we conducted a multiple regression analysis. In case of multiple vaccinations per study, the results of the merged analysis refer to averaged scores across the single vaccinations. These results were consistent with two other analysis procedures: randomly choosing one of the multiple vaccinations per participant and analysing only the vaccination that was presented first. The same is true for a linear mixed model considering participants, study, and vaccination type as random effects. We regressed the intention to get vaccinated on mean-centred conspiracy mentality, mean-centred subjective norm, and their interaction term. We also included the general attitude toward vaccinations and perceived behavioural control as covariates in line with TPB. In the reported main analysis, we entered the predictors in separate steps. That is, we entered (1) the covariates, (2) the main effects of conspiracy mentality and subjective norm, and (3) the interaction of conspiracy mentality and subjective norm.

Results

Table 2 contains the correlations between conspiracy mentality and all relevant other measures as well as between subjective norm and vaccination intention for the single vaccinations. Table 3 displays the means and standard deviations of all central constructs across all studies and vaccinations.

Testing the moderation hypothesis

Entering the covariates into the multiple regression analysis in the first step, we found that higher vaccination intentions were predicted by both a more positive attitude towards vaccination in general, B = 10.35, SE = 0.64, 95% CI [9.09, 11.61], β = 0.41, t

Table 2. Correlations between conspiracy mentality and other measures as well as between subjective norm and vaccination intention for all vaccinations in all single studies

	Vaccination	Conspiracy mentality – Subjective norm	Conspiracy mentality – Vaccination intention	Subjective norm – Vaccination intention	Conspiracy mentality – General attitude toward vaccinations	Conspiracy mentality – Attitude toward the specific vaccination
Study 1	Travel	−.11	−.27***	.49***	−.41***	−.28***
	Child	−.15	−.28***	.62***		−.35***
Study 2	Travel	−.19*	−.17*	.55***	−.30***	−.30***
	Child	−.22**	−.19*	.68***		−.23**
Study 3	COVID-19	−.18**	−.28***	.71***	−.44***	–
Study 4	Influenza	.01	−.05	.72***	−.38***	−.14*
Study 5	Travel	−.12*	−.20***	.48***	−.40***	−.25***
	Child	−.10*	−.20***	.66***		−.25***
	COVID-19	−.22***	−.32***	.76***		−.34***
	TBEV	−.09	−.11*	.63***		−.21***
Overall	-	−.10**	−.20***	.75***	−.37***	–

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 3. Means (standard deviations) of the central measures for all vaccinations in all studies

	Vaccination	Conspiracy mentality (1–7)	General attitude toward vaccinations (1–7)	Subjective norm (1–7)	Attitude toward the specific vaccination (1–7)	Behavioural control (1–7)	Vaccination intention (0–100)
Study 1	Travel	4.04 (1.28)	5.83 (1.14)	6.60 (0.88)	6.55 (0.88)	5.72 (1.56)	90.85 (15.10)
	Child			6.19 (1.10)	5.99 (1.31)	4.99 (1.86)	81.89 (23.72)
Study 2	Travel	3.79 (1.15)	6.07 (0.88)	6.57 (0.83)	6.23 (1.13)	5.30 (1.99)	90.84 (15.66)
	Child			6.20 (1.15)	5.99 (1.23)	4.37 (2.03)	83.75 (21.69)
Study 3	COVID-19	3.21 (1.08)	6.08 (0.95)	5.79 (1.48)	–	5.17 (1.86)	80.53 (23.66)
Study 4	Influenza	3.60 (1.17)	6.13 (0.86)	4.34 (1.85)	5.61 (1.43)	5.68 (1.48)	57.17 (35.95)
Study 5	Travel	2.93 (1.09)	5.93 (0.99)	6.14 (1.19)	6.41 (0.91)	5.39 (1.67)	88.06 (16.19)
	Child			6.15 (1.15)	6.44 (0.92)	4.83 (1.84)	90.24 (16.18)
	COVID-19			5.38 (1.63)	5.79 (1.45)	5.10 (1.91)	77.20 (25.98)
	TBEV			5.49 (1.52)	6.29 (1.12)	5.76 (1.55)	83.96 (26.27)
Overall	–	3.36 (1.20)	6.01 (0.97)	5.71 (1.43)	–	5.27 (1.61)	79.80 (24.53)

(1,277) = 16.13, $p < .001$, and lower perceived behavioural control, $B = -1.12$, $SE = 0.39$, 95% CI [−1.88, −0.36], $\beta = -0.07$, $t(1,277) = -2.88$, $p = .004$. Adding the main effects of our key variables to the multiple regression in a second step, we found higher vaccination intentions to be predicted by lower conspiracy mentality, $B = -1.33$, $SE = 0.39$, 95% CI [−2.10, −0.56], $\beta = -0.07$, $t(1,275) = -3.40$, $p = .001$, and higher subjective norm, $B = 11.74$, $SE = 0.32$, 95% CI [11.12, 12.37], $\beta = 0.68$, $t(1,275) = 36.75$, $p < .001$. To test our hypotheses, we entered the interaction of

conspiracy mentality and subjective norms to the multiple regression analysis in a third step and found a significant interaction of these two variables on vaccination intention, $B = 0.69$, $SE = 0.25$, 95% CI [0.20, 1.19], $\beta = 0.05$, $t(1,274) = 2.74$, $p = .006$ (Table 4). The direction was in line with Hypothesis B that predicted an attenuation of the relationship between conspiracy mentality and vaccination intentions, when subjective norm was high (and not with our preregistered Hypothesis A that predicted high conspiracy mentality to reduce the relationship between subjective norm and vaccination intentions). As can be seen in Figure 2, higher conspiracy mentality was only related to lower vaccination intentions when the perceived subjective norm to vaccinate was low (i.e., −1 *SD*), $B = -2.39$, $SE = 0.55$, 95% CI [−3.46, −1.31], $t(1,274) = -4.35$, $p < .001$. When subjective norm was high (i.e., +1 *SD*), there was no significant relationship between conspiracy mentality and vaccination intentions, $B = -0.41$, $SE = 0.51$, 95% CI [−1.42, 0.64], $t(1,274) = -0.80$, $p = .426$.

The main analysis was carried out in a way that fits the TPB framework, that is, entering subjective norms, attitudes, and perceived behavioural control simultaneously in the regressions. It should be noted, though, the interaction effect of conspiracy mentality and subjective norm was even stronger when not controlling for attitudes and behavioural control, $B = 0.91$, $SE = 0.26$, 95% CI [0.41, 1.42], $\beta = 0.07$, $t(1,276) = 3.53$, $p < .001$.

The results for the single vaccinations largely resemble this pattern (Table 5). For the travel vaccination, the child vaccination, the COVID-19 vaccination, as well as the TBEV vaccination, an interaction of conspiracy mentality and subjective norm emerged. In all these cases, conspiracy mentality predicted vaccination intention to a lesser degree, when subjective norms were perceived as high as compared to low.

However, for the influenza vaccination the pattern looked quite differently. There was no interaction effect of conspiracy mentality and subjective norm on vaccination intention. In addition, this was the only vaccination where no relationship between conspiracy mentality and vaccination intention occurred, $B = -0.76$, $SE = 1.67$, 95% CI [−4.05, 2.52], $\beta = -0.03$, $t(191) = -0.46$, $p = .648$. Thus, there was no relationship in the first place that could have been moderated by high subjective norms.

General discussion

The current research set out to illuminate whether subjective norms moderate the negative relationship between a conspiracy mentality and vaccination intentions. Consistent with previous research, both subjective norms and conspiracy mentality were associated with vaccination intentions. More relevant to the current paper, however, an interaction between conspiracy mentality and subjective norm on vaccination intentions emerged across a number of different vaccination contexts. Speaking against Hypothesis A, conspiracy mentality did not weaken the relationship between subjective norm and vaccination intentions. To the contrary, conspiracy mentality *only* predicted lower vaccination intentions when the subjective norm to vaccinate was low (consistent with Hypothesis B). When the subjective norm was high, conspiracy mentality did not play a role with regard to vaccination intentions. For instance, when close others approved of the COVID-19 vaccination, people with high conspiracy mentality were as willing to get vaccinated against COVID-19 as those with low conspiracy mentality. This finding suggests an important boundary condition to the presumed negative impact of conspiracy mentality on vaccination intentions: when close others approve of vaccination, this appears to trump conspiracist thinking as a factor in

Table 4. Unstandardized coefficients (*B*), standard errors (*SE*) and standardized coefficients (β) from hierarchical multiple regression analyses for the merged analysis

	Equation 1		Equation 2		Equation 3	
Variable	*B* (*SE*)	β	*B* (*SE*)	β	*B* (*SE*)	β
Step 1						
General attitude toward accinations	10.35 (0.64)***	.41	4.52 (0.50)***	.18	4.38 (0.50)***	.17
Behavioural control	−1.12 (0.39)**	−.07	−0.56 (0.27)*	−.04	−0.55 (0.27)*	−.04
Adj. R^2	.17					
F(2, 1,277)	135.79***					
Step 2						
Subjective norm			11.74 (0.32)***	.68	11.69 (0.32)***	.68
Conspiracy mentality			−1.33 (0.39)**	−.07	−1.40 (0.39)***	−.07
R^2_{Change}			.43			
F(2, 1,275)			678.71***			
Step 3						
Subjective norm x Conspiracy mentality					0.69 (0.25)**	.05
R^2_{Change}					.002	
F(1, 1,274)					7.52**	

*$p < .05$, **$p < .01$, ***$p < .001$.

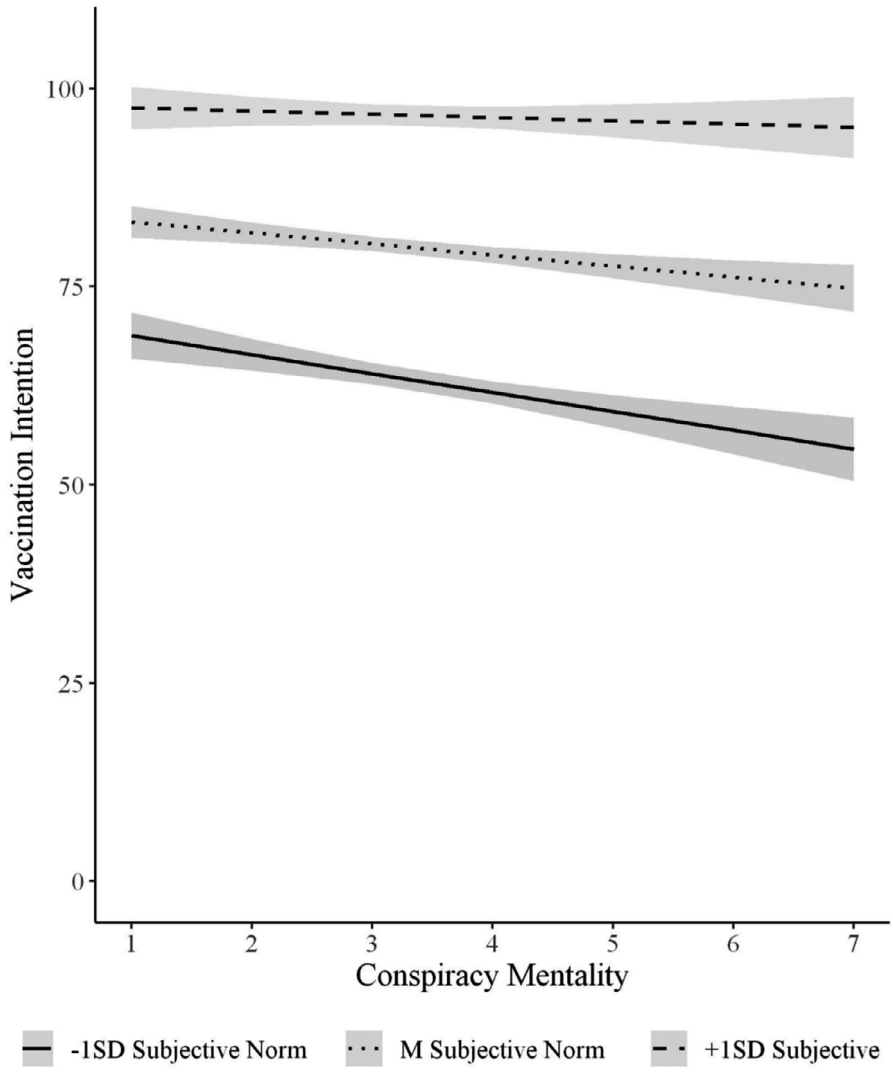

Figure 2. Vaccination intention as a function of subjective norm and conspiracy mentality (merged analysis: $N = 1{,}280$). Shaded areas represent 95% confidence intervals.

Table 5. Overview of interaction effects of conspiracy mentality and subjective norm on vaccination intention from the multiple regressions; presented for the single vaccinations and for the merged analysis

	B (*SE*)	95% CI	β	*t*	*df*	*p*
Travel	0.75 (0.35)	[0.06, 1.45]	.07	2.14	699	.033
Child	1.26 (0.33)	[0.61, 1.92]	.10	3.78	699	<.001
COVID-19	0.78 (0.31)	[0.18, 1.38]	.06	2.55	764	.011
Influenza	0.60 (0.81)	[−1.01, 2.20]	.04	0.73	191	.465
TBEV	1.35 (0.59)	[0.19, 2.52]	.09	2.29	386	.023
Merged analysis	0.69 (0.25)	[0.20, 1.19]	.05	2.74	1,274	.006

shaping one's intentions to vaccinate. In sum, most of the existing literature focuses on the conditions under which belief in conspiracy theories limits the impact of social influences (e.g., Imhoff et al., 2018). The current research is the first to identify a factor (i.e., high subjective norm) that moderates the relationship between conspiracy beliefs and vaccination intentions.

In addition to this primary finding, we replicated and extended previous work by finding a consistent negative relationship between conspiracy mentality and vaccination intentions. This goes beyond previous work that correlated the belief in vaccination-*specific* conspiracy theories with lower vaccination intentions (Jolley & Douglas, 2014, 2017) or correlated conspiracy mentality with more negative vaccination *attitudes* (Hornsey et al., 2018; Lewandowsky et al., 2013).

A closer inspection of the single vaccinations revealed that the pattern of results did not only occur for the merged dataset, but also for almost all of the single vaccinations. For the travel vaccination, the child vaccination, the COVID-19 vaccination, and the TBEV vaccination, we consistently found support for Hypothesis B, which speaks for the generalizability of our findings across entirely different vaccinations. While the results are consistent across the different vaccinations, it should be noted that the influenza vaccination constitutes an exception in some regards. First, it is the only vaccination for which the interaction effect was not significant. Second, vaccination intentions were not related to conspiracy mentality – another pattern that only occurred for this particular vaccination and that could also explain the absence of an interaction effect. As the influenza vaccination was only included in Study 4, sample characteristics or other unknown influences on this specific study might explain the deviating results. At the same time, they could also be rooted in the vaccination itself. Given that the influenza vaccination takes place every year, participants' habitual behaviour (i.e., whether they have regularly been vaccinated against influenza in the past) might be more predictive of vaccination intentions than the generalised attitudes we assessed. In addition, influenza vaccination is primarily recommended to people older than 60 years who constituted a minority of our sample. Last, it should be noted that there were supply shortages regarding the influenza vaccine in Germany at the time of conducting the study.

Limitations and future directions

Although the current research revealed interesting new insights, it comes with limitations. First, the setup of all studies was cross-sectional. Thus, the current data do not allow to draw conclusions about the directionality of relationships. Longitudinal studies are needed to detect any causal effects involved in the interplay of conspiracy mentality and subjective norm when it comes to vaccination intentions. Experimental approaches might be less suitable here, given that both the general conspiracy mentality and expectations of friends and family are hard to manipulate.

One could also criticise the fact that the current studies do not cover actual vaccination behaviour, but only self-report measures of vaccination intentions. However, for influenza and TBEV, we did ask participants whether they had already been vaccinated as an indicator of past behaviour. In addition, given that behavioural intention strongly influences actual behaviour (Ajzen, 1991), the current findings might still be applicable to actual vaccination decisions – an assumption that needs to be proven in field studies. Moreover, both vaccination intentions and subjective norm perceptions were assessed with single item measures as is often done in research on TPB (Ajzen, 1991). Although we acknowledge that multi-item measures are to be preferred, we are reassured by the strong

face validity of the items that were used. It should be noted that we focused on pro-vaccination subjective norms in line with the TPB approach, which considers positive subjective norms as predictors of behavioural intentions. The influence of vaccination-sceptical subjective norms, which might be prevalent among those high in conspiracy mentality, remains to be tested in future research.

Practical implications

The current findings have some interesting implications for how to deal with vaccination hesitancy that has its roots in conspiracy beliefs (as appears to be the case for the COVID-19 vaccines, for example). While a lot of effort in both research and practice is put into debunking conspiracy theories or persuading those who believe in them (e.g., Banas & Miller, 2013; Cook, Lewandowsky, & Ecker, 2017; Jolley & Douglas, 2017), our results suggest a different (probably complementary) strategy. Considering the attitudes of friends and families seems to be highly important: When these close others convey the impression that getting vaccinated is what they think a person should do (i.e., the norm), conspiracy mentality no longer predicts vaccination intentions. This seems particularly promising as attempts to influence conspiracy believers are often unsuccessful, especially when the communication comes from authorities (Imhoff et al., 2018; Lamberty & Imhoff, 2018). In the current case, personalised health communication might be more successful (Sassenrath, Greving, & Sassenberg, 2018; Sassenrath, Sassenberg, & Greving, 2017). When talking, for instance, about the COVID-19 vaccination, it could be a first step to reveal one's own positive vaccination intentions to close others who endorse conspiracy beliefs. Rather than trying to reduce conspiracy beliefs, signalling a positive subjective norm might be a means of circumventing the negative impact of a conspiracist tendency on vaccination intentions.

As outlined in the introduction and as is reflected in the samples under investigation, our research mostly focused on people who are hesitant to get vaccinated but not necessarily have deeply entrenched worldviews that lead them to reject any vaccination per se. Thus, subjective norms might be helpful to reach those on the edge to conspiracist beliefs but might be less effective among those who are deeply enmeshed in fringe conspiracy communities. In terms of practical implications this is important to acknowledge as potential interventions should be tailored to the audience of interest.

Conclusions

The current research provides first evidence that conspiracy mentality and subjective norm conjointly predict vaccination intentions. However, it is not conspiracy mentality that reduces the impact of subjective norm as was initially expected. Rather, it is the subjective norm that determines whether or not the conspiracy mentality negatively predicts vaccination intentions. Conspiracy mentality negatively predicts vaccination intentions only when the norms set by close others is not in favour of vaccination. Thus, keeping social bonds instead of rejecting people who are susceptible to conspiracy beliefs should be encouraged. This way, it seems possible to contain the negative impact of conspiracy beliefs and possibly also the spread of serious diseases.

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Conflicts of interest

All authors declare no conflict of interest.

Author contributions

Kevin Winter (Data curation; Formal analysis; Investigation; Methodology; Project administration; Resources; Software; Supervision; Validation; Visualization; Writing – original draft; Writing – review & editing) Lotte Pummerer (Formal analysis; Methodology; Resources; Writing – review & editing) Matthew J. Hornsey (Conceptualization; Funding acquisition; Writing – review & editing) Kai Sassenberg (Conceptualization; Funding acquisition; Methodology; Project administration; Resources; Supervision; Writing – review & editing).

Data availability statement

The data (http://dx.doi.org/10.23668/psycharchives.4959) and analysis code (http://dx.doi.org/10.23668/psycharchives.4958) of all studies are openly accessible.

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Supporting Information

The following supporting information may be found in the online edition of the article:

Appendix S1 Online Supplement