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# Spirituality and intentions to engage in Covid-19 protective behaviours

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## Abstract

Accumulating evidence points to spirituality as a belief system that contributes to low trust in science, with self-identified spiritual individuals reporting high levels of unwarranted scepticism towards science in general and vaccination specifically. We investigated whether self-identified spirituality also predicts intentions to engage with Covid-19 protective measures during the pandemic. In Studies 1–3 ( $N = 774$ ), we asked participants to report their spirituality and desire to be vaccinated against Covid-19 shortly after the first vaccine rollout. In Studies 2–3, we included measures of scepticism towards and intentions to comply with Covid-19 prevention measures (handwashing, wearing face coverings, distancing). As expected, stronger self-reported spirituality involved lower desire to be vaccinated, controlling for various worldview and demographic variables. Yet, we found no evidence for spirituality to predict scepticism towards other Covid-19 preventative behaviours or intentions to engage with them. Our findings corroborate and extend previous literature on science rejection, demonstrating that spirituality is uniquely involved in vaccine rejection.

## KEYWORDS

Covid-19, health behaviours, science scepticism, spirituality, vaccine hesitancy, vaccine rejection

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## 1 | INTRODUCTION

In recent decades, research investigating causes of science scepticism--unwarranted rejection of science and scientific evidence--has been substantially accumulating. Given that science scepticism can harm individual and societal health alike, it is pivotal to understand its psychological roots. This issue has become even more important during the Covid-19 pandemic. Factors such as misperceptions about Covid-19 severity, vaccine refusal, and lack of adherence to prevention measures, all resulted in severe public health outcomes, including the spread of Covid-19, increased number of people developing severe symptoms, and even a higher fatality rate (de Figueiredo et al., 2020; Farrenkopf, 2022). Recent evidence identified spirituality as a belief system that robustly contributes to science rejection (e.g., Rutjens et al., 2022). In the present manuscript, we investigate whether spirituality is also an important predictor of intentions to engage in Covid-19 protective behaviours. Understanding correlates of such engagement is crucial in informing the design of future interventions against lack of compliance with important health measures.

Many perspectives have been proposed to account for the causes of science rejection across different scientific domains. Education-based approaches to scepticism offered solutions to reduce misperceptions through encouraging analytical thinking (accuracy nudge), prebunking misinformation (inoculation) or by simply educating people (Bago et al., 2020; McPhetres et al., 2019; Pennycook et al., 2020; van der Linden et al., 2021). While these techniques can be effective in dealing with misperceptions, they fail to predict and reduce scepticism across many science domains (Gavin et al., 2022; van Stekelenburg et al., 2021; Zarzeczna et al., 2021). This is partly because worldviews and ideologies play an important role in shaping science rejection (Rutjens et al., 2018, 2022; Zarzeczna et al., 2021). Increasingly, evidence points to the importance of spirituality in predicting science rejection (Rutjens & van der Lee, 2020; Rutjens et al., 2021). In the current research, we build upon this evidence to further understand correlates of intentions to engage in measures preventing Covid-19 spread as well as desire to be vaccinated against Covid-19.

Spirituality is a belief system focusing on an experiential and individualised, rather than institutionalised, approach to truth. This is different to traditional religious belief, which relies more on institutionalized knowledge and guidance (Houtman & Tromp, 2021; Rutjens et al., 2022). As such, spiritual individuals tend to rely on subjective experiences and faith in intuition to obtain knowledge (Hanegraaff, 1996; Wong & Vinsky, 2009). It has been suggested that spiritual individuals might be more likely to reject science, as science is often counter-intuitive (Rutjens & van der Lee, 2020; Shtulman, 2017). This could particularly be true when applied to science concerned with infectious diseases and vaccination; for many it is counter-intuitive to assume that injecting weakened doses of a virus has a protective effect against that virus.

As such, across many studies, including cross-country work, high self-identified spirituality has been consistently found to be a significant predictor of low trust in science, and in particular, high vaccination scepticism (Rutjens et al., 2022; Rutjens & van der Lee, 2020; Rutjens et al., 2021). Furthermore, in an analysis of Covid-19 vaccination rates across 195 regions in the world, the regions inhabited by people reporting higher spirituality had significantly lower vaccination rates (Martens & Rutjens, 2022). These findings mirror evidence demonstrating that spirituality contributes to high Covid-19 vaccination scepticism which is explained by spiritual individuals' lower general faith in science (Zarzeczna et al., 2022). Since there is accumulating evidence to suggest that spirituality is an important obstacle to science acceptance, and in particular vaccination, we tested whether its involvement extends beyond vaccination, to higher scepticism towards Covid-19 protective behaviours and lower intentions to engage with them. To further replicate previous findings, we also investigate whether spirituality predicted lower desire to be vaccinated against Covid-19.

We aimed to test our predictions using large samples of participants to achieve high power. For that reason, we collapsed the data across relevant studies and used an integrative data analysis approach (Curran & Hussong, 2009) by estimating multilevel models with *studies* as our contextual variable (we describe this approach in more detail in the Results section). First, using data across all studies (Studies 1–3;  $N = 774$ ), we aimed at corroborating previous findings (Martens & Rutjens, 2022; Zarzeczna et al., 2022) to examine whether self-identified spirituality predicted lower desire to be vaccinated against Covid-19 at the time of vaccine rollout (at the end of 2020 and beginning of

2021). Second, using data from two studies (Studies 2–3;  $N = 581$ ), we examined whether self-identified spirituality was also important in predicting scepticism towards and intentions to engage in Covid-19 prevention measures, which was recommended by the government at the time (in 2020/2021). Based on recent evidence (Martens & Rutjens, 2022; Rutjens & van der Lee, 2020; Rutjens, van der Linden, et al., 2021; Zarzeczna et al., 2022), we hypothesised that self-identified spirituality would predict lower desire to be vaccinated against Covid-19, as well as high scepticism towards and lower intentions to engage in prevention measures (handwashing, wearing a face covering, social distancing), controlling for other worldview (political ideology, religiosity) and demographic variables.<sup>1</sup>

## 2 | METHOD

### 2.1 | Participants

Across all studies, we recruited samples of British participants via Prolific, a recruitment platform (see Table 1 for samples' characteristics). In Study 1, 218 participants took part. Eighteen participants failed at least one attention check and one participant was identified as a potential bot by Qualtrics software. Hence, they were excluded from the analysis leaving the total of 198 participants.

In Study 2, we recruited 303 participants and excluded 7 for failing attention checks, leaving the total sample size of 296. In Study 3, the original sample was 297 and we excluded 8 participants due to failed attention checks, leaving the sample of 289 participants in total.

### 2.2 | Materials

We measured desire to be vaccinated against Covid-19 in all studies (Studies 1–3), whilst scepticism towards and intentions to comply with Covid-19 prevention measures in Studies 2–3. All studies were conducted between

TABLE 1 Summary of participants' demographics in studies 1–3.

Variables	Study 1 (N = 198)	Study 2 (N = 296)	Study 3 (N = 289)
Age (years)	$M = 39.48$ ( $SD = 13.75$ ), range: 18–76	$M = 47.91$ ( $SD = 17.40$ ), range: 19 – 83	$M = 47.03$ ( $SD = 17.27$ ), range: 18 - 79
Gender (0: men)	Women: 115, men: 83	Women: 149, men: 147	Women: 146, men: 143
Formal education (years)	$M = 16.20$ ( $SD = 3.23$ )	$M = 15.50$ ( $SD = 3.81$ )	$M = 15.44$ ( $SD = 3.70$ )
Science literacy	$M = 12.00$ ( $SD = 1.67$ )	$M = 12.03$ ( $SD = 1.62$ )	$M = 10.43$ ( $SD = 2.61$ )
Subjective socio-economic status	$M = 5.53$ ( $SD = 1.51$ )	$M = 5.34$ ( $SD = 1.51$ )	$M = 5.45$ ( $SD = 1.56$ )
Science training (yes/no)	No: 146, yes: 52	No: 239, yes: 57	No: 234, yes: 55
Political orientation	$M = 3.30$ ( $SD = 1.19$ )	$M = 3.46$ ( $SD = 1.20$ )	$M = 4.66$ ( $SD = 1.80$ )
Religiosity	$M = 2.04$ ( $SD = 1.48$ )	$M = 2.30$ ( $SD = 1.61$ )	$M = 2.31$ ( $SD = 1.76$ )
Religious orthodoxy	$M = 2.45$ ( $SD = 1.51$ )	$M = 2.29$ ( $SD = 1.62$ )	$M = 2.20$ ( $SD = 1.71$ )
Spirituality	$M = 2.70$ ( $SD = 1.54$ )	$M = 2.64$ ( $SD = 1.53$ )	$M = 2.77$ ( $SD = 1.77$ )
Desire to be vaccinated	$M = 6.03$ ( $SD = 1.51$ )	$M = 5.45$ ( $SD = 1.89$ )	$M = 6.02$ ( $SD = 1.72$ )
Scepticism towards measures	NA	$M = 2.43$ ( $SD = 1.31$ )	$M = 2.25$ ( $SD = 1.23$ )
Intentions to comply with measures	NA	$M = 4.71$ ( $SD = 0.52$ )	$M = 4.74$ ( $SD = 0.48$ )

Note: Data included for studies 2–3 are partially based on data collected for another project and presented in a published paper (Zarzeczna et al., 2022, Table 2).

December 2020 and February 2021; around the time of the first vaccine rollout in the UK (8 December 2020), and during the national lockdown. All measures were presented online via Qualtrics. Participants indicated their responses on a scale from 1 (*strongly agree*) to 7 (*strongly disagree*), unless otherwise stated.

## 2.3 | Predictors

### 2.3.1 | Self-reported spirituality

We used two items to tap into spirituality (Study 1:  $r = 0.83$ ; Study 2:  $r = 0.85$ ; Study 3:  $r = 0.90$ ): “To what extent do you consider yourself to be a spiritual person?” and “To what extent do others consider you to be a spiritual person?”. Participants responded on a scale from 1 (*not at all*) to 7 (*very much*). This measure has been validated in previous research (Rutjens & van der Lee, 2020; Rutjens et al., 2022; Rutjens, van der Linden, et al., 2021).

### 2.3.2 | Religiosity

We asked participants to indicate how religious they were on a scale from 1 (*not religious at all*) to 7 (*very religious*).

### 2.3.3 | Religious orthodoxy

We used two items to measure this construct (adapted from Rutjens et al., 2018): “God has been defined for once and for all and therefore is immutable” and “Religion is the one thing that gives meaning to life in all its aspects” (Study 1:  $r = 0.66$ ; Study 2:  $r = 0.82$ ; Study 3:  $r = 0.83$ ).

### 2.3.4 | Political orientation

Participants responded to two questions about their political orientation: “People often refer to their political orientation in the context of the left- and right-wing spectrum. What is your political orientation on the left/right-wing dimension?” (1 = *left-wing*, 7 = *right-wing*), and “To what extent would you describe yourself as progressive or conservative?” (1 = *very progressive*, 7 = *very conservative*). We combined these variables into a single score (Study 1:  $r = 0.75$ ; Study 2:  $r = 0.72$ , Study 3:  $r = 0.74$ ).

### 2.3.5 | Science literacy test

In Study 1, we presented participants with 11 statements about science and asked them to judge whether they were true or false (adapted from Hayes & Tariq, 2009; Rutjens et al., 2018). Example items are: “All human-made chemicals can cause cancer”, “Electrons are smaller than atoms”, “Antibiotics kill viruses as well as bacteria.”

### 2.3.6 | Demographics

Participants were asked to indicate their gender (woman, men, other), age, years spent in formal education, subjective social-economic status, and whether they had science training (yes/no).

## 2.4 | Outcomes

### 2.4.1 | Desire to be vaccinated against Covid-19

We asked participants to express agreement with the statement: "I would like to be vaccinated against Covid-19." We measured this item across all studies.

### 2.4.2 | Scepticism towards Covid-19 prevention measures

Across Studies 2–3, participants were presented with the following statement first: "The statements below discuss the mandated Covid-19 prevention measures introduced by the government. By the prevention measures, we mean the current restrictions associated with social distancing, working from home as much as possible, avoiding socialising with people not living in your household, self-isolating after travelling abroad/or taking a Covid-19 test, temporary local and national lockdowns (e.g., pub/restaurants closure). Please indicate to what extent you agree with the statements below." We used the following statements: "The economic risks associated with Covid-19 prevention measures outweigh the health benefits," "Because there are so many unknowns associated with Covid-19, it is wise to follow the restrictions mentioned above" (reverse scored), "Covid-19 prevention measures are important in containing the virus spread" (reverse scored), "Covid-19 related restrictions violate people's freedom too much", "The severity of Covid-19 symptoms is overrated," "Covid-19 is just like the seasonal flu." (Study 2:  $\alpha = 0.91$ ; Study 3:  $\alpha = 0.90$ ).

### 2.4.3 | Intentions to comply with Covid-19 prevention measures

In Studies 2–3, we asked participants to indicate their intentions to comply with the official government measures to prevent the spread of Covid-19, including wearing a face covering: "I will wear a face covering in enclosed spaces (e.g., supermarket, public transport)," handwashing: "I will regularly wash my hands thoroughly," and distancing: "I will socially distance from strangers on the street."<sup>2</sup> On a scale from 1 (*very unlikely*) to 5 (*very likely*). We collapsed the items, such that higher scores indicated higher intentions to comply with the prevention measures (Study 2:  $\alpha = 0.71$ ; Study 3:  $\alpha = 0.61$ ).

## 3 | RESULTS

### 3.1 | Desire to be vaccinated

To test our predictions regarding desire to be vaccinated with a large sample of participants, we analysed the data across Studies one to three in a multilevel analysis. First, we identified 9 participants who took part in more than one study, and we excluded them from the analysis. Four participants had missing data for the question about religiosity, leaving the total sample size across all studies at 770.

Second, we conducted a multilevel multiple regression analysis of desire to get vaccinated against Covid-19.<sup>3</sup> We included *study* (Studies 1–3) as random intercepts and entered spirituality as the main predictor, with demographic and worldview variables as control predictors (see Table 2). There was no evidence of multicollinearity, VIF <5. As hypothesised, spirituality significantly predicted desire to be vaccinated against Covid-19, such that higher spirituality was associated with lower desire.

We also found that religiosity, age, socio-economic status, and science literacy were positively related to higher desire, whilst higher religious orthodoxy, political conservatism predicted lower desire to be vaccinated.

TABLE 2 Multilevel multiple regression analyses of desire to be vaccinated against Covid-19 in studies 1–3.

Predictors	$\beta$	95% CI	<i>p</i>
Age	0.20	0.13 to 0.27	0.001
Gender (0: men)	-0.00	-0.09 to 0.09	0.972
Socio-economic status	0.12	0.06 to 0.19	0.001
Education	0.01	-0.06 to 0.09	0.700
Science training (0: No)	0.01	-0.06 to 0.09	0.703
Science literacy	0.12	0.05 to 0.20	0.002
Political conservatism	-0.14	-0.22 to -0.07	0.001
Religiosity	0.17	0.04 to 0.29	0.008
Religious orthodoxy	-0.17	-0.29 to -0.05	0.005
Spirituality	-0.16	-0.25 to -0.08	0.001
Random effects			
$\sigma^2$	0.86		
$\tau_{00}$ study	0.06		
ICC	0.07		
$N_{\text{study}}$	3		
Observations	770		
Marginal $R^2$ /Conditional $R^2$	0.121/0.179		

### 3.2 | Scepticism towards prevention measures

Subsequently, we tested whether spirituality predicted higher scepticism towards Covid-19 prevention measures. To achieve this, we estimated a multilevel multiple regression model, with *study* (Studies 2–3) as random intercepts. Again, four participants did not respond to the question about religiosity, and hence were not included in the model, leaving the total sample of 581 participants. We did not find support for our hypothesis, as spirituality was not a significant predictor of scepticism towards prevention measures (see Table 3; VIF <5). Yet, stronger political conservatism, lower science literacy, and being younger predicted higher scepticism.

### 3.3 | Intentions to comply with prevention measures

Finally, we investigated whether spirituality contributed to lower intentions to comply with Covid-19 prevention measures, controlling for the same demographic and worldview variables as in the previous model. Again, we found no evidence to support the hypothesis (see Table 4; VIF <5). Age was the only other significant predictor, such that being older predicted higher intentions to comply. We also conducted analyses for each measure (handwashing, distancing, wearing a face covering) separately, after adjusting the alpha level to correct for multiple comparisons (see Online Supplemental Materials). In this analysis, we additionally found that higher political conservatism/right-wing ideology was associated specifically with lower intentions to comply with social distancing.

## 4 | DISCUSSION

The dramatic impact of science rejection on public health has been highlighted during the Covid-19 pandemic. Refusal to be vaccinated against Covid-19 as well as lack of adherence to Covid-19 prevention measures have led to increased preventable Covid-19 spread (e.g., Farrenkopf, 2022). This increased the fatality rate, but also the necessity

TABLE 3 Multilevel multiple regression analyses of scepticism towards Covid-19 preventive measures in studies 2–3.

Predictors	$\beta$	95% CI	<i>p</i>
Age	-0.27	-0.35 to -0.18	0.001
Gender (0: men)	-0.05	-0.16 to 0.05	0.302
Socio-economic status	0.05	-0.03 to 0.13	0.240
Education	-0.04	-0.12 to 0.05	0.412
Science training (0: No)	0.00	-0.08 to 0.09	0.942
Science literacy	-0.11	-0.20 to -0.02	0.015
Political conservatism	0.18	0.10 to 0.27	0.001
Religiosity	-0.13	-0.28 to 0.03	0.117
Religious orthodoxy	0.12	-0.03 to 0.27	0.130
Spirituality	0.08	-0.03 to 0.19	0.141
Random effects			
$\sigma^2$	0.91		
$\tau_{00 \text{ study}}$	0.01		
ICC	0.01		
$N_{\text{study}}$	2		
Observations	581		
Marginal $R^2$ /Conditional $R^2$	0.103/0.115		

TABLE 4 Multilevel multiple regression analyses of intentions to comply with Covid-19 prevention measures in studies 2–3.

Predictors	$\beta$	95% CI	<i>p</i>
Age	0.16	0.07 to 0.24	0.001
Gender (0: men)	0.04	-0.04 to 0.12	0.352
Socio-economic status	-0.04	-0.12 to 0.05	0.403
Education	0.07	-0.02 to 0.16	0.115
Science training (0: No)	-0.04	-0.13 to 0.05	0.352
Science literacy	-0.02	-0.11 to 0.07	0.725
Political conservatism	-0.08	-0.17 to 0.02	0.108
Religiosity	0.08	-0.09 to 0.24	0.350
Religious orthodoxy	-0.04	-0.19 to 0.11	0.606
Spirituality	-0.06	-0.18 to 0.05	0.255
Random effects			
$\sigma^2$	0.99		
$\tau_{00 \text{ study}}$	0.00		
$N_{\text{study}}$	2		
Observations	581		
Marginal $R^2$	0.029		



to maintain national lockdowns, resulting in economic losses. In the present manuscript, we investigated predictors of low intentions to engage in protective behaviours against Covid-19. We specifically focused on self-identified spirituality as an important contributor to such intentions. Indeed, controlling for worldviews and demographics, we found that high spirituality significantly contributed to decreased desire to be vaccinated against Covid-19. However, we found no evidence for spirituality to be involved in scepticism towards other Covid-19 prevention measures and intentions to follow them.

Our findings support and extend the previous literature in two important ways. First, using a large sample of participants across three studies, we corroborated previous cross-country evidence by demonstrating that high spirituality is linked to lower intentions to be vaccinated against Covid-19 (Martens & Rutjens, 2022; Rutjens et al., 2022; Zarzeczna et al., 2022). Given that spiritual beliefs have become more widespread in secular countries (De Hart, 2014; Pew Research, 2009; Ruiter & de Fijter, 2016), it is pivotal to take spiritual beliefs into account when designing interventions against vaccination misperceptions.

Second, we found no evidence to suggest that the adverse outcomes of spirituality extend to scepticism towards health measures or intentions to comply with them, pointing to the unique involvement of spirituality in vaccine rejection. It is possible that unlike vaccination, which to many people is counterintuitive (Rutjens & van der Lee, 2020; Shtulman, 2017), most Covid-19 prevention measures, such as handwashing or distancing, are not perceived as counterintuitive. As one important aspect of spirituality is a strong reliance on intuition to guide judgement, it is likely that spiritual individuals are particularly concerned with the more counterintuitive aspects of protective behaviours against COVID-19. Another possibility is that vaccines uniquely are perceived as unnatural or violating moral purity concerns. Such concerns have been shown to be another important aspect of the spiritual worldview (Billet et al., 2023) and may therefore also help explain the spirituality–vaccination rejection relationship. Future research should examine these mechanisms.

In terms of other predictors of scepticism towards Covid-19 measures, higher conservatism, lower science literacy, and being younger predicted higher scepticism towards the measures. Additionally, being younger was also associated with higher intentions to comply with the measures overall, whilst higher political conservatism predicted lower intentions to engage in social distancing in particular. This is in line with other studies demonstrating that conservative-leaning individuals were less likely than liberals to engage in distancing measures (Grossman et al., 2020). Possibly, this is because conservatives perceived Covid-19 as less threatening in general, while social distancing as a specific threat to freedom (Conway et al., 2021; Rutjens, van der Linden, et al., 2021; van der Linden, et al., 2021).

Beyond our main focus on self-identified spirituality, we also identified other worldviews and demographics to contribute to desire to be vaccinated. Interestingly, despite strong intercorrelations (but no multicollinearity), higher religiosity (but low religious orthodoxy) was associated with stronger desire to be vaccinated against Covid-19. This might suggest that different types of religious beliefs (e.g., orthodox vs. progressivist; Jensen, 1997) may have different outcomes when it comes to intentions to be vaccinated. We also found that stronger political liberalism, being older, as well as having higher socio-economic status, and science literacy contributed to stronger vaccination intentions.

To conclude, our findings corroborate and extend previous research demonstrating that spirituality is a robust and unique antecedent of low intentions to be vaccinated against Covid-19. Therefore, it is important to acknowledge the role of spirituality when designing interventions against low trust in vaccination among self-identifying spiritual individuals. We suggest that future research investigates the underlying mechanisms associated with the relationship between spirituality and science rejection. Such mechanisms could relate to faith in intuition, a strong focus on subjective experience, and naturalness bias.

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## CONFLICT OF INTEREST STATEMENT

We declare no conflicts of interest.

## DATA AVAILABILITY STATEMENT

Data and analyses code are available on OSF: [https://osf.io/z6hnb/?view\\_only=4c95660092f84c2ea9e67d4a9bd666c5](https://osf.io/z6hnb/?view_only=4c95660092f84c2ea9e67d4a9bd666c5).

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## ENDNOTES

- <sup>1</sup> The outcome measures reported in this manuscript were collected as part of larger projects aiming at understanding other science-related perceptions, not reported here (see Večkalov et al., 2022; Zarzeczna et al., 2022).
- <sup>2</sup> This measure was the most relevant during lockdown periods. Even though public spaces were closed (e.g., restaurants) during lockdowns, people were still advised to limit contact with strangers as much as possible; see <https://www.gov.uk/government/publications/covid-19-guidance-on-social-distancing-and-for-vulnerable-people/guidance-on-social-distancing-for-everyone-in-the-uk-and-protecting-older-people-and-vulnerable-adults>.
- <sup>3</sup> Zero-order correlations between all variables are included in Online Supplemental Materials.

## REFERENCES

- Bago, B., Rand, D. G., & Pennycook, G. (2020). Fake news, fast and slow: Deliberation reduces belief in false (but not true) news headlines. *Journal of Experimental Psychology: General*, 149(8), 1608–1613. <https://doi.org/10.1037/xge0000729>
- Billet, M. I., Baimel, A., Sahakari, S. S., Schaller, M., & Norenzayan, A. (2023). Ecospirituality: The psychology of moral concern for nature. *Journal of Environmental Psychology*, 87, 102001. <https://doi.org/10.1016/j.jenvp.2023.102001>
- Conway, L. G., Woodard, S. R., Zubrod, A., & Chan, L. (2021). Why are conservatives less concerned about the coronavirus (COVID-19) than liberals? Comparing political, experiential, and partisan messaging explanations. *Personality and Individual Differences*, 183, 111124. <https://doi.org/10.1016/j.paid.2021.111124>
- Curran, P. J., & Hussong, A. M. (2009). Integrative data analysis: The simultaneous analysis of multiple data sets. *Psychological Methods*, 14(2), 81–100. <https://doi.org/10.1037/a0015914>
- de Figueiredo, A., Simas, C., Karafillakis, E., Paterson, P., & Larson, H. J. (2020). Mapping global trends in vaccine confidence and investigating barriers to vaccine uptake: A large-scale retrospective temporal modelling study. *The Lancet*, 396(10255), 898–908. [https://doi.org/10.1016/S0140-6736\(20\)31558-0](https://doi.org/10.1016/S0140-6736(20)31558-0)
- DeHart, J. (2014). *Believing within and without context. Religious developments in The Netherlands*. Sociaal en Cultureel Planbureau.
- Farrenkopf, P. M. (2022). The cost of ignoring vaccines. *Yale Journal of Biology & Medicine*, 95(2), 265–269. PMID: 35782470; PMCID: PMC9235251.
- Gavin, L., McChesney, J., Tong, A., Sherlock, J., Foster, L., & Tomsa, S. (2022). Fighting the spread of COVID-19 misinformation in Kyrgyzstan, India, and the United States: How replicable are accuracy nudge interventions? *Technology, Mind, and Behavior*, 3(3). <https://doi.org/10.1037/tmb0000086>
- Grossman, G., Kim, S., Rexer, J. M., & Thirumurthy, H. (2020). Political partisanship influences behavioral responses to governors' recommendations for COVID-19 prevention in the United States. *Proceedings of the National Academy of Sciences*, 117(39), 24144–24153. <https://doi.org/10.1073/pnas.2007835117>
- Hanegraaff, W. J. (1996). *New age religion and Western culture: Esotericism in the mirror of secular thought*. BRILL. <https://doi.org/10.1163/9789004378933>
- Hayes, B. C., & Tariq, V. N. (2009). Gender differences in scientific knowledge and attitudes toward science: A comparative study of four Anglo-American nations. *Public Understanding of Science*, 9(4), 433–447. <https://doi.org/10.1088/0963-6625/9/4/306>
- Houtman, D., & Tromp, P. (2021). The post-Christian spirituality scale (PCSS): Misconceptions, obstacles, prospects. In A. L. Ai, P. Wink, R. F. Paloutzian, & K. A. Harris (Eds.), *Assessing spirituality in a diverse world* (pp. 35–57). Springer International Publishing. [https://doi.org/10.1007/978-3-030-52140-0\\_3](https://doi.org/10.1007/978-3-030-52140-0_3)
- Jensen, L. A. (1997). Culture wars: American moral divisions across the adult lifespan. *Journal of Adult Development*, 4(2), 107–121. <https://doi.org/10.1007/BF02510084>
- Martens, J. P., & Rutjens, B. T. (2022). Spirituality and religiosity contribute to ongoing COVID-19 vaccination rates: Comparing 195 regions around the world. *Vaccine X*, 12, 100241. <https://doi.org/10.1016/j.jvaxc.2022.100241>
- McPhetres, J., Rutjens, B. T., Weinstein, N., & Brisson, J. A. (2019). Modifying attitudes about modified foods: Increased knowledge leads to more positive attitudes. *Journal of Environmental Psychology*, 64, 21–29. <https://doi.org/10.1016/j.jenvp.2019.04.012>
- Pennycook, G., McPhetres, J., Zhang, Y., Lu, J. G., & Rand, D. G. (2020). Fighting COVID-19 misinformation on social media: Experimental evidence for a scalable accuracy-nudge intervention. *Psychological Science*, 31(7), 770–780. <https://doi.org/10.1177/0956797620939054>

- Pew Research. (2009). More Americans now say they're spiritual but not religious. Retrieved September 6, 2009, from <https://www.pewresearch.org/fact-tank/2017/09/06/more-americans-now-say-theyre-spiritual-but-notreligious/>
- Ruiter, P., & de Fijter, N. (2016). Grenzen tussen religie, spiritualiteit en zingeving vervagen. *Trouw*, March 13. <https://www.trouw.nl/nieuws/grenzen-tussen-religie-spiritualiteit-en-zingeving-vervagen-b3c513b0/12>
- Rutjens, B. T., Sengupta, N., der Lee, R., van Koningsbruggen, G. M., Martens, J. P., Rabelo, A., & Sutton, R. M. (2022). Science skepticism across 24 countries. *Social Psychological and Personality Science*, 13(1), 102–117. <https://doi.org/10.1177/19485506211001329>
- Rutjens, B. T., Sutton, R. M., & van der Lee, R. (2018). Not all skepticism is equal: Exploring the ideological antecedents of science acceptance and rejection. *Personality and Social Psychology Bulletin*, 44(3), 384–405. <https://doi.org/10.1177/0146167217741314>
- Rutjens, B. T., & van der Lee, R. (2020). Spiritual skepticism? Heterogeneous science skepticism in the Netherlands. *Public Understanding of Science*, 29(3), 335–352. <https://doi.org/10.1177/0963662520908534>
- Rutjens, B. T., van der Linden, S., van der Lee, R., & Zarzczyzna, N. (2021). A group processes approach to antiscience beliefs and endorsement of “alternative facts”. *Group Processes & Intergroup Relations*, 24(4), 513–517. <https://doi.org/10.1177/13684302211009708>
- Rutjens, B. T., Zarzczyzna, N., & van der Lee, R. (2021). Science rejection in Greece: Spirituality predicts vaccine scepticism and low faith in science in a Greek sample. *Public Understanding of Science*, 096366252110615. <https://doi.org/10.1177/09636625211061520>
- Shtulman, A. (2017). *Scienceblind: Why our intuitive theories about the world are so often wrong*. Basic Books.
- van der Linden, S., Dixon, G., Clarke, C., & Cook, J. (2021). Inoculating against COVID-19 vaccine misinformation. *EclinicalMedicine*, 33, 100772. <https://doi.org/10.1016/j.eclinm.2021.100772>
- van Stekelenburg, A., Schaap, G., Veling, H., & Buijzen, M. (2021). Boosting understanding and identification of scientific consensus can help to correct false beliefs. *Psychological Science*, 32(10), 1549–1565. <https://doi.org/10.1177/09567976211007788>
- Večkalov, B., Zarzczyzna, N., McPhetres, J., van Harreveld, F., & Rutjens, B. T. (2022). Psychological distance to science as a predictor of science skepticism across domains. *Personality and Social Psychology Bulletin*, 014616722211181. <https://doi.org/10.1177/01461672221118184>
- Wong, Y.-L. R., & Vinsky, J. (2009). Speaking from the margins: A critical reflection on the ‘Spiritual-but-not-religious’ discourse in social work. *British Journal of Social Work*, 39(7), 1343–1359. JSTOR. <https://doi.org/10.1093/bjsw/bcn032>. <http://www.jstor.org/stable/23724439>
- Zarzczyzna, N., Bertlich, T., Večkalov, B., & Rutjens, B. T. (2022). Spirituality is associated with Covid-19 vaccination scepticism. *Vaccine*, 41(1), 226–235. S0264410X22014633. <https://doi.org/10.1016/j.vaccine.2022.11.050>
- Zarzczyzna, N., Večkalov, B., Gligorić, V., & Rutjens, B. T. (2021). Letter to the editors of psychological science: Boosting understanding is unlikely to correct false beliefs about most science domains: Regarding van Stekelenburg et al. (2021). *Psychological Science*. <https://doi.org/10.25384/SAGE.16640672.V2>

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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