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Reasoning ability predicts irrational worldview but not conspiracy belief

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Abstract

Previous research showed that individual tendency to believe in conspiracy theories is related to numerous social, personality, and cognitive variables. Moreover, such a tendency may reflect a broader trait for epistemic irrationality, which drives other pseudoscientific and paranormal beliefs. However, the relationship between conspiracy belief and reasoning ability (fluid intelligence; *Gf*) was not sufficiently studied to date, even though *Gf* level strongly influence the way in which individuals think and reason. Using confirmatory factor analysis, we found the robust link between conspiracy belief and other irrational beliefs. All those irrational beliefs were also substantially related to the close-minded cognitive style. However, even though *Gf* significantly predicted other irrational beliefs, it explained less than 2% of variance in conspiracy belief. This result suggests that effective reasoning cannot prevent even highly intelligent people from endorsing conspiracy theories.

Keywords: rationality; intelligence; conspiracy theory; paranormal beliefs; pseudoscience;

Introduction

Conspiracy theory is an explanation of a significant event, like the sudden death of famous person, terrorists attack, or catastrophe, as resulting from some secret plot made by a powerful organization or a group of powerful individuals. Although, in principle, such theories may be true (e.g., the Watergate scandal), usually they are insufficiently supported by facts, disregarded by experts, and based on pseudoscientific assumptions.

Importantly, the belief in conspiracy theories (henceforth, conspiracy belief) pertains not only to advocates of extreme ideologies or to paranoid and delusional individuals, but is prevalent in diverse cultures and societies (Raab, Ortlieb, Auer, Guthmann, & Carbon, 2013). Although to date most of research on the topic was conducted in Western countries, some studies showed that conspiracy belief is a widespread phenomenon among people all over the world (e.g. Raab et.al., 2013; Goertzel, 1994; Swami et al., 2011; Bruder, Haffke, Neave, Nouripanah, & Imhoff, 2013).

Certain people are more likely to hold conspiracy belief than others. What is important, this tendency may be a part of more general mindset, worldview or mentality (Goertzel, 1994; Dagnall, Drinkwater, Parker, Denovan, & Parton, 2015; Imhoff & Bruder, 2014). People who believe in one conspiracy theory are also more likely to believe in another one, even if the theories are unrelated (Swami, Chamorro-

Premuzic, & Furnham, 2010), contradictory (Wood, Douglas, & Sutton, 2012), or the second one is fictional and encountered for the first time (Swami et al., 2011). Such a kind of conspiratorial mentality was associated with numerous socio-psychological variables, including anomie, powerlessness, feeling of meaninglessness, distrust, authoritarianism, political cynicism, low self-esteem, and schizotypy (Goertzel, 1994; Abalakina-Paap, Stephan, Craig, & Gregory, 1999; Swami et al., 2010; Swami et al., 2011). Moreover, conspiracy belief is closely related to other epistemically dubious beliefs, like paranormal and pseudoscientific claims and theories (Lobato, Mendoza, Sims, & Chin, 2014). Altogether, paranormal, pseudoscientific, and conspiracy beliefs may result from one and the same irrational worldview/mindset.

The problem that we investigated was how are various instances of irrational thought, and particularly conspiracy belief, related to reasoning ability (fluid intelligence; *Gf*), which is defined as the ability to solve novel problems by means of abstract reasoning. As *Gf* strongly predicts many socio-psychological variables (see Deary, 2012), can *Gf* also predict individual tendency for irrational beliefs? At least intuitively, it seemed reasonable to expect that more intelligent people, because of their more powerful reasoning, would be more sceptical toward dubious, unsupported beliefs, including conspiracy theories. Besides intuition, numerous premises can be found in existing literature.

First, positive correlations between intuitive thinking style and conspiracy belief were reported. Also, experimentally induced willingness to engage in analytic reasoning reduced this belief (Swami, Voracek, Stieger, Tran, & Furnham, 2014). Thus, a disposition for reflective thinking may help to embrace more sceptical stance towards irrational claims and theories, and may affect one's worldview even counter to cultural factors (Pennycook, Fugelsang, & Koehler, 2015). Moreover, tendency for analytic thinking may prevent people from relying on intuitions and "gut feelings" that often lead to cognitive biases and heuristics, which may, at least to some extent, drive conspiracy belief. For example, Clarke (2002) argued that such a belief may stem from attribution bias, which consists of overestimating the influence of personal factors, and ascribing responsibility primarily to agents, instead of explaining events in terms of situational factors and coincidence. Likewise, it was argued that this belief may be related to representativeness heuristic, which leads people to seek explanations that

possess salience proportional to the very significance of events (Leman & Cinnirella, 2007). Since major events need major explanations, people may see ordinary causes of great-impact events as unsatisfying and thus unlikely, and thus may embrace conspiracy theories instead. Finally, Brotherton and French (2014) showed the people displaying conspiratorial mentality to be more prone to conjunction fallacy, which is a reasoning error consisting of assessing the probability of two co-occurring events as being more likely than the joint probability that these events will occur alone. As the tendency for analytical thinking is at least moderately related to intelligence (Pennycook et al., 2015), a negative relationship between intelligence and conspiracy belief may also exist.

On the other hand, the relationship between intelligence and biased/irrational thinking is not straightforward. Although some biases might be attenuated by higher reasoning ability, some may not be related to intelligence at all (Stanovich & West, 2008). High reasoning ability may not be enough to prevent people from embracing dubious theories. A research program aimed at understanding the relationship between intelligence and rationality, started by Stanovich, put emphasis on the need to distinguish between these two mental qualities. Although there can be a positive relationship between the two, what is essential for rationality may be such thinking dispositions as the willingness to think reflectively and open-mindedly. Consistently, the relationship between intelligence and irrational beliefs might be at least partially mediated by cognitive style. Although such a possible mediation so far has never been studied in the context of conspiracy theories, some supporting evidence comes from studies on paranormal and religious beliefs (Pennycook, 2014).

Finally, studies showed a moderate negative link between paranormal/pseudoscientific beliefs and intelligence (e.g., Rindermann, Falkenhayn, & Baumeister, 2014), but the relationship between intelligence and conspiracy belief in conspiracies has not been studied sufficiently enough.

Only one study to date examined this relationship (Swami et al., 2011). First, it showed a negative, though weak, correlation between conspiracy belief and self-assessed intelligence. However, this result does not seem reliable, as this measure of intelligence had low validity. Second, the study reported weak negative correlation of conspiracy belief and crystallized intelligence (G_c) – the ability to use acquired experience and knowledge. However, G_f may be even more important for the rejection of conspiracy theories than G_c , because higher G_f levels allow more effective processing of relations among objects, events, and facts (Chuderski, 2014). Such relations can be used to create counterexamples in a reasoning process (Johnson-Laird, 2006).

Study

The main goal of the study was to fill in the gap in existing data on the relationship between G_f and conspiracy belief. We expected reasoning ability to at least weakly predict

belief in conspiracy theories. Furthermore, we intended to replicate the results that show moderate positive correlations between different kinds of dubious beliefs: conspiracy, paranormal, as well as pseudoscientific ones (Labato et al., 2014; Brotherton & French, 2014; Swami et al., 2011).

In order to test the strength of the conspiracy-reasoning link as well as to examine the strength of relationship between conspiracy and paranormal/pseudoscientific belief we used multiple measures of each belief, as well as we applied latent variable modelling by means of confirmatory factor analysis (CFA). Applying more than one measure of each construct and calculating latent variables enables a more valid and reliable measurement of the constructs in question as well as the relationships between them, as compared to using single measures (see Kline, 1998).

We applied two measures of conspiracy belief to a large sample of Polish adults. Because many conspiracy theories are strongly culture-specific, one scale was created to measure belief in a particular conspiracy theory pertaining to political situation in Poland: the theory about catastrophe in Smolensk. The Smolensk conspiracy is probably the most distinctive case of conspiracy theory in the Polish society, and it is similar to conspiratorial themes that are vivid in other societies (e.g., the death of President Kennedy and Princess Diana). However, it is possible that some specific factors may play a crucial role for the Smolensk conspiracy (e.g. most of its advocates are right-wing/conservative), which might not drive other conspiracy theories, and which thus may bias the relationship between reasoning ability and conspiracy belief. To avoid such a bias, we also applied a measure of general conspiratorial beliefs and attitudes – The Generic Conspiracist Beliefs Scale (GCB) (Brotherton et al., 2014). Importantly, GCB does not concern any particular conspiracy theory, but deals with common conspiratorial themes (e.g. governments totally controlling the information flow), that enables broader generalization of the results. Also, we used one questionnaire to measure paranormal beliefs, and another for pseudoscientific beliefs.

In addition, we measured open-minded cognitive style, understood as mental flexibility and openness toward the alternative views, perspectives, and counter-evidence. To do so we applied two questionnaires: NEO-openness subscale and open-minded thinking scale. Open-minded thinking was previously shown to be negatively (though rather weakly) related to conspiracy belief (Swami et al., 2014). Finally, G_f was measured with two visuospatial tests and one numerical test that involved abstract reasoning.

Method

Participants

A total of 318 voluntary participants (218 women, 100 men) were recruited via ads in publicly accessible websites. The participants were paid an equivalent of 20 euros in Polish currency. The mean age was 24.4 years ($SD = 6.02$, range 18 - 45). Four participants did not complete all the applied questionnaires and were excluded from the analysis.

Materials

Smolensk Conspiracy Scale

Conspiracy theories are cultural phenomena. Studying particular conspiracy theories requires that the participants are familiar with them and their cultural context. Our choice of a theme for well-known conspiracy theory was the 2010 catastrophe in Smolensk (the Russian Federation), in which the Polish President's plane crashed, and all of the 96 crew and passengers, including President Lech Kaczynski, died. The Smolensk catastrophe was judged by official aviation experts (PCINAA, 2011) to result from the pilot's error as well as the improper organization of the flight. The crash had a specific political context: The death of President Kaczynski, who travelled across Russian territory, in order to commemorate Polish officers killed by Soviets during WWII, despite his tense political relations with the Russian government of President Vladimir Putin. Furthermore, President Kaczynski and his conservative camp strongly opposed the Polish government and its supporting liberal party, while the presidential campaign in Poland was about to start. All of this made an excellent context for various accusations and plot hypotheses, even though the explanation of the catastrophe is straightforward. Consequently, five years after the catastrophe, a public opinion survey (CBOS, 2015) showed that about 30% members of the Polish society considered the hypothesis of assassination of Lech Kaczynski plausible (among them 8% were convinced it was true). Thus, the Smolensk catastrophe made a crucial and interesting case of conspiracy belief (henceforth we call it the Smolensk conspiracy). So, a twelve-item questionnaire was developed, with seven items measuring belief in the Smolensk conspiracy, and five reverse-scored items probing belief in the official explanation of the catastrophe.

The Generic Conspiracist Beliefs scale

We used the validated 15-item scale of Brotherton et al. (2014) to measure the general tendency for conspiracy belief. The scale covers general conspiratorial assumptions such as beliefs in prevalent government misconduct, secret groups exerting the control over global events, dangers to personal health and liberties (e.g., the mind control experiments), extraterrestrial cover-up, and the full censorship over information. The sample item was "The governments are involved in the murder of innocent citizens and/or well-known public figures, and keep this a secret".

Pseudoscientific Belief Scale

We created an 18-item questionnaire to measure pseudo-science belief and disapproval of scientific knowledge. The items covered range of topics (medicine/health, natural science, evolution, psychology, sexuality), and were mixed with 9 filler items dealing with general scientific knowledge. Sample test items were "Mercury in vaccines may increase probability of acquiring autism among small children" and "Crystals possess qualities which protect against negative influence of electromagnetic radiation".

Paranormal Belief Scale

Our measure of paranormal belief was based on Revised Paranormal Belief Scale (Tobacyk, 2004). We removed four items concerning religious belief, as we applied a separate religious beliefs questionnaire in the session (not analysed in the present study). We removed another three items concerning extra-ordinary life forms (e.g. Loch Ness monster), as being outdated and possibly unfamiliar to our participants. The final version contained 20 items such as "In some cases it is possible to communicate with the dead".

Fluid intelligence tests

We applied three Gf tests. The classic Gf test – Raven's Advanced Matrices (Raven, Court, & Raven, 1983), as well as Figural Analogies (Chuderski & Necka, 2012), were administered in shortened versions (18 items each). Each of the two tests was composed of odd numbered items from respective standard 36-item versions. Their administration time was half of the standard one (20 and 15 minutes respectively). The third test was Number series, in which the task was to find the rule according to which the number sequence or the array is constructed, and to complete the sequence/array with the missing number. Participants were given 18 minutes to solve the 18 number series problems.

Open-mindedness cognitive style questionnaires

The first questionnaire measuring open-minded thinking included 14 items from Actively Open-minded Thinking scale (Stanovich & West, 2007), selected on the basis of our previous data. All 14 items were scored in such a way that higher scores represented a larger tendency toward rigid, dogmatic, categorical thinking, as well as the trend for sticking to one's beliefs even in the face of counterevidence (e.g., "Changing your mind is a sign of weakness"). The total score on the scale was reversed, so that higher total scores indicated more open-minded, flexible thinking. The second questionnaire was an 12-item openness to experience subscale of the Polish adaptation of the NEO-Five Factor Inventory (Costa & McCrae, 1992).

In all of the questionnaires except the cognitive style measures, participants judged whether the given statements are true or false using a seven-point scale (0 = *false for sure*, 3 = *uncertain*, 6 = *true for sure*). Five-point (1 = *definitely disagree*, 5 = *definitely agree*) and a four-point scale were used in the Open-minded Thinking and the NEO-openness scales, respectively.

Procedure

Participants were tested in a psychological laboratory, in groups of six participants on average. The Gf tests were applied in the fixed order (Raven APM, Figural Analogy Test, Number series test). All the questionnaires were completed via computers at the end of the study session. At the course of the session participants completed other tasks (working memory and cognitive control tests, religiosity questionnaires, etc.) unrelated to the topic of this study.

Results

All the measures applied had at least satisfactory internal consistency (Cronbach's alphas > .71), including Smolensk conspiracy and GCB scales (Cronbach's alpha = .88, and .94, respectively), and all of them fitted well the normal distribution (max. skew = -0.28, max. kurtosis = -0.82).

Firstly, the endorsement of the most extreme form of conspiracy theory, the assassination theory, was examined. Answers on the respective item ("The cause of the catastrophe was an assassination.") of the Smolensk Conspiracy scale showed that about 10% ($N = 32$) of the participants considered it a possible option (answered "*it is probably true*"), 5% ($N = 16$) answered "*it is true*", and 4% ($N = 12$) answered "*it is true for sure*". Thus, the support for Smolensk conspiracy in our sample was rather low.

The CFA model (Figure 1) correlated four latent variables: Conspiracy Belief (loading Smolensk Conspiracy scale and GCB), Irrational Belief (Paranormal and Pseudoscience), Gf (the three reasoning tests), and Open-mindedness (NEO-openness and Open-minded Thinking).

The model fit was assessed with three indices (see Kline, 1998): χ^2 statistic (its value divided by the number of degrees of freedom should not exceed $\chi^2/df = 2.0$), Bentler's comparative fit index (CFI should exceed .92), and the root mean square error of approximation (RMSEA should be less than .08). The fit of the model was good: $\chi^2(21) = 36.01$, CFI = .981, RMSEA = .047 (90% CI = [.017, .074]).

All factor loadings (see Table 1) showed satisfactory validity of the applied measures, except for NEO-openness. Importantly, belief in Smolensk conspiracy was substantially related to GCB. Thus, Smolensk Conspiracy scale seems to be a valid measure of conspiracy belief.

In line with our expectations, the correlation between the Conspiracy Belief and Irrational Belief factors was strong, $r = .72$, $p < .001$. However, the negative link between the Conspiracy Belief and Gf was very weak ($r = -.13$), and despite our large sample it was not statistically significant ($p = .08$). Thus, Gf predicted only a negligible amount of variance (2%) in conspiracy belief. However, as expected, there was a negative correlation between Gf and Irrational Belief, $r = -.31$, $p < .001$. In addition, the open-minded

cognitive style showed the substantial negative correlation with Conspiracy Belief and Irrational Beliefs. Thus cognitive style was a much stronger predictor of conspiracy and irrational beliefs than Gf.

Discussion

We aimed to test whether conspiracy belief weakens with an increased reasoning ability (Gf). Contrary to our expectations, results showed that it virtually did not; Gf explained less than 2% of variance in conspiracy belief, and despite our large sample the link was not significant. On the other hand, Gf predicted about 9% of variance in paranormal and pseudoscience belief. Although the relationship was weaker than in previous studies, it is in line with these studies (Rindermann, Falkenhayn, & Baumeister, 2014). Moreover, irrational beliefs shared half of variance with conspiracy belief, also replicating similar findings (Lobato et al., 2014; Brotherton & French, 2014; Swami et al., 2011).

The robust relationship between conspiratorial, paranormal, and pseudoscientific beliefs suggests that they rely on a common underlying mindset/worldview, which reflects the tendency to believe in irrational, epistemically dubious claims and theories. There probably are specific social and cognitive factors (e.g. anomie, political cynicism, distrust, radicalism) that seem to induce the conspiratorial mindset, and, to a lesser extent, the other kinds of dubious beliefs. However, the general tendency to believe in the irrational most likely stems primarily from interrelated personality traits and thinking dispositions, such as intuitive thinking and close-mindedness (the latter shown by the present data).

If so, why is conspiracy belief unrelated to Gf, as compared to paranormal and pseudoscientific beliefs? First, although more intelligent people more frequently hold to proper scientific explanations of facts (what makes them less likely to believe in pseudoscience), most of conspiracies (also the Smolensk conspiracy) needn't be inconsistent with the body of scientific knowledge (though are unsupported by facts). Plots, evil politicians, and secret organisations undoubtedly exist, but usually they are not the reasonable

Table 1. Factor loadings from the CFA model (all $ps < .001$)

Latent variable	Measure	Factor loading
Gf	Raven Matrices	0.84
	Analogies	0.78
	Numbers	0.66
Irrational Belief	Pseudoscience	0.84
	Paranormal	0.74
Conspiracy Belief	Generic conspiracist beliefs	0.87
	Smolensk conspiracy	0.50
Open-mindedness	NEO-openness	0.36
	Open-minded thinking	0.96

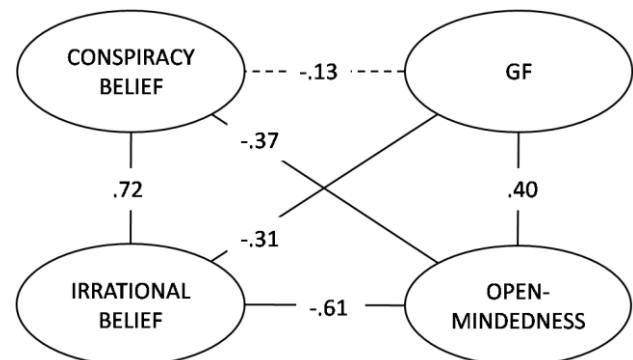


Figure 1. Correlations between four latent variables in the CFA model. All correlation are significant at $ps < .001$, except for the one presented in the dashed line.

explanations of complex phenomena. Thus, even though intelligent people may easily suppress their intuitions favouring paranormal/unscientific phenomena as being unlikely and contradicting the general scientific knowledge, they may let their intuitions about political/social issues develop more freely.

Second, endorsing conspiracy theories may be seen as a process of motivated reasoning (Kunda et al., 1990; Saunders, State, & Farhart, 2016), which is a kind of biased reasoning directed by motivation to arrive at the desired conclusions. In context of conspiracy theories, this process may satisfy the ideological and psychological needs such as the loyalty toward ideological groups (Saunders, State, & Farhart, 2016). Conspiracy belief seems to be strongly motivated personally as well as engaging, as it touches the basic political and social opinions and values. Thus, people may have stronger motivation to rationalize their conspiracy beliefs, comparing to paranormal or pseudoscientific beliefs. Importantly, myside/confirmation bias – the tendency to evaluate and provide arguments in a manner biased towards our own views – is basically unrelated to intelligence (Stanovich, West, & Toplak, 2013). Also, the more subjectively important the issue, the more strongly motivated the reasoning process becomes. Thus, intelligent and curious individuals may perform better at finding quality arguments supporting their worldview and prior beliefs, but they are not more inclined to objectively consider counterevidence and alternative perspectives, especially in cases of highly engaging issues. Moreover, more politically knowledgeable individuals may be even more likely to embrace conspiracy theories than the less knowledgeable ones (Saunders et al., 2016). Similarly, although providing relevant scientific information may change people's opinion on global warming (Ranney & Clark, 2016), general scientific literacy/numeracy is unrelated to differences in opinion on global warming risk, but is related to a greater opinion polarization on the issue (Kahan et al., 2012). The opinion is instead well predicted by different values sets/worldviews. Also, at least in some cases, a high level of reasoning ability/reflective thinking may actually lead to more motivated reasoning (Kahan, 2013), and thus leading to greater polarization of prior beliefs, rather than alleviating their influence. To sum up, whether an individual embraces a conspiracy theory may be primarily dependent on his/her prior worldview and mindset, which directs the reasoning process to conclusions consistent with this worldview, and high intelligence may rather serve this process instead of hindering it. Consequently, sheer high intelligence may not be enough to prevent people from endorsing dubious conspiracy theories. Even some highly intelligent individuals may believe in conspiracies, as did some of our participants who scored really high on intelligence tests, but regardless of their high ability believed in assassination as the major cause of the Smolensk catastrophe.

More generally, our results serve as another example that intelligence and rationality should be treated as dissociable constructs (see Stanovich et al., 2013). Although some

irrationality indices (e.g., paranormal and pseudoscience) may be moderately related to intelligence, other may be weakly related, as probably is in the case of at least some conspiracy beliefs.

On the other hand, we should notice that conspiracy theories are not homogenous phenomena, and are also not irrational by definition. In some cases lack of healthy skepticism toward official information from seemingly reliable sources may be as harmful as unreflective belief in dubious conspiracy theories, and thus we do not think the less ones score on a conspiracy questionnaire the better. However, confidence in questionable conspiracy beliefs may be interpreted as irrational, as is confidence in dubious paranormal or pseudoscientific beliefs. Secondly, although we think that use of two measures of conspiracy belief dealing with different conspiratorial attitudes and beliefs provides a good measure of general conspiratorial mindset, we cannot exclude that the relation between belief in conspiracies and cognitive dispositions might be different in cases of some particular conspiracy theories.

In conclusion, our results make an important contribution to the conspiracy and rationality research, by showing conspiracy belief to be virtually unrelated to reasoning ability. Given the present data as well as numerous other cognitive, social, and personality variables that play role in prevalence of such complex socio-cultural phenomena as conspiracy theories, it seems that intelligence alone cannot prevent people from believing in conspiracy theories. Additionally, they provide more evidence for the strong conspiracy-irrationality relationship, supporting the view that the individual tendency to think in an irrational/conspiratorial way may constitute a stable and important personality trait/cognitive style.

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