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The Role of Age, Gender and Education in the Relationship Between Critical Thinking and Conspiracy Belief Susceptibility

ABSTRACT

The article examines the relationship between critical thinking and susceptibility to conspiracy theories in the context of demographic factors such as age, gender, and both the level and type of education. The study, conducted on a sample of 531 participants using the Computer-Assisted Web Interviewing (CAWI) method, indicates that lower levels of critical thinking are associated with greater acceptance of conspiratorial narratives, which has significant implications for education and the functioning of contemporary media culture. The results show that this phenomenon is particularly pronounced among individuals with a background in the humanities and in certain age groups, possibly reflecting differences in how information is acquired and interpreted. The article contributes to the interdisciplinary debate on the role of education and media literacy in building resilience to disinformation, offering new perspectives for research in cultural studies, media studies, and the philosophy of culture. The findings emphasize the need for targeted educational strategies aimed

at developing critical thinking skills, which may be crucial in counteracting the influence of conspiracy theories on contemporary societies.

KEYWORDS: conspiracy theories, critical thinking, COVID-19, education

STRESZCZENIE

Wiek, płeć i wykształcenie a związek między krytycznym myśleniem a podatnością na wierzenia spiskowe

Artykuł analizuje relację między myśleniem krytycznym a podatnością na teorie spiskowe w kontekście czynników demograficznych, takich jak wiek, płeć oraz poziom i typ wykształcenia. Badanie, przeprowadzone na próbie 531 uczestników z wykorzystaniem metody CAWI, wskazuje, że niższy poziom myślenia krytycznego sprzyja większej akceptacji narracji spiskowych, co ma istotne konsekwencje dla edukacji i funkcjonowania współczesnej kultury medialnej. Wyniki pokazują, że zjawisko to jest szczególnie widoczne wśród osób z wykształceniem humanistycznym oraz w określonych grupach wiekowych, co może wynikać z różnic w sposobach przyswajania i interpretowania informacji. Artykuł wpisuje się w interdyscyplinarną debatę na temat roli edukacji i kompetencji medialnych w kształtowaniu odporności na dezinformację, oferując nowe perspektywy dla badań z zakresu kulturoznawstwa, medioznawstwa oraz filozofii kultury. Przedstawione wnioski podkreślają konieczność wdrażania ukierunkowanych strategii edukacyjnych wspierających rozwój myślenia krytycznego, co może mieć kluczowe znaczenie w przeciwdziałaniu wpływowi teorii spiskowych na współczesne społeczeństwa.

SŁOWA KLUCZE: teorie spiskowe, krytyczne myślenie, COVID-19, edukacja

Introduction

Contemporary societies face a growing threat of disinformation that affects democratic processes, public health, and the functioning of social institutions. Crises, whether health-related, social, or psychological, disrupt societal norms and create uncertainty, driving individuals to seek simple explanations. This tendency can lead to an increased acceptance of conspiracy theories, particularly during periods of instability such as the COVID-19 pandemic. In these contexts, false narratives offer a perceived sense of control and coherence, albeit at the expense of empirical accuracy.

Education and critical thinking are crucial tools in countering this trend. Research has shown that individuals with higher education and critical thinking skills are better equipped to evaluate information critically, reducing susceptibility to false narratives. The authors' own research presented in the article

examines the interplay between critical thinking and belief in conspiracy theories, exploring how demographic factors such as age, gender, and education influence this relationship. By addressing the role of individual traits in conspiracy theory susceptibility, this research aims to contribute significantly to the interdisciplinary debate on the role of critical thinking in forming beliefs and susceptibility to disinformation.

Critical Thinking

Brook Moore and Richard Parker (2009, p. 2) emphasize that critical thinking is "our primary tool in making better judgments." It is foundational for logical reasoning, effective problem-solving, and informed decision-making. The roots of critical thinking can be traced to philosophical traditions such as critical rationalism. As articulated by Popper, it combines skepticism and rationality, positing that all knowledge is provisional and open to revision in light of new evidence. This approach underscores the importance of logical reasoning as a cornerstone of critical thinking and emphasizes the iterative nature of scientific inquiry.

Critical thinking is defined as control over cognitive processes and is understood as the prevalence of these processes over automatic ones (Czerwonka, 2016). Modern approaches to critical thinking emphasize three foundational components: evidence-based evaluation, inductive or deductive reasoning, and structured problem-solving (Abrami, Bernard, Borokhovski, Waddington, Wade, & Persson, 2015). Evidence-based evaluation involves scrutinizing the validity of information through rigorous analysis and empirical verification. Inductive and deductive reasoning are core to drawing valid conclusions. Effective problem-solving demands the integration of reasoning and creativity. These components enable individuals to assess claims critically, mitigating biases and enhancing decision-making quality in both academic and everyday contexts (Holmes, Wieman, & Bonn, 2015).

Creating Beliefs about Reality

Constructing beliefs about reality is an inherently cognitive process influenced by both automatic and controlled thinking mechanisms. Research shows that beliefs can develop as a result of personal experiences and social interactions, highlighting their role as an interpretive framework of reality (Fazio & Petty, 2019). In the context of conspiracy theories, individuals with low levels of trust in institutions are more susceptible to misinformation, as confirmed by research by Karen Douglas and Robbie Sutton (2018). Belief in conspiracy theories has

been found to be negatively correlated with age (Bordeleau & Stockemer, 2014) and with low levels of education (Stockemer, 2023).

Beliefs strongly influence behavior, and thus individuals often make decisions that are consistent with their prior interpretations, even if those beliefs are wrong (Imhoff & Bruder, 2014). This cognitive vulnerability is exacerbated by reliance on intuitive thinking rather than analytical reasoning, which has been shown to correlate with a higher likelihood of endorsing conspiracy claims and thinking (Vranić, Hromatko, & Tonković, 2022).

Research indicates that conspiracy and pseudoscientific beliefs are interrelated, and both are rooted in shared cognitive predispositions such as ontological confusions and susceptibility to intuitive over analytical thinking (Šrol, Mikušková, & Čavojová, 2021). The prevalence of such beliefs has been amplified during societal crises such as the COVID-19 pandemic, where a lack of trust in scientific institutions and overconfidence in personal reasoning abilities fueled the spread of conspiracy theories (Teovanović, Lukić, Zupan, Lazić, Ninković, & Žeželj, 2020).

Conspiracy and Critical Thinking in Education

Intuitive thinking sometimes includes elements labeled as pseudoscientific and serves as a psychological adaptation mechanism, particularly during crises. Psychological research demonstrates that belief systems, including those that deviate from empirical standards, may help individuals cope with uncertainty or regain a sense of control in adverse situations (Kay, Whitson, Gaucher, & Galinsky, 2009; Šrol et al., 2021). Intuitive thinking often supports reasoning and learning processes in education, however, it cannot dominate intellectual processes based on facts and critical thinking. Studies consistently show that individuals with lower levels of education or limited critical thinking abilities are more susceptible to conspiracy theories and misinformation, as they may lack the tools to evaluate information critically or identify reliable sources properly (Swami, Chamorro-Premuzic, & Furnham, 2010; Pennycook & Rand, 2020).

In an educational context, critical thinking is not only a skill but also a pedagogical principle: higher education aims to cultivate critical thinkers capable of questioning assumptions and engaging in evidence-based reasoning. Critical thinking is a vital competency for both academic success and practical decision-making. Its importance lies in fostering skepticism, supporting evidence-based discussions, and countering misinformation. However, achieving these outcomes requires deliberate educational strategies and a critical assessment of whether current pedagogical models are sufficient to produce the outcomes desired.

Critical thinking is not only a skill essential for academic contexts but also highly beneficial in everyday life, where individuals must navigate complex and often contradictory information. As Robert DiYanni and Anton Borst (2020) asserted, critical thinking enables purposeful, logical, and evidence-based decision-making, equipping individuals to engage with societal challenges thoughtfully and constructively. Laila Cekule and Andrejs Cekuls (2022) demonstrated the fundamental role of information analysis and synthesis in the outcome of a decision-making process. James Wilson (2018) proved that the course in critical thinking and scientific methods may significantly reduce belief in paranormal phenomena and pseudoscientific explanations among participants. Fostering critical thinking requires deliberate educational strategies that encourage students to question, analyze, and engage with diverse perspectives. By emphasizing these components, critical thinking serves as a foundation for lifelong learning and informed decision-making.

The Significance of the Study

The significance of the presented authors' own research stems from its novel approach, as it is one of the few studies to simultaneously analyze the relationship between critical thinking and belief in conspiracy theories while also considering a broad set of demographic variables, including the type and level of education.

Research on beliefs in conspiracy theories and on critical thinking is essential for understanding the social and psychological dynamics that shape attitudes and behaviors. This understanding underscores the need for interdisciplinary approaches that integrate psychological, social, and educational perspectives to effectively address the societal impact of crises as well as the educational impact of belief in conspiracy theories. By examining these factors in tandem, researchers can develop targeted interventions to support critical thinking and reduce the influence of false narratives in times of uncertainty.

Therefore, the presented study was designed to investigate differences in the level of belief in conspiracy theories among groups differentiated by critical thinking level and demographic factors such as age, gender, and both the level and type of education.

Method

Objectives and Research Hypotheses

The main aim of the study was to investigate the connection between belief in conspiracy theories and critical thinking, considering variables such as gender, age, and education level and type. The literature findings presented show that both demographic variables and critical thinking level are connected to belief in conspiracy theories. The novelty of the study is based on the fact that few research reports have included both critical thinking and demographic variables, especially type and level of education, as factors related to belief in conspiracy theories. Therefore, the current study seeks to determine whether belief in conspiracy theories significantly differs based on critical thinking levels and the following variables: gender, age, education level, and type. By exploring these relationships, we aim to understand the psychological and social dynamics influencing the propensity to believe in conspiracies and identify strategies for enhancing critical thinking and resilience against misinformation. Such strategies could become or be elaborated as components of educational programmes at various levels.

The paper addresses five specific questions:
Is the level of belief in conspiracy theories significantly different in respondents divided according to the level of:

1. critical thinking and gender?
2. critical thinking and age?
3. critical thinking and residence type?
4. critical thinking and education level?
5. critical thinking and education type?

Hypotheses were developed, grounded in findings by Daniel Stockemer (2023) and Jean-Nicolas Bordeleau and D. Stockemer (2024) on the relationship between conspiracy beliefs, age, and low education levels. Research by these authors, which identified age and low education levels as key predictors of conspiracy beliefs, directly prompted the formulation of our hypotheses to test whether these specific demographic variables play a similar role when interacting with critical thinking levels. The works of L. Cekule and A. Cekuls (2022) and R. DiYanni and A. Borst (2020) also informed the hypotheses, highlighting the role of critical thinking in information evaluation. Given the limited information on the relationship between conspiracy beliefs and demographic variables, gender and education type were included as additional factors in the hypotheses.

Five hypotheses were tested:

H1: Belief in conspiracy theories varies with critical thinking levels and gender.

H2: Belief in conspiracy theories differs across age groups with varying critical thinking levels.

H3: Belief in conspiracy theories differs in groups of participants of varied residence types and critical thinking levels.

H4: Education level influences the relationship between critical thinking and conspiracy beliefs.

H5: Education type impacts the relationship between critical thinking and conspiracy beliefs.

Post hoc analyses were planned to verify differences between specific groups of participants.

Data Collection Procedure and Participants

The study was conducted using Computer-Assisted Web Interview (CAWI) method. The system accepted the form with research tools completed by the respondent only when all items of the Belief in Conspiracy Theories Questionnaire and the Cognitive Reflection Test were fully answered. It was assumed that the data from 500 respondents would be collected, including individuals from each subgroup reflecting values of independent variables such as age, gender, kind of education and level of education. In this sense, the selection of participants was purposeful. The system then randomly selected participants from each subgroup. Data were gathered in January 2024. The period of data collection lasted three weeks.

Instruments

In the research, the Belief in Conspiracy Theories Questionnaire and the Cognitive Reflection Test were used.

Belief in Conspiracy Theories Questionnaire was used as a measure of belief in conspiracy theories and is presented in the Appendix. The questionnaire was developed specifically for the study by the Institute of Pedagogy. The expert judges method was used to evaluate content validity of original items (Sireci, 1998; Roebianto, Savitri, Aulia, Suciyana, & Mubarokah, 2023). It was assumed that the tool should contain items relating to beliefs concerning the COVID-19 pandemic, information technology, and global policy issues. Original items were evaluated in terms of relevance and clarity. As a result, one item was added. The Belief in Conspiracy Theories Questionnaire consists of five items, concerning: the reasons for the COVID-19 pandemic, the description of the operation of 5G technology, the definition of Artificial Intelligence (AI), the definition of the New World Order (NWO),

and the definition and consequences of global warming. Analysis of the questions' clarity was conducted among 48 participants with upper secondary education and an average age of 20.02 years (SD = 1.96) on a scale ranging from 1 (completely incomprehensible) to 7 (completely comprehensible). The results revealed average total score of ratings for answers to all questions equal to 5.47. Median ratings for Questionnaire items ranged from 5 for the items concerning 5G technology and New World Order to 7 for the item concerning Artificial Intelligence. Each questionnaire item consisted of a sentence introducing the name of the phenomenon and an instruction to choose one of the four options for its definition and explanation. The options included: (1) a scientific explanation (including empirically tested facts and professional terminology), (2) a popular scientific explanation (empirically proven content but without potentially difficult professional terminology), (3) a neutral explanation (containing the admission of insufficient knowledge), and (4) a pseudoscientific explanation (with general statements not supported by empirical evidence and indicating that these phenomena are harmful and controlled by groups acting for their own profit).

The sum of points from five questionnaire items indicated the level of belief in conspiracy theories. Participants received 3 points for choosing a scientific explanation, 2 for a popular science explanation, 1 for a neutral explanation, and 0 for a conspiracy explanation. Scores ranged from 0 to 15, with higher scores indicating lower belief in conspiracy theories and a greater acceptance of scientific explanations.

The Cognitive Reflection Test: critical thinking was measured using the expanded version of the Cognitive Reflection Test (Frederick, 2005; Toplak, West, & Stanovich, 2014; Czerwonka, 2016), which assesses the dominance of controlled over automatic cognitive processes. This allowed individuals to resist accepting the first intuitive answer and instead rely on rational, reflective thought.

The version used in this study included seven tasks, each requiring participants to suppress the intuitive first-choice answer. These tasks were specifically designed to elicit false intuitive responses, thus necessitating critical thinking to arrive at the correct answer. A respondent is awarded 1 point for each correct answer and 0 points for an incorrect one. The total score for the Cognitive Reflection Test ranges from 0 to 7 points. The higher the score of a participant, the higher their critical thinking skills. The value of Cronbach's Alpha coefficient calculated based on the data was α = 0.812 (N = 531) and indicates fully satisfactory reliability of the tool.

The Sample

Table 1 presents detailed characteristics of the respondents.

Table 1. Sample characteristics

Sample characteristics	Category	Total count	Percentage %
Age group	18-24	73	13.7
	25-34	107	20.2
	35-44	116	21.8
	45-54	88	16.6
	55-64	71	13.4
	65+	76	14.3
	Total	531	100.0
Gender	Females	275	51.8
	Males	248	46.7
	LGBT+	7	1.3
	Undisclosed	1	0.2
	Total	531	100.0
Residence type	Villages	101	19.0
	Towns (<20,000)	93	17.5
	Towns (20,000-99,000)	122	23.0
	Cities (100,000-500,000)	122	23.0
	Cities (>500,000)	93	17.5
	Total	531	100.0
Education level	Primary/Lower Secondary	76	14.3
	Vocational	144	27.1
	Secondary	156	29.4
	Higher	155	29.2
	Total	531	100.0
Education type	Humanities	165	31.1
	Sciences	185	34.8
	Both humanities and sciences	14	2.6
	No specific	167	31.5
	Total	531	100.0

Data were collected from 531 participants. The sample consisted of 275 females (51.8%) and 248 males (46.7%). Seven participants (1.3%) identified as LGBT+ (average age 23.86, SD = 6.17), while one person (0.20%) did not disclose their gender. The age of participants in the study ranged from 18 to 65 years, with an average value of 43.02 years (SD = 15.67). Participants were stratified by education level and type, as well as residence type (urban/rural).

Procedure

Participants completed the Belief in Conspiracy Theories Questionnaire and the Cognitive Reflection Test via the CAWI method. Scores from the Cognitive Reflection Test and the Belief in Conspiracy Theories Questionnaire were analysed using the Kruskal-Wallis and Dunn tests to identify differences across demographic groups. The age of the respondents and their raw scores in the Belief in Conspiracy Theories Questionnaire and the Cognitive Reflection Test were coded into four categories:
- very low results – the lowest 25% of scores;
- low results – scores ranging from values greater than the lowest 25% to the median value;
- high results – scores ranging from values higher than the median to scores lower than or equal to the value achieved by 75% of the respondents;
- very high results – scores higher than the value obtained by 75% of the respondents.

The hypotheses were tested by means of the Kruskal-Wallis Test (Myers & Well, 2003). The non-parametric test was used because of the significant deviation of the Belief in Conspiracy Theories Questionnaire scores from a normal distribution. Exploratory post-hoc comparisons were performed with the Dunn test (Myers & Well, 2003).

Results

Preliminary analyses

The arithmetic mean of scores on the Belief in Conspiracy Theories Questionnaire for all 531 participants was 8.179 (SD = 2.970), with a maximum theoretical value of 15 points. The median was 8.000 (IQ = 4.000), and the distribution significantly deviated from normality (Kolmogorov-Smirnov Test D = 0.088, p < 0.010). A total score in the lowest 25% range, indicating strong belief in conspiracy theories, was achieved by 167 participants (31%). Scores between the 25% and 50% ranges were observed in 111 participants (20.9%). A score above the median

but below the 75% value, indicating weak belief in conspiracy theories, was registered in 125 participants (23%). A total score higher than that of 75% of respondents, indicating a strong preference for scientific explanations and very weak belief in conspiracy theories, was obtained by 128 participants (24.1%).

No significant differences were found in the level of belief in conspiracy theories when participants were divided into groups according to:

- gender (men, women, the LGBT+ group, or preferring not to report their gender – H (2, N = 531) = 5.604; p = 0.061
- age (six age groups) – H (5, N = 531) = 2.558; p = 0.768
- residence type (five groups) – H (4, N = 531) = 6.813; p = 0.146
- educational level (primary or lower secondary, vocational, secondary, higher) – H (3, N = 531) = 5.547; p = 0.136
- education type (humanities, sciences, humanities and sciences, no specific education) – H (3, N = 531) = 5.291; p = 0.152

Table 2. Belief in conspiracy theories among participants with various critical thinking skills

Critical thinking skills' level	N	Belief in conspiracy theories			Z ; p
		Mdn	IQ	AvR	
very low	164	7.000	5.000	239.924	1.277; ns
low	130	8.000	4.000	262.931	
very low	164	7.000	5.000	239.924	0.538; ns
high	121	8.000	4.000	249.822	
very low	164	7.000	5.000	239.924	4.473; p < 0.005
very high	116	9.000	4.000	323.181	
low	130	8.000	4.000	262.931	0.676; ns
high	121	8.000	4.000	249.822	
low	130	8.000	4.000	262.931	3.075; p < 0.020
very high	116	9.000	4.000	323.181	
high	121	8.000	4.000	249.822	3.679; p < 0,001
very high	116	9.000	4.000	323.181	

N – Number of participants; Mdn – Median; IQ – Interquartile range; Belief in Conspiracy Theories; AvR – Belief in Conspiracy Theories Average Rank; Z – Z calculated based on the Dunn test; p – significance level

Differences in belief in conspiracy theories among participants based on critical thinking and demographic variables (gender, age, residence type, education level, and type of education) were analyzed using the Kruskal-Wallis test. Preliminary analysis, including critical thinking skills without controlling for

demographic variables, revealed significant differences in belief in conspiracy theories among participants with very low, low, high, and very high critical thinking levels (H = 22.462; p = 0.0001; η^2 [H] = 0.033). Inter-group comparisons through the Dunn test are shown in Table 2. Lower median and average ranks in belief in conspiracy theories corresponded to a higher tendency to accept non-scientific explanations.

The results shown in Table 2 indicate that in the whole group of respondents, three significant differences in the level of belief in conspiracies were found, while controlling the level of critical thinking. Measurements of the belief in conspiracy theories in participants with very low ability to think critically (Mdn = 7; IQ = 5; AvR = 239.924) indicated a significantly higher level of belief in non-scientific explanations (Z = 4.47; p < 0.005) than in participants with very high critical thinking skills (Mdn = 9; IQ = 4; AvR = 323.181). Respondents with low level of critical thinking achieved results (Mdn = 8; IQ = 4; AvR = 262.931) indicating a higher tendency to believe in conspiracies (Z = 3.075; p < 0.020) than informants whose ability to think critically was very high (Mdn = 9; IQ = 4; AvR = 323.181). Likewise, the responses of participants with high level of critical thinking skills (Mdn = 8; IQ=4; AvR = 249.822) show higher level of belief in conspiracy theories (Z = 3.679; p < 0.001) than those with very high levels of critical thinking (Mdn = 9; IQ = 4; AvR = 323.181).

Key findings

Critical thinking and gender. To verify hypothesis H1, which proposed a relationship between critical thinking, gender, and belief in conspiracy theories, a detailed, multi-step analysis was conducted. First, the research sample was divided by gender (women and men). Then, within each of these two groups, four subgroups of respondents were distinguished, characterized by very low, low, high, and very high levels of critical thinking. This procedure allowed for a precise examination of whether critical thinking levels differentiate the propensity for conspiracy beliefs differently for each gender.

Comparisons of the level of belief in conspiracy theories across these defined subgroups, using the Kruskal-Wallis test, revealed statistically significant differences for both women (H = 12.594; p < 0.005; η^2[H] = 0.028) and men (H = 9.755; p < 0.003; η^2[H] = 0.020).

However, further detailed post-hoc analysis using the Dunn test revealed different patterns for each gender. For women, a statistically significant difference was observed only between the two extreme groups. Women with a very low level of critical thinking (AvR = 119.621) exhibited a significantly higher belief in conspiracy theories than women with a very high level of critical thinking (AvR = 166.163; Z = 3.327; p < 0.005).

A more complex relationship was identified among men. The Dunn test revealed two statistically significant differences, with men possessing a very high level of critical thinking (AvR = 147.452) serving as the reference group in both comparisons. It was found that men with low critical thinking levels (AvR = 112.209; Z = 2.662; p < 0.050) as well as those with high levels (AvR = 113.103; Z = 2.687; p < 0.050) displayed a significantly stronger belief in conspiracy theories compared to this reference group. This finding is particularly noteworthy as it suggests that for men, only a very high level of critical thinking acts as an effective buffer against believing in conspiratorial narratives. A merely "high" level of critical thinking proved insufficient to produce a statistically significant reduction in this tendency.

C r i t i c a l   t h i n k i n g   a n d   a g e. Participants with very low, low, high, and very high critical thinking skills were divided into particular groups. In terms of age, respondents were divided into six groups: 18 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 64, and 65 and older. The differences in the level of belief in conspiracy theories among respondents according to their critical thinking skills were found only in one age group, namely among the participants between 25 and 34 years of age (H = 9.874; p < 0.020; η^2[H] = 0.047). In this group, the measurements of belief in conspiracy theories in participants with very low critical thinking skills (Mdn = 7; IQ = 5; AvR = 42.719) indicated a higher tendency to believe in non-scientific explanations (Z = 3.081; p < 0.020) than in respondents whose critical thinking skills were very high (Mdn = 10; IQ = 4.5; AvR = 66.625).

C r i t i c a l   t h i n k i n g   a n d   r e s i d e n c e   t y p e. No significant differences in beliefs in conspiracy theories were found between groups of participants divided according to their residence type and critical thinking skills.

C r i t i c a l   t h i n k i n g   a n d   e d u c a t i o n a l   l e v e l. To test hypothesis H4, participants were divided into four groups based on their education level: primary or lower secondary, vocational, secondary, and higher. The Kruskal--Wallis test indicated that critical thinking skills significantly differentiated belief in conspiracy theories in two of these groups: participants with primary or lower secondary education (H = 8.645; p < 0.050; η^2[H] = 0.050) and those with higher education (H = 9.472; p < 0.030; η^2[H] = 0.029).

To identify the specific subgroups (with different critical thinking levels) between which these differences occurred, a Dunn post-hoc test was conducted. In the group with primary or lower secondary education, participants with very low critical thinking skills (AvR = 32.021) showed a significantly higher tendency to accept non-scientific explanations compared to those with very high critical thinking skills (AvR = 52.808; Z = 2.733; p < 0.050). A slightly different pattern was observed in the higher education group: participants with high critical thinking skills (AvR = 65.908) demonstrated a significantly greater tendency to accept conspiracy theories compared to those with very high critical thinking skills (AvR = 93.350; Z = 2.841; p < 0.030).

C r i t i c a l   t h i n k i n g   a n d   e d u c a t i o n a l   t y p e. A similar analysis was performed for hypothesis H5, dividing participants by education type into four groups: humanities, sciences, both humanities and sciences, and no specific type. The Kruskal-Wallis test revealed a statistically significant difference only within the group with a degree in humanities (H=14.567; p<0.002; η^2[H]=0.059).

A post-hoc analysis (Dunn test) within this group indicated that participants with very low critical thinking skills (AvR = 69.879) had a significantly higher level of belief in conspiracies compared to respondents whose critical thinking skills were very high (AvR = 109.532; Z = 3.773; p < 0.001). No significant differences were found in the other groups (sciences, both, or no specific type).

Discussion

The study revealed significant differences in conspiracy beliefs among groups with varying critical thinking skills, with lower skills associated with a higher belief in conspiracy explanations. In particular, the first hypothesis was partially confirmed, showing significant differences in conspiracy belief levels among participants with varying critical thinking skills, regardless of gender. The second hypothesis, claiming that the belief in conspiracy theories differs across age groups with varying critical thinking levels was confirmed only for participants aged 25 to 34. The fourth hypothesis, pointing out that education level influences the relationship between critical thinking and conspiracy beliefs was validated for individuals with primary or lower secondary education. The fifth hypothesis, indicating that education type impacts the relationship between critical thinking and conspiracy beliefs was confirmed among participants with a degree in humanities, while no significant differences were found for those with science degrees, mixed, or unspecified education. The registered effect sizes were small. The strongest effect of critical thinking level on belief in conspiracy theories (η^2[H] = 0.059) was observed in respondents with a humanities background.

Post hoc analyses revealed that, except for men and individuals with higher education, significant differences in conspiracy beliefs were mainly observed between participants with very low and very high critical thinking skills. In men, significant differences were noted between those with low and very high critical thinking. A similar pattern was observed among participants with higher education, where significant differences were found between those with high and very high critical thinking. Across all comparisons, lower critical thinking was associated with a higher tendency to believe in conspiracy theories.

Our findings fit into the broader research literature, while also refining and partially challenging previous findings. On one hand, the general conclusion that a lower level of critical thinking is associated with greater susceptibility to

misinformation aligns with the theoretical frameworks presented by R. DiYanni and A. Borst (2020) and L. Cekule and A. Cekuls (2022), who emphasize the key role of analytical skills in information evaluation. Our study provides empirical support for these assumptions, demonstrating that a very high level of critical thinking acts as a protective buffer against conspiracy beliefs. On the other hand, our results appear to contradict the research by D. Stockemer (2023), which found a direct link between low education levels and high belief in conspiracy theories. In our study, we did not observe a significant direct main effect of education level on conspiracy beliefs. This apparent discrepancy can be explained by our study's novel approach, which analyzed education not as an isolated factor but in interaction with critical thinking. Our findings suggest that education does matter, but its role is moderated by an individual's cognitive abilities, which is an important addition to the existing body of knowledge. Furthermore, our results concerning age – which highlight the particular importance of critical thinking in the 25–34 age group – partially resonate with the findings of Bordeleau and Stockemer (2024), who also identified a relationship between age and conspiracy beliefs, although in our study this dependency proved to be more specific to a particular age cohort.

Limitations and Future Directions

A key limitation of the study is the geographical focus, as data were collected from only one Central European country. Additionally, the Belief in Conspiracy Theories Questionnaire included only one item per topic (AI, 5G, vaccination, NWO, and global warming), suggesting that expanding the scope of items could enhance result interpretation.

This study has certain limitations that also point toward promising directions for future research. First, its geographical focus was narrow, as data were collected from only one Central European country. Second, the Belief in Conspiracy Theories Questionnaire included only one item per topic (AI, 5G, vaccination, NWO, global warming). Expanding this tool could enhance the interpretability and robustness of the findings.

One of the most important avenues for future research is a deeper investigation into how education level and the specifics of educational experiences impact the development of critical thinking and resilience against misinformation. By the "specifics of educational experiences," we refer to concrete elements of the educational process that go beyond the formal level and type of degree. These include, but are not limited to:
  • Pedagogical Methods: Do curricula emphasize rote memorization, or do they prioritize curiosity, the ability to formulate questions, problem-solving, debate, and independent source analysis?

- Curriculum Content: Are students explicitly taught the principles of scientific reasoning, fact-checking, logic, or media literacy, which are crucial for combating disinformation?
- Educational Profile in Practice: Given our findings, which showed particular susceptibility among participants with a background in the humanities, future studies should examine whether their programs, while developing interpretive skills, may neglect training in scientific methodology and empirical verification of claims.

Further studies should also examine in greater detail the role of age, gender, and other demographic factors in shaping tendencies toward intuitive or analytical thinking. Understanding how these demographic and cognitive factors interact in belief formation can contribute to the development of more effective, evidence-based educational strategies for fostering analytical reasoning and encouraging more informed decision-making within society.

By addressing these gaps, future research can enhance our ability to design evidence-based interventions that foster critical thinking, promote scientific literacy, and mitigate the societal impact of conspiracy theories.

Conclusions

The presented findings highlight the significant role of critical thinking in shaping beliefs in conspiracy theories. Low and very low levels of critical thinking are associated with greater acceptance of conspiracy explanations, while very high levels of critical thinking correspond to a significant reduction in such beliefs. These findings suggest that fostering critical thinking can serve as a key mechanism for enhancing resilience against misinformation. Demographic factors such as gender, age, education level, and type of education further modulate the relationship between critical thinking and belief in conspiracy theories, particularly at the extremes of critical thinking ability. These interactions underscore the importance of tailoring interventions to demographic contexts, with special attention to populations identified as more vulnerable to misinformation due to limited critical thinking skills.

Educational systems have a pivotal role in equipping students with the analytical tools necessary to navigate an increasingly complex information landscape. The article makes an important contribution to the interdisciplinary debate on the role of critical thinking in forming beliefs and susceptibility to disinformation, particularly conspiracy theories. The obtained results underscore the need for comprehensive educational programs that prioritize the development of critical thinking and information literacy. Such programs should teach students not only to analyze and evaluate information but also to approach it with scientific skepticism and to question the reliability of first impressions.

By fostering these skills, educational interventions can empower individuals to become more discerning consumers of information.

References

Abrami, P., Bernard, R.M., Borokhovski, E., Waddington, D., Wade, C., & Persson, T.J. (2015). Strategies for teaching students to think critically. *Review of Educational Research*, 5(2), 275–314. DOI: 10.3102/0034654314551063

Bordeleau, J. & Stockemer, D. (2024). On the relationship between age and conspiracy beliefs. *Political Psychology*. DOI: 10.1111/pops.13044

Cekule, L. & Cekuls, A. (2022). Understanding the potential of information in decision making. In: *Proceedings of 9th SWS International Scientific Conference on Social Sciences – ISCSS 2022*. SGEM WORLD SCIENCE (SWS). Scholarly Society. DOI: DOI: 10.35603/sws.iscss.2022/s08.090

Czerwonka, M. (2016). Cognitive reflection test in the context of heuristics, religion and gender. *Annales Universitatis Mariae Curie-Skłodowska, sectio H – Oeconomia*, 50(3), 19–28. DOI: http://dx.doi.org/10.17951/h.2016.50.3.19

DiYanni, R. & Borst, A. (2020). *The craft of college teaching: A practical guide*. Princeton University Press. DOI: 10.23943/princeton/9780691183800.003.0011

Douglas, K.M. & Sutton, R.M. (2018). Why conspiracy theories matter: A social psychological analysis. *European Review of Social Psychology*, 29(1), 256–298.

Fazio, R.H. & Petty, R.E. (2019). *Attitudes: Their structure, function, and consequences*. Psychology Press.

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives*, 19(4), 25–42. DOI: 10.1257/089533005775196732

Holmes, N., Wieman, C., & Bonn, D. (2015). Teaching critical thinking. *Proceedings of the National Academy of Sciences*, 112(37), 11199–11204. DOI: 10.1073/pnas.1505329112

Imhoff, R. & Bruder, M. (2014). Speaking (un–) truth to power: Conspiracy mentality as a generalised political attitude. *European Journal of Personality*, 28(1), 25-43.

Kay, A.C., Whitson, J.A., Gaucher, D., & Galinsky, A.D. (2009). Compensatory control: Achieving order through the mind, our institutions, and the heavens. *Current Directions in Psychological Science*, 18(5), 264–268. DOI: 10.1111/j.1467-8721.2009.01649.x

Moore, B.N. & Parker, R. (2009). *Critical thinking*. McGraw-Hill Higher Education.

Myers, J.L. & Well, A.D. (2003). *Research design and statistical analysis*. Lawrence Erlbaum.

Pennycook, G. & Rand, D.G. (2020). Fighting misinformation on social media using crowdsourced judgments of news source quality. *Proceedings of the National Academy of Sciences*, 117(6), 2775–2783. DOI: 10.1073/pnas.1912444117

Roebianto, A., Savitri, S.I, Aulia, I., Suciyana, A., & Mubarokah, L., (2023). Content validity: Definition and procedure of content validation in psychological research. *TPM – Testing*, 30, 5–18.

Sireci, S. (1998). The Construct of Content Validity. *Social Indicators Research*, 45, 83–117.

Šrol, J., Ballová Mikušková, E., & Čavojová, V. (2021). When we are worried, what are we thinking? Anxiety, lack of control, and conspiracy beliefs amidst the COVID-19 pandemic. *Applied Cognitive Psychology*, 35, 720–729. DOI: 10.1002/acp.3798

Stockemer, D. (2023). Conspiracy theories in the US: Who believes in them? *The Forum*, 21(4), 529–550. https://doi.org/10.1515/for-2023-2022

Swami, V., Chamorro-Premuzic, T., & Furnham, A. (2010). Unanswered questions: A preliminary investigation of personality and individual difference predictors of 9/11 conspiracist beliefs. *Applied Cognitive Psychology*, 24(6), 749–761. DOI: 10.1002/acp.1583

Teovanović, P., Lukić, P., Zupan, Z., Lazić, A., Ninković, M., & Žeželj, I. (2020). Irrational beliefs differentially predict adherence to guidelines and pseudoscientific practices during the COVID-19 pandemic. *Applied Cognitive Psychology*, 35, 486–496.DOI: 10.1002/acp.3770

Toplak, M.E., West, R.F., & Stanovich, K.E. (2014). Assessing miserly information processing: An expansion of the Cognitive Reflection Test. *Thinking & Reasoning*, 20(2), 147–168. DOI: 10.1080/13546783.2013.844729

Vranić, A., Hromatko, I., & Tonković, M. (2022). "I Did My Own Research": Overconfidence, (Dis)trust in Science, and Endorsement of Conspiracy Theories. *Frontiers in Psychology*, 13. DOI: 10.3389/fpsyg.2022.931865

Wilson, J.A. (2018). Reducing Pseudoscientific and Paranormal Beliefs in University Students Through a Course in Science and Critical Thinking. *Science & Education*, 27, 183–210. DOI: 10.1007/s11191-018-9956-0

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APPENDIX. The research tool

Belief in Conspiracy Theories Questionnaire
Please indicate an answer – a, b, c, or d – with which you agree the most.
1. Please indicate with which description of the causes of the COVID-19 pandemic – a, b, c, or d – you agree the most.
    a. As doctors explain, the original source of the SARS-CoV-2 pandemic, which is a pathogen belonging to the coronavirus family, can be traced to the breaking of the interspecies barrier, i.e., the colonization of the human population by a pathogen of animal origin.
    b. It cannot be ruled out that the pandemic was unleashed for profit, so that pharmaceutical companies could make money on us – in short, so that the rich would get richer.
    c. U.S. scientists say that the Chinese may have studied a strain of coronavirus found in bats there, but during sequencing the sample became contaminated with other animal DNA from monkeys and hamsters, which are used for research in laboratories.
    d. I have no opinion on the cause of the COVID-19 pandemic.
2. Please indicate with which description of how 5G technology works – a, b, c, or d – you agree the most.
    a. 5G uses waves in a completely different part of the spectrum, where much lower levels of radiation are emitted. This places it in the non--ionizing part of the spectrum, along with 4G technology, microwaves and radio waves, which we have been living safely with for years, and in the case of radio waves for almost a century.
    b. The operation of 5G networks relies on cellular transmitters operating within frequencies inherent in millimeter-wave radio waves, which have a very short range. To ensure constant connectivity, small cellular transmitters will be set up in groups, in places where users will need connectivity to supplement the macrocell network. 5G macrocells will use MIMO antennas, which have multiple connection elements to simultaneously send and receive large amounts of data.
    c. I have no opinion on how 5G technology works.
    d. 5G technology poses health risks. So do 4G and 3G technologies. They cause electromagnetic radiation emitted by 5G communications, which is harmful to humans.
3. Please indicate with which description of Artificial Intelligence – a, b, c, or d – you agree the most.
    a. AI is part of a secret plan of the global elite to create a new world order. AI is being created by the elite to take control of humanity and create a unified society that will be subject to total control. According to

conspiracy theory proponents, artificial intelligence will be used to monitor people, control their thoughts and actions, and even eliminate those who oppose the new order. Artificial intelligence is a tool in the hands of global elites who want to create a dystopian world in which humanity will only be a tool to achieve their goals.

b. Artificial intelligence (AI) is a field of computer science and science that deals with the design of systems and algorithms that are capable of making decisions and performing tasks that typically require human intelligence, such as image recognition, natural language understanding, planning, decision-making, or machine learning. AI systems are typically built from algorithms that analyze and learn from input data, such as sensory data or textual data.

c. Artificial intelligence is a set of technologies and methods that allow computers to understand and mimic human intelligence. Nowadays, AI can be found in various forms, such as chatbots, voice assistants, recommendation systems and autonomous cars.

d. I have no knowledge of Artificial Intelligence.

4. Please indicate with which definition of the New World Order (NWO) – a, b, c, or d – you agree the most.

a. I don't know what the NWO is.

b. NWO – New World Order – is a secret organization consisting of leaders of states, corporations and international organizations, which plans to introduce a world government and eliminate national sovereignty. Proponents of conspiracy theories believe that the NWO is responsible for various global crises and conflicts, and it controls the media and financial system. However, there is no evidence of such an organization or plan to introduce a world government.

c. New World Order (NWO) is a term referring to the concept of global unity and order, which aims to bring stability and peace to the world. NWO is identified with the idea of a global government in which power is centralized and controlled by a small group of decision-makers. One of the most important aspects of the NWO is its impact on politics and economics, which aim to advance global goals and interests. Although there is no clear definition of the NWO, the concept is often used in political and social discourse.

d. The New World Order is a concept that rules the world and aims to dominate and control society through a small political, economic and media elite. The NWO is a conspiracy theory that appears in various forms around the world and is often identified with secret organizations such as the Illuminati and the Freemasons. Proponents of conspiracy theories believe that the NWO aims to establish total control over humanity and eliminate individual freedom.

5. Please indicate with which description of global warming – a, b, c, or d – you agree the most.
    a. The Earth's climate is constantly changing. However, it is a very slow process. Therefore, scientists do not agree whether the warming observed in our time is caused by human activity or whether it is a natural change.
    b. Global warming is the result of excessive concentrations of gases in the atmosphere, and thus an increase in the greenhouse effect, which causes the Earth's temperature to rise. It is estimated that it is currently 1.5°C higher compared to data from the late 19th century. This may not seem like much, but it is important to remember that this is an averaged result. Some regions of the world, such as Africa and Europe, are heating up much more strongly. This seemingly small increase in temperature is causing major climate change that could result in threats to health and life on Earth.
    c. I have no knowledge of global warming.
    d. The average temperature of the Earth's surface in the mid-19th century (before the Industrial Revolution) was used as the starting temperature to determine the amplitude of change. In the mid-20th century, it increased by an average of 0.5° C, and in the last 15 years it has already increased by about 1° C. This long-term trend of rising temperatures has been called global warming. It is positively correlated with the increase in the concentration of gases.