COMENIUS UNIVERSITY IN BRATISLAVA

FACULTY OF MATHEMATICS, PHYSICS AND INFORMATICS

PSYCHOLOGICAL INTERVENTIONS AGAINST SUSCEPTIBILITY TO FAKE NEWS ABOUT COVID-19

(Diploma Thesis)

2022 **Bc. Beáta Sobotová**

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(Diploma Thesis)

Study program: Cognitive Science

Field of Study: Cognitive Science

Department: Department of Applied Informatics

Supervisor: Mgr. Jakub Šrol, PhD.

Bratislava 2022 **Bc. Beáta Sobotová**

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THESIS ASSIGNMENT

Name and Surname:	Bc. Beáta Sobotová
Study programme:	Cognitive Science (Single degree study, master II. deg., full time form)
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Title: Psychological interventions against susceptibility to fake news about COVID-19

Annotation: COVID-19 pandemic brought about a veritable surge of disinformation about the origins of the virus, preventions measures, and vaccination about COVID-19 on social media. Although the disinformation about COVID-19 is very diverse in their content, they usually do exploit similar psychological mechanisms (evoking emotions, suggestive pictures, clickbait titles). Knowledge of the mechanisms that make fake news spread quickly can therefore be used to design interventions to limit people's susceptibility to such disinformation. This project will examine two potential interventions to limit the susceptibility to fake news about COVID-19.

Aim: Explore the effect of two psychological interventions on reducing the susceptibility to fake news.

Literature: van Der Linden, S., Roozenbeek, J., & Compton, J. (2020). Inoculating against fake news about COVID-19. Frontiers in psychology, 11, 2928.
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.

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ZADANIE ZÁVEREČNEJ PRÁCE

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Názov: Psychological interventions against susceptibility to fake news about COVID-19
Psychologické intervencie proti podliehaniu falošným správam o COVID-19

Anotácia: Pandémia COVID-19 vyvolala na sociálnych sieťach skutočnú vlnu dezinformácií o pôvode vírusu, preventívnych opatreniach a očkovaní proti COVID-19. Hoci dezinformácie o COVID-19 sú obsahovo veľmi rôznorodé, zvyčajne využívajú podobné psychologické mechanizmy (vyvolávanie emócií, sugestívne obrázky, clickbaitové názvy). Poznanie mechanizmov, ktoré spôsobujú rýchle šírenie falošných správ, možno preto využiť pri navrhovaní intervencií na obmedzenie náchylnosti ľudí na takéto dezinformácie.

Cieľ: Preskúmať vplyv dvoch psychologických intervencií na zníženie náchylnosti na falošné správy.

Literatúra: van Der Linden, S., Roozenbeek, J., & Compton, J. (2020). Inoculating against fake news about COVID-19. Frontiers in psychology, 11, 2928.
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.

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DECLARATION

I hereby declare that this thesis is my own and that all sources have been acknowledged.

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ABSTRACT

The pandemic of COVID – 19 is still shaping the world in many ways, one of which is the huge spread of fake news about the virus and the vaccination against it. From psychological research, we know mainly two potentially efficient interventions to reduce people's susceptibility to fake news and conspiracy theories – priming critical thinking and detailed inoculation. This diploma thesis aimed to verify the efficiency of these two interventions among the Slovak population. Participants (N = 352) were split into three groups, two experimental groups, and one control group. In the control group participants had no intervention, in one of the experimental groups only the intervention priming critical thinking, and in the other group both interventions, and then we measured their trust in fake news and conspiracy theories about COVID – 19. The participants were asked to fill out demographic details, containing questionnaires about their political leaning and their attitude toward vaccination in general. Our results showed that neither one of the interventions was efficient in reducing people's susceptibility to fake news. However, our correlational results showed in line with previous findings, that reliance on fake news and conspiracy theories is strongly connected with a negative attitude toward vaccination and more conservative political leaning. The inefficiency of the interventions seems to have occurred mainly due to very low overall conspiracy belief among our sample, which highlights the need for further research on these interventions on a more representative sample of participants.

Keywords: fake news, COVID – 19, psychological interventions

ABSTRAKT

Pandémia COVID – 19 stále ovplyvňuje svet v mnohých ohľadoch, jedným z nich je aj obrovské šírenie falošných správ o víruse a očkovaní proti nemu. Z psychologického výskumu poznáme hlavne dve potenciálne účinné intervencie na zníženie náchylnosti ľudí na falošné správy a konšpiračné teórie – priming kritického myslenia a inokuláciu protiargumentami. Cieľom tejto diplomovej práce bolo overiť účinnosť týchto dvoch intervencií na slovenskej populácii. Účastníci (N = 352) boli rozdelení do troch skupín, dvoch experimentálnych a jednej kontrolnej. V kontrolnej skupine účastníci nemali žiadnu intervenciu, v prvej z experimentálnych skupín len intervenciu priming kritického myslenia a v druhej skupine obe intervencie a následne sme merali ich dôveru vo falošné správy a konšpiračné teórie o COVID - 19. Účastníci boli požiadaní o vyplnenie demografických údajov, ktoré obsahovali aj dotazníky o ich miere politického liberalizmu, ako aj o ich postoji k očkovaniu vo všeobecnosti. Naše výsledky ukázali, že ani jedna z intervencií nebola účinná pri znižovaní náchylnosti ľudí na falošné správy. Naše korelačné výsledky však v súlade s predchádzajúcimi zisteniami ukázali, že dôvera falošným správam a konšpiračným teóriám je silne spojená s negatívnym postojom k očkovaniu a nižšou mierou politického liberalizmu. Zdá sa, že k neúčinnosti intervencií došlo najmä v dôsledku veľmi nízkej celkovej dôvery konšpiračné teórie v našej vzorke, čo poukazuje na potrebu ďalšieho výskumu týchto intervencií na reprezentatívnejšej vzorke účastníkov.

Kľúčové slová: falošné správy, COVID – 19, psychologické intervencie

CONTENT

INTRODUCTION

With the beginning of the internet, people were talking about the start of the era of information, where now, when everything is on the internet and at least in developed countries almost everyone knows how to use it, we are starting to talk about the era of disinformation, or post-truth times. Fake news and conspiracy theories are not some new phenomena, they have been here with us for a very long time, always concerning the topics that were of interest to people, giving them for example someone to blame for their hard life or some simple solution to a global problem.

The first news about COVID – 19 in December 2019 and early 2020 were immediately accompanied by fake news about the virus's origin, treatments, danger, possible vaccines, etc. Many people believed the disinformation about COVID – 19 and therefore did not obey the restrictions and guidelines given by governments all over the world, which in the end caused many unnecessary deaths caused by the illness. This thesis aimed to verify the efficiency of two psychological interventions – priming critical thinking and detailed inoculation – to reduce people's susceptibility to fake news about COVID – 19 and the new vaccines against the illness.

1 FAKE NEWS DISCERNEMENT

If we want to fight the spread of fake news and conspiracy theories, we must first understand what they are and why are people willing to believe in them. The term *fake news* has many definitions. It can be understood as referring to viral posts, that are based on fake accounts made to look like a news report, or as intentionally and verifiably false news articles that could mislead readers (Allcott & Gentzkow, 2017; Tandoc et al., 2018). Allcott & Gentzkow (2017) explain in their article the two main purposes, that lie behind the creation of fake news, financial and ideological. Earlier studies refer to fake news as being news parodies, politically oriented satires, and news propaganda. We can look at fake news from a wider perspective by differencing between *misinformation* and *disinformation*, claiming that misinformation is the unintentional sharing of false information, whereas disinformation is the intended production and spread of information known to be false (Pennycook & Rand, 2021). Fake news belong also news satire, news parody, news fabrication, and photo manipulation, and it can be used also for advertising and public relations, and propaganda (Tandoc et al., 2018).

Hoax is in common language often misleadingly used as a synonym for fake news. It can be characterized as a form of deliberate dissemination of false information or misinformation, the aim of which is to create a sensation to highlight a particular issue or otherwise educate the audience, often using elements of humor. The hoax is usually explained and set straight after some time (Finneman & Thomas, 2018).

Another very similar problem related to fake news are *conspiracy theories.* This concept can be defined as conspiracy-based explanations that deal with large-scale, dramatic social and political events, for which they do not just describe or explain a supposed conspiracy, but uncover it and so expose a shocking, unknown truth about the world, or they can point to the existence of alleged plots that carry a dangerous threat (Byford, 2011).

1.1 Reasoning

Many scientists studying cognition believe that decision-making and reasoning can be best understood by *dual-process theories*. They suggest that there are two types of qualitatively different processes involved: *Type 1 processes*, which are fast, autonomous, intuitive, automatic, and high capacity, and *Type 2 processes*, slow, deliberate, resource-demanding, and reflective. There are multiple explanations of ways how these two systems interact, but the main idea remains, and that is that the Type 1 processes bring about a

contextualized representation of the problem accompanied by judgments, that can be revised in depth by thoughtful, decontextualized Type 2 processes (Evans, 2006; Kahneman, 2003; Pennycook et al., 2015; Thompson et al., 2011). The question (that is often pointed out by researchers who criticize dual-process theories) is how the two types of processes operate. Most dual-process theories' supporters suggest that Type 2 processes control the outputs of Type 1 processes, which clarifies why often Type 2 processes are biased by the Type 1 processes' products. Other theories, known as parallel-competitive models, explain that bias occurs because of fast Type 1 processes outputting a response before the slower Type 2 processes can complete. If the two types of processing output conflicting responses, additional Type 2 processing can arise (Pennycook et al., 2015). According to parallel-competitive models, the key for later Type 2 processing is conflict detection. The issue in these explanations is that none clarifies important aspects of cognitive architecture. It is believed that Type 2 processing is effectively caused by itself. The importance of this lies in the utility and explanatory value of dual-process theories, which are thought to depend on our understanding of the sources of analytic reasoning (Thompson, 2009). Pennycook et al. (2015) are describing a three-stage model of analytic engagement. The first step is called *initial response generation* in which autonomous Type 1 processes bring about intuitive responses. If there is no conflict between Type 1 outputs in the second step known as *conflict monitoring*, the initial response acquired in the first step will continue to the third stage where it will be accepted by an analytic analysis (Type 2 process). If the conflict is detected, an actual Type 2 reasoning will be involved. The second stage is a bottom-up source of analytic engagement. In the third stage, in the so-called *final response selection/generation*, two different Type 2 processes can be employed: rationalization or decoupling. In the rationalization despite the successful conflict detection, the person engaged in the reasoning focuses on verifying the initial response and that may lead to a response that would be considered a bias. Cognitive decoupling involves additional processing needed for inhibiting and abrogating the intuitive response.

Ross et al. (2021) are highlighting the role of analytic thinking in distinguishing fake from real news. The main function of analytic thinking according to dual-process theories is correcting false intuition. In the context of fake news, it means, that engaging the Type 2 processes supports the dismission of the inaccurate subject and aids individuals distinguish between real and fake news. This *classical reasoning account* explains that people fall for fake news when they fail to employ Type 2 processes. Also, the fact that people believe in

misleading information relates to its intuitiveness, as it is often highly emotional (Martel et al., 2020), shocking, and draws people's attention. An alternative explanation to classical reasoning is *motivated reasoning*, which involves Type 2 processes. Motivated reasoning suggests that people choose to believe only the facts that support their cultural or political worldview, and that this selection is aided by the Type 2 processes. Pennycook & Rand (2019) did studies where they tested and compared classical and motivated reasoning in the context of political fake news. Their results support the classical reasoning account as it points out that people who employ more reasoning are more likely to reject false content, and consequently not more likely to engage in politically motivated reasoning, that uses Type 2 processes.

1.2 Predictors of belief in fake news and conspiracy theories

Pennycook & Rand (2021) are distinguishing between two different ways of conceptualizing belief in true or false news. One of them focuses on truth discernment, which is calculated as belief in false news subtracted from the belief in real news, and this way captures the overall accuracy of a person's belief. This ability to distinguish between fake news and real ones is called *fake news discernment*. The other way of conceptualizing belief in true or false news is the focus on overall belief. In other words, it is the extent to which information is believed, independent of its truthfulness. Batailler et al. (2021) discovered, that factors that alter overall belief have no impact on the ability of a person to distinguish true from false information and that increasing or decreasing belief in headlines that were true or false, did not affect the overall accuracy of the person's belief (Batailler et al., 2021; Pennycook & Rand, 2021). Douglas et al. (2017) suggest that people are more likely to believe in conspiracy theories when they promise to satisfy social-psychological motives, defined as epistemic, social, or existential. Epistemic motives, which are connected to ambition for understanding, accuracy, and subjective certainty, can appear to be satisfied by conspiracy theories. One of the examples of this is the conjunction fallacy, which is an error of probabilistic reasoning by which people aggravate the likelihood of co-occurrence of events. Also, the tendency to accept epistemically unwarranted beliefs, religiosity, and lower levels of intelligence are connected to conspiracy beliefs. These are more common among people who are seeking patterns and meaning in their environment, which is typical among people believing in paranormal and supernatural phenomena, they are also linked to the need for cognitive closure, specifically when the cases lack an explanation, and to feelings of boredom (Douglas et al., 2019). If people feel like they have lost control and security in their

life, which defines the existential motives of belief in conspiracy theories, there is a higher risk of becoming a conspiracy theories believer, as these offer the opportunity to reject official narratives and allow people to feel that they possess a better account. This agrees with the findings that conspiracy beliefs are associated with feelings such as powerlessness, existential anxiety, as well as anxious attachment style, and lack of understanding of the social world (Douglas et al., 2019). The ambition to keep one's good image of self or the group is characterized as a social motive and conspiracy theories can help with this. Not only is the support of conspiracy theories linked with individual narcissism, but also with collective narcissism of certain groups individuals belong to (Douglas et al., 2017, 2019).

Dyrendal et al. (2021) did a study focused on detecting the predictors of belief in conspiracy theories on a sample containing over 800 Norwegian students tested in 2016. They found that while the basic individual difference predictors of conspiracy beliefs include intuitive cognitive style, intentionality bias, anthropomorphism, and schizotypy, the best describing ones were created concepts of *Conspiracy Mentality* – a construct of generalized political attitude that strongly predicted belief in specific conspiracy theories, created by Bruder et al. (2013) *Right-Wing Authoritarianism* created by Zakrisson (2005) and *Social Dominance Orientation* created by (Sidanius & Pratto, 1999). Dyrendal et al. (2021) found when comparing men and women, for men, the best predictors of belief in conspiracy theories were conspiracy mentality and paranormal beliefs, while for women, the best predictors were conspiracy mentality and right-wing authoritarianism (Bruder et al., 2013; Dyrendal et al., 2021; Sidanius & Pratto, 1999; Zakrisson, 2005).

Pennycook & Rand (2021) are naming several factors that are influencing if someone falls for fake news or not: *political partisanship and ideology*, *reasoning* – delusionality, dogmatism, religious fundamentalism, bullshit receptivity, and overclaiming, *heuristics* – mental shortcuts, familiarity, source, social feedback from social media, the evocation of emotions. One of the reasons why people seem to believe in fake news is that they are believed to be motivated consumers. That means, that they employ "identity-protective cognition" when presented with political opinionated content, which then results in them overly believing information consistent with their ideology and to skeptical about information inconsistent with their worldview. Another theory suggests that people put the loyalty to not only political ideologies above facts, and therefore fail to in falsehood discernment and rather believe in information, that is consistent with the ideology they trust (van Bavel & Pereira, 2018). These statements suggest, that political ideology has a

dominant influence on people's belief in fake news. A larger overall belief in politically coherent news does not automatically mean that the reasoning is politically motivated. Pennycook & Rand (2021) on the other hand point out that the effect of political concordance is typically much smaller than the effect of the news's actual veracity, as the true but politically disconcordant news is typically believed much more than false but politically concordant news.

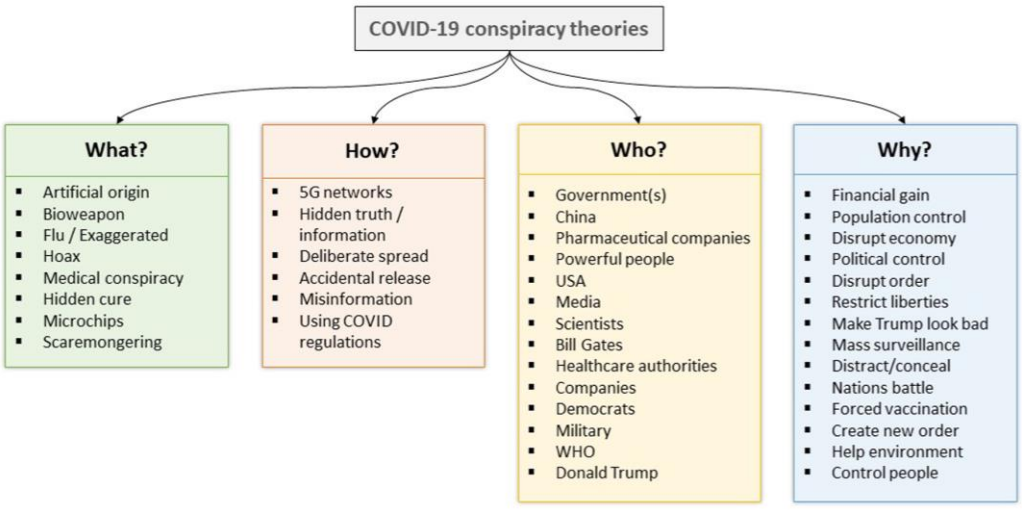
Fake news is spreading very fast mostly thanks to social media. This brings us to another problem and that is sharing fake news. Pennycook & Rand (2019) found out, that when participants were asked, which headlines were accurate, they rated the true headlines as much more correct than the false ones. Interestingly, when the participants were asked if they would share the headlines, their accuracy had little impact on sharing intentions. Another study found that regardless of the participant's attitude towards the topic of the headlines, a more positive attitude toward social media, leads to more trust, and a higher tendency to like, and share posts based on both real and fake news (Lutzke et al., 2019; Pennycook & Rand, 2019).

1.3 COVID – 19 conspiracy theories and attitudes toward vaccination

Conspiracy theories about COVID – 19 arose immediately after the first news and information were shared about the disease. The belief in these coronavirus-related conspiracy theories negatively affected people's compliance with the restriction and guidelines that were introduced by the governments around the globe to protect their citizens from the spread of the coronavirus, as it is a highly infectious and causes serious health problems, in many cases death (Allington et al., 2021), as well as with prejudice and negative attitudes toward vaccination, mainly against COVID – 19 (Bertin et al., 2020). In the systematic review of 133 studies, 85 articles, that were all somehow connected to conspiracy theories and COVID – 19, done by (van Mulukom et al., 2022), the authors identified antecedents and consequences of belief in coronavirus-related conspiracy theories. They characterized nine antecedents and sorted them into three categories: individual differences (coping with threat and uncertainty, personality traits and demographic variables), beliefs, biases, and attitudes (epistemically suspect beliefs, thinking styles and cognitive biases, and attitudes toward science), and social factors (group identities, trust in authorities and social media). Among consequences, they identified six of them, in two main groups: protective behaviors (safeguarding behaviors, self–centered behaviors, and misguided behaviors) and health and social consequences (vaccination intentions, psychological wellbeing, and

negative social consequences). Hughes & Machan (2021) suggest that people scoring high on Dark Tetrad traits, including Machiavellianism, narcissism, psychopathy, and sadism, are more likely to believe in conspiracy theories. Very important predictors of belief in conspiracy theories and fake news (not only COVID – 19 related) are epistemically suspect beliefs. They can be characterized as beliefs that are not in line with the current empirical knowledge and include paranormal, conspiracy, and pseudoscientific beliefs (Lobato et al., 2014). The epistemically suspect beliefs, as well as coronavirus-related conspiracy beliefs, lead to belief in other, even contradictory conspiracy theories about COVID – 19, belief in popular generic conspiracy theories, claims about the efficiency of pseudoscientific approaches in the cure for COVID – 19 and other illnesses, pseudoscientific attitudes toward vaccination and belief in paranormal phenomena (Bertin et al., 2020; Čavojová et al., 2022; Miller, 2020; Šrol et al., 2022). Another interesting antecedent to belief in conspiracy theories is the attitude toward science, which is also one of the strongest predictors of compliance with health guidelines (Plohl & Musil, 2021). Among the antecedents that belong to the group of social factors were several interesting findings. In many countries, political leaning somehow correlated with beliefs in COVID – 19 related conspiracy theories. In most countries the more conservative (e.g., USA, Turkey, etc.) or radical on either side of the political spectrum (e.g., Germany, Switzerland) people were, the more likely they were to believe in coronavirus-related conspiracy theories. Also, religiosity and lower trust in authorities predicted higher conspiracy beliefs in many countries (van Mulukom et al., 2022). Figure 1 taken from van Mulukom et al. (2022) is an overview of the most common topics of the coronavirus-related conspiracy theories.

Figure 1 *Overview of the categories of the conspiracy theory items (ordered in the frequency of occurrence)* (van Mulukom et al., 2022)



The systemic review study from (van Mulukom et al., 2022) had, as mentioned above, also characterized six consequences of belief in coronavirus-related conspiracy theories. For this thesis, we will examine the vaccination intentions more deeply. From the beginning of the pandemics, there has been a strong aim among scientists to develop a vaccine against COVID – 19 as soon as possible. The vaccine hesitancy has been strongly connected with the belief in coronavirus-related conspiracy theories (Freeman et al., 2022). The intention to get vaccinated against COVID – 19 has been repeatedly negatively correlated with epistemically suspect beliefs, lower scientific and analytic thinking, as well as higher intuitive and biased thinking (Čavojová et al., 2022; Teovanović et al., 2021). The negative attitude toward vaccination against COVID – 19 is also related to the overall negative attitude toward vaccination based on misinformation about other vaccines, for example, that Measles, Mumps, and Rubella (MMR) vaccine causes autism, or conspiracy theories about mind control through vaccination (Blaskiewicz, 2013; Jolley & Douglas, 2014). Other factors contributed to low vaccination intentions, such as confusion due to a huge amount of information, distress from emotive negative messages, as well as distrust following incompetence in the governments' responses (Lockyer et al., 2021).

1.4 Interdisciplinary approach

Reduction of peoples' susceptibility to fake news is an important topic in many research areas such as psychology, political science and other social sciences, economics, journalism and computer science, and artificial intelligence. Although this thesis is mainly focusing on the psychological aspects of the topic, there are also many interesting findings and contributions from other disciplines, mainly the involvement of artificial intelligence in this problem. A new phenomenon that has arisen with the development of intelligent technologies is *deepfake*, a combination of deep-learning and fake. Deepfakes are highly realistic and difficult to detect manipulations of audiovisual materials and can be defined as a technique of changing the content of videos by using computer code. This can be done by using the Generative Adversarial Networks, algorithms made to change human faces or voices in images and videos to make them indistinguishable from reality, and thanks to the method they are using, they are learning how to get better every day (Vizoso et al., 2021).

With the rise of artificial intelligence, we can use computers to detect these threats on the internet. Especially when considering deepfakes it is almost impossible for people to tell what is a deepfake and what is not. Pennycook & Rand (2021) are mentioning two main problems and challenges when we want to use AI to fight fake news. Firstly, they are

suggesting that truth is not a clearly defined property, therefore it is difficult to decide what content and features should be included during training and artificial intelligence approaches run the risk of false positives and, thus, unjustified censorship. Detecting misinformation is very challenging also because mostly they are made to contain a mixture of false and real information and manipulated images which can give rise to confusion among readers. Secondly the misinformation and disinformation content evolve rapidly and so the efficacy of features when identifying these, can change within days. Another way involves attaching warnings to content, that has been identified as problematic by professional fact-checkers because it helps to reduce misperceptions and sharing. But there is a very small risk that these fact-checkers could backfire, which would lead to an increased belief in false content. Another issue is that fact-checking is not scalable, and it also requires time and effort to investigate the truthfulness of the claims the process is very slow, so when the warning about some information occurs, it is in most cases already widespread. Fact-checks in many cases fail to deliver their message to those groups, who would need it the most and so their content may fade with time. They also provide insufficient protection against the familiarity effect and cause the corrected users to share more problematic material (Pennycook & Rand, 2021).

Giachanou et al. (2020) developed a multimodal modal system to detect fake news, by a neural network, that combines textual, visual, and semantic information. Most of the previously developed combined systems were approaching only textual and visual information, but the authors of this study find it important to look at the semantic information as well because the similarity between the visual and the textual part is very important since in some fake news the image can be inconsistent to the textual content. Although this information can be useful, there are still gaps in its application. Results of their experiments on three different collections show that combining textual, visual, and semantic information can increase the efficacy of fake news detection. Jadhav & Thepade (2019) used Recurrent Neural Networks and Deep Structured Semantic Model when developing a framework for detecting fake news. This approach achieved an accuracy of 99% without any previous domain knowledge by intuitive identification of the important features associated with fake news. When detecting deepfakes, Mirsky & Lee (2022) are distinguishing between artifact-specific approaches and undirected approaches. Many deepfakes generate artifacts that may be invisible to humans but can be detected by using machine learning and forensic analysis. They characterize seven categories of artifacts, that can be used for detection: spatial artifacts in blending, environments, and forensics; temporal artifacts in behavior, physiology,

synchronization, and coherence (Giachanou et al., 2020; Jadhav & Thepade, 2019; Mirsky & Lee, 2022).

Fake news, conspiracy theories, and especially deepfakes are being considered also from an ethical point of view. Hancock & Bailenson (2021) are discussing in their article the impact of deepfakes on society. They are comparing the consequences of watching deepfakes with ones caused by watching scenes or videos made in virtual reality (VR) by using the viewer's doppelganger, which can lead to the creation of false memories by this person, although this phenomenon has not occurred while watching another person's doppelganger. There exists an assumption, that there arise new psychological mechanisms when viewers are exposed to videos that are perceptually indistinguishable from real videos. The core of deepfakes is deception, which means intentionally, knowingly, and purposely misleading someone and as the literature suggests people, in general, are not very skilled at identifying betrayals and disinformation which then leads to misbeliefs. When comparing the deception detection ability by sort of media used for the deception it has been found that there is almost no difference in it regardless of the message type, whether it is text, audio, or video. Despite these findings, they assume that the impact of deception by deepfake is potentially greater than that of verbal deception because of the primacy of visual communication for human cognition, because the deepfakes not only change the verbal content but also the visual features of how the message was brought to recipients, regardless if it is the content of the statements that have never been said or it is the behavior that has never been done by the person used in the deepfake. This is supported also by the fact that people trust mostly their visual perception. Philosopher Don Fallis (2021) describes an epistemic threat of deepfakes, that they will interfere with our ability to acquire knowledge about the world by watching media. He believes that because of deepfakes people can acquire false beliefs more easily because they assume deepfakes to be normal videos. But there are also other ways how deepfakes may cause people harm. One of them is that the recipient then may not be able to distinguish what is real and fake and by being precautious not believe the true information, even if it is from legitimate news media. Vaccari & Chadwick (2020) did a study in which they were looking at the effect of deepfakes on trust in news and they found that even if people were unlikely to be completely misled by deepfakes, the exposure to them increased their uncertainty and so decreased their trust about media in general and by that confirming the epistemic threat mentioned by Fallis (2021). Hancock & Bailenson (2021) are suggesting another consequence of deepfakes is the change

in interpersonal relationships, as it has been found that exposure to a deepfake depicting a political figure significantly worsened participants' attitudes toward that politician (Dobber et al., 2021). Lastly Hancock & Bailenson (2021) also describe the humiliation of the person used in the deepfake for saying or doing something, that he or she never did. Early forms of deepfakes involved mostly alternations of pornography, depicting non-consensual persons engaging in sexual activity and it had a horrible impact on the victim's life (Dobber et al., 2021; Fallis, 2021; Hancock & Bailenson, 2021; Vaccari & Chadwick, 2020).

2 INTERVENTIONS

There have been many studies researching how to improve people's ability to discern between fake and real news and not to believe in conspiracy theories. We know several psychological interventions that should prevent people from believing unsubstantiated claims. One of the simplest interventions is *communicating scientific consensus* (van der Linden et al., 2015). This intervention is built upon showing participants, that when it comes to the topic of interest, for example, anthropological causes of climate change, there is a very large unity in the opinions among the scientific community. Another interesting intervention is *accuracy prompts* (Pennycook, McPhetres, et al., 2020) where researchers are trying to shift people's attention to the concept of accuracy by asking them, for example, to evaluate the accuracy of a headline or showing a video about the importance of only sharing accurate content. There are also other interventions such as *lateral reading in education* (Wineburg et al., 2022), *lateral reading online* (Panizza et al., 2022), *media literacy tips* (Guess et al., 2020), *self-reflection tools* (Lorenz-Spreen et al., 2021), and *warning and fact-checking labels* (Kozyreva et al., 2022; Pennycook, Bear, et al., 2020). Psychological interventions that are used in this study are priming critical thinking and inoculation.

2.1 Priming critical thinking

One of the interventions, that can be used to reduce people's susceptibility to fake news and conspiracy theories is *priming critical thinking.* This can be done, by giving some simple guidelines to participants before rating the headlines. These guidelines can be in form of questions, or some announcements about best practices. Lutzke et al. (2019) used priming critical thinking in their study by showing simple questions to the participants before asking them to rate true or false headlines. In this experiment were two experimental and one control group. One of the experimental groups was shown only four simple questions (*guidelines condition*), while the other was also asked to rate them according to importance (*enhanced guidelines condition*). The questions were: *(1) Do I recognize the news organization that posted the story?; (2) Does the information in the post seem believable?; (3) Is the post written in a style that I expect from a professional news organization?; (4) Is the post politically motivated?* The headlines were concerning the topic of climate change and the participants were divided into two groups, believers, and doubters. They found that when participants were rating fake news and were exposed to the *guidelines condition* the group of doubters were less likely to trust and like these posts and believers were less likely to share posts based on fake news. When exposed to *enhanced guidelines conditions* believers

were less likely to trust and share fake climate news and doubters were less likely to like and share fake news when compared to doubters in the control group. When rating real news, believers of climate change who were exposed to the guidelines condition were more likely to trust real news. On the contrary guidelines or enhanced guidelines conditions did not affect the doubters of climate (Lutzke et al., 2019).

Drummond & Fischhoff (2019) used priming critical thinking (in this case called priming scientific reasoning skills) in a slightly different context, namely to reduce the participants' myside bias when evaluating scientific evidence about which they have prior positions. In three studies they used the intervention priming scientific skills by an 11-item Scientific Reasoning Scale (Drummond & Fischhoff, 2017), but this intervention was efficient only when accompanied by direct instructions to apply those skills to the task at hand. To reduce belief in conspiracy theories Swami et al. (2014) also used priming critical (in this case called analytical) thinking in their research. In a set of four studies, they first examined the relationship between conspiracy belief and analytical thinking, which showed that the stronger conspiracy belief was correlated with lower analytical thinking and open-mindedness. The next three studies showed, that by using experimental manipulations to retrieve analytic thinking the belief in conspiracy theories was effectively reduced.

Like this is another intervention called *friction* (Fazio, 2020), which involves making things slower or more effortful by design. This can be done by asking or nudging the participant to stop and think before sharing content on social media. Another similar intervention is called *social norms*, which leverages social information to encourage people not to share or believe in misinformation (Cookson et al., 2021). Where the friction intervention tries to teach people not to share fake news, this intervention goes beyond and teaches people to disapprove of the sharing of misinformation by others, as well as if someone of them shares fake news, the behavior of this person should be disapproved by society, as it was an action against social norms.

2.2 Inoculation

Another possible intervention is based on the *inoculation theory* from McGuire (1964). It is a resistance model, which was explained by using a medical analogy, seeing persuasion inoculation as the parallel of medical inoculation. To protect the patient from some diseases medicine uses a weakened version of the virus to avert the infection and create immunity. In case, the patient is then exposed to the real threat, his body should be able to defeat the virus

without him getting ill. During persuasion inoculation, some counterarguments are offered to the recipient of the information, to prevent the persuasion. In the context of fake news, their recipients are first exposed to some true information, so they do not fall for the misinformation when they encounter it. Inoculation can be also called *prebunking*, as it aims to build attitudinal resistance against online. Similar to prebunking is *debunking*, which provides corrective information to reduce specific misconceptions or false beliefs (Ecker et al., 2020; Kozyreva et al., 2022).

The inoculation was used in the study done by van der Linden et al. (2017) on a large sample size of 2167 participants in the US. The topic of interest was climate change. Before this study, they researched 1000 participants in the US to find out that the most influential misinformation believed among the population is regarding climate change. In the actual study, they then tested if it is possible to inoculate people against such misinformation. They used a mixed within-subject design of the experiment with six different experimental conditions: *consensus treatment, counter-message, consensus treatment followed by counter-message, consensus treatment with general inoculation followed by counter-message,* and *consensus treatment with detailed inoculation followed by counter-message.* Consensus treatment was a pie chart showing how concise are the scientists about the reality of human-caused climate change, the counter-message was misinformation. They hypothesized, that the consensus treatment would have a positive influence on the perceived scientific agreement. On the other hand, a counter-message would have a negative influence. When a counter-message follows the consensus treatment, its positive impact would decrease. For the inoculation, they hypothesized, that both general and detailed inoculation would protect the effect of the consensus treatment against misinformation. All their hypotheses have been supported by their findings. They also found that the inoculation messages were equally effective, regardless of the political identification of participants (McGuire. William J., 1964; van der Linden et al., 2017).

An interdisciplinary approach to psychological interventions can be seen in the online game called *Bad news* developed in the research done by Roozenbeek & van der Linden (2019). They have involved technologies when trying to fight people's susceptibility against fake information by creating this interactive intervention, that teaches people six techniques commonly used in the production of fake news: polarization, invoking emotions, spreading conspiracy theories, trolling people online, deflecting blame, and impersonating fake accounts. This game is based on the inoculation metaphor mentioned before. Authors proved

in this research that precautionary exposure, warning, and enlightening people in the strategies used in the production of fake news help them become resistant to fake news when exposed to them in the real world (Roozenbeek & van der Linden, 2019). This game was used also by van der Linden et al. (2020) against fake news about COVID – 19 and proved to significantly improve the players' ability to resist misinformation techniques after gameplay, and increase players' confidence in spotting misleading information. *Bad news* is not the only game used to inoculate people against susceptibility to fake news. Basol et al. (2021) used in their research an online game called *Go Viral!* that was created by the researchers in the collaboration with the UK Cabinet Office and DROG with support from the WHO and the United Nations Verified Campaign. In this game players are exposed to three manipulation techniques commonly used in COVID-19 misinformation: fearmongering, using fake experts, and spreading conspiracy theories.

2.3 Present study

The design of the current research was created in line with the findings from previous research. In our first and second hypotheses, where we suggest that both interventions, priming critical thinking and combined intervention of detailed inoculation and priming critical thinking, will be effective and that we expect the combined intervention to be more effective in the fake news discernment of the participants, are built on the findings in the two above mentioned studies as they show that both interventions are effective on their own and the combination of different interventions was effective in van der Linden et al. (2017).

When creating the interaction in the videos for the detailed inoculation in the combined intervention we used in one of the experimental groups and formulating the second hypothesis, we were inspired by the research done by Roozenbeek & van der Linden (2019), as it points out the importance of engaging participants in the intervention. In the third hypothesis, which suggested the presence of correlations between fake news discernment and political leaning, conspiracy belief, and negative attitude toward vaccination, we considered the findings described in *1.2 Predictors of belief in fake news and conspiracy theories*, mostly the ones by Pennycook & Rand (2021).

The design itself contained two experimental groups, one with the intervention priming critical thinking, one with combined intervention – priming critical thinking and detailed inoculation by interactive video, and one control group, that was without any intervention.

3 METHODS

The purpose of this experiment was to discover if detailed inoculation of the participants into the topic of vaccines against COVID – 19 would be an effective intervention for creating a greater ability to discern fake news from real news among our participants and that way fight the spread of misinformation. The detailed inoculation was done by using an interactive video interrupted by questions with obvious answers mentioned in the video. We compared this intervention with a control group (without intervention) as well as a priming critical thinking intervention with simple questions to see if a more detailed and more engaging intervention would have a greater effect on the belief in fake news. We hypothesized that:

1. Both interventions will decrease the belief of the participants in fake news when compared to the control group (Lutzke et al., 2019; S. van der Linden et al., 2017).
2. Using both, priming critical thinking and detailed inoculation by interactive video as the intervention will have a greater effect on fake news discernment than using only priming critical thinking intervention (Roozenbeek & van der Linden, 2019).
3. The fake news discernment will be correlated with participants' conservative/liberal political leaning, negative attitude toward vaccination in general, and conspiracy beliefs (Pennycook & Rand, 2021).

The total number of participants was 359 (90 men, with an average age of 28.25, *SD* = 10.029) but 7 out of them had to be excluded as they did not pass the attention control question. The required number of participants (*N*=159) was determined by using the software GPower. We have chosen following parameters: effect size f = 0.24, α error probability = 0.05, power (1 – β error probability) = 0.80, and number of groups = 3. The participants were divided into three groups: the control group (with *N*=130), the group with the intervention priming critical thinking (*N*=120), and the group with the combined intervention priming critical thinking and the detailed inoculation by interactive video (*N*=102).

As for education, we asked the participants, what is their highest educational attainment. Most of the participants (*N*=134, 38.1%) had a master's degree or equivalent. The second most represented group among participants (*N*=125, 35.5%) had graduated from high school. In our sample were also participants with bachelor's degree (*N*=72, 20.5%),

participants with completed PhD studies (*N*=19, 5.4%), and participants with completed elementary studies (*N*=2, 0.6%).

3.1 Materials

For the survey, we used the Qualtrics platform. Demographic data included in addition to the most general questions also questions about participants' conservative/liberal political leaning, the role of religion in their lives and decision making, their attitude towards vaccination, and if they are vaccinated against COVID - 19 and the media they trust. The abovementioned variables' average scores can be found under their description in Table 1. The questionnaires used for conservative/liberal political leaning, the role of religion, and negative attitude toward vaccination were taken from the study done by Čavojová et al. (2022).

Conservative/liberal political leaning. The participants were asked: *On social issues, where would you place yourself on the political spectrum from conservative to liberal-leaning?* For the evaluation of the identification with political ideologies, we used a Likert scale from 1 to 7, where 1 denoted very conservative and 7 very liberal.

Role of religion. The participants were asked: *How important is the role of religion in your life?* When evaluating the role of religion in participants' lives, we used a Likert scale from 1 to 7, where 1 denoted no role and 7 very important role.

Conspiracy belief. For the conspiracy belief, we asked participants about their belief in five common conspiracy theories connected to pandemics, such as *The SARS-CoV-2 virus was artificially created and deliberately released so that pharmaceutical companies could make the highest possible profit from the sale of vaccines.* The statements we used were taken from Šrol et al., (2022). For evaluation, we used the 1 to 5 Likert scale, where 1 denoted total disagreement and 5 denoted total agreement. The index of reliability, Cronbach's α was 0.785.

Negative attitude towards vaccination. When measuring the attitude towards vaccination, we asked them to evaluate on the 1 to 5 Likert scale, how much they agree with ten statements describing vaccination, such as *I am more afraid of vaccines' side effects than of the disease.* The statements we used were taken from Čavojová et al., (2022). The lower value the participants gained, the more positive attitude they had towards vaccination. The index of reliability, Cronbach's α was 0,818.

Table 1 *Predictors for belief in fake news and conspiracy theories*

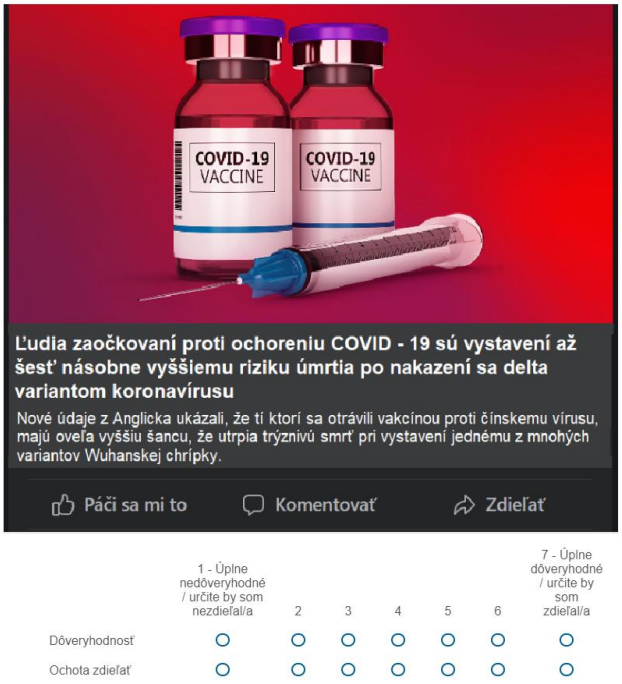
Variables	*M*	*SD*
Conservative/liberal political leaning	4.77	1.39
Role of Religion in Life	3.14	2.15
Negative Attitude towards Vaccination	2.02	0.669
Conspiracy belief	1.36	0.601

Reliance on real/fake news, willingness to share real/fake news, and fake news discernment. Our main measuring tool were questions in which we asked the participants to evaluate the accuracy of fabricated headlines with both real and fake news (Figure 2).

Figure 2 *Examples of the fabricated news: real (left side) and fake (left side)*

Participants were presented with ten fabricated news with the following task: *In the next section of the research, we will present several headlines containing news of varying credibility. Please look carefully at each of the messages and rate how credible you find it and how likely you would be to share it on social media.* For evaluation in both cases, we used a Likert scale from 1 to 7, where 1 denoted total disagreement and 7 denoted total agreement as you can see in Figure 3.

Figure 3 *Examples of the task in the control group*



These questions were in randomized order but were the same for all groups. Here we calculated four different scales, reliance on real news (α = 0.761), reliance on fake news (α = 0.705), willingness to share real news (α = 0.843) and willingness to share fake news (α = 0.753). As in Pennycook & Rand (2021), we calculated the fake news discernment described above (see chapter *1.2 Predictors for belief in fake news and conspiracy theories*). The average scores in the above-named variables are shown below in Table 2.

Table 2 *Reliance on real/fake news*

Variables	*M*	*SD*
Reliance on Real News	4.18	1.32
Reliance on Fake News	1.62	0.814
Willingness to Share Real News	3.31	1.56
Willingness to Share Fake News	1.33	0.663
Fake News Discernment	2.56	1.69

3.2 Procedure

As a part of the experiment, we first gathered demographic data from our participants. In case they were not vaccinated we asked them also about the reason for their decision as well as if they would consider in the case of more strict restrictions non-vaccinated

population getting vaccinated. After the experimental part, we also checked the conspiracy belief of our participants.

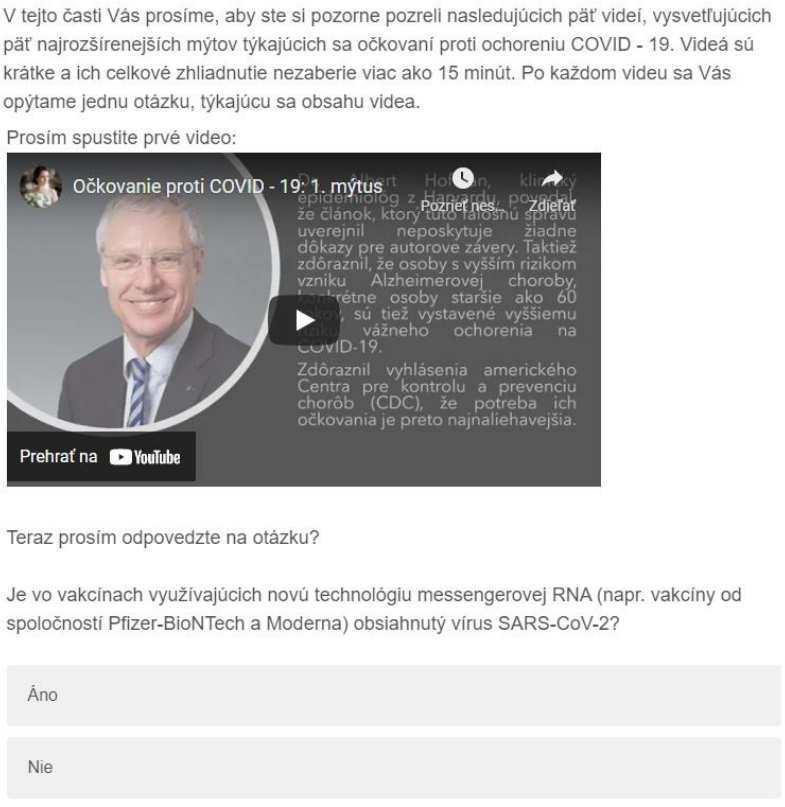
Priming critical thinking. Participants in the experimental group with the intervention priming critical thinking were shown questions, that were similar to the above-mentioned study done by Lutzke et al. (2019): *(1) Does the post try to trigger strong negative emotions in me, like anger, fear, disgust, or is it shocking?; (2) Is the post written in the style I expect from a professional news organization?; (3) Is the post politically motivated, and is the topic controversial?* These they should have considered while evaluating the accuracy of the headlines (see Figure 3). The exposure to these questions was done together with the headlines, whose accuracy we asked the participants to evaluate the same way as the control group.

Figure 4 *Example of the applied intervention priming critical thinking*

Combined intervention by inoculation and priming critical thinking. In the experimental group with combined intervention priming critical thinking and detailed inoculation participants were shown short interactive videos. In the videos we explained the

five most common myths considering the COVID – 19 vaccines among the Slovak population, which were: *(1) The mRNA COVID – 19 vaccines are dangerous; (2) The COVID – 19 vaccines can change your genetic material or your DNA; (3) The COVID – 19 vaccines include nanotechnologies and nanorobots; (4) The COVID – 19 vaccines include cells from aborted fetuses; (5) The COVID – 19 vaccines cause infertility.* The interaction was ensured by interrupting the video with multiple-choice questions related to the information mentioned in the video with obvious answers (see Figure 4). After exposure to the video, they were also exposed to the simple questions for priming critical thinking mentioned above. Then we asked the participants to evaluate the accuracy of the headlines the same way as the groups above.

Figure 5 *Example of the applied inoculation intervention*



4 RESULTS

For the analysis of the results, we used the SPSS statistical tool. As for the results, we firstly analyzed the demographic data and the reliability of the various parts of the questionnaire (attitude towards vaccination, reliance on real news, willingness to share the real news, reliance on fake news, and willingness to share the fake news, attitude towards conspiracy theories). Next, we examined participants' answers in the main part of the experiment, where they were asked to rate the reliability and willingness to share real and fake news.

4.1 Comparison of fake news discernment across the groups

For comparison of fake news discernment scores across our two experimental groups and one control group, we used the one-way ANOVA analysis with the dependent variable fake news discernment and the independent variable being control and experimental groups. According to our analysis the results of interventions' efficiency comparison are not statistically significant, $F(2,346) = 0.438$, $p = .646$. Neither the first hypothesis nor the second hypothesis is supported by these results. As can be seen from Table 3, there were minimal differences between the means of fake news discernment scores across all groups.

Table 3 *Fake news discernment average scores*

Groups	*N*	*M*	*SD*	*SE*
Control	130	2.48	1.65	0.145
Experimental 1: critical thinking	120	2.67	1.57	0.143
Experimental 2: inoculation + critical thinking	99	2.54	1.86	0.187
Total	349	2.56	1.68	0.090

Further, we compared means across our two experimental groups and one control group using the one-way ANOVA analysis regarding the willingness to share fake and real news. We used willingness to share real and fake news as dependent and the groups as the independent variable. The average scores of willingness to share real and fake news are shown in Table 4. The ANOVA analysis did not show any statistically significant differences in willingness to share fake and real news between the groups, fake news $F(2,344) = 1.471$, $p = .231$, real news $F(2,344) = 2.263$, $p = .106$.

Table 4 *Willingness to share fake and real news average scores*

Willingness to share		*N*	*M*	*SD*	*SE*
Fake news	Control group	130	1.31	0.583	0.052
	Experimental group 1: critical thinking	120	1.27	0.506	0.046
	Experimental group 2: inoculation + critical thinking	97	1.42	0.902	0.092
	Total	347	1.33	0.667	0.036
Real news	Control group	130	3.11	1.58	0.139
	Experimental group 1: critical thinking	120	3.33	1.54	0.140
	Experimental group 2: inoculation + critical thinking	97	3.55	1.55	0.157
	Total	347	3.31	1.56	0.084

In addition to the above-described analysis, we compared means across our two experimental groups and one control group using the one-way ANOVA analysis for the trust in real and fake news. As the dependent variable, we used the trust in real and fake news and the control and experimental groups as the independent variable. The average scores of trust in real and fake news are shown in Table 5. The ANOVA analysis did not show any statistically significant differences in the trust in real and fake news between the groups, real news $F(2,348) = .332$, $p = .718$, fake news $F(2,346) = 1.507$, $p = .223$.

Table 5 *Trust in real and fake news average scores*

Trust in		*N*	*M*	*SD*	*SE*
Real news	Control group	130	4.11	1.32	0.115
	Experimental group 1: critical thinking	120	4.19	1.30	0.119
	Experimental group 2: inoculation + critical thinking	101	4.25	1.35	0.134
	Total	351	4.18	1.32	0.070
Fake news	Control group	130	1.63	0.777	0.068
	Experimental group 1: critical thinking	120	1.52	0.628	0.057
	Experimental group 2: inoculation + critical thinking	99	1.71	1.03	0.104
	Total	349	1.62	0.815	0.044

4.2 Moderations and correlations

First, we analyzed moderations by using jamovi 2.3.2, to determine whether the correlations that occurred in our sample were significantly different across groups. As in the moderation, analyses cannot be more than two categorical variables, so we merged the experimental groups and compared them with the control group. For all the correlations mentioned in the 3rd hypothesis, (between conservative/liberal political leaning as the predictor and fake news discernment as the dependent variable, and groups as a moderator (see Table 6), between conspiracy belief as the predictor and fake news discernment as the

dependent variable, and groups as a moderator (see Table 7), and between attitude toward vaccination as the predictor and fake news discernment as the dependent variable, and groups as a moderator (see Table 8)), the moderation analysis did not show a statistically significant difference across groups.

Table 6 *Moderation Estimates: conservative/liberal political leaning, fake news discernment correlation*

	Estimate	*SE*	*Z*	*p*
Conservative/liberal political leaning	0.28374	0.0633	4.486	< .001
Group	0.03287	0.0452	0.728	0.467
Conservative/liberal political leaning ✻ Group	-0.00696	0.0324	-0.215	0.830

Table 7 *Moderation Estimates: conspiracy belief, fake news discernment correlation*

	Estimate	*SE*	*Z*	*p*
Conspiracy belief	-1.7457	0.1177	-14.834	< .001
Group	0.0289	0.0364	0.794	0.427
Conspiracy belief ✻ Group	-0.1005	0.0596	-1.686	0.092

Table 8 *Moderation Estimates: attitude toward vaccination, fake news discernment correlation*

	Estimate	*SE*	*Z*	*p*
Attitude toward vaccination	-1.5728	0.1059	-14.854	< .001
Group	0.0535	0.0363	1.474	0.140
Attitude toward vaccination ✻ Group	-0.0249	0.0561	-0.443	0.658

Therefore, we analyzed the correlations for the whole sample together. All the results can be found in Table 9. First, we analyzed the correlation between *fake news discernment* and *conservative/liberal political leaning.* Here we found a weak correlation, which suggests that the more liberal our participants were, the better were they able to discern fake news from real ones. Further, we analyzed the correlation between *fake news discernment* and the

negative attitude toward vaccination and we found a large negative correlation, which means that the more dismissive the attitude toward vaccination is, the worse participants discern fake news from real ones. Also, the correlation between *fake news discernment* and the *conspiracy belief* was found to be a largely negative one, meaning that the more participants believe in conspiracy theories, the less are they able to discern between fake and real news. These findings support our 3rd hypothesis, which suggested, that there will be some correlations between the above-mentioned variables

Table 9 *Correlations among fake news discernment, conservative/ liberal political leaning, negative attitude toward vaccination, conspiracy beliefs*

	Cross-correlations *(r)*						
	1.	2.	3.	4.	5.	6.	7.
1. Reliance on real news	1						
2. Reliance on fake news	**-.19**	1					
3. Willingness to share real news	**.73**	**-.19**	1				
4. Willingness to share fake news	**-.18**	**.80**	.01	1			
5. Fake news discernment	**.88**	**-.64**	**.66**	**-.53**	1		
6. Conspiracy belief	**-.44**	**.55**	**-.28**	**.48**	**-.53**	1	
7. Negative attitude toward vaccination	**-.53**	**.42**	**-.42**	**.30**	**.48**	**.62**	1
8. Conservative/liberal political leaning	**.22**	**-.14**	.05	**-.17**	**.30**	**-.28**	**-.25**

Note: All the correlations written in bold are statistically significant ($p < .05$).

Other correlations, such as the reliance on fake news and the willingness to share them were interconnected, and it is of no surprise, that they correlated strongly with conspiracy belief. These findings mean, that people who have strong conspiracy belief trust in fake news and are willing to share them, which corresponds with previous findings (Lobato et al., 2014; Miller, 2020). The reliance on fake news and conspiracy belief, as well as negative attitude toward vaccination, were weakly negatively correlated with political liberalism, which corresponds with findings by Šrol (2022).

When comparing groups, men ($M = 2.75$, $SD = 1.69$) and women ($M = 2.49$, $SD = 1.68$) for means in fake news discernment, we used an independent t-test with fake news discernment scores as a dependent variable and gender as the independent variable. We found no statistically significant differences $t(345) = 1.245$, $p = .214$.

5 DISCUSSION

Our research aimed to verify the efficiency of two psychological interventions – priming critical thinking and detailed inoculation by interactive video combined with priming critical thinking to reduce people's susceptibility to COVID – 19 related fake news and conspiracy theories. We did so by comparing fake news discernment among three groups of participants, one control group and two experimental groups. The control group was beside the demographic details, only asked to rate the accuracy of fabricated real and fake news headlines, while in the first experimental group we used the intervention priming critical thinking and in the second experimental group, we used the detailed inoculation by interactive video, which was followed by the priming critical thinking intervention. We hypothesized that the belief in fake news will be decreased by both interventions when compared to the control group and that the combined intervention will be even more efficient than only the priming critical thinking intervention. We also expected that there will be correlations between fake news discernment, conspiracy belief, political leaning, and negative attitude toward vaccination.

There are several possible explanations, for why our interventions did not prove to be efficient. Also in the study done by Lutzke et al. (2019) priming critical thinking has been shown to have a small effect size on a person's likelihood to trust, like, and share fake news online. This however does not diminish the importance of critical thinking for fake news discernment. For example, Pennycook & Rand (2019) found that people with higher analytical abilities, which were assessed by a modified version of the Cognitive Reflection Test (Frederick, 2005), regardless of their political identifications, are better able to recognize fake news. The main difference between these two studies is that while Pennycook & Rand (2019) studied critical thinking ability as a covariate, Lutzke et al. (2019) used it as a treatment effect. Since we did not measure the ability of critical thinking in our research, we only presumed its presence, we cannot say anything about the overall ability to think critically among our participants. Future research should take also this variable into consideration.

Priming critical (analytical) thinking was proved to be efficient in reducing belief in conspiracy theories by Swami et al. (2014). As already mentioned in chapter *2.1 Priming critical thinking*, priming critical thinking (here called priming scientific reasoning skills) was used also by Drummond & Fischhoff (2019) to reduce the myside bias in participants' evaluations of scientific evidence regarding the Affordable Care Act by an 11-item test of

scientific reasoning skills called the Scientific Reasoning Scale (SRS). After conducting a set of three studies, they found that their intervention was efficient in reducing the myside bias only after adding instructions on how to use those skills.

Neither our second intervention, detailed inoculation by an interactive video explaining the five most common myths about COVID – 19 vaccines in the Slovak population, has shown to be effective. One could argue that the reason for its ineffectiveness was that our video could be classified as an intervention done by debunking. The difference between inoculation – also called prebunking – and debunking is mainly in the way they address the problem. While prebunking tries to prevent people from believing in fake news and conspiracy theories by showing them how they spread on the internet, and how they are created, as in studies that used online games done by Roozenbeek & van der Linden (2019) and Basol et al. (2021). Another example of prebunking is *Truth labs for Education*, a project created by the collaboration between Cambridge University, the University of Bristol, and Google Jigsaw. In this project, they created a series of short videos, each of which inoculates people against a particular manipulation technique or misleading rhetorical device often used in the online world (Cambridge Social Decision-Making Lab. Department of Psychology., 2022; Roozenbeek & van der Linden, 2021). On the other hand, debunking takes already existing fake news and conspiracy theories and retrospectively refutes them with factual arguments. In the study done by (Paynter et al., 2019), debunking has been proved effective against misinformation related to autism treatment. Tay et al. (2021) have compared in their study the effectiveness of prebunking and debunking as psychological interventions. Even if it is in general rather believed that debunking is less effective, as it is very difficult to correct already encoded information, the results of this study suggested that it was surprisingly better able to counteract misinformation than prebunking. There is very little research done on the comparison of prebunking and debunking effectiveness, therefore it is very difficult to say if there are any significant differences in their effectiveness at all. Future research should compare these two inoculation strategies to see what is more effective in the Slovak population. These strategies are also very similar so it could be interesting to combine them and compare their effectiveness when separate with their effectiveness when combined.

Another possible explanation for the low efficiency of our interventions is the overall low reliance on fake news and belief in conspiracy theories about COVID – 19 among our participants. The conspiracy belief in our sample is lower (M = 1.35, SD = 0.60) than the

one reported by Čavojová et al. (2020; *M* = 2.07, *SD* = 0.87), or the two samples reported by Šrol et al., (2022; Study 1: *M* = 2.49, *SD* = 1.02; Study 2: *M* = 2.32, *SD* = 1.10). These studies, except for Study 2 (Šrol et al., 2022), were done on the Slovak population. It seems that our sample was lacking representativeness and our participants were already mostly skeptical about unsupported claims about COVID – 19 and so their opinions were not influenced by our interventions.

Although our results did not show the efficiency of any intervention we used, they did show interesting correlations suggesting a positive relationship between reliance on fake news and conspiracy theories about COVID – 19, as well as with negative attitude toward vaccination in general and more conservative political leaning, are in line with findings from previous studies (Šrol, 2022; van Mulukom et al., 2022). The negative attitude toward vaccination is one of the consequences mentioned by van Mulukom et al. (2022) and it is connected with the antecedents defined in this review article, which were already mentioned above in *1.3 COVID – 19 conspiracy theories and attitudes toward vaccination*, especially epistemically suspect beliefs, attitudes toward science as well as trust in authorities. The connection between conservative political leaning with reliance on fake news and conspiracy theories about COVID – 19, can be explained also in terms of higher religiosity among people with more conservative political leaning, as religiosity has been proved to be connected to pseudoscientific beliefs and epistemically suspect beliefs (Šrol, 2022; van Mulukom et al., 2022). Future research should try to recruit participants with more conservative political leaning and expected negative attitude toward vaccination in general, as this population seems to be most vulnerable to strong conspiracy belief and reliance on fake news not only about COVID – 19.

Nevertheless, we consider our research to be beneficial, as it is one of the first psychological studies devoted to interventions to reduce susceptibility to fake news and conspiracy theories in Slovakia. The high cultural specificity of unsupported beliefs (Bruder et al., 2013; van Mulukom et al., 2022) suggests that if we want to know how people's trust in fake news or conspiracy theories can be reduced, we cannot rely uncritically on foreign research alone, but need to confront their findings with our own specific cultural and social context. While the research done in this thesis does not provide definitive findings regarding the possibilities of reducing trust in unsubstantiated claims, we believe that it at least provides a basic starting point for further research in this area.

There are several limitations in our research, that should be avoided in future studies. The main limitations are the lacking representativeness of our sample and the inefficiency of interventions. One of the most important improvements should be done in recruiting a more representative sample of participants, trying to focus on the more conservative population with a negative attitude toward vaccines. The participants' analytical thinking abilities should be also taken into an account and measured by using a test such as the Cognitive Reflection Test. The interventions, specially inoculation, should be done more interactively and engagingly, such as the inoculation by a video game as was done in done by Roozenbeek & van der Linden (2019) and Basol et al. (2021). This game could combine prebunking, as it would show the participants how unsubstantiated claims are created and spread, and debunking, where it could explain some of the already existing fake news or conspiracy theories.

CONCLUSION

This thesis aimed to verify the efficiency of two psychological interventions, priming critical thinking and detailed inoculation by interactive video, to reduce people's susceptibility to fake news and conspiracy theories about COVID – 19. This was done in a study with an experimental design on a sample of participants ($N = 352$), who were randomly assigned to three groups, one control group, and two experimental groups. Participants were asked to fill out demographic details, containing also questionnaires about their political leaning as well as their attitude toward vaccination in general and the conspiracy belief, and afterward to rate the accuracy of fabricated real and fake news headlines, either after being exposed to one of the interventions (priming critical thinking or combined intervention of detailed inoculation with priming critical thinking) or without any intervention for the control group. The results showed that none of the interventions was efficient in reducing people's susceptibility to fake news. On the other hand, our correlational results suggested in line with previous findings, that reliance on fake news and conspiracy theories about COVID – 19 is strongly connected with a negative attitude toward vaccination and more conservative political leaning. The spread of fake news and conspiracy theories and reliance on them is one of the most important current issues that we as a society must face. Psychological researchers are not the only scientists that are trying to address this problem already for years. This topic became a priority mostly during the pandemics as it has led to many unnecessary victims of the illness and caused a strong polarization in the society.

REFERENCES

Allcott, H., & Gentzkow, M. (2017). Social media and fake news in the 2016 election. In *Journal of Economic Perspectives* (Vol. 31, Issue 2, pp. 211–236). American Economic Association. https://doi.org/10.1257/jep.31.2.211

Allington, D., McAndrew, S., Moxham-Hall, V., & Duffy, B. (2021). Coronavirus conspiracy suspicions, general vaccine attitudes, trust and coronavirus information source as predictors of vaccine hesitancy among UK residents during the COVID-19 pandemic. *Psychological Medicine*, 1–12. https://doi.org/10.1017/S0033291721001434

Basol, M., Roozenbeek, J., Berriche, M., Uenal, F., McClanahan, W. P., & Linden, S. van der. (2021). Towards psychological herd immunity: Cross-cultural evidence for two prebunking interventions against COVID-19 misinformation. *Big Data & Society*, *8*(1), 205395172110138. https://doi.org/10.1177/20539517211013868

Batailler, C., Brannon, S. M., Teas, P. E., & Gawronski, B. (2021). A Signal Detection Approach to Understanding the Identification of Fake News. *Perspectives on Psychological Science*, *1*, 174569162098613. https://doi.org/10.1177/1745691620986135

Bertin, P., Nera, K., & Delouvée, S. (2020). Conspiracy Beliefs, Rejection of Vaccination, and Support for hydroxychloroquine: A Conceptual Replication-Extension in the COVID-19 Pandemic Context. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.565128

Blaskiewicz, R. (2013). The Big Pharma conspiracy theory. *Medical Writing*, *22*(4), 259–261. https://doi.org/10.1179/2047480613Z.000000000142

Bruder, M., Haffke, P., Neave, N., Nouripanah, N., & Imhoff, R. (2013). Measuring Individual Differences in Generic Beliefs in Conspiracy Theories Across Cultures: Conspiracy Mentality Questionnaire. *Frontiers in Psychology*, *4*. https://doi.org/10.3389/fpsyg.2013.00225

Byford, J. (2011). Towards a Definition of Conspiracy Theories. In *Conspiracy Theories* (pp. 20–37). Palgrave Macmillan UK. https://doi.org/10.1057/9780230349216_2

Cambridge Social Decision-Making Lab. Department of Psychology. (2022). *Inoculation Science*. https://inoculation.science/

Čavojová, V., Šrol, J., & Ballová Mikušková, E. (2020). How scientific reasoning correlates with health-related beliefs and behaviors during the COVID-19 pandemic? *Journal of Health Psychology*. https://doi.org/10.1177/1359105320962266

Čavojová, V., Šrol, J., & Ballová Mikušková, E. (2022). How scientific reasoning correlates with health-related beliefs and behaviors during the COVID-19 pandemic? *Journal of Health Psychology*, *27*(3), 534–547. https://doi.org/10.1177/1359105320962266

Cookson, D., Jolley, D., Dempsey, R. C., & Povey, R. (2021). A social norms approach intervention to address misperceptions of anti-vaccine conspiracy beliefs amongst UK parents. *PLOS ONE*, *16*(11), e0258985. https://doi.org/10.1371/journal.pone.0258985

Dobber, T., Metoui, N., Trilling, D., Helberger, N., & de Vreese, C. (2021). Do (Microtargeted) Deepfakes Have Real Effects on Political Attitudes? *The International Journal of Press/Politics*, *26*(1), 69–91. https://doi.org/10.1177/1940161220944364

Douglas, K. M., Sutton, R. M., & Cichocka, A. (2017). The Psychology of Conspiracy Theories. *Current Directions in Psychological Science*, *26*(6), 538–542. https://doi.org/10.1177/0963721417718261

Douglas, K. M., Uscinski, J. E., Sutton, R. M., Cichocka, A., Nefes, T., Ang, C. S., & Deravi, F. (2019). Understanding Conspiracy Theories. *Political Psychology*, *40*(S1), 3–35. https://doi.org/10.1111/pops.12568

Drummond, C., & Fischhoff, B. (2017). Development and Validation of the Scientific Reasoning Scale. *Journal of Behavioral Decision Making*, *30*(1), 26–38. https://doi.org/10.1002/bdm.1906

Drummond, C., & Fischhoff, B. (2019). Does "putting on your thinking cap" reduce myside bias in evaluation of scientific evidence? *Thinking & Reasoning*, *25*(4), 477–505. https://doi.org/10.1080/13546783.2018.1548379

Dyrendal, A., Kennair, L. E. O., & Bendixen, M. (2021). Predictors of belief in conspiracy theory: The role of individual differences in schizotypal traits, paranormal beliefs, social dominance orientation, right wing authoritarianism and conspiracy mentality.

Personality and Individual Differences, *173*. https://doi.org/10.1016/j.paid.2021.110645

Ecker, U. K. H., Butler, L. H., & Hamby, A. (2020). You don't have to tell a story! A registered report testing the effectiveness of narrative versus non-narrative misinformation corrections. *Cognitive Research: Principles and Implications*, *5*(1), 64. https://doi.org/10.1186/s41235-020-00266-x

Evans, J. St. B. T. (2006). The heuristic-analytic theory of reasoning: Extension and evaluation. *Psychonomic Bulletin & Review*, *13*(3), 378–395. https://doi.org/10.3758/BF03193858

Fallis, D. (2021). The Epistemic Threat of Deepfakes. *Philosophy & Technology*, *34*(4), 623–643. https://doi.org/10.1007/s13347-020-00419-2

Fazio, L. (2020). Pausing to consider why a headline is true or false can help reduce the sharing of false news. *Harvard Kennedy School Misinformation Review*. https://doi.org/10.37016/mr-2020-009

Finneman, T., & Thomas, R. J. (2018). A family of falsehoods: Deception, media hoaxes and fake news. *Newspaper Research Journal*, *39*(3). https://doi.org/10.1177/0739532918796228

Frederick, S. (2005). Cognitive Reflection and Decision Making. *Journal of Economic Perspectives*, *19*(4), 25–42. https://doi.org/10.1257/089533005775196732

Freeman, D., Waite, F., Rosebrock, L., Petit, A., Causier, C., East, A., Jenner, L., Teale, A.-L., Carr, L., Mulhall, S., Bold, E., & Lambe, S. (2022). Coronavirus conspiracy beliefs, mistrust, and compliance with government guidelines in England. *Psychological Medicine*, *52*(2), 251–263. https://doi.org/10.1017/S0033291720001890

Giachanou, A., Zhang, G., & Rosso, P. (2020). *Multimodal Fake News Detection with Textual, Visual and Semantic Information* (pp. 30–38). https://doi.org/10.1007/978-3-030-58323-1_3

Guess, A. M., Lerner, M., Lyons, B., Montgomery, J. M., Nyhan, B., Reifler, J., & Sircar, N. (2020). A digital media literacy intervention increases discernment between mainstream and false news in the United States and India. *Proceedings of the National*

Academy of Sciences, *117*(27), 15536–15545. https://doi.org/10.1073/pnas.1920498117

Hancock, J. T., & Bailenson, J. N. (2021). The Social Impact of Deepfakes. *Cyberpsychology, Behavior, and Social Networking*, *24*(3), 149–152. https://doi.org/10.1089/cyber.2021.29208.jth

Hughes, S., & Machan, L. (2021). It's a conspiracy: Covid-19 conspiracies link to psychopathy, Machiavellianism and collective narcissism. *Personality and Individual Differences*, *171*, 110559. https://doi.org/10.1016/j.paid.2020.110559

Jadhav, S. S., & Thepade, S. D. (2019). Fake News Identification and Classification Using DSSM and Improved Recurrent Neural Network Classifier. *Applied Artificial Intelligence*, *33*(12), 1058–1068. https://doi.org/10.1080/08839514.2019.1661579

Jolley, D., & Douglas, K. M. (2014). The Effects of Anti-Vaccine Conspiracy Theories on Vaccination Intentions. *PLoS ONE*, *9*(2), e89177. https://doi.org/10.1371/journal.pone.0089177

Kahneman, D. (2003). A Perspective on Judgment and Choice: Mapping Bounded Rationality. In *American Psychologist* (Vol. 58, Issue 9, pp. 697–720). https://doi.org/10.1037/0003-066X.58.9.697

Kozyreva, A., Lorenz-Spreen, P., Lewandowsky, S., Ecker, U., & Hertwig, R. (2022). *"Toolbox of interventions against online misinformation and manipulation."*

Lobato, E., Mendoza, J., Sims, V., & Chin, M. (2014). Examining the Relationship Between Conspiracy Theories, Paranormal Beliefs, and Pseudoscience Acceptance Among a University Population. *Applied Cognitive Psychology*, *28*(5), 617–625. https://doi.org/10.1002/acp.3042

Lockyer, B., Islam, S., Rahman, A., Dickerson, J., Pickett, K., Sheldon, T., Wright, J., McEachan, R., & Sheard, L. (2021). Understanding COVID-19 misinformation and vaccine hesitancy in context: Findings from a qualitative study involving citizens in Bradford, UK. *Health Expectations*, *24*(4), 1158–1167. https://doi.org/10.1111/hex.13240

Lorenz-Spreen, P., Geers, M., Pachur, T., Hertwig, R., Lewandowsky, S., & Herzog, S. M. (2021). Boosting people's ability to detect microtargeted advertising. *Scientific Reports*, *11*(1), 15541. https://doi.org/10.1038/s41598-021-94796-z

Lutzke, L., Drummond, C., Slovic, P., & Árvai, J. (2019). Priming critical thinking: Simple interventions limit the influence of fake news about climate change on Facebook. *Global Environmental Change*, *58*. https://doi.org/10.1016/j.gloenvcha.2019.101964

Martel, C., Pennycook, G., & Rand, D. G. (2020). Reliance on emotion promotes belief in fake news. *Cognitive Research: Principles and Implications*, *5*(1), 47. https://doi.org/10.1186/s41235-020-00252-3

McGuire. William J. (1964). *Inducing resistance to persuasion: Some contemporary approaches in Advances in Experimental Social Psychology*. Academic Press.

Miller, J. M. (2020). Do COVID-19 Conspiracy Theory Beliefs Form a Monological Belief System? *Canadian Journal of Political Science*, *53*(2), 319–326. https://doi.org/10.1017/S0008423920000517

Mirsky, Y., & Lee, W. (2022). The Creation and Detection of Deepfakes. *ACM Computing Surveys*, *54*(1), 1–41. https://doi.org/10.1145/3425780

Panizza, F., Ronzani, P., Martini, C., Mattavelli, S., Morisseau, T., & Motterlini, M. (2022). Lateral reading and monetary incentives to spot disinformation about science. *Scientific Reports*, *12*(1), 5678. https://doi.org/10.1038/s41598-022-09168-y

Paynter, J., Luskin-Saxby, S., Keen, D., Fordyce, K., Frost, G., Imms, C., Miller, S., Trembath, D., Tucker, M., & Ecker, U. (2019). Evaluation of a template for countering misinformation—Real-world Autism treatment myth debunking. *PLOS ONE*, *14*(1), e0210746. https://doi.org/10.1371/journal.pone.0210746

Pennycook, G., Bear, A., Collins, E. T., & Rand, D. G. (2020). The Implied Truth Effect: Attaching Warnings to a Subset of Fake News Headlines Increases Perceived Accuracy of Headlines Without Warnings. *Management Science*, *66*(11), 4944–4957. https://doi.org/10.1287/mnsc.2019.3478

Pennycook, G., Fugelsang, J. A., & Koehler, D. J. (2015). What makes us think? A three-stage dual-process model of analytic engagement. *Cognitive Psychology*, *80*, 34–72. https://doi.org/10.1016/j.cogpsych.2015.05.001

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

Pennycook, G., & Rand, D. G. (2019). Lazy, not biased: Susceptibility to partisan fake news is better explained by lack of reasoning than by motivated reasoning. *Cognition*, *188*, 39–50. https://doi.org/10.1016/j.cognition.2018.06.011

Pennycook, G., & Rand, D. G. (2021). The Psychology of Fake News. *Trends in Cognitive Sciences*, *25*(5), 388–402. https://doi.org/10.1016/j.tics.2021.02.007

Plohl, N., & Musil, B. (2021). Modeling compliance with COVID-19 prevention guidelines: the critical role of trust in science. *Psychology, Health & Medicine*, *26*(1), 1–12. https://doi.org/10.1080/13548506.2020.1772988

Roozenbeek, J., & van der Linden, S. (2019). Fake news game confers psychological resistance against online misinformation. *Palgrave Communications*, *5*(1). https://doi.org/10.1057/s41599-019-0279-9

Roozenbeek, J., & van der Linden, S. (2021). *Don't just debunk, prebunk: Inoculate yourself against digital misinformation*. https://spsp.org/news-center/character-context-blog/dont-just-debunk-prebunk-inoculate-yourself-against-digital

Ross, R. M., Rand, D. G., & Pennycook, G. (2021). Beyond "fake news": Analytic thinking and the detection of false and hyperpartisan news headlines. In *Judgment and Decision Making* (Vol. 16, Issue 2).

Sidanius, J., & Pratto, F. (1999). *Social Dominance*. Cambridge University Press. https://doi.org/10.1017/CBO9781139175043

Šrol, J. (2022). Individual differences in epistemically suspect beliefs: the role of analytic thinking and susceptibility to cognitive biases. *Thinking & Reasoning*, *28*(1), 125–162. https://doi.org/10.1080/13546783.2021.1938220

Šrol, J., Čavojová, V., & Ballová Mikušková, E. (2022). Finding Someone to Blame: The Link Between COVID-19 Conspiracy Beliefs, Prejudice, Support for Violence, and Other Negative Social Outcomes. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.726076

Swami, V., Voracek, M., Stieger, S., Tran, U. S., & Furnham, A. (2014). Analytic thinking reduces belief in conspiracy theories. *Cognition*, *133*(3), 572–585. https://doi.org/10.1016/j.cognition.2014.08.006

Tandoc, E. C., Lim, Z. W., & Ling, R. (2018). Defining "Fake News": A typology of scholarly definitions. In *Digital Journalism* (Vol. 6, Issue 2, pp. 137–153). Routledge. https://doi.org/10.1080/21670811.2017.1360143

Tay, L. Q., Hurlstone, M. J., Kurz, T., & Ecker, U. K. H. (2021). A comparison of prebunking and debunking interventions for implied versus explicit misinformation. *British Journal of Psychology*. https://doi.org/10.1111/bjop.12551

Teovanović, P., Lukić, P., Zupan, Z., Lazić, A., Ninković, M., & Žeželj, I. (2021). Irrational beliefs differentially predict adherence to guidelines and pseudoscientific practices during the <scp>COVID</scp> -19 pandemic. *Applied Cognitive Psychology*, *35*(2), 486–496. https://doi.org/10.1002/acp.3770

Thompson, V. A. (2009). Dual-process theories: A metacognitive perspective. In *In two minds: Dual processes and beyond* (pp. 171–196). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199230167.003.0008

Thompson, V. A., Prowse Turner, J. A., & Pennycook, G. (2011). Intuition, reason, and metacognition. *Cognitive Psychology*, *63*(3), 107–140. https://doi.org/10.1016/j.cogpsych.2011.06.001

Vaccari, C., & Chadwick, A. (2020). Deepfakes and Disinformation: Exploring the Impact of Synthetic Political Video on Deception, Uncertainty, and Trust in News. *Social Media + Society*, *6*(1), 205630512090340. https://doi.org/10.1177/2056305120903408

van Bavel, J. J., & Pereira, A. (2018). The Partisan Brain: An Identity-Based Model of Political Belief. *Trends in Cognitive Sciences*, *22*(3), 213–224. https://doi.org/10.1016/j.tics.2018.01.004

van der Linden, S. L., Leiserowitz, A. A., Feinberg, G. D., & Maibach, E. W. (2015). The Scientific Consensus on Climate Change as a Gateway Belief: Experimental Evidence. *PLOS ONE*, *10*(2), e0118489. https://doi.org/10.1371/journal.pone.0118489

van der Linden, S., Leiserowitz, A., Rosenthal, S., & Maibach, E. (2017). Inoculating the Public against Misinformation about Climate Change. *Global Challenges*, *1*(2), 1600008. https://doi.org/10.1002/gch2.201600008

van der Linden, S., Roozenbeek, J., & Compton, J. (2020). Inoculating Against Fake News About COVID-19. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.566790

van Mulukom, V., Pummerer, L. J., Alper, S., Bai, H., Čavojová, V., Farias, J., Kay, C. S., Lazarevic, L. B., Lobato, E. J. C., Marinthe, G., Pavela Banai, I., Šrol, J., & Žeželj, I. (2022). Antecedents and consequences of COVID-19 conspiracy beliefs: A systematic review. *Social Science & Medicine*, *301*, 114912. https://doi.org/10.1016/j.socscimed.2022.114912

Vizoso, Á., Vaz-Álvarez, M., & López-García, X. (2021). Fighting Deepfakes: Media and Internet Giants' Converging and Diverging Strategies Against Hi-Tech Misinformation. *Media and Communication*, *9*(1), 291–300. https://doi.org/10.17645/mac.v9i1.3494

Wineburg, S., Breakstone, J., McGrew, S., Smith, M. D., & Ortega, T. (2022). Lateral reading on the open Internet: A district-wide field study in high school government classes. *Journal of Educational Psychology*. https://doi.org/10.1037/edu0000740

Zakrisson, I. (2005). Construction of a short version of the Right-Wing Authoritarianism (RWA) scale. *Personality and Individual Differences*, *39*(5). https://doi.org/10.1016/j.paid.2005.02.026