

COMENIUS UNIVERSITY IN BRATISLAVA
FACULTY OF MATHEMATICS, PHYSICS AND INFORMATICS

EXAMINING THE RELATIONSHIPS BETWEEN CLIMATE
SKEPTICISM AND SUSCEPTIBILITY TO FAKE NEWS AND
CONSPIRACY BELIEFS
DIPLOMA THESIS

Bc. Lucia Kubíčková
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Názov: Examining the relationships between climate skepticism and susceptibility to fake news and conspiracy beliefs
Skúmanie vzťahu medzi klimatickým skepticizmom a náchylnosťou na falošné správy a konšpiračné presvedčenia

Anotácia: Aj keď klimatický skepticizmus za ostatných desať rokov klesá, stále existuje značná časť populácie, ktorá neverí tomu, že k antropogénnym klimatickým zmenám dochádza aj napriek presvedčivým vedeckým dôkazom. Je známe, že populárne konšpiračné presvedčenia a falošné správy znižujú dôveru vo vedcov a iné úradné orgány, a sú teda pravdepodobne základom pretrvávajúceho skepticizmu voči klimatickým zmenám. Tento projekt teda preskúma vplyv náchylnosti na falošné správy a konšpiračné presvedčenia na klimatický skepticizmus v kontexte analytického myslenia a informačnej gramotnosti.

Cieľ: Preskúmajte efekt náchylnosti (susceptibility) na falošné správy a konšpiračné presvedčenia na skepticismus v kontexte klimatickej zmeny.

Literatúra: Lewandowsky, S., Oberauer, K., Gignac, G. E. (2013). NASA faked the moon landing—therefore, (climate) science is a hoax: An anatomy of the motivated rejection of science. *Psychological science*, 24(5), 622-633.
Lutze, 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, 101964.

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Title: Examining the relationships between climate skepticism and susceptibility to fake news and conspiracy beliefs

Annotation: Although the climate skepticism is in decline for the past ten years, there is still a sizeable proportion of population which does not believe that anthropogenic climate change is happening despite overwhelming scientific evidence. Popular conspiracy beliefs and fake news are known to reduce trust in scientists and other official authorities and are thus likely at the root of the ongoing skepticism toward climate change. This project will thus examine the effect of susceptibility to fake news and conspiracy beliefs on climate skepticism in the context of analytic thinking and information literacy.

Aim: Explore the effect of susceptibility to fake news and conspiracy beliefs on skepticism toward climate change.

Literature: Lewandowsky, S., Oberauer, K., Gignac, G. E. (2013). NASA faked the moon landing—therefore, (climate) science is a hoax: An anatomy of the motivated rejection of science. *Psychological science*, 24(5), 622-633.
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Declaration

I hereby declare that the presented master's thesis is original and the result of my own investigations. Formulations and ideas taken from other sources are cited as such.

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Abstrakt

Alarmujúci stav nášho životného prostredia a obrovské percento vedcov pôsobiacich v oblasti klímy, ktorí sa zhodujú na tom, že ku globálnym zmenám v podnebí dochádza, stále nie sú dostatočným dôkazom o zmene podnebia pre niektorých jedincov. Sociálne siete sa stali novou platformou pre šírenie pochybností o existencii zmeny podnebia. Porozumenie toho či a ako falošné správy a konšpiračné teórie ovplyvňujú vývoj klimatického skepticizmu je rozhodujúcim prvkom pri redukcii tohto správania. V našom prieskume (n = 655 účastníkov) sa zameriavame na otázky s cieľom identifikovať vplyv konšpiračného myslenia a náchylnosti k falošným správam na klimatický skepticizmus. Ďalším cieľom tejto štúdie je pochopiť, či v tomto vzťahu hrá nejakú úlohu analytické myslenie a informačná gramotnosť. Našimi výsledkami potvrdzujeme predchádzajúce zistenia, že dôvera v konšpiračné teórie a náchylnosť na falošné správy pozitívne koreluje s klimatickým skepticizmom a naopak analytické myslenie negatívne koreluje s predchádzajúcimi tromi premennými. Moderačná analýza ukazuje, že preferencia konzervatívnej ideológie polarizuje vzťah medzi náchylnosťou k falošným správam a klimatickým skepticizmom, zatiaľ čo liberálna ideológia polarizuje vzťah medzi dôverou v konšpirácie a klimatickým skepticizmom. Ďalej zisťujeme, že dôvera v konšpirácie a stotožnenie sa s falošnými správami sú silnými prediktormi klimatického skepticizmu. Naše výsledky naznačujú, že vyššie analytické myslenie a vyššia informačná gramotnosť sú malým prediktorom menšieho klimatického skepticizmu, aj to iba ak je sprostredkovaný cez náchylnosť k falošným správam alebo konšpiračným presvedčeniam, a sám osebe nemá priamy dopad. V neposlednom rade zisťujeme, že stotožnenie s falošnými správami má väčší vplyv na klimatický skepticizmus ako schopnosť detekovať falošné správy.

Kľúčové slová: Klimatický skepticizmus, falošné správy, dôvera v konšpirácie, analytické myslenie, informačná gramotnosť.

Abstract

The alarming state of our environment and the enormous percentage of climate scientists agreeing that global climate change is happening is still not plausible evidence of climate change for some individuals. Social networks became a new platform for spreading doubts about the existence of climate change. Understanding whether and why fake news and conspiracy theories influence the development of climate scepticism is a crucial element in eliminating this behaviour. Our survey (n = 655 participants) addresses questions to identify the effect of conspiracy thinking and susceptibility to fake news on climate scepticism. Another aim of this study is to understand whether analytical thinking and information literacy play any role in this relationship. We confirm previous findings of positive correlation between conspiracy theories, fake news susceptibility and climate scepticism and negative correlation of analytical thinking with the previous three variables. Moderation analysis shows that preference for conservative ideology polarises the relationship between susceptibility of fake news and climate scepticism. Meanwhile, liberal ideology polarises the relationship between conspiracy thinking and climate scepticism. Furthermore, we find that conspiracy beliefs and agreeableness with fake news are strong predictors of climate scepticism. Our results suggest that higher analytical thinking and higher information literacy is a slight predictor of smaller climate scepticism but only if mediated through fake news susceptibility or conspiracy beliefs and on its own has no direct impact. Lastly, we discover that agreeing with fake news has a more decisive influence on climate change belief than the ability to detect fake news.

Keywords: Climate scepticism, fake news, conspiracy belief, analytical thinking, information literacy.

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Introduction

The almost unanimous consensus of the scientific community confirms that climate change exists and is negatively impacted by humans. As everyday proof of its existence, we have experienced in the past ten years abnormalities in weather and natural phenomena such as relentless fires in Amazon forests, California, Australia, Siberia; floods around Europe and South-East Asia; melting icebergs in Antarctica, Greenland or the North Pole; or increasing number of tornadoes and tsunamis. Despite these catastrophes becoming more occurring, a substantial part of our society is still unwilling to admit the actual cause of these events. Whether it is denial on the epistemic level or doubting the involvement of humans and third parties in climate change, one thing we know for sure - climate scepticism has not diminished yet.

Denying “scientific news”, different value orientation, political ideology, conspiracy theories, scientific literacy, and lower cognitive abilities are principal determinants that fuel scepticism (Tranter and Booth, 2015; Dunlap and McCright, 2008; Whitmarsh, 2011; Poortinga et al., 2011). Increased access to the internet has two downsides: firstly, doubtful and false information are becoming more and more present in our lives; secondly, anyone has the opportunity to share anonymised content. Fabricated “facts” are also popular in climate change, and it is believed that they have a significant role in persisting climate scepticism. Whereas some of these reasons (e.g. political ideology) are easily explainable and supported by consistent scientific evidence, the explanation of the role of fake news, conspiracy theories and cognitive abilities are often conflicting (e.g. Lutzke et al., 2019 vs Trémolière and Djeriouat, 2021).

To fill this knowledge gap, we set this study to examine relationships between climate scepticism, fake news, and conspiracy beliefs. Additionally, we will also look at the role of analytical thinking and information literacy concerning these variables to determine more precisely where the real roots of climate scepticism are. Another aspect we will pay attention to is whether the influence of fake news on climate scepticism is related more to classical reasoning or motivated reasoning (Pennycook and Rand, 2019b). For this purpose, we will conduct an online questionnaire to gather empirical data on selected

topics. The topics include assessment of analytical thinking, informational literacy, evaluation of fake news and conspiracies, and climate scepticism.

The first chapter provides insights from the domain of climate change and climate scepticism. In the second chapter, we explain what analytical thinking is, the underlying processes and how analytical thinking is measured. The third chapter provides a fusion of fake news, conspiracy belief with analytical thinking and climate scepticism, putting the theoretical concepts into the bigger context. The fourth and fifth chapters clarify our research, hypotheses, and implemented methods and tools. Chapter six reports the data and results from our survey, which are interpreted and concluded in the Discussion chapter. Finally, the limitations of our study and recommendations for future research are mentioned in the last chapter as well.

Chapter 1

Roots of climate change scepticism

1.1 Brief history of climate change

The first mentions of climate change are dated back to 1824 by scientist Joseph Fourier. He divided heating of earth into three sources: “a, solar radiation, which is unequally distributed over the year and which produces the diversity of climates; b, the temperature communicated by interplanetary space irradiated by the light from innumerable stars; and c, heat from the interior of the Earth remaining from its formation”. He believed that the third source is the one that is responsible for the phenomenon nowadays called the greenhouse effect (Fleming, 1999). His work was the first known out of thousands focused on the greenhouse effect, global warming or climate change. NASA defines climate change as “A long-term change in the average weather patterns that have come to define Earth’s local, regional and global climates.”(Overview: Weather, Global Warming and Climate Change, n.d.).

The modern history of climate change started approximately in the 1970s. The trigger in these times was a call-out done by Reid Bryson in 1972, suggesting that we are on the verge of global cooling. Although they never achieved this consensus, it was enough to start raising the topic of climate change more often (Peterson et al., 2018). Another significant milestone in 1972 was the first UN environment conference. During 70’s first scientific papers with global warming and the greenhouse effect as the primary domain were written (e.g. Sawyer, 1972; Broecker, 1975). In 1979 the World Climate Conference took place. In the declaration launched after this conference, three essential calls to action are mentioned: (a) To take full advantage of man’s present knowledge of climate; (b) To take steps to improve significantly that knowledge; (c) To foresee and prevent potential artificial changes in climate that might be adverse to the well-being of humanity (WMO, 1979, p. 723). During the 1980s, the term started to be so popular that the first international policies were created. In 1987 The Montreal Protocol was adopted, restricting the use of chemicals that can damage the ozone layer (UN Ozone Secretariat, 1987). 1988 marks the

Intergovernmental Panel on Climate Change (IPCC) establishment to gather and assess evidence on climate change.

From 1990 IPCC produces every six years assessment reports that summarise the objective, scientific information that should help understand the scientific basis behind the risk of human-induced climate change, its impact and possible reactions. These reports contribute to the United Nations Framework Convention on Climate Change (UNFCCC), the leading international treaty on climate change (IPCC, n.d.). The central role of IPCC lies in building scientific consensus about climate change through elite scientists agreeing with IPCC synthesis reports. The agreement was reached, and as reported by Powell (2017), the consensus should be at 100%. The scientific consensus arising from the IPCC 5th assessment report is “Human influence has been the dominant cause of the observed warming since the mid-20th century.”

1.2 Climate Scepticism

As with every scientific stream, soon after the consensus regarding climate change started to form, the line of sceptical and denying work unravelled. The term climate change scepticism refers to the arguments that reject, dismiss or doubt the scientific consensus on the extent of climate change, its existence, relevance or its connection to human behaviour (Van Rensburg, 2015). Some studies, such as the one by Dunlap and McCright (2010), may also use the term “denial” with the same meaning as we are going to use the word “scepticism” in our work. The interpretation of climate change scepticism varies, and different studies have divided scepticism into several streams (Painter and Ashe (2012) - 4 streams; Capstick and Pidgeon (2014) - 2 streams; Akter et al. (2012) - 5 streams). We have decided to continue mainly with the work done by Van Rensburg (2015), which divides scepticism into three streams: a, epistemic scepticism; b, process scepticism; c, response scepticism.

1.2.1 Epistemic Scepticism

Epistemic Scepticism (sometimes also called evidence scepticism) is related to doubts about the status of climate change as a scientific and physical phenomenon (Capstick and Pidgeon, 2014). This scepticism can be further divided by the Trend-Attribute-Impact typology proposed by Rahmstorf (2004), a typology popularised in climate change

scepticism theories. The first level of denial can occur at the trend level when sceptics deny the existence of climate change. They are unwilling to admit that something like climate change exists and consider it a construct of the media, politicians, or corrupted scientists. The next level starts when sceptics can accept the existence of climate change, but they challenge it at the level of attribution, claiming that humans are not primarily responsible for climate change. They are stating that climate change can be real. However, we as humans have no effects on it, and all of the alterations are just effects of natural causes. The third level is impact scepticism. Impact scepticism accepts that we humans are altering the climate but refuses that any negative consequences arise from climate change (Rahmstorf, 2004).

1.2.2 Process Scepticism

This category tends to be also considered as a subcategory of epistemic scepticism. Process scepticism relates to doubts about the status of climate change as a political phenomenon. Sceptics criticise the scientific, bureaucratic, and political processes behind climate science. The main arguments focus on the massive funding of climate research, which became a biasing factor in climate research, and often overlooks contradictory research in the mainstream climate research (Van Rensburg, 2015). It is believed that the presence of this type of scepticism roots from the people's doubts about climate science. Sceptics don't consider science as a process that aims to determine an accurate and proper picture of the world. And doubts can just reflect the universal belief that scientists' knowledge is also limited (Bauer et al., 2000).

1.2.3 Response Scepticism

This type is related to doubts about the efficacy of action taken to address climate change (Capstick and Pidgeon, 2014). It refers to the concerns of one's individual willingness to respond to climate change, capacity, and effectiveness. Therefore, most sceptics of this group believe that climate change is happening and that humans are responsible for it and harm the environment. However, they don't think that their actions could help mitigate climate risk. They are also limited and often derive from assessing the probability and severity of future climate risks.

1.2.4 Spread of climate scepticism

This behaviour spread mainly in the 1980s in the US when the awareness of climate change was on the rise. Subjects (e.g. oil and petrol companies) were labelled as the main threats of climate change, and conservative political parties started with anti-environmental rhetoric and actions. It mainly served as a response to increasing regulations established on the US ground (Dunlap, 1987). More and more conservative parties worldwide created movements supported by companies that contributed to the worsening climate situation and started to take over the anti-campaign, which caused slower environmental regulations (Dryzek et al., 2011, p. 148).

In the review from Capstick et al. (2014), we can see the higher level of “worry” about climate change at the beginning of the 1990s (62% of participants), in less than a decade, dropped by more than 10% and then again in two years raised to the maximum (69%) held until 2014 and from the beginning of 21st century these levels were frequently fluctuating.

In 2011 surveys showed that 64% of Americans think that global warming is happening compared to 18% of who think it is not happening (Leiserowitz et al., 2011), and in Europe, the number of people considering climate change a severe problem reached 68% (Eurobarometer, 2021). For comparison, the data from 2021 show that 70% of Americans think that global warming is happening compared to 15% of who think it is not happening (Leiserowitz et al., 2021). Meanwhile, 93% of Europeans (and 95% of Slovak citizens) believe that climate change is a severe problem (Eurobarometer, 2021). Worth a mention is also information from Eurobarometer (2021) that climate change ranks first as the single most serious problem facing the world as a whole for the first time in its history. We can see that in Europe, during the past ten years, climate scepticism was in rapid retreat while the decrease in the US has a slower pace. A few of the reasons suggested by Capstick et al. (2014) underlying repetitive changes in climate scepticism belief are anomalous weather, political polarisation, diminishing engagement to this topic.

Meanwhile, the US remains the country with the most influential movement of climate change scepticism. Through the decades, it has spread all over the world. Research conducted in 14 developed countries has shown that citizens of countries such as Norway,

New Zealand or Australia are as sceptical as Americans (Tranter and Booth, 2015). Scepticism was predicted to be lower in the countries with a higher focus on the quality of life than economic and physical security; however, citizens of countries such as Sweden, Finland, Canada, and Norway were more sceptical than expected. The question is, are there any universal factors that can determine inclination to the climate change scepticism?

1.3 Are you likely to become climate sceptic?

The research conducted in past decades tried to determine whether there are any common signs among the climate change sceptics. The ones most often discovered are political orientation, gender, relationship to environmental issues, and relatively consistent predictors of climate scepticism in several countries (Tranter and Booth, 2015; Dunlap and McCright, 2008; Whitmarsh, 2011). Other variables are often considered in the prediction of the conclusion that climate scepticism is rooted in people's core values, worldviews or their age (Poortinga et al., 2011).

Gender

The majority of studies test and include in their hypothesis arguments about gender differences. It has been shown that more excellent scientific knowledge and environmental concern is conveyed among women than among men (Engels et al., 2013; Tranter and Booth, 2015; Leiserowitz, 2005; Whitmarsh, 2011).

Age

This predictor is controversial among studies. While in some studies, the effects of age weren't proven (Tranter and Booth, 2015). In other, older participants with varying age borders (55 and over; 65 and over) tend to incline more towards climate scepticism than younger ones, especially taken into consideration together with other predictors such as political ideology or lower social class (Poortinga et al., 2011; Whitmarsh, 2011).

Values

One of the commonly researched variables is one's values and their impact on scepticism. As expected, people who possess pro-environmental values are less sceptical and tend to be more worried about climate change (Leiserowitz, 2005). On the other hand, the conservative values tend to be higher predictors of scepticism, with anti-environmental

attitudes, individuals and hierarchic inclines and religious tendencies (Poortinga et al., 2011; Leiserowitz, 2005; Engels et al., 2013).

Political Ideology

Political ideology has been so far proven as one of the strongest indicators of being sceptical towards climate change. Starting with the origins of climate change scepticism, people with conservative ideology were the ones that used to be more sceptical towards climate science (Engels et al., 2013; Poortinga et al., 2011; Hornsey et al., 2018; Van der Linden, 2015). Next to them are also standing individuals with non-voting intentions (Whitmarsh, 2011; Engels et al., 2013; Poortinga et al., 2011). Firstly, it is believed that this trend is happening due to conservative political leaders who tend to question or even reject climate change publicly much more often than liberal leaders. It is also proven that conservative voters follow politicians' cues or engage and share their world views more often than voters of more liberal parties. This combination naturally creates a higher probability of sharing sceptical thoughts on climate change.

Conspiracy belief

Strongly tied to political ideology also stands conspiracy belief as a predictor for being climate change sceptic. Studies examining participants influenced and not influenced by exposure to fake news have revealed that brief conspiracy videos make people more inclined to have less concern about climate change and show more signs of climate scepticism (Van der Linden, 2015; Uscinski and Olivella, 2017). Conspiracy believers are also more inclined to have faith in intuition and general feelings associated with information processing (Martel et al., 2020). Evidence also suggests that even negative emotions, generally thought to promote scepticism (Forgas, 2019), can also contribute to conspiracy belief theories, mainly when such feelings are related to the subject of the conspiracy theory. We will describe other relationships between conspiracy belief and fake news in chapter 3.

Proximity to climate change risk

Another debatable predictor of climate change scepticism is proximity to experiencing the effects of climate change. Hypotheses usually expect people from the areas experiencing a higher probability of being affected by climate change or coastal areas, having higher acceptance of climate change and therefore lower scepticism. Meanwhile, citizens of

inland countries and areas that do not experience climate extremes could open a bigger door for climate scepticism to settle. However, the data do not always support these hypotheses. As research has shown (Tranter and Booth, 2015; Brügger et al., 2015), countries producing higher levels of CO₂ are the ones with a higher number of sceptics. Also, they have shown that proximity to threats plays no role in climate change scepticism.

Literacy

The measurement of literacy connected with climate scepticism was done mainly in two streams. The first one is science literacy with statements such as, “Electrons are smaller than atoms” - determine whether this statement is true or false. Scientific literacy is a term for the different types of literacy - written, numerical, and digital, that leads to understanding science, methodology, observations, and theories. Scientific literacy is also focused on understanding the scientific methods, units and measurement, empiricism, knowledge of statistics in particular correlations and qualitative versus quantitative observations and aggregate statistics, and a basic understanding of core scientific fields (Laugksch, 2000). The second dimension of literacy is connected with “numeracy” - the capacity to use quantitative information with mathematical problems, e.g., “A bat and a ball cost \$1.10 in total. The bat costs \$1.00 more than the ball. How much does the ball cost?” (Kahan et al., 2012). Numeracy skills are the ability to use, interpret and communicate mathematical information to solve real-world problems. These include the ability to understand basic math like addition, subtraction, division and multiplication (Reyna and Brainerd, 2007). As examined earlier (Kahan et al., 2012), literacy has an effect on the perception of climate change risk, and (mis)beliefs towards it.

1.4 Are you likely to help with climate change mitigation?

Prosocial behaviour is a social behaviour that benefits other people or society as a whole, such as helping, sharing, donating, co-operating, and volunteering (Bénabou and Tirole, 2006). Prosocial behaviour is the opposite of antisocial behaviour or aggression. It is usually motivated by empathy, fear of losing one’s social status, hope for return, one’s system of fairness, or concern about the rights and welfare of others (Nolan and Schultz, 2013). Prosocial behaviour is not necessarily conscious and includes activities generally expected from society, such as following the traffic signs, standing in line, paying in shops. Prosocial behaviour is also believed to be “contagious” (Brief and Motowidlo, 1986;

Tsvetkova and Macy, 2015) in two different ways: rivalry - happening mainly in the offline environment, with intended receiver - and non-rivalry - often occurring in online space with no specific receiver, but with much higher spreadability.

1.4.1 Pro-environmental behaviour

One of the forms of prosocial behaviour is also pro-environmental behaviour. This behaviour can be divided into two main streams. First, is direct impact done by active demonstration of pro-environmental behaviour and actions that are considered friendly to the environment such as not eating meat, using reusable bags, recycling, using public transportation, using green energy. The second stream is being a policymaker (politician) that indirectly influences others by taking decisions/actions that might need to be also followed by others, but in the end will lead to the minor damage done on our environment, e.g. passing forward a law that forbids the usage of plastic straws (Nolan and Schultz, 2013). Acting pro-environmentally often costs us a small price that we need to pay when we are acting sustainably, such as a few extra seconds when we are cleaning the plastic trash to be able to recycle it. The actors of pro-environmental behaviour believe that their actions can help the environment in the long term horizon and therefore, they are more prompt to choose delayed gratification that arises from what they do (Arbuthnott, 2010). McClure (2004) and Kollmuss and Agyeman (2002) have already examined the concept of selecting a postponed reward. These studies have concluded that a big part in whether the person chooses immediate compensation or greater long-term rewards in an individual's cognitive abilities.

Chapter 2

Analytical thinking

2.1 What is analytical thinking

Analytical thinking is the ability to break down information into smaller categories and pieces to conclude. The conclusions being made help solve problems, analyse data and recall and use information (Amer, 2005). Analytical thinking or analytical skills are critical skills needed in the 21st century (Finegold and Notabartolo, 2010). Some of the most common competencies considered a part of analytical skills are problem-solving, decision making, research and inquiry and critical thinking (Finegold and Notabartolo, 2010).

2.1.1 Anatomy of analytical thinking

It is believed that the explanation of analytical thinking lies in “Dual-process theory”, which specifies two distinct cognitive processes executed by two different systems. “System 1” (intuitive thinking) processes occur spontaneously and do not require much attention, such as recognising that the face of the person entering the classroom belongs to your math teacher. On the other hand, counting square root of 123 without a calculator involves “System 2” (analytical thinking), responsible for mental operations requiring effort, motivation, concentration, and the execution of learned rules (Stanovich and West, 2000). These two examples are distinct because they both work only with one of the systems. However, in daily life, some tasks require solutions that can trigger both systems. Autonomous subsystems supplement the consciousness corresponding to System 2 thinking in System 1, which run unconsciously. System 2 allows us to think that modern humans have unique potential for a higher level of rationality in their reasoning and decision-making (Evans, 2003).

System 1 outcomes can only be replaced indirectly by asking people to make a solid effort to reason deductively (Evans, 2003). System 1 processes are fast, automatic, effortless, unconscious and hard to change or overcome. These processes can be language-mediated and usually relate to events (Leron and Hazzan, 2009). System 2

processes are slow, conscious, effortful and flexible (Leron and Hazzan, 2009). The low processing capacity of System 2 leads to it being computationally expensive that requires high effort, and the exclusion of attention to other matters (Evans, 2003). The review of neuroimaging studies done by Evans and Stanovich (2013) showed that different brain areas are activated when responses are intuitive, produced by System 1 than when they are computed by System 2.

In System 1, primarily activated regions are the limbic system (McClure, 2004) - also known for emotional processing and lower order tasks, and the ventromedial prefrontal cortex - known for being engaged in guessing and intuitive tasks (Goel and Dolan, 2003). These regions are involved in firing the immediate answer that has not been critically evaluated.

For critical evaluation, the Anterior cingulate cortex is activated to detect the incorrect response (Neys et al., 2008). In a study made by Greene et al. (2004), the limbic system's presence during the critical evaluation was suggested (Greene et al., 2004). Neys et al. (2008) believe that conflict is detected every time, and it is System 2 that fails to override the intuitive response (Neys et al., 2008).

If System 2 activates the right lateral prefrontal cortex (Evans and Stanovich, 2013; Neys et al., 2008; Goel and Dolan, 2003), dorsolateral prefrontal cortex (Greene et al., 2004; Goel and Dolan, 2003), parietal areas - more precisely inferior parietal lobe and posterior cingulate cortex (Greene et al., 2004; McClure, 2004) our brain is on the best way to override the intuitive responses (McClure, 2004).

However, the question that stays unanswered is "Based on what our brain decides whether System 2 is going to be successful?". A study done by Kane and Engle (2002) has shown that significant importance lies within working memory and its capacity. Working memory is the system that regulates what will get our attention. Its capacity is the attribute that can determine how many different pieces of stimuli we will process at the same time. Therefore a bigger capacity of our working memory can ensure a bigger chance that the request to override the System 1 information will be accepted (Barrett et al., 2004; Kane and Engle, 2002).

2.2 Cognitive reflection test

Cognitive reflection test (CRT) was developed and designed by Shane Frederick (2005) as a task that measures one's ability to override the intuitive response and implement further thinking to find a correct answer. It is believed that the CRT measures analytic thinking by presenting problems that have quick, instinctive reactions but are incorrect and must be overridden to provide the correct answer. Speaking in terms of Dual-Process Theory, the response from System 1 needs to be flagged as incorrect and System 2 should take place. The original and most common CRT tasks are popular in several variances worldwide in different studies. Let's look at the example of "A bat and a ball cost \$1.10. The bat costs \$1.00 more than the ball. How much does the ball cost?". First, the fast System 1 immediately responds with the answer 10 cents since this answer is much more significant. This answer is accepted as final with some people because the overriding mechanism of System 2 has failed. However, in other cases, people engage in further reflection when the conflict leads to System 2 computing the correct answer, 5 cents (Leron and Hazzan, 2009). The original CRT tasks are not always considered reliable measurements of analytical thinking because they engage with a significant amount of mathematical skills and knowledge, and instead of cognitive reflection, they can provide better data for numeracy measurement. However, non-numerical versions of CRT were developed and are currently being used (Sirota et al., 2020).

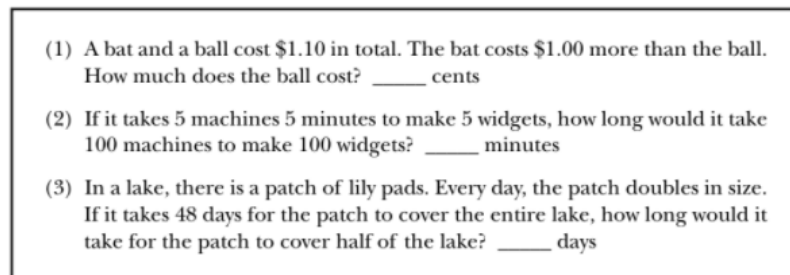
- 
- (1) A bat and a ball cost \$1.10 in total. The bat costs \$1.00 more than the ball. How much does the ball cost? ____ cents
 - (2) If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? ____ minutes
 - (3) In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? ____ days

Figure 2.1 - Original CRT task created by Shane Frederick showing three basic CRT tasks

Chapter 3

Fake news and conspiracy beliefs

In the past several studies were done looking into the relationship of cognitive factors (e.g. analytical reasoning) and the ability to judge characteristics of stimuli (such as credibility of a source or trustworthiness of shared information). Some studies have discovered that higher analytical reasoning was associated with greater accuracy and reduced perceived credibility for fake news and more accurate detection of real news (Pennycook and Rand, 2019a; Pehlivanoglu et al., 2021; Bronstein et al., 2019; Pennycook et al., 2015). Other studies have shown a clear relationship between climate scepticism and conspiracy or fake news beliefs (Van der Linden, 2015; Uscinski and Olivella, 2017, Hornsey et al., 2018; Hornsey, 2020). This chapter will look deeper into the discovered relationships to set the theoretical ground for our research.

3.1 Fake news

“Fake news” is defined as “fabricated information that mimics news media content in form but not in organisational process or intent. Fake news outlets, in turn, lack the news media’s editorial norms and procedures for ensuring the accuracy and credibility of information” (Lazer et al., 2018). This type of news is created purposefully to deceive or misinform their receivers. Usually, they are designed to push a political agenda, influence people’s views, cause confusion or ensure profit for the business in which this news is created. Their original purpose and use was mainly in politics to draw away attention or support certain parties, but they have also spread around diets, stock rates, or currently also around COVID-19 vaccination. Among these topics, the particularly popular is climate change which stays through the years as one of the traditional targets of fake news. Fake news is often being published on sites that resemble either with their appearance or name trustworthy media. Studies in past years have been looking into the traits and expected behaviours in the online space that characterise individuals who share fake news.

As Pennycook and Rand claim in their studies (2019a; 2019b), people who are used to think less analytically tend to rate fake news as more accurate than those with higher scores on the Cognitive Reflection Test. They also discovered a general lack of scepticism

or reflexive open-mindedness, which might be the underlying reason why some people fall for fake news. In another study, the relationship between the preference of political parties and the likeliness to distinguish real news from fake news was found. Individuals with more conservative choices are more likely to incorrectly judge whether the information is accurate or fake and to have a more intuitive judgement (Bago et al., 2005). One of the persistent demographic factors occurring at a higher percentage of individuals who seem to believe and share “fake news” content is over 65 years old (Guess et al., 2019). The main behaviours the supporters of fake news tend to have are: a, the greater trust towards the content shared on social media; b, missing authentication of the shared content; c, higher self-disclosure (Talwar et al., 2019); d, higher presence on Facebook than other social media (Hopp et al., 2020).

Meanwhile, as with any news, fake news usually has short-term nature, which causes sensation and later diminishes from the public view. If the same topic remains nurtured, it can turn into conspiracy theories, and conspiracy ideas cause the birth of new fake news (Albarracín, 2020).

3.2 Conspiracy beliefs

In a world where you might feel powerless, uncertain and alienated, it is comforting to believe that someone is plotting against you and your interests. Conspiracy theory is defined as “a belief that several actors join together in secret agreement to achieve a hidden goal that is perceived as unlawful or malevolent” (Van Prooijen, 2018). Although paranoid ideas are not new and have accompanied humankind for decades and had been widely popularised in the 1950s (Coady, 2021), the internet has helped transfer them within seconds. While some of the conspiracy theories might be harmless, such as “The assassination of John F. Kennedy was not committed by the lone gunman Lee Harvey Oswald but was rather a detailed, organised conspiracy to kill the president.” (Lewandowsky et al., 2013), others might lead to serious health or safety risks. These threats are evident in 2021 when an enormous number of conspiracy theories questioning vaccination against Covid-19 is slowing down the process of achieving collective immunity all around the world (Islam et al., 2021). This is only a brief example of why we believe the roots of conspiracy beliefs need to be detected.

As we will examine later, there are a vast number of underlying reasons for conspiracy thinking. People who seek conspiracies usually expect some benefits from nurturing such beliefs (Douglas et al., 2017). However, to their disappointment, these needs are often not fulfilled, and belief in conspiracies reinforces feelings of confusion, isolation, disenfranchisement, and loneliness. These feelings then foster new ideas in other schemes, and although the next conspiracy they are going to believe is not connected with their identity, they are much more likely to believe in them than those who haven't fallen for the conspiracies yet (Goertzel, 1994).

3.2.1 Why do people fall for conspiracies

Many studies were conducted to find the reasons underlying conspiracy beliefs. Only a few of the findings are that conspiracy beliefs are correlated with lower levels of analytic thinking (Swami et al., 2014), lower levels of education (Douglas et al., 2015) and the tendency to perceive agency and intentionality where it does not exist (Douglas et al., 2015). It is also stronger when significant events leave people dissatisfied with mundane, subjectively insufficient explanations (Leman and Cinnirella, 2013). As found by Lantian et al. (2017), conspiracy theories may serve people's desire to be unique, highlighting a motivational underpinning of conspiracy belief.

Besides our demographic or psychological backgrounds, Douglas et al. (2017) suggest that people incline to conspiracy theories when they promise to satisfy social-psychological motives falling into one of these three categories: (a) epistemic - understanding our environment; (b) existential - being safe and in control of own environment; (c) social - maintaining a positive image of the self and the social group.

Epistemic Motives

Understanding events around us and their explanations are one of the key needs that people have. When the information we seek is unavailable, doesn't explain the root cause of our problem, and cause us discomfort, we tend to turn towards conspiracy theories for explanations. These theories don't need to provide the exact information we were seeking. Sometimes it is enough to assure us that the proof exists, and we are just not those who have access to them. They require the cooperation of controversial agents or suggest that the actual evidence which is unsatisfactory is being falsified (Douglas et al., 2017).

Conspiracy believers often attack those who refuse these theories and incorporate them into their plot (Lewandowsky et al., 2015b). They are also willing to fabricate “evidence” often presented as scientific findings as a product of this conspiracy. (Lewandowsky et al., 2013). The epistemically motivated schemes tend to satisfy us at the expense of other factors, such as expressing beliefs arising uncertainty while being less likely to be accurate (Douglas et al., 2017).

Existential Motives

Already Maslow in 1943 defined that one of the basic needs for people is to feel safe and secure in their environment and control the environment. Therefore it should be no surprise that conspiracy theories may compensate people who lack the control because they offer them the opportunity to reject official accounts and feel that they have an alternative explanation (Goertzel, 1994). Conspiracy theories may promise people a sense of control and answers when they feel powerless (Abalakina-Paap et al., 1999). The question remains unanswered: whether the existential motives are also being fulfilled and conspiracy theories bring desired value to their believers.

Social Motives

The last group of conspiracy-belief motives is the desire to belong and maintain a positive image of the self and our community. Individuals motivated by social reasons may use conspiracies to avoid any social threats they might be facing (Cichocka et al., 2016). As reviewed by Douglas et al. (2017), such threats might be ethnic discrimination, losing side of political/sport processes or simply the feeling of being in the minority. This suggests that conspiracy theories may be adapted to relieve the self or community from feelings of being disadvantaged. However, the side product of conspiracy beliefs is the negative, distrustful representation of other people and groups, which can also cause the feelings of alienation and valuelessness with which they are associated (Abalakina-Paap et al., 1999).

3.3 Reasoning behind conspiracy thinking and fake news belief

It is essential to ask the question, “What is happening within our reasoning when we let ourselves believe in fake news or conspiracies?”. As researchers before them, also Pennycook and Rand (2019b) tried to investigate the answers to this question in their study. Based on past research of motivated reasoning and results (Bago et al., 2005;

Pennycook and Rand, 2021), they could expect people to convince themselves that even implausible fake news is accurate if it supports their ideology. However, as they discovered, it is the analytical thinking - classical reasoning that fails to detect misinformation which was also in line with the discoveries of Swami et al. (2014). We have paid attention to analytical thinking in the previous chapter, and in upcoming rows, we will address motivated reasoning.

3.3.1 Motivated reasoning

Motivated reasoning is a cognitive bias that explains our tendency to accept what we want to believe quicker without further investigating what we don't want to believe. It is “a form of implicit emotion regulation in which the brain converges on judgments that minimise negative and maximise positive affect states associated with threat to or attainment of motives” (Westen et al., 2006). Although motivated reasoning may seem like the opposite of analytical thinking and implements System 1, which was previously described in chapter 2.1.1, it is represented through System 2. Motivated System 2 Reasoning, or MS2R, refers to the relationship between cultural cognition and conscious information processing (Kahan, 2013). Cultural cognition is a term for an inclination to form beliefs about society and its dangers in a way that reinforce their commitments to visions of the ideal society (Kahan, 2008). This combination of cultural cognition and System 2 postulates reflection that causes people to only believe information that aligns with their ideological identity, and therefore further deliberative process increases the tendency to engage in ideologically motivated reasoning (Kahan, 2013). Arising from this, if MS2R is involved, even more significant differences in conspiracy or fake news belief can occur in people with “more analytical thinking” (Kahan et al., 2012).

3.4 Conspiracy thinking and fake news towards climate scepticism

As we stated in chapter 1, nearly 100% of scientists agree that human activity is causing global climate change. Meanwhile, scientists and some politicians tried to implement steps to reduce carbon emissions and mitigate climate change. There has been ongoing resistance from the responsible bodies (industry) and general public. The most alarming part of those who refuse to obey climate change solutions are those who believe that human-caused climate change is not happening and that climate scientists are lying. The evidence that conspiracy thinking and fake news are connected, and influence on the level

of climate scepticism is various (Van der Linden, 2015; Lewandowsky et al., 2013; Lewandowsky et al., 2013b; Uscinski and Olivella, 2017; Hornsey et al., 2018).

The process happening when it comes to the denial of scientific consensus was described previously by Uscinski et al. (2017). It starts with identifying the threat arising from scientific fact or its implications, such as when you need to comply with regulations. This identification may result in the activation of identity-protective cognition that activates a person's worldview against an attack and displays in various ways. In the case of climate change, identity-protective cognition faces challenging scientific consensus and evidence. Given these circumstances, the only way to avoid this confrontation is to doubt or reinterpret the existence of consensus. Instead of accepting it, a common alternative explanation is a conspiracy among climate scientists, who cooperate to fabricate evidence for malicious purposes.

The question that remains is why such rejection is happening. Lewandowsky et al. (2013) investigated this issue further. The most obvious were psychological factors and indecision arising from inaccurate or misleading media coverage. As Hornsey (2020) already summarised, psychological factors may root from: (a) ideologies, (b) vested interests, (c) conspiracist worldviews (seeing the world through conspiracies), (d) fears and phobias, (e) personal-identity expression, and (f) social identity needs. We can not omit that Thisopular reason for climate scepticism arising from conspiracy/fake news belief is emotional imbalance and quest to avoid negative emotions (Thagard and Findlay, 2010; Martel et al., 2020). Additionally, the impact of political ideologies on climate scepticism is strong on and also through conspiracy beliefs. As numerous research shows, conservatives were more likely to fall for global warming hoaxes or display a pro-environmental action (Van der Linden, 2015; Lewandowsky et al., 2013; Lewandowsky et al., 2013b).

Whether we accept or not the conspiracy beliefs or fake news regarding climate change, we should keep in mind that it influences not only the belief and perception of climate change and science as such but also decreases the will to act prosocially in the climate domain but also outside of it (Van der Linden, 2015).

Chapter 4

Current Research

4.1 General Objective

Up to this point, there has been much research that was looking into the reasons underlying climate change scepticism. The majority of the work is coming from the United States, where climate change scepticism is a widespread topic for conspiracy makers (e.g., Kahan et al., 2012; Van der Linden, 2015; Uscinski and Olivella, 2017; Drummond et al., 2020; Martel et al., 2020; Van der Linden et al., 2015). However, very little research was conducted in our geographical location, Central Europe - more precisely Slovakia. The main objective of this study is to examine the connection between analytical thinking and climate change scepticism. As already mapped out in the theoretical overview, many variables could predict climate change scepticism. In this study, we will examine the relationship between conspiracy thinking and fake news belief towards climate change scepticism in the context of information literacy and analytical thinking. We have chosen these predictors to complement an already ongoing line of research examining the effect of political ideology, science literacy and perception of weather changes towards climate change scepticism.

4.2 Methodological Approach

For purposes of this study, we have created a questionnaire, through which we aimed to gather data about analytical thinking represented by the Cognitive Reflection Test, information literacy, conspiracy thinking and belief in fake news, political preferences and climate scepticism of our participants. We paid particular attention to the relationship between analytical thinking and climate scepticism. Therefore we have chosen to work with conspiracy thinking and belief in fake news as our predicted mediators of this relationship.

4.3 Hypotheses

Considering previously stated theoretical and empirical findings, we have set the following hypotheses to examine the relationship between analytical thinking, fake news and climate scepticism. Some of them arise from our aim to conduct mediation analysis to equally target all age groups further discover how our variables are related.

(H1) Climate scepticism is negatively correlated to the ability to think analytically (CRT) (Lutzke et al., 2019; Trémolière and Djeriouat, 2021).

(H2) Climate scepticism is negatively correlated to information literacy (Happer and Philo, 2013).

(H3) Climate scepticism is positively correlated to trustworthiness **(H3a)**, agreeableness **(H3b)** and shareability **(H3c)** (Drummond et al., 2020).

(H4) Climate scepticism is positively related to conspiracy beliefs (Van der Linden, 2015; Uscinski and Olivella, 2017, Hornsey et al., 2018).

(H5) The relationship between conspiracy belief and climate scepticism is moderated through political preferences, such that more conservative ideology strengthens the positive relationship between conspiracy belief and climate scepticism. (Trémolière and Djeriouat, 2021).

(H6) The relationship of trustworthiness **(H6a)**, agreeableness **(H6b)**, shareability **(H6c)** of fake news and climate scepticism is moderated through political preferences such that more conservative ideology strengthens the positive relationship between fake news susceptibility and climate scepticism (Lutzke et al., 2019).

(H7) Higher analytical thinking (CRT) correlates with lower trustworthiness **(H7a)**, agreeableness **(H7b)** and shareability **(H7c)** of fake news (Pennycook and Rand, 2019a; Pennycook and Rand, 2019b; Bago et al., 2005; Pehlivanoglu et al., 2021; Bronstein et al., 2019, Lutzke et al., 2019).

(H8) Higher analytical thinking (CRT) correlates to the lower belief in conspiracies (Swami et al., 2014; Pennycook et al., 2015b; Barron et al., 2018)

Due to missing knowledge in the mediation of these relationships, we have chosen to formulate two research questions of this research:

(RQ1) Relationship between analytical thinking and climate scepticism is mediated through belief in conspiracies.

(RQ2) Relationship between analytical thinking and climate scepticism is mediated through trustworthiness **(RQ2a)**, agreeableness **(RQ2b)** and shareability **(RQ2c)** of fake news.

Chapter 5

Methods

5.1 Participants

For this study, we have recruited 655 participants. The recruitment of participants took place through social networks, more particularly facebook. We targeted our research on a diverse demographic sample through groups with diversified demographic structures. After the data sorting (removing participants who rated all of the questions with the same number or those who did not provide a CRT legitimate answer), 625 (469 females and 156 male) participants remained valid cases for analysis. Participants were aged between 18 and 74 years ($M = 24.52$, $SD = 6.63$). All participants were fluent Slovak speakers over the age of 18, agreed with participation in the research and were not provided with any remuneration for participation in research.

5.2 Procedure and Materials

The research itself consisted of filling a questionnaire designed on the google forms platform. In the questionnaire, participants encountered as first the demographic section, where they provided basic information about their backgrounds, such as age, gender, education level, size of the city of their residence, and their perceived categorisation in political preferences (from very conservative to very liberal). The following sections were:

5.2.1 Cognitive Reflection Test

During the design of our questionnaire, we have decided to implement six non-numerical questions from the Cognitive Reflection Test developed by Sirota et al. (2020). The correct answers were during analysis summed to the final CRT score ($M = 3.65$, $SD = 1.61$, $\alpha = .557$). CRT was established as a measurement of analytical thinking, which was also implemented in studies before (Pennycook and Rand, 2019a; Bago et al., 2005; Pehlivanoglu et al., 2021; Bronstein et al., 2019). Higher accuracy on CRT reflects greater cognitive ability and a more analytic cognitive style. In our study, we have decided to work with non-numerical questions due to high recognition of original tasks in the common

public and doubts that the numerical nature of the CRT can confuse reflection ability with a mathematical ability (Sirota et al., 2020). All of the tasks were translated from English original to the Slovak language without altering their meaning.

5.2.2 Self-assessment of information literacy

In this part of the questionnaire, we have addressed four questions that were examining participant's work with information. The rating for all of the questions was averaged into the variable representing information literacy ($M = 4.03$, $SD = 0.46$, $\alpha = .347$). Information literacy achieved unacceptable internal consistency, and therefore we will need to keep an eye on this variable later during the interpretation of our results. We extracted these questions from the Questionnaire on Information Literacy (Beutelspacher, 2014). For information literacy questions, we had to reverse ratings for the statement "I believe that almost all of the information that a person can find on the internet is usually true" since this statement suggested low information literacy while others suggested high information literacy. "I trust more the information I find and check myself than the ones I am given from somebody else."

5.2.3 Fake news susceptibility assessment

In our study, we chose susceptibility to fake news as a mediating factor between analytical thinking and climate change scepticism. We wanted to examine whether there is a positive relationship between the belief in fake news or conspiracy thinking and climate change scepticism (Van der Linden, 2015; Uscinski and Olivella, 2017) or whether it does not play a significant role in climate scepticism (Drummond et al., 2020). In assessing fake news susceptibility, we have introduced ten headlines (five real and five fake) to participants with a one-sentence description and image. All of the excerpts focused on the topics related to climate change and were presented in random order. Real news excerpts were taken from credible sources and compared with information from other mainstream media. Their content was either announcing the latest effects of climate change or describing actions that need to be taken to mitigate the climate crisis. To find fake news about climate change, we looked into the database of misinformation media (konspiratori.sk) in the Slovak Republic. Subsequently, we were looking through these resources for articles that were denying the existence of climate change, questioning its source, the effect of humans on climate change, or political propaganda connected with climate change. All of the

excerpts were accompanied by three questions rated on a 5 point Likert scale from “Absolutely No” to “Absolutely Yes”. The questions that were later taken also as separate variables were: 1, “Do you consider this news as trustworthy?”; 2, “Is the presented opinion the same as yours?”; 3, “Would you consider sharing this news on your social media?”. The answers to these questions were later divided in between the fake and real news, and their averages created six new variables:

- (A) Trustworthiness of fake news ($M = 1.76$, $SD = 0.60$, $\alpha = .668$);
- (B) Trustworthiness of real news ($M = 3.08$, $SD = 0.80$, $\alpha = .807$);
- (C) Agreeableness with fake news ($M = 1.59$, $SD = 0.58$, $\alpha = .705$);
- (D) Agreeableness with real news ($M = 3.25$, $SD = 0.83$, $\alpha = .705$);
- (E) Shareability of fake news ($M = 1.23$, $SD = 0.46$, $\alpha = 0.904$);
- (F) Shareability of real news ($M = 1.85$, $SD = 0.93$, $\alpha = 0.846$).

For these variables, we later created differences of their fake news values - real news values and created three variables that represented for each observed characteristic how much higher/lower-rated they were for fake news. The final variables were Trustworthiness (A-B) ($M = -1.31$, $SD = 0.87$), Agreeableness (C-D) ($M = -1.67$, $SD = 0.99$) and Shareability (E-F) ($M = -0.63$, $SD = 0.82$). A lower difference in shareability is an element we will later consider during the interpretation of our results.

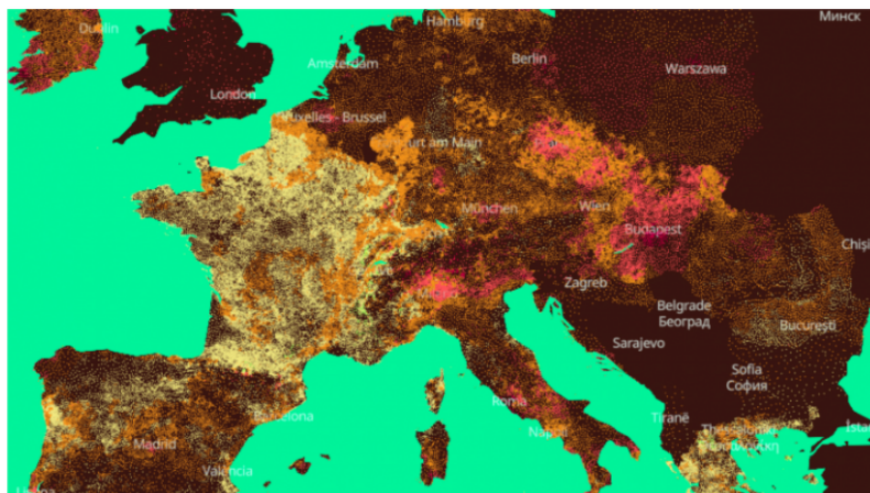
NASA pripúšťa, že zmenu klímy spôsobuje obežná dráha Zeme, nie fosílna palivá



Už viac ako 60 rokov Národný úrad pre letectvo a vesmír (NASA) vie, že zmeny, ktoré sa odohrávajú v planetárnych modeloch počasia, sú úplne prirodzené a normálne.

Figure 4.1 Example of fake news excerpt used in our questionnaire.

2020 bol najteplejším zaznamenaným rokom



Minulý rok bol v Európe najteplejším zaznamenaným. Podľa satelitného programu Copernicus bola priemerná teplota o 0,4 stupňa vyššia, než v 2019. V globálnom meradle sa predchádzajúci rok vyrovnal doteraz najteplejšiemu roku 2016.

Figure 4.2 Example of real news excerpt used in our questionnaire.

5.2.4 Conspiracy thinking assessment

Conspiracy thinking assessment helped us to obtain complementary information to the fake news susceptibility. Our study participants were presented with four popular conspiracy theories that were not connected with climate change, e.g. “Pharmaceutical and medical industry united to invent new diseases to earn more profit”. They rated their agreeableness with these theories on the 5 points Likert scale from “Absolutely disagree” to “Absolutely agree”. Their ratings were averaged and used later in the analysis ($M = 1.89$, $SD = 0.96$, $\alpha = .871$).

5.2.5 Climate Change Scepticism Scale

The climate change scepticism scale used in our study was adapted from Lorraine Whitmarsh (2011), popularised and widely used in climate change scepticism research. This scale was developed to measure multidimensional scepticism, which consists of uncertainty about the existence of climate change, certain beliefs about how the media exaggerate and a general mistrust in the evidence of climate change (Engels et al., 2013). The scale consists of twelve statements that can be rated on a 5 point scale from “Completely agree” with the given statement to “Completely disagree” and was fully

translated to the Slovak language. Our final variable representing climate scepticism was created as an average of these 12 questions ($M = 1.77$, $SD = 0.71$, $\alpha = .917$).

5.3 Analysis

We have used jamovi software version 1.6.23 with installed module “medmod” to analyse the data. Firstly we conducted a descriptive analysis to verify the accuracy and normality of our research sample. Then we ran an internal consistency test for all of the composite variables that showed us the probability of other values in the group being the same as the one we are comparing them to. The following analysis we ran was a correlation matrix for all variables to see which variables correlate together. As a third analysis, we used linear regression with model coefficients and model fit measures for climate change scepticism being a dependent variable and all other correlating variables. The fourth analysis we ran was mediation analysis to discover relationships arising from our research questions. Additionally, we ran a moderation analysis to determine the moderating role of political preferences on our independent and dependant variables.

Chapter 6

Results

The descriptive statistics of variables used in our research is displayed in Table 6.1. The only variable which we could not consider here was gender due to its nominal nature. Important information for us is the Shapiro-Wilks normality test shown for all of the variables non-normal distribution, which we will have to consider when interpreting our results.

Table 6.1: Descriptive statistics of the variables used in research.

<i>Descriptive Statistics</i>									
	<i>Politics</i>	<i>Age</i>	<i>CS</i>	<i>CRT</i>	<i>IL</i>	<i>Share.</i>	<i>Trust.</i>	<i>Agree.</i>	<i>Consp.</i>
<i>Mdn</i>	4	23	1.58	4	4.00	-0.200	-1.20	-1.60	1.50
<i>IQR</i>	1.00	4.00	1.000	2.00	0.500	1.00	1.20	1.40	1.50
<i>Min</i>	1	18	1.00	0	2.25	-4.00	-3.80	-4.00	1.00
<i>Max</i>	5	74	5.00	6	4.75	2.60	1.00	1.20	5.00
<i>D</i>	0.887	0.561	0.885	0.934	0.938	0.850	0.986	0.991	0.851
<i>p</i>	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001

6.1 Correlation Matrix

To examine the relationships between our variables, we started the analysis with a correlation matrix. This matrix revealed a strong correlation between climate scepticism measures and conspiracy belief $r(625) = .576$, $p < .001$ (see Table 6.2) that was also expected based on H4. From the variables that were serving the measurement of belief in fake news, the strongest correlation was found between climate scepticism and agreeableness $r(625) = .571$, $p < .001$ followed by medium correlation with trustworthiness $r(625) = .453$, $p < .001$ and low correlation with shareability $r(625) = .228$, $p < .001$ (see Table 6.2) and these correlations support H3 in all of its points. Results of climate

scepticism and political preferences showed negative medium correlations $r(625) = -.379$, $p < .001$. Since lower values in political preferences represented a more conservative ideology, these correlations confirm our presumptions that more conservative beliefs are connected with higher climate scepticism. The proof of central hypothesis H1, leaning on the correlation between analytical thinking (CRT) and climate scepticism, was found as significant, but with a small association $r(625) = -.099$, $p < .05$. All correlations with either analytical thinking or information literacy were not significant or had low associations, with the highest being the negative one between information literacy and climate scepticism $r(625) = -.261$, $p < .001$ that is also supporting our hypothesis H2. The last significant correlation between climate scepticism and other variables was found with age $r(625) = .123$, $p < .01$, leaving the only non-significant correlation between gender and climate scepticism.

Furthermore strong correlations were found between trustworthiness and agreeableness $r(625) = .783$, $p < .001$ and trustworthiness with shareability $r(625) = .520$, $p < .001$. Correlations of agreeableness and shareability were in medium association $r(625) = .453$, $p < .001$. These strong correlations also support the relationship we expected while choosing these variables as predictors of fake news susceptibility. Another negative correlation was found between the political preferences and conspiracy belief $r(625) = -.408$, $p < .001$ and political preferences with agreeableness $r(625) = -.329$, $p < .001$. The last medium correlation confirming our assumptions found a relationship between conspiracy belief and trustworthiness $r(625) = .360$, $p < .001$ and agreeableness $r(625) = .451$, $p < .001$ and low correlations of conspiracy belief and a shareability $r(625) = .123$, $p < .01$.

The correlations we expected between analytical thinking (CRT) and trustworthiness (H7a), agreeableness (H7b), conspiracy belief (H8) were found significant although with low effect, and therefore our hypotheses were confirmed (Table 6.2). However, correlations between shareability (H7c) and analytical thinking were not found, and this sub-hypothesis needs to be refuted.

Table 6.2: Pearson correlations of the variables used in research.

Pearson Correlations

		<i>CRT</i>	<i>IL</i>	<i>BC</i>	<i>CS</i>	<i>T</i>	<i>A</i>	<i>S</i>	<i>Age</i>	<i>PP</i>
<i>CRT</i>	Pearson's r	—								
	p-value	—								
<i>Information Literacy</i>	Pearson's r	0.027	—							
	p-value	0.505	—							
<i>Conspiracy Belief</i>	Pearson's r	-0.178	-0.245	—						
	p-value	< .001	< .001	—						
<i>Climate Scepticism</i>	Pearson's r	-0.099	-0.261	0.576	—					
	p-value	0.013	< .001	< .001	—					
<i>Trustworthiness</i>	Pearson's r	-0.130	-0.128	0.360	0.453	—				
	p-value	0.001	0.001	< .001	< .001	—				
<i>Agreeableness</i>	Pearson's r	-0.180	-0.171	0.451	0.571	0.783	—			
	p-value	< .001	< .001	< .001	< .001	< .001	—			
<i>Shareability</i>	Pearson's r	0.058	-0.031	0.123	0.228	0.520	0.453	—		
	p-value	0.144	0.434	0.002	< .001	< .001	< .001	—		
<i>Age</i>	Pearson's r	-0.061	0.042	0.123	0.103	0.066	0.121	-0.003	—	
	p-value	0.130	0.290	0.002	0.010	0.100	0.002	0.949	—	
<i>Political Preferences</i>	Pearson's r	0.074	0.169	-0.408	-0.379	-0.270	-0.329	-0.149	-0.031	—
	p-value	0.063	< .001	< .001	< .001	< .001	< .001	< .001	0.443	—
<i>Gender</i>	Pearson's r	-0.081	-0.041	0.076	-0.063	0.070	0.087	-0.026	-0.035	0.032
	p-value	0.042	0.312	0.059	0.113	0.078	0.030	0.510	0.386	0.426

Note: Values in bold had $p < 0.5$.

6.2 Linear Regression

Through the elimination of variables (gender) that did not show significant correlations, we continued linear regression with only the remaining variables. The model fit measures ($F_{8,616} = 69.3$; $p < .001$) revealed that our proposed model explains about 47% of the variance (Table 6.3), which is considered according to Cohen (1992) as a high effect size.

Table 6.3: A model fit measure of the linear regression model.

Model fit measures

Model	R	R ²	Adj R ²	F	df1	df2	p
1	0.688	0.474	0.467	69.3	8	616	< .001

Looking further into the model coefficient analysis, we can see as the most significant predictors of our model conspiracy belief ($SE = .349$, $p < .001$) and agreeableness ($SE = .362$, $p < .001$) overall being in the range of medium association. Together with the power of the whole model, these predictors can be considered solid predictors of climate scepticism.

Other significant predictors for climate scepticism are political preferences and information literacy. From the results of the model coefficients measure, we see that political preferences are a low negative predictor ($SE = -.101$, $p < .01$) for climate scepticism - meaning that people with more conservative ideology are more likely to become climate sceptics (Table 6.4). These findings are in line with findings from previous research. Another low negative predictor is information literacy predictor ($SE = -.097$, $p < .001$). Our presumptions that analytical thinking will also be a predictor for climate scepticism were not confirmed, together with the belief that trustworthiness will be a stronger determinant for climate scepticism than agreeableness.

Table 6.4: Model coefficients of the linear regression model for variables that were showing significant correlations.

Model Coefficients					
Predictor	Estimate	SE	t	p	Standardised Estimate
Intercept	2.492	0.239	10.414	< .001	-
Political Preferences	-0.079	0.025	-3.108	0.002	-0.101
CRT	0.018	0.013	1.376	0.169	0.042
Age	0.002	0.003	0.655	0.513	0.019
Information Literacy	-0.151	0.047	-3.194	0.001	-0.097
Conspiracy Belief	0.259	0.026	9.868	< .001	0.349
Trustworthiness	0.010	0.040	0.246	0.805	0.012
Agreeableness	0.258	0.036	7.192	< .001	0.362
Shareability	-0.005	0.030	-0.170	0.865	-0.006

6.3 Moderation Analysis

From the results of correlation analysis, we could see that political preferences are correlated with almost every variable (except analytical thinking) that we were examining. On the linear regression model we could see that political preferences are also a predictor of climate scepticism (Table 6.4) which was also in line with previous findings (e.g., Engels et al., 2013; Poortinga et al., 2011; Hornsey et al., 2018; Van der Linden, 2015). However, as we determined while designing our research, in this study, we will examine political preferences as a moderating variable. In that order, we conducted moderation analyses to see whether different political ideologies (M) can influence climate scepticism among (Y) participants with varying levels of conspiracy beliefs, trustworthiness, agreeableness and shareability of fake news (X).

The first moderation relationship we were reviewing was with trustworthiness as a predictor (X). The output of moderation analysis was significant. However, its estimate is

telling us that it does not have a big effect size on our variables ($\beta = -.073$, $SE = 0.030$, $t = -2.46$, $p < .05$). In figure 6.1, we can see that for the participants with more conservative political preferences. Simple slope analysis has a steeper incline ($\beta = .382$, $SE = 0.040$, $t = 9.47$, $p < .001$), therefore the relationship is strengthened, and trustworthiness has a higher impact on climate scepticism than at participants with more liberal political preferences ($\beta = .248$, $SE = 0.038$, $t = 6.62$, $p < .001$). This finding also supports one of our hypotheses (H6a).

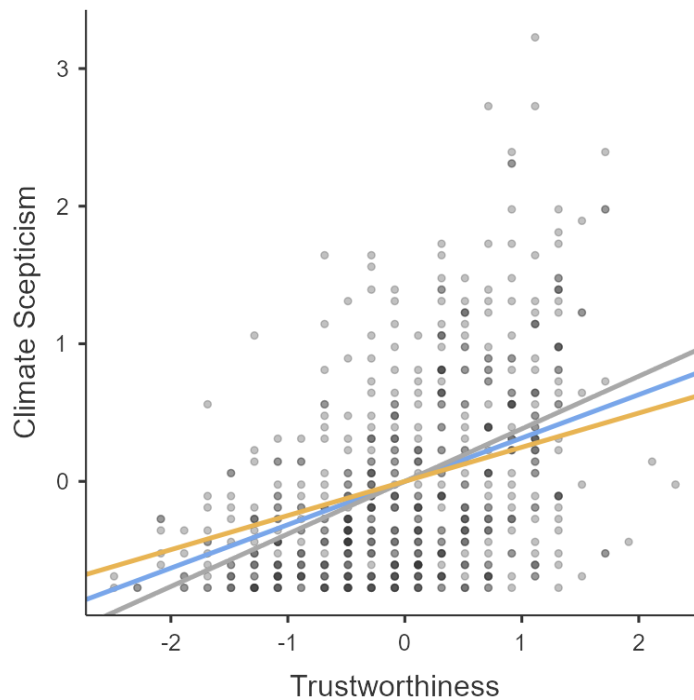


Figure 6.1: Moderation analysis slope estimates for trustworthiness and climate scepticism. *The yellow line is describing more liberal ideologies. Blue - moderate. Grey - conservative.*

Continuing with moderation analysis we set it as a predictor. Similarly as in the previous case, moderation was significant with low estimates ($\beta = -.085$, $SE = 0.023$, $t = -3.63$, $p < .001$). The results were supporting our hypothesis (H6b) and conservative ideology indeed strengthens the relationship between agreeableness and climate scepticism ($\beta = .438$, $SE = 0.032$, $t = 13.87$, $p < .001$). For the more liberally oriented participants, estimates were lower ($\beta = .283$, $SE = 0.031$, $t = 9.16$, $p < .001$).

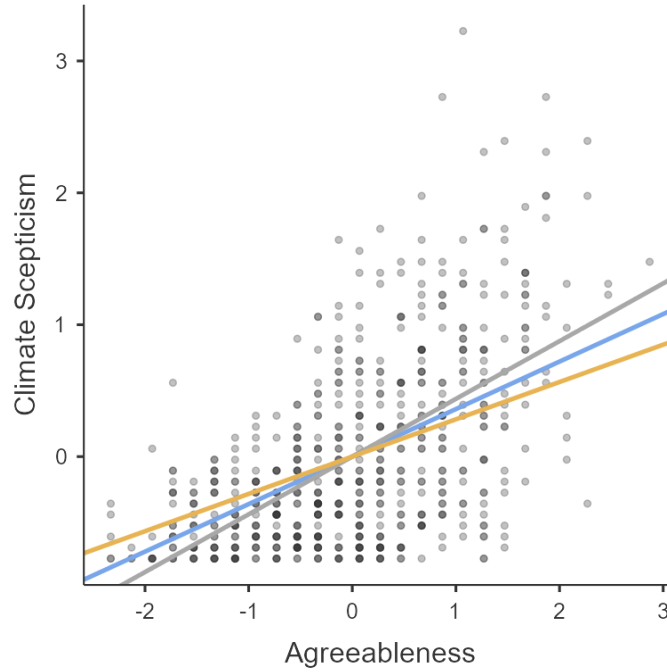


Figure 6.2: Moderation analysis, slope estimates for agreeableness and climate scepticism. *The yellow line is describing more liberal ideologies. Blue - moderate. Grey - conservative.*

The third moderation analysis we ran was where conspiracy belief takes on the role of predictor (X). Similarly as in the previous case, moderation was significant with the lowest estimates ($\beta = .064$, $SE = 0.025$, $t = 2.56$, $p = .01$). The results contrast our hypothesis (H7), where we assumed that more conservative ideology strengthens the relationship between conspiracy beliefs and climate scepticism. From the figure 6.3 we can see that steeper incline is for participants with more liberal political preferences ($\beta = .459$, $SE = 0.040$, $t = 11.5$, $p < .001$) than for the ones with conservative ($\beta = .342$, $SE = 0.028$, $t = 12.5$, $p < .001$).

For the relationship where shareability was a predictor, we did not find a significant p-value ($\beta = -.044$, $SE = 0.033$, $t = -1.33$, $p = .183$), and therefore we did not investigate this relationship further, and we need to reject the sub-hypothesis H7b.

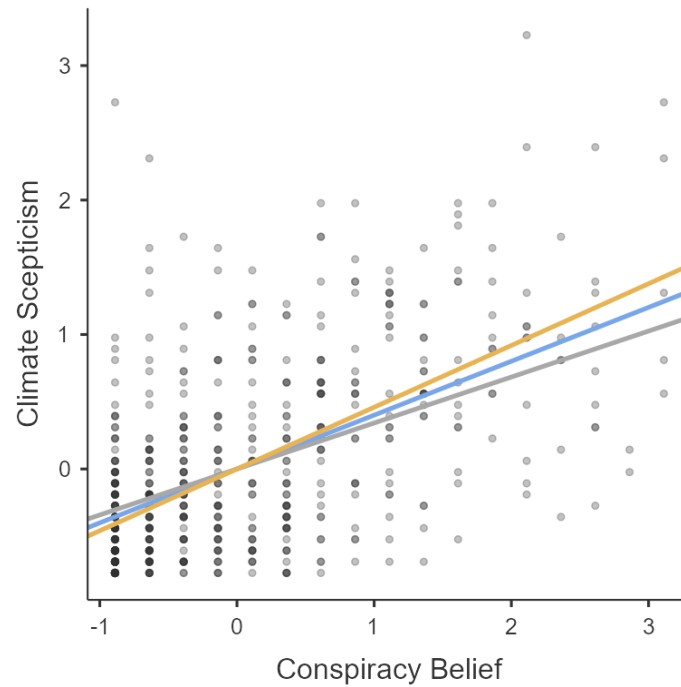


Figure 6.3: Moderation analysis, slope estimates for agreeableness and climate scepticism. *The yellow line is describing more liberal ideologies. Blue - moderate. Grey - conservative.*

6.4 Mediation Analysis

To answer our research questions (RQ1 and RQ2), we wanted to look deeper into analytical thinking and climate scepticism and see whether the relationship these two variables could have is direct or mediated through another variable. We have conducted an analysis where we examined the association of analytical thinking (x) and climate scepticism (y) through mediators (m) conspiracy belief, agreeableness and trustworthiness. Since the correlation between shareability and analytical thinking was not significant, we have excluded this mediator from further analysis. Therefore we can state with certainty that the relationship between analytical thinking and climate scepticism is not mediated through shareability, answering this way our RQ2c.

First analysis was done on agreeableness as a mediator and we found significant ($p < .001$) negative association between the analytical thinking and agreeableness ($a = -0.111$, $SE = 0.024$, $95\%CI [-0.159, -0.064]$) as well as we have found significant positive effect of agreeableness on climate scepticism ($b = 0.407$, $SE = 0.024$, $95\%CI [0.361, 0.454]$). The direct effect of analytical thinking on climate scepticism was not found significant ($p > .05$) ($c = 0.001$, $SE = 0.014$, $95\%CI [-0.027, 0.031]$) (see Fig. 6.4). However the existing

effect was found as significant ($p < 0.001$) when it comes to the indirect path ($a \times b = -0.045$, $SE = 0.010$, $95\%CI [-0.066, -0.025]$) explaining more than 96% of this relationship and answering this way RQ2a.

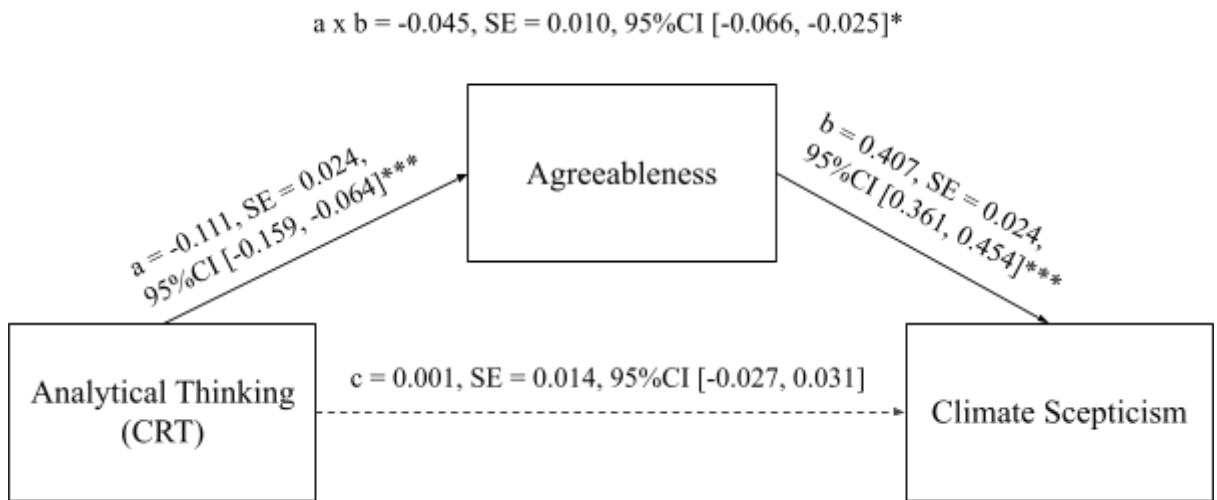


Figure 6.4: Mediation analysis pathways with standard errors(SE) and 95% confidence intervals (CI), where the predictor of climate scepticism is analytical thinking, while this relationship is mediated with agreeableness.

*Significance levels: * $p < .05$; ** $p < .01$; *** $p < .001$.*

Next mediator we were looking at, to find answer for RQ2b, is trustworthiness where again significant ($p < .001$) relationships were found between analytical thinking and trustworthiness ($a = -0.070$, $SE = 0.022$, $95\%CI [-0.113, -0.028]$, $p = .001$) and trustworthiness with climate scepticism ($b = 0.365$, $SE = 0.029$, $95\%CI [0.308, 0.423]$, $p < .001$) making the whole indirect relationship as also significant explaining 58,9% of the relationship ($a \times b = -0.026$, $SE = 0.008$, $95\%CI [-0.041, -0.010]$, $p = 0.002$) (see Fig. 6.5). The direct effect was again not found significant ($c = -0.018$, $SE = 0.016$, $95\%CI [-0.049, 0.013]$, $p = 0.258$).

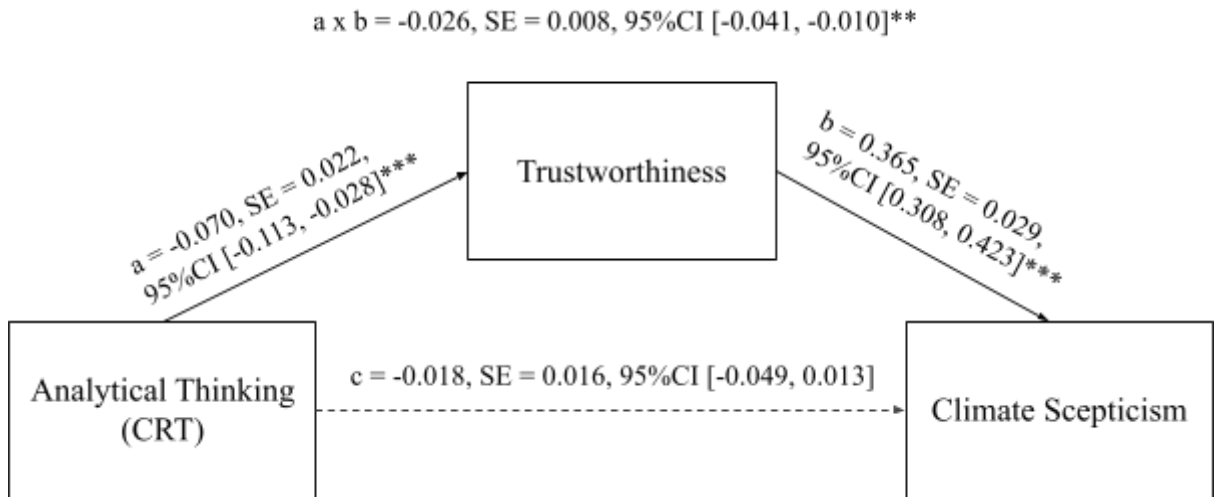


Figure 6.5: Mediation analysis pathways where the predictor of climate scepticism is analytical thinking, while this relationship is mediated through trustworthiness.

We examined the last observed mediation effect between analytical thinking and climate scepticism through conspiracy belief (see Fig. 6.6). Similarly, as in previous cases, an indirect relationship was found significant ($p < .001$) also during all of the stages on the path ($a \times b = -0.004, SE = 0.018, 95\%CI [-0.078, -0.009]$), explaining 96,3% of relationships and this mediation also answers the research question (RQ1) stating that this relationship is mediated through conspiracy belief. The direct effect was again not found significant ($c = 0.002, SE = 0.015, 95\%CI [-0.027, 0.031], p = 0.904$).

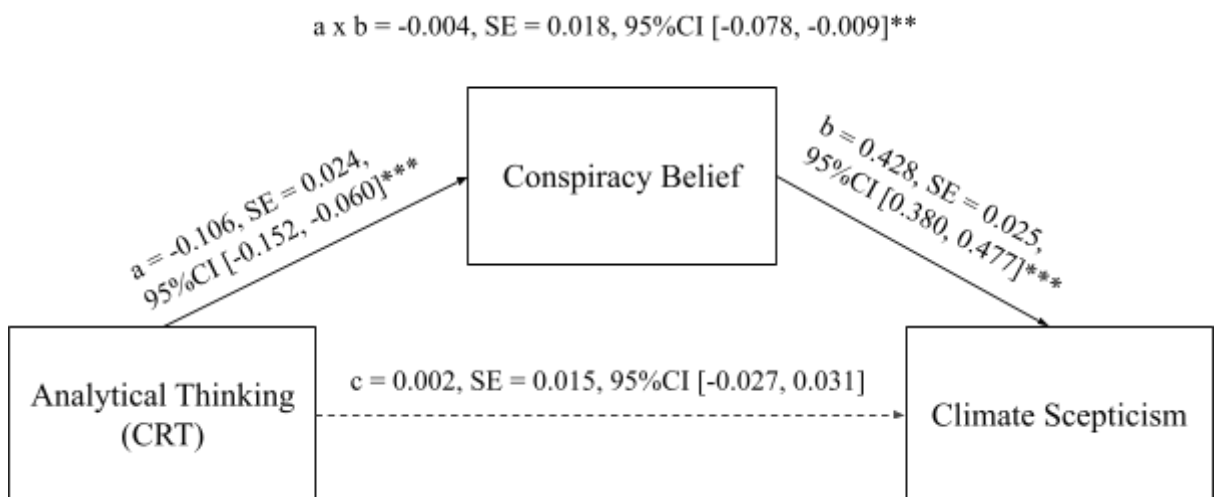


Figure 6.6: Mediation analysis pathways where the predictor of climate scepticism is analytical thinking, while this relationship is mediated with conspiracy belief.

All these three models showed non-significant direct pathways. We can conclude that despite analytical thinking correlated with climate scepticism, it is not directly related to it, and its predictive value is fully mediated either through trustworthiness, agreeableness, or agreeableness or conspiracy belief.

From observations of mediation effects between information literacy and climate scepticism we want to highlight the mediation effect of conspiracy belief, which was found significant for both indirect and direct relationships - showing partial mediation explaining 51.2% of relationships (see Fig. 6.7). Other mediation effects held a lower proportion in explaining indirect relationships than direct and were significant on both pathways. Relationship with shareability was not examined, again due to missing correlations.

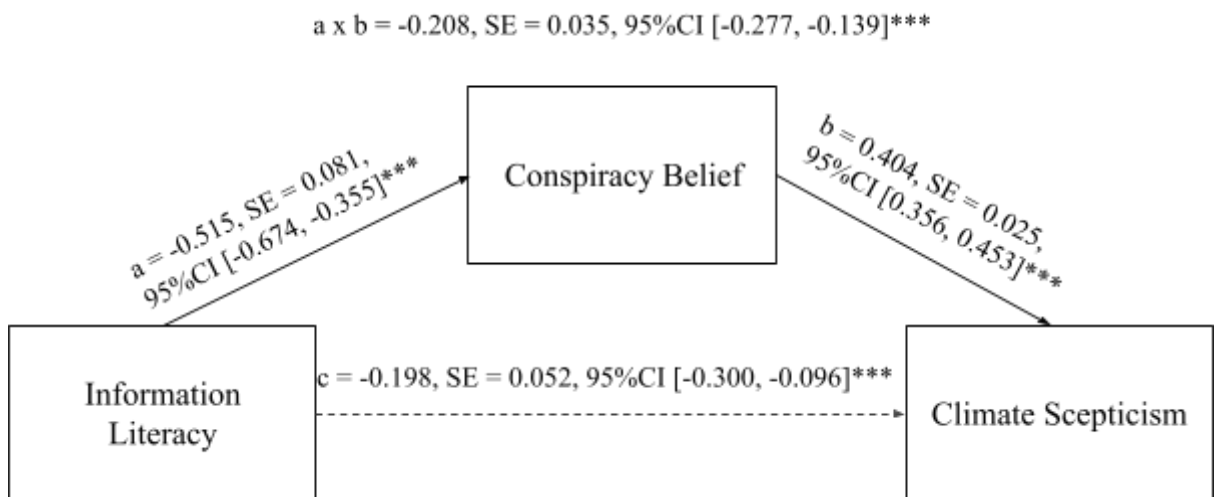


Figure 6.7: Mediation analysis pathways where the predictor of climate scepticism is information literacy, while this relationship is mediated with conspiracy belief.

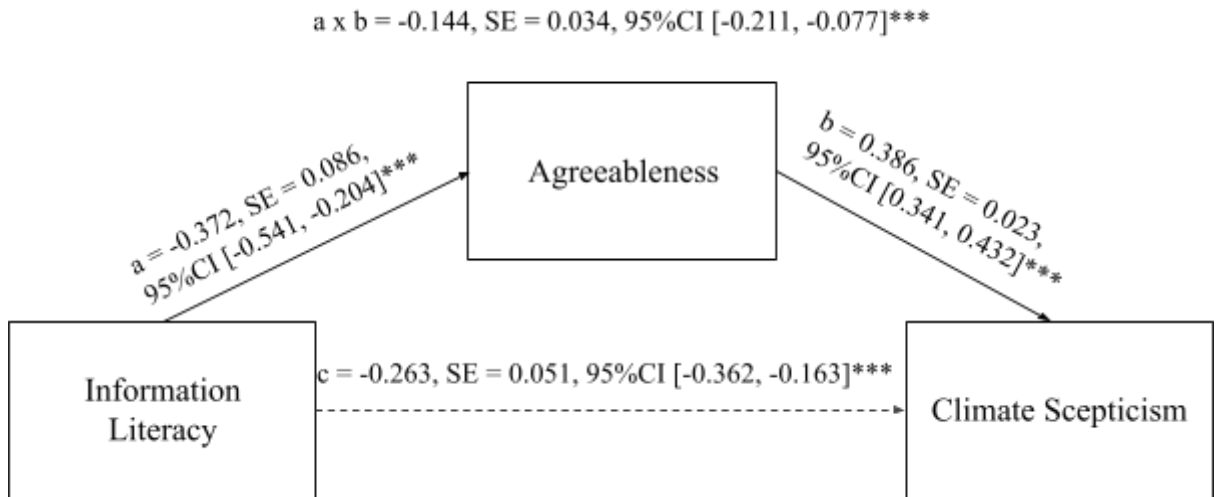


Figure 6.8: Mediation analysis pathways where the predictor of climate scepticism is information literacy, while this relationship is mediated with agreeableness. The indirect path is explaining 35,4% of relationships.

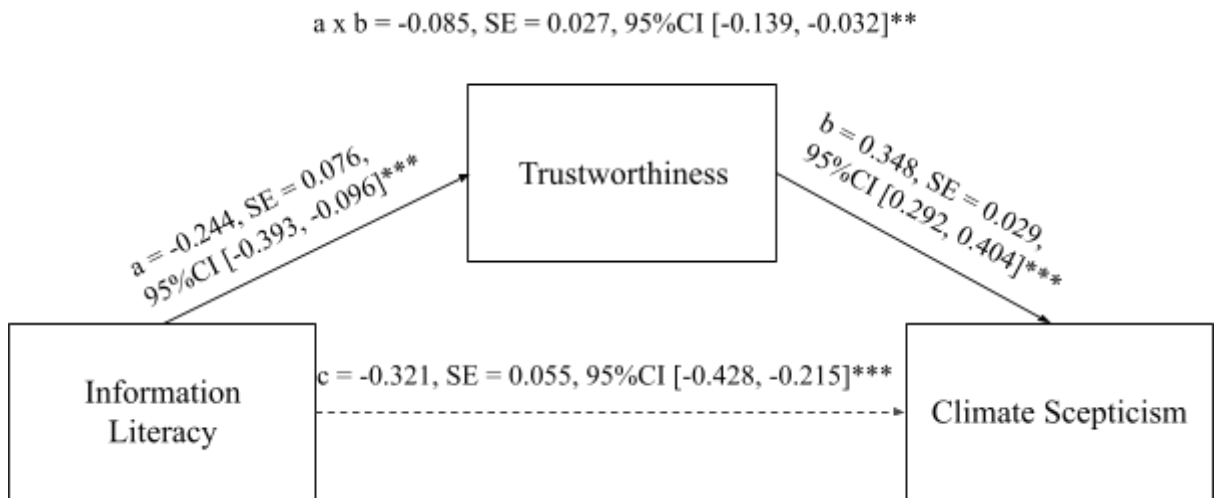


Figure 6.9: Mediation analysis pathways where the predictor of climate scepticism is information literacy, while this relationship is mediated with trustworthiness. The indirect path is explaining 20,1% of relationships.

Chapter 7

Discussion

This study was designed to examine the relationship between climate scepticism, fake news susceptibility and conspiracy belief in the context of analytical thinking and information literacy. To explore these roles, firstly, we needed to map out particular relations between all of the variables and then look deeper into the relationship between analytical thinking and climate scepticism. Our primary presumption was that with increased analytical thinking, incline to climate scepticism is eliminated, and this relationship is mediated through lower fake news susceptibility and lower conspiracy beliefs. We did not differ between different stages of climate scepticism, which can be further also found as one of the limitations of this study; however, we have considered various reasons underlying the fake news susceptibility, which brought us new findings in this research topic.

Before we dive into the interpretation of results, we need to mention that the data distribution in our sample ($n = 625$) was non-normal. One of the main causes of non-normal data distribution was the low age of our participants ($Mdn = 23$) and the fact that the majority of our participants were recruited through university student groups. We believe that these demographic factors also infer that most of our participants had more than an average number of correct answers on CRT ($Mdn = 4$). Influenced higher information literacy ($Mdn = 4$), lower conspiracy belief ($Mdn = 1.5$) and under average ratings of trustworthiness ($Mdn = 1.6$) and agreeableness ($Mdn = 1.4$) with fake news.

7.1 Results Interpretation

We hypothesised that fake news susceptibility plays a role in climate scepticism. We predicted that higher fake news susceptibility relates to the higher climate scepticism. Past research examined this relationship from different angles. In a study made by Drummond et al. (2020), they found little effect of exposure to fake news before rating climate scepticism, pointing out that more significant influence lies within political orientation. In a study made by Lutzke et al. (2019), this relationship was already examined in an online experiment where groups of participants were given guidelines with different analytical

and critical thinking involvement. As the results have shown, priming of analytical thinking through guidelines before exposure to fake news leads to a lower susceptibility of climate change fake news. However, differences between the groups with different levels of priming were not found. Overall, this effect was small. To measure fake news susceptibility, we have asked three questions. First and the leading indicator was the perceived trustworthiness of displayed news, which examined how our participants score in the detection of fake news. The second was agreeableness - identification of presented opinion with your own. The third one was the shareability of this news (“How likely are you to share this news on your social media?”).

The latter showed minor differences in average for real news ($M = 1.85$) and fake news ($M = 1.23$), and therefore we consider it an unreliable variable when looking deeper into the relationships. Consistent with our hypothesis, fake news susceptibility plays a significant role in climate scepticism among all of our supporting variables. We verified the existing findings that the detection of fake news is significantly correlated to climate scepticism (Lutzke et al., 2019, Drummond et al., 2020), but more importantly, we have discovered that agreeableness plays an even more prominent role in this relationship. We chose to work with agreeableness based on the findings made by Lutzke et al. (2019), which were also confirmed in our study. Our results support the assumption that people are often motivated to reject the output of analytical thinking (Taber and Lodge, 2006) even when they can suspect fake news because they are deciding in favour of information that is more closely aligned with their preexisting belief. Therefore they may incorporate Motivated System 2 Reasoning.

Further, we also predicted that higher conspiracy belief correlates with higher climate scepticism. As described in the theoretical part of this study, fake news susceptibility measurements are often accompanied by conspiracy beliefs measurements. Numerous studies were done and proved that underlying conspiratorial thinking drives climate scepticism (Lewandowsky et al., 2013; Lewandowsky et al., 2015; Van der Linden, 2015; Uscinski and Olivella, 2017, Hornsey et al., 2018). Also, in our study, the results were not different. Both correlation analysis and linear regression effects were significant and set out conspiracy belief as one of the two strongest predictors of climate scepticism. As already presented by Lewandowsky et al. (2013b), even if participants are not directly exposed to climate change conspiracy beliefs, those who score higher on “conspiracy

thinking” measurements are usually the ones who are also more sceptical towards climate science. Lewandowsky et al. (2013b) believed that they are driven to do so due to their underlying conspiratorial thinking. Our study could describe a similar relationship since we presented participants with mainstream conspiracy theories that did not connect with climate change, and we still found a significant association between them. Besides this relationship, conspiracy belief also showed the strongest correlations with fake news susceptibility (trustworthiness and agreeableness) and political preferences. Information literacy, analytical thinking and age also showed significant but low relations on correlation analysis. Knowing these correlations, we have looked at whether we can moderate this effect through demographic factors, and we found that age plays no role in this relationship.

Following up on these findings, we wanted to examine whether political preferences moderate the relationship between fake news susceptibility or conspiracy thinking and climate scepticism, as was previously indicated (Lutzke et al., 2019). Here we need to inform readers that political ideology often plays a central role in the research of reasons underlying climate scepticism (Jacques et al., 2008; Poortinga et al., 2011; Hornsey et al., 2018; Dunlap and McCright, 2008; McCright, 2010; Lutzke et al., 2019; Trémolière and Djeriouat, 2021; Capstick et al., 2014). We have decided to include political preferences only on the mediator’s level, mainly due to the lack of objective measurement of political choices and our research’s different focus. We found that political ideology correlates with fake news susceptibility, conspiracy beliefs, climate scepticism and information literacy through correlation measures. We ran a moderation analysis for fake news susceptibility with this premise where we discovered in both cases (Trustworthiness and Agreeableness) significant moderation effect. In both cases, we found out that a higher inclination to conservative ideology creates more significant differences in climate scepticism for different levels of agreeableness or trustworthiness. We found more critical effects of conspiracy thinking on differences in climate scepticism for individuals with a more liberal ideology, contrary to our expectations based on the research done by Trémolière and Djeriouat (2021) where political ideology as moderating factor was stronger for individuals with conservative ideology. Based on our results, more liberal individuals tend to be more affected by conspiracy beliefs concerning climate scepticism than those more conservative ones. Using political ideology as a moderating factor, we also looked into the relationship between analytical thinking and climate scepticism, also

examined by Trémolière and Djeriouat (2021). Their findings were that there is a significant moderating effect, with steeper slopes for liberal ideology. Meanwhile, in our study, we didn't find any significant effect.

There was missing empirical research that would examine further information literacy and its relationship with climate scepticism to the author's knowledge. Research in the past mainly focused on investigating climate change denial and its link with science literacy, numeracy, education, and technical reasoning. However, any of these relationships were not found as significant predictors for climate scepticism. (Drummond and Fischhoff, 2017; Zhou, 2014; Kahan et al., 2012). Arising from the presumption that informational literacy improves fake news identification (Jones-Jang et al., 2019; Pennycook and Rand, 2021), we expected greater information literacy to be in a negative relationship with fake news detection (Trustworthiness) and, therefore, to be in a mediated relationship with climate scepticism. We found significant correlations and a significant effect on climate scepticism during linear regression. Moreover, mediation analysis showed that information literacy affects climate scepticism indirectly through trustworthiness, agreeableness and conspiracy belief and directly. In the case of agreeableness, it even played a more significant role in mediation than the indirect effect and therefore is explainable mainly through direct effect. However, we need to point out one more time that the internal consistency test showed low values for this predictor (Cronbach's $\alpha = .347$). Therefore, we can not interpret that these data support the pre assumptions that higher information literacy is related to higher fake news susceptibility and lower climate scepticism. In future research, we strongly suggest including this variable with improved information literacy tasks and scale.

One of the most important aims of our research was to examine the relationships of climate scepticism with fake news susceptibility and conspiracy beliefs in the context of analytical thinking. The correlations that would support this prediction were found during the correlation analysis, where trustworthiness, agreeableness and conspiracy belief showed low but significant negative correlations with analytical thinking (CRT). The only value that did not show a significant correlation was shareability. However, as we have stated before, the informative value of this variable might be questionable due to the low difference between the shareability of fake and real news. The correlation between analytical thinking and information literacy was not found as significant. Other correlations

of analytical thinking that were found significant were gender and climate scepticism. To examine analytical thinking as a predictor of climate scepticism, we ran linear regression, which was not statistically significant. Since the author is not aware of extensive research that would examine this direct effect, we can only conclude that our findings conflict with Trémolière and Djeriouat (2021) research, where analytical thinking was found as a significant predictor of climate scepticism. The commonly researched link also found in previous research is between analytical thinking and evaluation of fake news (Pennycook and Rand, 2019a; Pennycook and Rand, 2019b; Bago et al., 2005; Pehlivanoglu et al., 2021; Bronstein et al., 2019, Lutzke et al., 2019) and similarly also between analytical thinking and conspiracy beliefs (Swami et al., 2014; Pennycook et al., 2015b; Barron et al., 2018). Therefore, we hypothesised that the relationship between analytical thinking and climate scepticism could be facilitated through this connection and does not necessarily need to impact our dependent variable directly. For this purpose, we ran a mediation analysis that showed significant indirect and total effects of analytical thinking on climate scepticism. This effect was mediated through all three examined variables: agreeableness, trustworthiness and conspiracy belief, however found effect size is small (trustworthiness: $\beta = -0.02$; agreeableness: $\beta = -0.04$; conspiracy belief: $\beta = -0.05$).

7.1.1 Main findings

To summarise our findings, we did not find a direct effect of analytical thinking on climate scepticism. As mediation analysis revealed, there are indirect effects through mediated relationships (trustworthiness, agreeableness, conspiracy belief), but these effects have low estimates. Although our findings support our hypothesis that the analytical thinking - climate scepticism relationship is mainly mediated through fake news susceptibility or conspiracy belief, these findings contrast with prior research (Trémolière and Djeriouat, 2021), where analytical thinking is a significant predictor of climate scepticism. We conclude that the underlying reasons for this relationship should be examined in future research through other mediating or moderating variables that could explain when analytical thinking plays a role in climate scepticism.

The inspection of information literacy as a predicting variable for climate scepticism was affected right from the beginning with its lower internal consistency. Therefore, we can not fully interpret our results with this variable as reliable. We found the most potent indirect effect in mediation between information literacy - conspiracy belief -

climate scepticism ($\beta = -0.21$). Other than that, mediation analysis showed that other relations are best explained through direct pathways.

The main findings arising from our study are related to fake news susceptibility and conspiracy belief, their interaction and their effect on climate scepticism. This study looked into three variables underlying fake news susceptibility - trustworthiness, agreeableness, and shareability. While in other studies, researchers were mainly investigating the detectability of fake news - trustworthiness (Lutzke et al., 2019, Drummond et al., 2020), we wanted to examine also the identification with the presented concept - agreeableness. As the results suggest, the latter shows the strongest correlation and, as the only variable describing fake news susceptibility, affects climate scepticism in our linear regression model. This finding supports the assumptions that motivated reasoning strongly influences whether we let fake news and conspiracies affect us or not. This finding also suggests that in future research, fake news susceptibility should be again divided into particular aspects to unveil the role of classical and motivated reasoning in the deliberation of fake news in climate scepticism. Trustworthiness also showed the first two pointed out a significant difference in the processing of fake news. At this point, we need to note that trustworthiness also showed correlations with climate scepticism; however, in our final regression model, it did not become a significant predictor of climate scepticism.

Following up on the difference between agreeableness and trustworthiness, our results also showed a higher correlation between agreeableness and conspiracy beliefs than between conspiracy beliefs and trustworthiness, which we believe is because the nature of the question requires in both cases impersonation and connection with one's own belief, instead of evaluation. Conspiracy thinking (standardised estimate = 0.349) and agreeableness have also shown similar effects on climate scepticism during linear regression. And similarly, as in previous studies (Uscinski and Olivella, 2017; Jacques et al., 2008; Hornsey et al., 2018; Dunlap and McCright, 2008; McCright, 2010; Lutzke et al., 2019; Capstick et al., 2014), we found that conspiracy thinking (as well as agreeableness) has a more substantial effect on climate scepticism in more extremely politically oriented participants.

Our conclusions go to the proposed model, which we examined during linear regression. This explains that almost 47% of the variance for climate scepticism can be

explained by the variables used in our regression model, which we consider as high effect size (Cohen, 1992). Based on significant variables, we can see that higher agreeableness and conspiracy belief are the strongest positive predictors of climate scepticism, followed by negative predictors - political preferences and information literacy. In the upcoming subchapters, we describe our proposed changes and limitations to existing measurements to increase the accuracy of our model.

7.2 Limitations

An important point to mention is a non-normal distribution in our sample ($n = 625$) among all of our observed variables. Besides the impact we described previously in this chapter, we would like to highlight that more than 92% of our participants are under 30. The representation of male and female participants was also very imbalanced (m: 24,96%, f: 75,04%), and mainly due to these reasons, we haven't engaged these variables in further analysis. We also question the distribution of education among our participants, which the lower age of our participants could highly impact (finished high school education: 47,20%; finished I. or II. degree university education: 48,96%; other: 3,84%), and their ongoing education.

Arising from uneven distribution among the population, we could see a limitation in our sample dominating young women, which can be caused by the data gathering method. Although we tried to target different age groups, since we mainly did our data gathering through social media, where there is a higher concentration of young age groups, we did not choose a medium to target all of the age groups equally. Also, the main stream of participants came from the groups created for Slovak university students. Due to the low balance of our sample, we decided to recruit a higher number of participants than we initially planned to ($n = 200$).

The first limitation we have realised once we started analysing gathered data is the absence of pilot research. Since we constructed all of our scales by combining tasks from different studies, we created a new tool without verified reliability values. Pilot research would determine whether the selected functions of individual rankings are sufficiently internally consistent and whether the chosen variables are in mutual relationships. Looking retrospectively, by taking this measure, we could avoid insufficient internal consistency of

information literacy ($\alpha = .347$), and we could adjust the CRT tasks to increase its consistency as well ($\alpha = .577$). Lower internal consistency is also connected with lower correlations found with these two variables and the overall interpretation of our study when we must consider low levels of internal consistency of information literacy.

Another limitation we found is within CRT tasks. Before evaluating the question “A monkey, a squirrel, and a bird are racing to the top of a coconut tree. Who will get the banana first, the monkey, the squirrel, or the bird?” we did not realise that the interpretation of answer “nobody” can be plausible both as an incorrect but also correct answer. In our case, we have decided to run an internal consistency test and chose the value that provided higher internal consistency. However, in future research, we suggest creating the correct and incorrect answers for each question to avoid circumstantial decisions.

As a weak point of our research, we also consider the number of questions used for conspiracy beliefs, information literacy and analytical thinking. To prevent participants from being eliminated from the study due to an unfinished questionnaire, we decided to lower the number of questions. However, as we later saw during analysis, small coverage of our scale could also influence low internal consistency.

The last limitation of our study is the generalisation of climate scepticism without further division based on its origin. We believe that in further research, the scale through which we could interpret where the most significant levels of scepticism are could bring us more precise information that would help us identify exact reasons for climate scepticism.

7.3 Recommendations for future research

Our first suggestion is to run the research on representative and normally distributed samples. We recommend targeting the older population and males to ensure the balance of participants. Our sample mainly consisted of a young population. Therefore we cannot conclude the entire population, and replication of the study is needed to draw these conclusions.

Secondly, using the chosen climate scepticism scale (Whitmarsh, 2011), we were only able to examine climate scepticism as one variable without looking deeper into the

different scepticism resources (Rahmstorf, 2003). For upcoming research, we propose investigating the effects of particular variables on various stages of climate scepticism. We believe that this research could support the inoculation of climate scepticism.

Thirdly we recommend improving information literacy measurement. We suggest either reviewing the questions used in other studies or validating the internal consistency in the pre-study. Our research has adapted four questions from the Questionnaire on Information Literacy (Beutelspacher, 2014). However, low internal consistency showed us that we should either keep to the original number of questions or look for different resources. This recommendation also applies to tasks in cognitive reflection tests, which should be reviewed and verified in pre-study.

In the future, we would also suggest higher involvement of the political preferences as one of predicting variables, since it proved its impact several times in studies done before (Jacques et al., 2008; Poortinga et al., 2011; Hornsey et al., 2018; Dunlap and McCright, 2008; McCright, 2010; Lutzke et al., 2019; Trémolière and Djeriouat, 2021; Capstick et al., 2014). In our study, we examined political preferences only as a moderating factor. However, we could see significant medium correlations that could play an essential role in explaining relationships between climate scepticism and other variables and explaining climate scepticism itself. However, for this purpose, we also suggest changing the questions that help to examine political ideology since the rating we used in our study was missing objective evaluation.

Lastly, we suggest unifying the information displayed in real and fake news excerpts in future studies. In the current research, our only criterion was for news to be connected with climate change, but we believe that we could observe a more accurate relationship between fake and real news if we would focus the materials on similar topics.

Conclusion

Decades after climate change has been identified, it finally raises the needed urgency among the general public (Eurobarometer, 2021). Although we have not entirely eliminated the deniers and sceptics of climate change, research conducted throughout these years helped us understand and tackle scepticism sources. This study also wanted to examine the public's attitudes towards climate change to contribute to the obtained knowledge.

Our study reviewed the complex relationships between climate scepticism, fake news and conspiracy beliefs in the context of analytical thinking and information literacy. The added value of our research lies within the connection of these individual factors and investigation of the relationships that are influencing each other. We found more robust relationships between climate scepticism and fake news susceptibility and conspiracy beliefs confirming our assumptions that they are predictors of climate scepticism. Weaker correlations were found for climate scepticism and analytical thinking/information literacy. Besides these relationships, we could see that information literacy, political preferences, conspiracy belief and fake news belief (agreeableness) together explain a very high variance of climate scepticism and, therefore, especially the latter two are strong indicators of climate scepticism.

One of our main findings is that conspiracy beliefs, belief in fake news and agreeableness are mediators of the relationship between analytical thinking, information literacy, and climate scepticism. Direct non-mediated relationships were not found significant, and we can explain their small influence on climate scepticism only through relationships with other variables. Further, we could see that agreeing with fake news or conspiracy statements has a greater relationship and impact on climate scepticism than the ability to detect fake news. This finding suggests that motivated reasoning (which is entailed with an incline to the information one can agree with) can play a greater role in climate scepticism than classical reasoning. Lastly, we could also see that relationships between fake news and climate change are more polarised for people who categorised themselves as more conservative. Controversially, relationships between conspiracy

thinking and climate change are more polarised for individuals who ranked themselves as more liberal.

We believe that our research will serve as a source of information for analysis to be done in climate scepticism. We recommend conducting a similar study that would examine relationships we were looking for to confirm their existence since some of the effects we found were pretty small but significant. Lastly, we would like to suggest building on and expanding the model we were working with to find possible climate scepticism predictors.

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