

**Compliance, Conspiracy Beliefs, and Contrarian Movements:  
Psychological Responses to the Coronavirus Pandemic**

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## **Abstract**

The Coronavirus pandemic will go down in history as a time when daily life around the globe was turned upside-down in an unprecedented way. Many people quickly adapted to the new status quo and complied with the governmental restrictions aimed at mitigating the spread of the virus. However, opposition against the protective measures also formed, and was accompanied, at least in part, by the spread of conspiracy theories and misinformation. This dissertation seeks to investigate these psychological responses to the Coronavirus pandemic. The first part explores the psychological processes that shape compliance with vs. opposition to the governmental protective measures. The second part investigates the causes and consequences of conspiracy beliefs in the context of the pandemic before generalizing the subject to societal crises more broadly.

Manuscript 1 argues that people complied with protective measures to protect themselves, out of solidarity with members of risk groups, or for both of these reasons. Results of two studies revealed that these motives were predicted by different psychological variables: Whereas self-protection was predicted by perceptions of uncertainty and threat, compliance out of solidarity was associated with the perception of a shared group identity, collective efficacy, and concern for vulnerable groups. This implies that psychological responses to the pandemic are influenced by intergroup dynamics, and that compliance can be facilitated by both self- and solidarity-related processes.

Manuscript 2 explores the characteristics of people that opposed the protective measures in the form of anti-lockdown protests. Using a large sample of such contrarian protestors, we examined similarities and differences in their belief systems. Results revealed four subgroups that differed mainly in socio-political ideology, but shared surprisingly similar anti-science convictions: unfounded conspiracy beliefs, downplaying of the dangers of the Coronavirus, esotericism, and vaccine hesitancy. These anti-science beliefs have helped unite contrarians with diverse socio-political views in a single, obtrusive anti-lockdown movement.

Manuscripts 3 and 4 investigate how conspiracy beliefs influence and are influenced by negative cognitive-affective experiences that are common during crises. More specifically, Manuscript 3 examines longitudinal linkages between conspiracy beliefs, anxiety, uncertainty aversion, and existential threat. Results from two studies conducted during the pandemic show that conspiracy beliefs most likely do not have beneficial consequences regarding these variables for the individuals that hold them. Instead, they may even reinforce negative fear- and uncertainty-related states under some circumstances.

Manuscript 4 directly targets conspiracy beliefs as potential explanations for societal problems (e.g., polarization). Results of a comprehensive Registered Report show that brooding, a dysfunctional form of repetitive negative thinking, contributes to the formation of conspiracy beliefs: In a repeated-measures experiment, difference scores in conspiracy beliefs were greater among participants who brooded over societal problems than among those in a control group - suggesting that brooding enables or causes conspiracy beliefs.

In sum, the present research illustrates the reciprocal relations between negative cognitive-affective experiences that are common during crises, socio-political beliefs, and behaviors that facilitate or impede a successful overcoming of crises like the pandemic. The manuscripts that comprise this dissertation have implications for (a) theories on the formation of conspiracy beliefs and collective behavior, (b) interventions aimed at facilitating evidence-based behavior changes in response to societal crises, and (c) political communication and media coverage during such crises.

## **Zusammenfassung**

Die Coronavirus-Pandemie wird als eine Zeit in die Geschichte eingehen, in der das alltägliche Leben weltweit auf beispiellose Weise auf den Kopf gestellt wurde. Viele Menschen passten sich schnell an den neuen Status Quo an und hielten sich an die staatlichen Beschränkungen. Allerdings bildete sich auch Widerstand, der zumindest teilweise mit der Verbreitung von Verschwörungstheorien und Fehlinformationen einherging. Diese Dissertation zielt darauf ab, diese psychologischen Reaktionen auf die Coronavirus Pandemie zu untersuchen. Im ersten Teil werden die psychologischen Prozesse untersucht, die eine Einhaltung bzw. Ablehnung der staatlichen Schutzmaßnahmen prägen. Der zweite Teil untersucht Ursachen und Konsequenzen von Verschwörungsglauben im Kontext der Pandemie, bevor das Thema auf gesellschaftliche Krisen im weiteren Sinne ausgeweitet wird.

Manuskript 1 argumentiert, dass Menschen Schutzmaßnahmen befolgt haben um sich selbst zu schützen, aus Solidarität mit Menschen in Risikogruppen, oder aus beiden dieser Gründe. Ergebnisse zweier Studien zeigen, dass diese Motive durch unterschiedliche psychologische Variablen vorhergesagt wurden: Während Selbstschutz mit einer Wahrnehmung von Ungewissheit und Bedrohung zusammenhing, war Compliance aus Gründen der Solidarität mit Wahrnehmung einer geteilten Gruppenidentität, kollektiver Wirksamkeit und Sorge um vulnerable Gruppen assoziiert. Dies impliziert, dass Reaktionen auf die Pandemie von Intergruppen-Dynamiken beeinflusst werden, und dass Compliance sowohl durch selbst- als auch solidaritätsbezogene Prozesse begünstigt werden kann.

Manuskript 2 untersucht die Merkmale von Menschen, die sich den Schutzmaßnahmen in Form von Anti-Lockdown-Protesten widersetzen. Anhand einer großen Stichprobe von Demonstrierenden wurden Gemeinsamkeiten und Unterschiede in ihren Überzeugungssystemen exploriert. Die Ergebnisse deuteten auf vier Untergruppen hin, die sich in ihrer sozio-politischen Ideologie unterschieden, aber überraschend ähnliche wissenschaftsablehnende Überzeugungen teilten: Verschwörungsglauben, Herunterspielen der Gefahren des Coronavirus, Esoterik und Impfskepsis. Diese wissenschaftsablehnenden Überzeugungen scheinen Demonstrierende mit unterschiedlichen politischen Weltanschauungen in einer einzigen, auffälligen Anti-Lockdown-Bewegung zu vereinen.

In Manuskripten 3 und 4 wurde untersucht, wie Verschwörungsglauben mit negativen kognitiv-affektiven Erfahrungen zusammenhängt, die in Krisen häufig vorkommen. Genauer gesagt untersucht Manuskript 3 längsschnittliche Zusammenhänge zwischen Verschwörungsglauben, Ängstlichkeit, einer Aversion gegen Ungewissheit und existenzieller Bedrohung. Die Ergebnisse zweier Studien zeigen, dass Verschwörungsglauben hinsichtlich

dieser Variablen wahrscheinlich keine positiven Folgen für Personen hat, die daran glauben. Stattdessen kann Verschwörungsglaube negative, mit Angst und Unsicherheit verbundene Zustände unter Umständen sogar verstärken.

Manuskript 4 zielt direkt auf Verschwörungstheorien als mögliche Erklärungen für gesellschaftliche Probleme (z. B. Polarisierung) ab. Ergebnisse eines umfangreichen Registered Reports zeigen, dass Grübeln, eine dysfunktionale Form des repetitiven negativen Denkens, zur Entstehung von Verschwörungsglauben beiträgt: In einem Experiment mit wiederholten Messungen waren die Differenzwerte im Verschwörungsglauben bei Teilnehmenden, die über gesellschaftliche Probleme grübelten, größer als bei Teilnehmenden in einer Kontrollgruppe. Dies deutet darauf hin, dass Grübeln Verschwörungsglauben ermöglichen oder verursachen könnte.

Zusammenfassend veranschaulicht die vorliegende Forschung die wechselseitigen Beziehungen zwischen negativen kognitiv-affektiven Erfahrungen, gesellschaftspolitischen Überzeugungen und Verhaltensweisen, die eine erfolgreiche Bewältigung gesellschaftlicher Krisen wie der Pandemie erleichtern oder behindern. Die Manuskripte dieser Dissertation haben Implikationen für (a) Theorien zur Entstehung von Verschwörungsglauben und kollektivem Verhalten, (b) Interventionen, die darauf abzielen, evidenzbasierte Verhaltensänderungen als Reaktion auf gesellschaftliche Krisen zu ermöglichen, und (c) politische Kommunikation und Medienberichterstattung in solchen Krisen.

## List of Attached Studies

**Manuscript 1:** Liekefett, L., & Becker, J. (2021). Compliance with governmental restrictions during the coronavirus pandemic: A matter of personal self-protection or solidarity with people in risk groups? *The British Journal of Social Psychology*, *60*(3), 924–946.  
<https://doi.org/10.1111/bjso.12439>

**Manuscript 2:** Liekefett, L., Bürner, A.-K., & Becker, J. C. (2023). Hippies Next to Right-Wing Extremists? Identifying Subgroups of Anti-Lockdown Protestors in Germany Using Latent Profile Analysis. *Social Psychology*. Advance online publication.  
<https://doi.org/10.1027/1864-9335/a000509>

**Manuscript 3:** Liekefett, L., Christ, O., & Becker, J. C. (2023). Can Conspiracy Beliefs Be Beneficial? Longitudinal Linkages Between Conspiracy Beliefs, Anxiety, Uncertainty Aversion, and Existential Threat. *Personality & Social Psychology Bulletin*, *49*(2), 167–179.  
<https://doi.org/10.1177/01461672211060965>

**Manuscript 4:** Liekefett, L., Sebben, S., & Becker, J. C. (2023). The Effect of Brooding about Societal Problems on Conspiracy Beliefs: A Registered Report. In-principle-acceptance for Stage 1 (<https://osf.io/y82bs>), Stage 2 under review at *Peer Community in Registered Reports*.

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# 1 General Introduction

This dissertation was conducted during the Coronavirus pandemic – a time during which most people on this planet experienced profound changes to their daily lives and the societies they lived in. This provided social psychologists with the unique opportunity to investigate how people experience and respond to a major crisis and related large-scale social changes as they unfolded. This dissertation focusses on three types of psychological responses to the pandemic that are of ongoing public interest. During the pandemic, they received a lot of attention from politicians and media alike: compliance with protective measures aimed at mitigating the spread of the Coronavirus, anti-lockdown protests, and the formation of conspiracy beliefs. With the studies presented in this dissertation, we hope to advance knowledge about the diverse responses that people exhibit during crises and contribute to a better preparedness to similar crises that humanity may have to face in the future.

More specifically, this dissertation seeks to answer the following questions: (1) What motivated compliance with governmental restrictions during the Coronavirus pandemic? (2) What are the characteristics of people that engage in anti-lockdown protests? (3) What are the antecedents and consequences of conspiracy beliefs in the context of societal crises? To answer these questions, a total of 10 empirical studies were conducted that make use of correlational, longitudinal, and experimental designs. Collectively, the manuscripts that comprise this dissertation advance our knowledge about the psychological factors that facilitated (i.e., compliance) or hindered (i.e., anti-lockdown protests, unfounded conspiracy beliefs) an effective overcoming of the Coronavirus pandemic. A better understanding of these processes will ultimately pave the way for targeted policies and interventions that have the potential to facilitate a successful overcoming of similar societal crises in the future.

## 1.1 Current Societal Crises

Humanity is currently facing a number of large-scale crises, including climate change, natural disasters, involuntary mass-migration, and, most recently, the Coronavirus pandemic (World Economic Forum, 2020, 2023). Although the term *crisis* is commonly used in public discourse, there is no universally agreed-upon definition for it. It encompasses a range of situations that differ in scale, scope, and complexity (Bergman-Rosamond et al., 2022). For instance, a crisis can refer to a period of personal distress, an organizational crisis like the

Volkswagen emissions scandal, or to societal problems like armed conflicts, structural conditions that produce inequality, and (arguably) politically manufactured problems like the “refugee crisis” in the Western world (Bergman-Rosamond et al., 2022; Björck, 2016).

The focus of this dissertation is on psychological responses to *societal* crises: Situations in which a society faces (or is perceived to face) significant challenges that have the potential to cause detrimental change to its stability and functioning, and threaten the well-being of its members (Walby, 2021). Unarguably, societal crises have accompanied human societies since their origins. Nevertheless, it has been argued that the scope, frequency, and complexity of societal crises have increased in recent years (Björck, 2016; Cárdenas et al., 2021). This may be due to the globalized and interconnected nature of our modern world: A crisis in one country may result in a ripple effect across the globe, forming a chain or cascade of interconnected crises (Walby, 2021). Such ripple effects may also result in a propagation and mutual reinforcement of interconnected crises. For example, climate change has led to more frequent and intense natural disasters, exacerbating already existing crises related to poverty and inequality. Similarly, the Coronavirus pandemic has demonstrated the vulnerability of our society to health crises that simultaneously threaten the economic, social, and political systems.

## **1.2 The Coronavirus Pandemic**

The following section provides a brief overview of the main characteristics of the Coronavirus pandemic that are relevant for contextualizing the present research. In an impactful televised address to the German public, former German chancellor Angela Merkel referred to the Coronavirus pandemic as “the largest societal challenge since WWII” (Merkel, 2020). The initial outbreak of the novel Coronavirus, named SARS-COV-2, was reported in December 2019 in Wuhan, China (Zinn, 2021). Subsequently, the disease rapidly spread worldwide and was classified as a global pandemic by the World Health Organization (WHO) from March 11, 2020, until May 5, 2023. While most cases of Coronavirus infections produce mild to severe flu-like symptoms, certain individuals face a significant risk of becoming seriously ill or dying, particularly the elderly and immunocompromised individuals, and those with other pre-existing medical conditions. Furthermore, regardless of the initial infection's severity, Coronavirus infections can lead to serious long-term health consequences, a condition known as Long-COVID that is estimated to affect around 10% of infections (Centers for Disease Control and Prevention,

2023). Long-COVID causes a range of debilitating health problems such as chronic fatigue, respiratory and heart symptoms, and neurological issues. As of this writing, more than 670 million people worldwide have been infected, and almost 7 million died (Mathieu et al., 2023).

To mitigate the number of fatalities and prevent healthcare systems from collapsing, governments around the world implemented extensive protective measures aimed at ‘flattening the curve’ of infections (Anderson et al., 2020; Zinn, 2021). These measures had a profound impact on people’s daily routines and the functioning of society. Stringent restrictions such as lockdowns, quarantines, contact limitations, and the closure of public and private establishments (e.g., shops, restaurants, schools) were put into place. Additionally, measures such as mandatory mask-wearing, targeted screening and testing, and the promotion of thorough hygiene practices, including frequent hand-washing, disinfection, and respiratory etiquette, were implemented (Bruinen de Bruin et al., 2020). These measures necessitated significant behavior changes and, in some cases, prolonged periods of isolation.

While such measures have proven an effective way to contain pandemics (Cheek et al., 2022; Kucharski et al., 2020; Schlosser et al., 2020), they come at a substantial cost, including the disruption of global supply chains, widespread job loss and financial hardships for many people, and inevitable economic downturns (Bareket-Bojmel et al., 2021; Fetzer et al., 2021). Unsurprisingly, the outbreak of the virus also caused detrimental mental health impacts. For instance, it has been documented that the initial spread of the virus in China was accompanied by increases in distress and depression (Han et al., 2021). Several meta-analyses have shown that the prevalence of depression and anxiety increased significantly during the pandemic, not only among healthcare workers and patients with pre-existing health conditions, but also among the general public (Luo et al., 2020; Nochaiwong et al., 2021; Salari et al., 2020). Further, the pandemic has provided fertile ground for the spread of conspiracy beliefs and misinformation, leading the WHO to declare a global ‘infodemic’ that threatened public health and livelihoods (World Health Organization, 2020).

In sum, the COVID-19 pandemic has not only caused “a global health crisis unlike any in the 75-year history of the United Nations” (United Nations, 2020). It has also caused humanitarian, economic, and social crises of unparalleled proportions for many people living today (United Nations, 2020). As such, it presents a suitable case study for investigating how individuals experience and respond to large-scale societal crises.

### **1.3 Psychological Responses to the Coronavirus Pandemic**

In times of crises and large-scale social change, people are confronted with significant disruptions to their daily lives and socio-political circumstances (Bonanno et al., 2023; Walby, 2021). In the case of the Coronavirus pandemic, these disruptions have entailed restrictions of individual freedom and civil liberties, for example in the form of lockdowns, contact restrictions, or curfews. In response to such restrictions, individuals can react in various ways that range from posttraumatic stress to stable mental health and resilience, and from solidarity and mutual support to reactance, opposition, and conflict (Bonanno et al., 2023; Cheek et al., 2022; Reicher & Stott, 2020). Some of these responses may facilitate, others may hinder an effective overcoming of the crisis. Further, some responses may align with the prevailing societal consensus (e.g., acknowledging the seriousness of the virus and the need for protective measures), others may diverge from this viewpoint, leading to dynamics that may result in societal divides.

In the following, I will focus on three types of social psychological responses to the Coronavirus pandemic: compliance with governmental restrictions, anti-lockdown protests, and conspiracy beliefs. Although representing by no means an exclusive account of all responses to the pandemic, these phenomena are of particular theoretical and practical interest to the field of social psychology for the following reasons: (a) they were crucial for the collective effort to overcome the pandemic (e.g., van Bavel et al., 2020), (b) they have garnered significant public attention throughout the pandemic (e.g., Bingener & Soldt, 2022; Butter, 2020; Kunkel, 2020), and (c) they are all concerned with intersections between societal crises and the psychological experiences, beliefs, and behaviors that such crises elicit among individuals. An investigation of these phenomena can hopefully provide insights that extend beyond the pandemic and contribute to a better individual and societal preparedness to similar crises in the future.

#### ***1.3.1 Compliance with Governmental Restrictions***

Manuscript 1 is concerned with the factors that motivated individuals to comply with governmental restrictions during the Coronavirus pandemic. It can be argued that compliance with protective behaviors served at least two distinct purposes: to protect the self from infection, to protect people in risk groups by reducing the rate at which the virus is being spread in society, or both. Importantly, the Coronavirus has a highly asymmetrical risk profile: it carries significantly greater risk for older individuals and those with underlying health conditions (e.g.,

heart conditions, pulmonary diseases, or immune deficiencies, Clark et al., 2020; Sohrabi et al., 2020). So, if people would consider only their personal risk of becoming seriously ill or dying, many younger and healthy individuals might not consider compliance worth the cost. As such, for people who do not see themselves at risk from the virus, compliance can become an act of intergroup solidarity with people in risk groups (Leder et al., 2020).

Some may argue that people simply complied because many protective measures were legally mandated. Although potential legal sanction for non-compliance may undoubtedly have played a role, many of the required behaviors (e.g., restricting the number of people one meets at home, or even mask-wearing and compliance with quarantines) were difficult to control through law enforcement, and depended in large parts on people's voluntary compliance (Yong & Choy, 2021). For this reason, we focus on the motivations for voluntary compliance in the following.

Two distinct theoretical perspectives can be drawn upon to better understand the motives for voluntary compliance with health behaviors: (a) theories on health-related behaviors that understand compliance as a product of personal threat appraisals and efficacy beliefs (i.e., Protection Motivation Theory; Rogers, 1975), and (b) social identity approaches that focus on group processes during emergencies (e.g., Drury, 2018). Firstly, Roger's (1975) Protection Motivation Theory posits that people's protective behaviors are influenced by their perceptions of the severity of the threat, their personal susceptibility to it, their perceived ability to deal with the threat, and the perceived efficacy of the recommended protective behaviors. To increase the likelihood of protective behaviors being shown, individuals should (a) feel that the threat is severe and likely to affect them personally, (b) believe that they have the necessary skills and resources to execute the recommended protective behaviors, and (c) believe that the recommended protective behaviors are efficacious in achieving their goal (Rogers, 1975).

Early research on compliance with restrictions during the Coronavirus pandemic has established the predictive utility of Protection Motivation Theory variables. It has been repeatedly shown that perceived personal threat from the Coronavirus (Al-Hasan et al., 2020; Anaki & Sergay, 2021; Rui et al., 2021), as well as self-efficacy and perceived efficacy of the protective measures (Chong et al., 2020; Ezati Rad et al., 2021; Kowalski & Black, 2021) predict compliance. In a similar vein, fear of the Coronavirus has been established as an important precursor of preventive behaviors (Demirtaş-Madran, 2021). This demonstrates that some degree of personal fear and perception of threat may be useful in promoting adherence to required

behaviors during crises. However, this strategy likely fails when individuals do not see themselves at risk from an infection. This is where group-based processes come into play: People who do not see themselves at risk might instead be motivated to comply for reasons of solidarity with members of disadvantaged groups.

Social identity theorists have long argued that group processes play a key role in public behavior during emergencies (e.g., Drury, Cocking, & Reicher, 2009). Contrary to the widespread belief that emergencies result in mass panic and selfish behavior, this line of research has established that people frequently respond with mutual cooperation and support (Drury, 2018). Previous research has investigated collective behavior during diverse crises, such as fires, earthquakes, floods, or terrorist attacks. Although the Coronavirus pandemic differs from such types of crises in several ways (i.e., it consists of multiple incidents spread out over a longer period of time across the entire globe, instead of being concentrated on a small group of people in one place), the pandemic also shares important features with such emergencies: There is a mortal threat which creates fear among the public, there are limited opportunities to escape this threat, and human behavior is crucial for mitigating or exacerbating the crisis (Drury, 2018; Drury & Guven, 2020). As such, research on mass emergencies can provide insights into collective behavior during the pandemic.

The social identity model of collective behavior in emergencies and disasters suggests that a shared social identity is at the core of solidarity in crises (Drury, 2018). The sense of common fate that survivors of emergencies typically feel allows for the formation of a new, shared identity and a sense of ‘emergent groupness’. This process is thought to shift the focus from a personal to a collective sense of self (Drury, 2018). Since people are more motivated to help and support members of their own group, this shared group identity motivates cooperation and solidarity (Drury, 2018). Diverse studies of real-life emergencies have shown that the experience of common fate precedes a sense of shared identity, and that mutual support and compliant behaviors are consequences of this common identification (Drury, Cocking, & Reicher, 2009).

Research on solidarity-based political behaviors can provide further insights into what might motivate compliance to protect the disadvantaged (here, members of risk groups). The collective effort to stop the spread of the Coronavirus has social movement characteristics: it can only function at the collective level and requires a large group of people to work together toward a common goal. It also requires people to, from their point of view, sacrifice some of their

individual freedoms and not to act upon some of their needs and desires for the benefit of the collective, particularly members of risk groups. A large body of research has concluded that a shared social identity, collective efficacy, and group-based emotions play a crucial role in determining solidarity-based actions for members of disadvantaged groups: those who (a) identify with a social movement aimed at improving the situation of disadvantaged groups, (b) feel collectively capable of achieving the desired change, and (c) experience anger and other group-based emotions in the face of the status quo are more likely to take part in solidarity-based collective action (Radke et al., 2020; van Zomeren et al., 2008). Applied to the Coronavirus pandemic, this again emphasizes the importance of a shared identity that is oriented toward the collective effort to fight the pandemic. Further, this research highlights the important role of collective efficacy and group-based emotions in solidarity-based compliance.

**Contribution of Manuscript 1.** Understanding the psychological factors that promote compliance helps design health communication in an effective manner. The literature reviewed above suggests that compliance may be motivated both by individual experiences of threat and vulnerability, as well as by group-based processes (shared identity, collective efficacy, and concern for disadvantaged groups). However, previous research had only examined these processes in isolation and neglected the intergroup characteristics of the pandemic. As such, a comprehensive account of the motives that shape compliance is lacking. Manuscript 1 addresses this gap in the literature by investigating people’s motives to comply with protective measures, as well as their differential psychological correlates, during the early phases of the pandemic. Thereby, this research provides insights into how both self- and solidarity-oriented processes might be drawn upon to facilitate evidence-based behavior change during crises.

### ***1.3.2 Anti-Lockdown Protests***

Despite the large and growing body of research suggesting that people often respond to crises by complying with emergency measures, showing solidarity and providing social support, historical records also show that some of the most extreme forms of societal conflict emerged during crises (Reicher & Stott, 2020). Indeed, quickly after the protective measures were implemented, protests against them emerged around the world, including countries like Australia, the United States, the Netherlands, and Germany (Carothers, 2020; Milburn, 2020). In Germany, anti-lockdown protestors united under the name of the “Querdenken” (“lateral thinking”)

movement. This movement aimed for the abolishment of all restrictions and a return to the pre-pandemic status quo (Querdenken 711, 2022).

Media reports about the protests frequently emphasized the unusual heterogeneity of participants: More moderate, “bourgeois” participants, were witnessed marching alongside neo-Nazis and other right-wing extremists (Koos, 2021a). For instance, prominent individuals that are known for endorsing antisemitic conspiracy beliefs, such as the TV chef Attila Hildmann, and agents from the German neo-Nazi scene were seen at protests, sometimes even speaking on stages. Yet there were also people that appeared to stem from a more alternative, left-wing crowd, such as people that one would describe as “hippies” based on their appearances (Pöhlmann, 2021). Due to these observations, the movement has been described as a strange mix of “regular” citizens, esoterics, conspiracy theorists, and right-wing extremists (Oswald, 2021). Protestors themselves frequently claimed to represent the center of society (Grande, et al., 2021), and officially distanced themselves from any kind of extremism (Querdenken 711, 2022). In sum, the movement’s socio-political ideology appears complex and partly contradictory.

To some extent, the anti-lockdown protests can be understood in terms of the freedom-security trade-off that individuals and societies have to resolve during crises (Cheek et al., 2022). In the past, many policies that aimed to increase security at the expense of individual freedom (such as seat-belt laws, smoking bans, or helmet requirements) have been met with protests (Cheek et al., 2022). Similarly, history provides many examples of opposition to health behaviors during past disease outbreaks (e.g., during the 20<sup>th</sup> century Influenza pandemic, Cheek et al., 2022). In this sense, participation in the anti-lockdown protests can be seen as prioritizing individual freedom over collective security, thus hindering societal cooperation and goal-striving. Following this perspective, the protests appear as the counterpart to solidarity-based compliance with governmental restrictions: The needs and desires of the individual (i.e., personal freedom) are valued more than the public good (i.e., collective security).

However, this perspective may not cover the whole picture. Indeed, many protest participants may not actually believe that the pandemic poses a real health threat. They would accordingly not perceive a health crisis, but rather a crisis of governmental overreach and mass manipulation. Initial research conducted with protest participants has shown that beliefs in opposition to the current scientific consensus that downplay or downright deny the dangers of the Coronavirus are wide-spread among protestors (Nachtwey et al., 2020). Among them are ideas



about natural self-healing powers allegedly strong enough to fight the virus, beliefs about the Coronavirus being no more dangerous than the common flu, or pseudoscientific theories of immunity that a natural diet and lifestyle are sufficient to ensure immunity, rendering protective measures such as mask wearing or vaccines superfluous or even harmful (Koos, 2021b; Nachtwey et al., 2020).

This demonstrates that anti-lockdown protestors perceive the pandemic quite differently than those who follow the official narrative. Apparently, protestors do not see themselves (and society) at risk from the Coronavirus. Instead, they see the protective measures as disproportionate, completely unnecessary or even harmful, and feel threatened by a government that is, in their view, illegitimately restricting fundamental human rights (Reichardt, 2021). Some protestors even proclaimed that the protective measures were misused in order to turn the German political system into a dictatorship (Jürigs, 2022). If these claims correspond to the protestors' honest convictions (and are not merely used for strategic purposes), the anti-lockdown protests can be understood as a response to a perceived crisis of democracy, emphasizing how competing and starkly opposing narratives about the pandemic have emerged.

What were the consequences of such protests for the development of the pandemic? Research has shown that the anti-lockdown protests contributed considerably to the rate of infections: One study identified home regions of protestors using the geography of a bus network that transported protestors to and from the rallies (Lange & Monscheuer, 2022). The authors analyzed infection rates before and after two major protest events in November 2020, and found that, by the end of the year, these regions experienced an increase in incidence rates of approximately 35% – corresponding to 15,000 – 21,000 additional infections (Lange & Monscheuer, 2022). As such, the protests endangered the individual by increasing the likelihood of infection. They also contributed to an increased rate of virus transmission throughout society, thus endangering vulnerable populations and hindering the collective attempt to curb transmissions. Further, the media coverage of these protests might have contributed to a biased perception of how many people are critical of the scientific consensus and the trustworthiness of these critics, providing some additional legitimacy to behaviors that deviated from evidence-based recommendations.

All in all, the anti-lockdown protests heavily propagated beliefs that are in opposition to the scientific consensus. Research has found that trust in science predicts compliance with protective

behaviors over and above other relevant predictors (Plohl & Musil, 2021). People who believe that scientists adjust their findings to get the answer they want also tend to reject a variety of science-based assessments of the Coronavirus, such as that controlling the virus should be a priority for governments (Safford et al., 2021). Trust in science is also a major determinant of willingness to get vaccinated, which is critical for an effective management of the pandemic (Adhikari et al., 2022; Latkin, Dayton, Yi, et al., 2021). This demonstrates that anti-science beliefs have severely damaging consequences for the functioning of society. They contribute to an erosion of public trust in scientifically validated information, which may also spread to other societal domains and undermine evidence-based behavior change among the public (e.g., regarding climate change).

**Contributions of Manuscript 2.** Despite the wide-spread media attention that they attracted, little empirical research had investigated the anti-lockdown protests. It remained uncertain to what extent the media portrayals of the protests were accurate. Manuscript 2 fills this gap by exploring the composition of the anti-lockdown movement in Germany, and investigating whether protestors are indeed as heterogeneous as commonly described. That is, this research aims to identify and quantify similarities and differences in protestors' belief systems regarding a range of variables that were frequently discussed in relation to the protests: conspiracy beliefs, misinformation downplaying the dangers of the Coronavirus, vaccine hesitancy, esotericism, economic concerns, and political ideology. We aimed to identify what might explain this perhaps surprising surface-level (mostly based on appearances) heterogeneity among contrarians.

### ***1.3.3 The Formation of Conspiracy Beliefs***

During the pandemic, the topic of conspiracy beliefs has taken center stage in public and scientific discourse. A variety of conspiracy theories about the pandemic emerged (e.g., that the virus was deliberately created in a lab to reduce the world population), and this development had experts and laypeople alike ponder questions such as: Why do people believe in conspiracy theories? How do they impact the individual and society? And what can we do against them (Douglas, 2021; Douglas & Sutton, 2023; van Bavel et al., 2020)? The second part of this dissertation provides at least some answers to these questions.

A conspiracy is a secret plot by a powerful group that aims to achieve a common goal. The conspirators pursue this goal without concern for other people and society as a whole, which is

why conspiracies tend to have harmful consequences for the public (Douglas & Sutton, 2023). A conspiracy belief is the conviction that a conspiracy has taken (or is currently taking) place. So, people who believe in a conspiracy see society in a state of crisis – whether this corresponds to the actual state of society or not. Some well-known examples are that Bill Gates is using the Coronavirus vaccines to gain control over the world population, or that the American government was responsible for the 9/11 terrorist attacks.

Importantly, conspiracy beliefs are not by definition false or implausible. There are many examples of conspiracies that one would consider real based on the best available evidence, for example the Volkswagen emissions scandal, where the corporation eventually pled guilty to charges of conspiracy (Carey, 2017). For the most part, the present research does not differentiate between true and false, or plausible and implausible conspiracy beliefs. Instead, the term ‘conspiracy beliefs’ is used as a superordinate category that entails both plausible and implausible beliefs (Nera & Schöpfer, 2022). In cases where an argument pertains only to plausible or implausible versions of conspiracy beliefs (particularly, regarding societal consequences of conspiracy beliefs), this will be explicitly mentioned.

There are numerous examples of conspiracy beliefs that have emerged as a direct response to societal crises, dating back to the Roman Empire: When the great fire of Rome erupted in the year AD 64, conspiracy beliefs emerged about the Emperor Nero (who was out of town when the fire started) having burnt the city on purpose in order to rebuild it according to his own wishes (van Prooijen & Douglas, 2017). In Medieval times, European Jews were a frequent target of conspiracy theories: They were blamed for various crises, such as outbreaks of the plague (van Prooijen & Douglas, 2017). More recently, the wars fought in Iraq and Afghanistan have inspired conspiracy theories about the role of oil companies in politics; the 2008 financial crisis has resulted in conspiracy beliefs about diverse actors (e.g., Democratic bankers) having caused it on purpose; and the global climate crisis has elicited claims about evidence being faked, or the crisis being a hoax entirely (van Prooijen & Douglas, 2017). Given these examples, it appears unsurprising that the Coronavirus pandemic has proven to be an ideal breeding ground for conspiracy beliefs (Imhoff & Lamberty, 2020).

Although these anecdotes do not by themselves provide evidence for a link from societal crises to conspiracy beliefs, they suggest that it may be worthwhile to study the relation between psychological experiences that are common during crises and the formation of conspiracy beliefs.

Indeed, research conducted so far supports the idea that such negative psychological experiences, particularly feelings of anxiety, uncertainty, and threat, are associated with conspiracy beliefs (Douglas et al., 2017; van Mulukom et al., 2022). For instance, conspiracy beliefs are more likely to emerge in situations in which people are anxious (Grzesiak-Feldman, 2013; Whitson & Galinsky, 2008). Further, they are particularly appealing to people who do not deal well with uncertainty (Marchlewska et al., 2018) – presumably because they provide seemingly simple, all-embracing explanations for complex phenomena (Douglas et al., 2017).

Similarly, the experience of existential threat (i.e., a subjective sense of being in danger) has been found to be associated with conspiracy beliefs (Douglas et al., 2017). Conspiracy theories typically proclaim that important systems (e.g., economics) and societal structures are controlled by a small number of powerful people, thereby implying that much of what happens on a societal level is, in fact, controllable (Keeley, 1999). Presumably, such a worldview is less threatening than an unpredictable world, where disastrous events might happen without a specific purpose. Research confirms that known, identified enemies are perceived as less threatening than random, diffuse perils (Sullivan et al., 2010). In line with these considerations, greater perceptions of threat during the Coronavirus pandemic have been found to predict increases in conspiracy beliefs (Heiss et al., 2021).

In sum, the literature reviewed above suggest that people turn to conspiracy beliefs when they experience negative cognitive-affective states. But can conspiracy beliefs successfully alleviate these negative experiences? That is, is the adoption of conspiracy beliefs during crises beneficial for the individual? There are reasons to believe that this is not the case. The content of conspiracy beliefs is inherently threatening: Conspiracy theories allege that society is at the mercy of malevolent, powerful groups. Such a worldview provides many additional triggers for anxiety, uncertainty, and threat (Peitz et al., 2021), potentially resulting in a negative feedback loop: People may turn to conspiracy beliefs in an attempt to alleviate the negative experiences they face during crises. But instead of making people feel better, conspiracy beliefs might actually exacerbate these experiences even further (Douglas et al., 2017). Research provides initial evidence for this idea: Several studies have shown that exposure to conspiracy theories increases people's levels of uncertainty and distrust, and decreases their sense of autonomy and control (Einstein & Glick, 2015; Jolley & Douglas, 2014). In addition, Leibovitz et al. (2021)

found that greater COVID-19 conspiracy beliefs at one time point predicted anxiety levels two month later.

**Contributions of Manuscript 3.** Our current knowledge on how conspiracy beliefs emerge and develop during societal crises is limited in several ways. First, most previous research on the cognitive-affective antecedents and consequences of conspiracy beliefs is cross-sectional and cannot provide evidence about within-person developments over time. However, the question of whether conspiracy beliefs result from, and in turn influence, negative cognitive-affective experiences is explicitly concerned with within-person changes. Further, most experimental studies conducted so far (Douglas & Leite, 2017; Einstein & Glick, 2015; Jolley & Douglas, 2014) predominantly manipulated *exposure* to conspiracy theories instead of conspiracy beliefs themselves (which, admittedly, are difficult to manipulate experimentally). However, being exposed to conspiracy theories cannot be equated with believing in them. As such, it has not yet been adequately tested whether the adoption of conspiracy beliefs decreases or increases negative affective experiences like anxiety, uncertainty, and existential threat. Manuscript 3 will fill this gap by conducting a longitudinal investigation of how conspiracy beliefs, anxiety, uncertainty aversion and existential threat co-develop over time.

**Contributions of Manuscript 4.** The literature reviewed above suggests that conspiracy beliefs result, at least in part, from negative cognitive-affective experiences (Douglas et al., 2017). This opens a new avenue for research on the psychological causes of conspiracy beliefs, namely dysfunctional emotion regulation in the form of rumination. Indeed, research from clinical psychology has highlighted the crucial role of rumination in increasing and maintaining negative affect (Ehring & Watkins, 2008; Nolen-Hoeksema et al., 2008; Watkins & Roberts, 2020). Since negative affect is theorized to be conducive to the formation of conspiracy beliefs, rumination in response to distressing societal events should contribute to conspiracy beliefs.

Beyond negative affect, rumination also induces cognitive biases that should be conducive to the formation of conspiracy beliefs: People that ruminate tend to make more negative attributions, remember more negative events from their past, and judge negative events as having occurred more frequently (Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky et al., 1999). As such, rumination draws the attention to negative interpretations and information. Since conspiracy beliefs are negative interpretations of ambiguous societal events, these cognitive biases should increase the likelihood of believing in a conspiracy.

Although research has accumulated a large body of evidence on the psychological *correlates* of conspiracy beliefs, consistent and convincing evidence about causal effects is still rare (Douglas & Sutton, 2023). The literature on conspiracy beliefs has also not yet profited from an integration with clinical psychological theories. For this reason, Manuscript 4 tests the novel hypothesis that rumination, a repetitive type of negative thinking, is causally involved in the formation of conspiracy beliefs. Several theories from the conspiracy beliefs literature, as well as from clinical research on the consequences of rumination, suggests such a link. In a series of studies, Manuscript 4 first develops a procedure to reliably induce rumination, and subsequently tests in a Registered Report whether dysfunctional rumination (specifically, brooding) about societal problems increases conspiracy beliefs. Thereby, this research informs about a potential mechanism that could open new directions for interventions that address the root causes of conspiracy beliefs. A causal link from rumination to conspiracy beliefs could also explain why conspiracy beliefs tend to surge during societal crises (e.g., van Prooijen & Douglas, 2017).

## 1.4 Dissertation Overview

The focus of this dissertation lies on the reciprocal relations between societal crises, and the diverse psychological experiences, beliefs, and behaviors these crises elicit among individuals. On the one hand, fear- and uncertainty-related experiences facilitate compliance with protective measures for reasons of self-protection (Manuscript 1). On the other hand, these negative experiences can be expected to contribute to the formation of conspiracy beliefs (Manuscripts 3 and 4), which entail doubt and mistrust in authorities and fundamental societal institutions. Conspiracy beliefs and anti-science beliefs, in turn, play an important role in anti-lockdown protests that fight for the abolishment of all protective measures (Manuscript 2). The extent to which people complied with vs. opposed the protective measures had an important impact on the development of the pandemic (i.e., whether the virus could be effectively contained or spread through society uncontrolled). Further, unfounded conspiracy beliefs and anti-science convictions can be expected to shape many kinds of societal crises beyond a global pandemic by reducing reliance on evidence-based practices and information, thereby hindering the public behavior change necessary for overcoming large-scale societal problems (e.g., in the context of climate change).

The reciprocal relations between individuals, the societies formed by these individuals, and the crises that may affect these societies, are depicted in Figure 1: Different kinds of societal crises influence each other in complex ways, resulting in a chain of interconnected crises (Walby, 2021). These crises influence, and are in turn influenced by, the diverse psychological responses from individuals. This is illustrated by example of the Coronavirus pandemic: Negative cognitive-affective experiences that were common during the pandemic can be expected to contribute to belief- and behavior-based responses (compliance, anti-lockdown protests, conspiracy beliefs). These beliefs and behaviors, while being reciprocally connected with each other, have the potential to contribute to a successful overcoming of the crisis, or exacerbate one or multiple societal crises, going full circle.

It is important to note that the consequences of compliance, conspiracy beliefs, and contrarian protests are context dependent. So far, it has been implied that compliance is beneficial, and conspiracy beliefs and anti-lockdown protests are harmful for society and individuals alike. This is not true unconditionally. First and foremost, whether compliance is beneficial for overcoming a crisis depends on whether the prescribed measures are actually

effective in eliminating the threat. Similarly, the consequences of contrarian movements depend on the specific goals of that movement, and whether these are beneficial or detrimental to overcoming the crisis. And lastly, the societal consequences of conspiracy beliefs depend on whether the alleged conspiracy exists or not: If an actual conspiracy existed, then it would be in the public interest for it to be uncovered and believed in.

So, the consequences of compliance, contrarian movements and conspiracy beliefs depend on a truth-criterion that is perhaps best captured by the best available scientific evidence. One can easily imagine a situation in which compliance with governmental recommendations would hinder the successful overcoming of societal crises (e.g., compliance with Donald Trump's recommendations to inject bleach to fight the Coronavirus, McGraw & Stein, 2021), or a context in which contrarian movements constitute an appropriate response (e.g., the failure of many governments to adequately address climate change). An important assumption underlying the present research is that the restrictions implemented by the German government during the Coronavirus pandemic were evidence-based and effective in limiting the spread of the Coronavirus (e.g., Talic et al., 2021).

**Manuscript 1** investigates people's motives for compliance with governmental restrictions during the Coronavirus pandemic. It argues that people may have complied with COVID-19 health mandates for different reasons: to protect themselves from infection, out of solidarity with people most at risk from the virus, or both. These motives are likely predicted differentially by negative cognitive-affective experiences (uncertainty, threat) and group-based beliefs within the pandemic-context (shared identity, collective efficacy, concern for risk groups). As such, Manuscript 1 examines how cognitive-affective experiences and beliefs relate to behavioral responses to the pandemic (see Figure 1).

**Manuscript 2** turns toward a behavior that can be considered the counterpart to solidarity-based compliance: anti-lockdown protests. Early media reports emphasized the unusual heterogeneity of protestors: Hippies and right-wing extremists appeared to be marching side by side. To shed some light on what might explain this seemingly surprising coalition, this research investigates the similarities and differences of protestors regarding a range of relevant beliefs: conspiracy beliefs, downplaying of the Coronavirus, esotericism, vaccine hesitancy, economic concerns, and socio-political ideology. As such, this research is concerned with the relations between beliefs and behavioral responses in the form of anti-lockdown protests (see Figure 1).

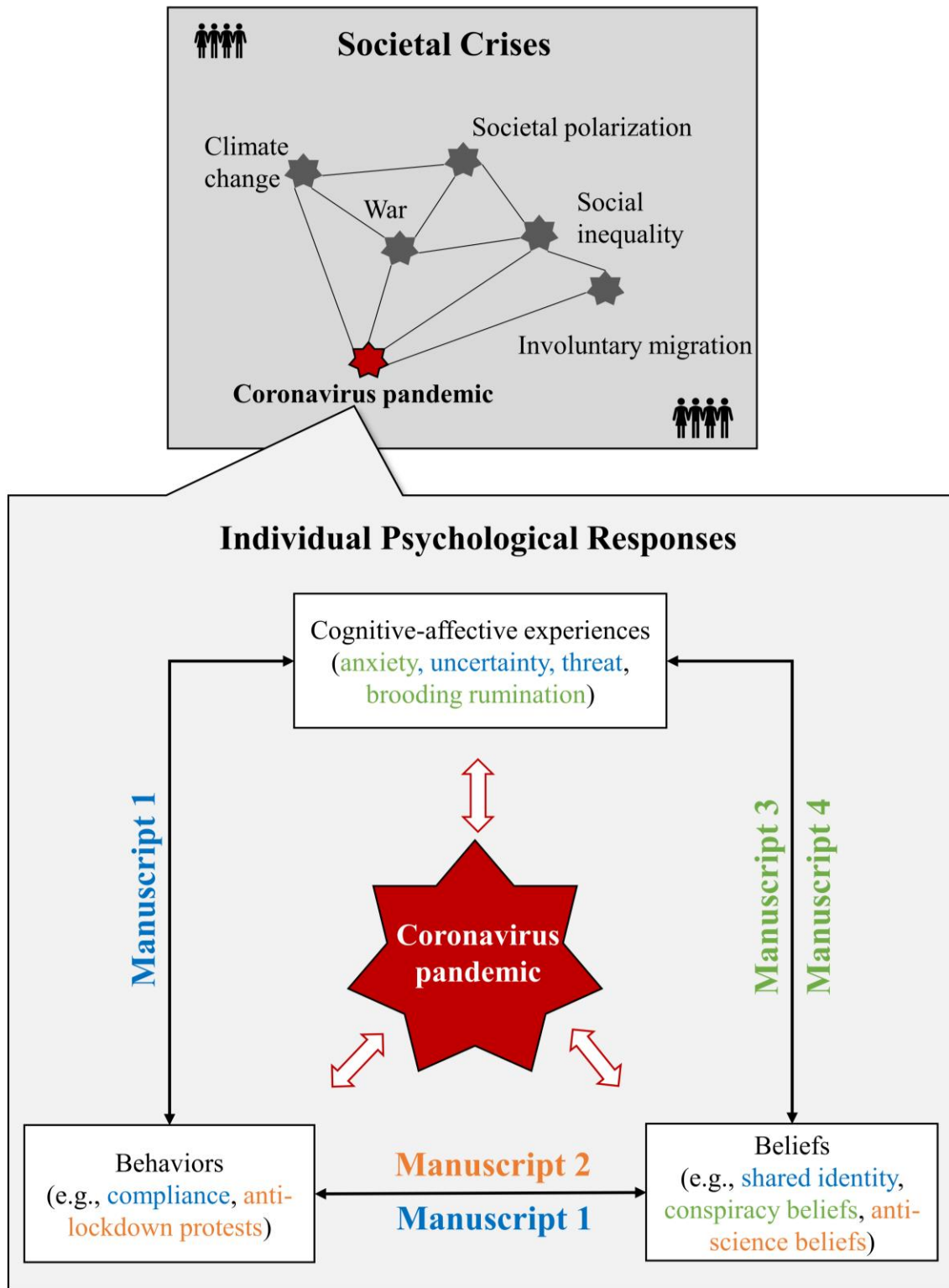


**Manuscripts 3 and 4** put the spotlight on conspiracy beliefs - a particularly salient phenomenon in the pandemic context. Conspiracy beliefs tend to arise in situations where many people experience anxiety, uncertainty, and threat. It has been suggested that they represent an attempt to alleviate such negative experiences. However, most likely turning toward conspiracy beliefs does not actually make people feel better. After all, people believe themselves to be at the mercy of selfish, uncaring, and mighty forces. Following this reasoning, Manuscript 3 tests the reciprocal relations between negative cognitive-affective experiences and conspiracy beliefs in two longitudinal studies.

Manuscript 4 shifts the focus of Manuscript 3 by directly targeting conspiracy beliefs as potential explanations for societal problems (e.g., polarization). In a series of studies, this manuscript investigates the critical role of rumination, a persistent and repetitive focus on negative content, in the formation of conspiracy beliefs. More specifically, this research tests the theoretically derived prediction that brooding, a dysfunctional type of thinking about negative experiences, increases conspiracy beliefs. For this purpose, we first developed a procedure that reliably induces brooding about societal issues. Subsequently, a Registered Report tested the prediction that brooding about distressing societal topics increases the likelihood of believing that a conspiracy is involved in these issues. As such, both Manuscripts 3 and 4 are concerned with the relations between cognitive-affective experiences and belief-based responses within the context of societal crises (see Figure 1).

Taken together, the present research suggests that negative psychological experiences that are common during crises do not only influence the extent to which people comply with or oppose the governmentally prescribed protective measures. They should also influence (and be influenced by) the type of beliefs that are adopted in the context of the crisis (e.g., conspiracy beliefs). Conspiracy beliefs and other socio-political attitudes, in turn, shape participation in contrarian protests that position themselves against the official government response. The manuscripts presented here advance knowledge about the psychological factors that promote or hinder societal collaboration and goal-striving during times of disruption and rapid societal change. In the words of Reicher and Stott (2020), they shed light on the factors that determine whether the pandemic “brings people together with authorities so as to maintain order or else pushes them apart and creates disorder” (p. 699).

**Figure 1**  
*Dissertation Overview*



**2 Manuscript 1: Compliance with Governmental Restrictions during the Coronavirus Pandemic: A Matter of Personal Self-Protection or Solidarity with People in Risk Groups?**

Liekefett, L., & Becker, J. (2021). Compliance with Governmental Restrictions during the Coronavirus Pandemic: A Matter of Personal Self-Protection or Solidarity with People in Risk Groups? *The British Journal of Social Psychology*, 60(3), 924–946.

<https://doi.org/10.1111/bjso.12439>

### **Abstract**

During the coronavirus pandemic, governments across the globe ordered physical distancing and hygiene restrictions to slow down the spread of COVID-19. The present work was conducted during the peak of restrictions in Germany (April/May 2020). In a convenient ( $N = 218$ ) and representative sample ( $N = 715$ ), we examined people's motivations to comply with these restrictions during the lockdown: Were they motivated by personal self-protection, or rather by solidarity with people in risk groups? Specifically, we investigated predictors of personal self-protection (compliance to protect the self against infection), and group-protection behavior (compliance for reasons of solidarity in protecting people in risk groups). Results indicate that self- and group-protection result from different psychological processes: Whereas personal self-protection seems to be a form of coping with personal anxieties (epistemic and existential needs, personal threat), group-protection is an intergroup phenomenon that is enabled by identification with a collective goal (common identity), the perception that society is capable of dealing with the virus (group efficacy), and concern for people in risk groups. We discuss potential implications for behavioral change in pandemics.

**Keywords:** restrictions; self-protection; group protection; solidarity; Covid-19

## **Compliance with Governmental Restrictions during the Coronavirus Pandemic: A Matter of Personal Self-Protection or Solidarity with People in Risk Groups?**

*And then the whole world walked inside and shut their doors and said: we will stop it all. EVERYTHING. To protect our weaker ones. Our sicker ones. Our older ones. And nothing – NOTHING in the history of humankind felt more like LOVE than this. (anonymous post on Facebook April 2020)*

In response to COVID-19, governments worldwide announced large-scale physical distancing measures, and urged their population to limit face-to-face contacts to a minimum in order to slow the rate of transmission. Yet the success of these measures is determined by the level of acceptance across populations, and the extent to which people are prepared to temporarily sacrifice their personal needs, desires and daily freedoms (Anderson et al., 2020; Elcheroth & Drury, 2020). In the current pandemic, compliance with restrictions and protective measures can either serve the individual, because it reduces the likelihood of becoming infected, or it can serve those groups who are most at risk from the virus, because it reduces the chance of the virus being spread in society. The present work was set up to better understand what motivated compliance with restrictions: Were personal self-protection motives more important, or did people act out of solidarity with those who are most vulnerable to the disease? Which psychological characteristics made such self- or group-protection behaviors more likely?

An important characteristic of COVID-19 is that it carries significantly greater risk for older individuals and those with underlying health conditions, such as heart conditions, diabetes, or pulmonary diseases (Clark et al., 2020; R. E. Jordan et al., 2020; Sohrabi et al., 2020). According to current statistics, among every 1,000 people infected in their seventies or older, on average 116 are likely to die, whereas under the age of 50, that number is close to zero (O'Driscoll et al., 2020; Pastor-Barriuso et al., 2020). So, if people were making decisions only in terms of their personal risks, many people (especially those who do not belong to a risk group), might conclude that complying with restrictions is not worth the cost (Jetten et al., 2020). We argue that especially for people with low personal risk of becoming seriously ill or dying, compliance becomes an act of intergroup solidarity: They accept the costs of physical distancing, in order to improve outcomes for people in risk groups (Jetten et al., 2020). As the citation at the

beginning suggests, many believed that this kind of solidarity was predominant in the coronavirus pandemic: Instead of everyone being out for themselves, different forms of solidarity and collective behaviors in communities have been witnessed, and feelings of solidarity with others ostensibly increased (Cappelen et al., 2020; Jetten et al., 2020)

Yet others emphasize that people mostly conformed to restrictions out of self-interest, and that even pro-socially oriented people sought out behaviors that were oriented toward personal self-protection (Leder et al., 2020). In this paper, we examine whether people in Germany during the early phase of the coronavirus outbreak (April/May 2020) complied with governmental restrictions primarily to protect themselves, or rather perceived compliance to be an act of solidarity with people in risk groups. We further identify psychological predictors that are specifically related to self- and group-protection, and thereby contribute to a more nuanced understanding of what shapes compliance with behavioral restrictions during the coronavirus pandemic.

### **Compliance for Personal Self-Protection**

Prior work has indicated that people who perceive an illness as more threatening are more likely to adopt behaviors that reduce their risk of infection (e.g., hand-washing, disinfection; (Brug et al., 2009; Lau et al., 2008; Lau et al., 2004; Rogers, 1975; Rubin et al., 2009). How individuals perceive personal threats, in turn, depends on fundamental needs for security and certainty that all humans possess to varying degrees (Jost et al., 2008).

Existential needs for security refer to the motive to establish and maintain personal safety, and reduce threat and distress (Tetlock, 2002). Those with high existential needs perceive the world to be an inherently dangerous place, and have a tendency to overestimate threats. In a pandemic, these individuals are likely to respond with greater personal anxiety and distress (Taylor, 2019). Thus, we assume that individuals with higher existential needs are more likely to see the virus as threatening and engage in personal self-protection behaviors to avoid being infected by the virus. Epistemic needs for certainty refer to the extent that people strive for consistency, predictability and meaning, or are capable of tolerating ambiguity and uncertainty (Hennes et al., 2012; Jost et al., 2003). Given that the current pandemic is associated with a high amount of uncertainty (e.g., whether another lockdown will occur, whether close others will be

seriously infected), individuals with an aversion toward uncertainty are expected to respond with greater perceptions of threat (Ashbaugh et al., 2013; Taha et al., 2014; Taylor, 2019).

Taken together, we hypothesize that the higher people's intolerance toward existential threats and uncertainty, the more they feel personally threatened by the virus. We further assume that the experience of personal threat translates into compliance with restrictions for reasons of personal self-protection.

### **Compliance for Group-Protection**

How the majority of the population complies with physical-distancing and hygiene guidelines determines the extent to which the virus is spread in society, and endangers people in risk groups. In this paper, we put forward the idea that compliance with physical-distancing and hygiene guidelines to protect vulnerable others represents a form of solidarity-based action that should be enabled by group-based variables such as common identity, group efficacy and emotions. Solidarity-based political actions can be defined as actions taken by allies that aim to improve conditions for disadvantaged groups. These include both public actions, such as participating in a protest, and more private behaviors such as taking part in discussions or writing letters (Radke et al., 2020). Recently, there has been an increase in research studying the determinants of such solidarity-based actions (Ashburn-Nardo, 2018; Becker, 2012; Broido, 2000; Brown, 2015; Brown & Ostrove, 2013; Droogendyk et al., 2016; Louis et al., 2019; Ostrove & Brown, 2018; Subasic et al., 2008; Thomas & McGarty, 2018; van Zomeren et al., 2011). In predicting solidarity-based actions, social identity, group efficacy beliefs and group-based emotions play a central role (Radke et al., 2020; van Zomeren et al., 2008). Those who identify with opinion-based groups or a social movement oriented toward improving the situation of the disadvantaged, are more likely to take part in political action, because the out-group's interests become an important part of one's identity (Bliuc et al., 2007; McGarty et al., 2009; Radke et al., 2020; Subasic et al., 2008; Thomas et al., 2012; van Zomeren et al., 2011). Similarly, shared identification has been associated with solidarity and cooperation in emergencies (Drury et al., 2016; Drury, Cocking, Reicher, et al., 2009). Especially in an intergroup context, suffering from distress after a disaster has been shown to increase a sense of psychological closeness to others, and this in turn translated to intergroup contact and helping (Vezzali et al., 2015; Vezzali et al., 2016).

Applied to the Coronavirus pandemic, the collective effort to protect people in risk groups has social movement characteristics: it can only function at the collective level and requires the contributions of a group of individuals to a collective goal. We propose that compliance to protect risk groups has an intergroup component: Whereas members of risk groups are at high risk of becoming seriously ill or dying, chances are high that most other people would overcome the disease fairly easily. In the context of the current pandemic, this asymmetric risk profile has been highly salient, and has prompted demands to isolate members of risk groups (while the rest go on as normal), as well as highly controversial statements. For instance, Boris Palmer (mayor of the German city Tübingen) said: “In Germany, we may be saving people who would be dead in half a year anyways – due to their age and previous medical conditions” (Soldt, 2020). This has led to the disease being portrayed as mainly the ‘problem of older adults’ and those in risk groups (Xiang et al., 2020), and separated people into the group of “vulnerable” versus the group of “rather safe” people.

Early research on the emergence of social identities during the coronavirus pandemic has shown that psychological groups can form around shared attitudes toward the pandemic, and might form the basis for compliance and non-compliance with recommended behaviors (Maher et al., 2020). We propose that these shared attitudes are particularly important when it comes to solidarity-based behaviors: Those who strongly identify with the collective goal of protecting people in risk groups should be more likely to demonstrate group-protective behaviors. Furthermore, those who believe that we are collectively capable of protecting risk groups (group efficacy) should be more likely to engage in behaviors that contribute to this goal (Drury & Reicher, 2005; van Zomeren et al., 2008). Finally, group-protection should be associated with group-based experiences of concern for people in risk groups. Both in the context of intergroup conflicts (Batson & Ahmad, 2009; Cikara et al., 2011) and health behavior (Sassenrath et al., 2016), caring for others has been shown to improve prosocial outcomes (see also Pfattheicher et al., 2020). Thus, concern about the pandemic’s consequences for members of risk-groups should predict behaviors aimed at mitigating these consequences.

### **The Present Research**

The present research was set up to contribute to our understanding of why people complied with the governmental restrictions during the coronavirus pandemic. We propose two main



motivations: They comply to protect the self from infection (personal self-protection behavior), or they comply to protect people in risk groups from infection (group-protection behavior). We further argue that personal self-protection behaviors are a consequence of dealing with personal anxiety, and heightened needs for security and certainty. Therefore, we expect that the effects of epistemic and existential needs on personal self-protection should be mediated by personal threat. We assume that behaviors that aim to protect people in risk groups are the result of group-based processes: identifying with the collective goal of stopping the virus, believing that society is capable of doing so, and experiencing concern for the sake of vulnerable others. We conducted two studies among the German population. Study 1 tested our predictions in an online convenience sample; in Study 2 we attempted to replicate our models in a nationally representative sample. Both studies focused on people who were not members of risk groups themselves, and were conducted during the peak of restrictions (lockdown) in Germany (April and May 2020): shops, schools and parks were closed, most people worked at home, it was required to keep a physical distance of around 1.5 meters, and it was prohibited to meet up with more than one person from another household (Steinmetz et al., 2020).

## Study 1

### Method

#### *Participants and Procedure*

Participants were recruited in April 2020 using Prolific. The sample size was determined a priori using the Monte Carlo power analysis for indirect effects (Schoemann et al., 2017; correlations among variables = .30, power = .90,  $\alpha = .05$ ). This indicated that we needed 223 participants to detect the mediation effect. In exchange for participation, they received a reward of 1.76€. A total of  $N = 300$  completed the survey. We excluded 47 people with German nationality who lived outside of Germany, because countries differed in their restriction policies and we wanted to examine a sample facing the same situation. We also excluded 29 people who belonged to a Corona risk group, because for them personal self-protection and group-protection motives were confounded, and six people who had already been infected with the virus, because for them personal self-protection behaviors were obsolete. The final sample consisted of  $N = 218$  participants. The mean age was 29.19 ( $SD = 9.21$ ), and 44% identified as female. The majority

were of German nationality (97.2%). There were six people with other nationalities: Vietnamese, Turkish, Romanian, Austrian and Greek.

### **Measures**

All responses were made on 7-point rating scales (where 1 = *do not agree at all*, 7 = *agree completely*).

**Epistemic Needs.** Epistemic needs were measured by three items from the Uncertainty Response Scale (Greco & Roger, 2001): “I feel anxious when things are changing”, “I get worried when a situation is uncertain”, and “Uncertainty frightens me” ( $\alpha = .89$ ).

**Existential Needs.** Existential needs were measured by three self-developed items: “I am often scared that something is going to happen to me”, “I often feel in danger”, and “I worry that something bad is going to happen” ( $\alpha = .92$ ).

**Identification.** Identification was measured by two items adapted from Becker et al. (2011): “I identify with the effort to stop the spread of the coronavirus”, and “It is important to me to be a part of the effort to stop the spread of the coronavirus” ( $r = .74$ ).

**Group Efficacy.** Group efficacy was measured by two self-developed items: “If we all stick together we can get a grip on the Corona-crisis”, and “We can improve the current situation if everyone in society contributes to it” ( $r = .76$ ).

**Personal Threat.** Personal Threat was measured by two self-developed items: “In the context of the Corona-crisis, I worry about getting infected”, and “In the context of the Corona-crisis, I worry that my life is endangered” ( $r = .59$ ).

**Concern for People in Risk Groups.** Concern for people in risk groups was measured by two self-developed items: “In the context of the Corona-crisis, I worry about older people and people with underlying medical conditions getting infected”, and “In the context of the Corona-crisis, I worry about people from high-risk groups getting infected” ( $r = .87$ ).

**Self-/ Group-Protection Behavior.** To measure self- and group-protection, participants indicated the extent to which they demonstrated the following five behaviors in order to a) *protect themselves* (personal self-protection behavior,  $\alpha = .94$ ) and b) *protect people in risk groups* (group protection behavior,  $\alpha = .91$ ): 1) keep more social distance than usual, 2) stop shaking hands, 3) wash their hands more than usual, 4) keep greater distance than usual from people they are passing, and 5) keep greater distance than usual in the line at the supermarket.

**Table 1***Descriptive Statistics and Bivariate Correlations from Study 1*

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1 Epistemic Needs	4.17	1.44	1	.34**	.35**	.16*	.01	.28**	.15*	.07	-.39**	-.18**	-.07	-.15*
2 Existential Needs	2.72	1.41		1	.48**	.10	-.02	.17*	.27**	.10	-.21**	.09	-.24**	.28**
3 Perceived Threat	2.91	1.45			1	.21**	.14*	.39**	.42**	.16*	-.15*	.15*	-.13	.06
4 Identification	3.88	1.43				1	.44**	.41**	.30**	.50**	-.26**	.05	.09	-.14*
5 Group Efficacy	5.83	1.15					1	.40**	.31**	.44**	-.02	-.02	.13	-.01
6 Concern for Risk Groups	4.96	1.75						1	.30**	.56**	-.29**	.00	.06	-.07
7 Personal Self- Protection	5.27	1.69							1	.30**	-.10	.15*	.10	.07
8 Group-Protection	5.94	1.34								1	-.25**	.06	.10	-.11
9 Gender	1.56	0.51									1	-.07	-.07	.12
10 Age	29.19	9.21										1	.12	.16*
11 Education	4.43	0.74											1	-.01
12 Political Orientation	3.05	1.18												1

## Results and Discussion

Descriptions and bivariate correlations are displayed in Table 1. Both self- ( $M = 5.27$ ,  $SD = 1.69$ ) and group-protection ( $M = 5.94$ ,  $SD = 1.34$ ) were highly prevalent. Women were more likely to report to protect people in risk groups ( $t(215) = 6.79$ ,  $p < .001$ ). Age was positively correlated with personal self-protection ( $r = .15$ ,  $p = .025$ ). A higher level of education and political orientation were uncorrelated with both dependent variables. We included correlated covariates into the models (this did not change the pattern of results, see Table S1 in the Supplemental Online Materials [SOM]). Given that self- and group-protection are correlated, and we aim to identify predictors that are unique for each outcome, we tested our prediction using the other variable as a covariate, respectively.

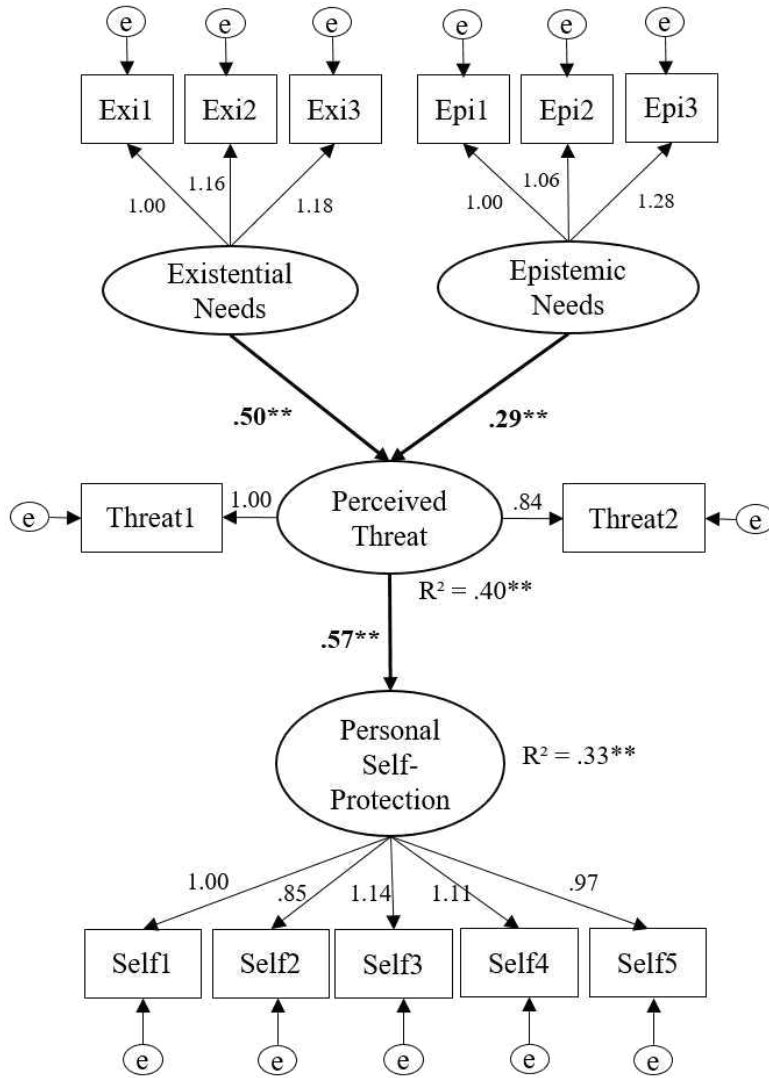
### Personal Self-Protection Behavior

We conducted structural equation modeling (SEM) using Mplus version 7.4. We regressed personal self-protection behavior on perceived threat (while controlling for group-protection, age and gender), and perceived threat on epistemic and existential needs (see Figure 1). Model fit was acceptable: root mean square error of approximation (RMSEA) = .08 (95% CI [.07, .09]), comparative fit index (CFI) = .93, Tucker-Lewis Index (TLI) = .92, standardized root mean square residual (SRMR) = .08. Existential ( $B = .44$ ,  $SE = .08$ ,  $p < .001$ , 95% CI [.32, .69]) and epistemic ( $B = .26$ ,  $SE = .08$ ,  $p < .001$ , 95% CI [.11, .47]) needs predicted perceived threat ( $R^2 = .40$ ,  $SE = .08$ ,  $p < .001$ ), which predicted personal self-protection ( $B = .59$ ,  $SE = .13$ ,  $p < .001$ , 95% CI [.34, .84],  $R^2 = .33$ ,  $SE = .07$ ,  $p < .001$ ). Existential needs had a positive indirect effect on personal self-protection through perceived threat ( $B = .30$ ,  $SE = .09$ ,  $p < .001$ , 95% CI [.13; .46]), as did epistemic needs ( $B = .17$ ,  $SE = .07$ ,  $p = .008$ , 95% CI [.04; .30]).

In order to test whether our model is unique for personal self-protection and cannot explain group-protection, we further tested whether existential and epistemic needs predicted group-protection through perceived threat (controlling for personal self-protection, age and gender). Perceived threat did not predict group-protection ( $B = .12$ ,  $SE = .13$ ,  $p = .357$ , 95% CI [-.13, .35]). Neither existential ( $B = .07$ ,  $SE = .08$ ,  $p = .361$ , 95% CI [-.08, .22]) nor epistemic needs ( $B = .06$ ,  $SE = .08$ ,  $p = .457$ , 95% CI [-.02, .02]) had indirect effects on group-protection.

**Figure 1**

*SEM for Personal Self-Protection Behavior from Study 1*



*Note.* Coefficients presented are unstandardized linear regression coefficients; \*\*  $p < .001$ , \*  $p < .050$ .

**Group-Protection Behavior**

We tested a SEM in which group-protection was regressed on identification, group efficacy and concern for people in risk groups (see Figure 2). The model provided acceptable fit: RMSEA = .07 (95% CI [.06, .08]), CFI = .95, TLI = .94, SRMR = .07. As predicted, identification ( $B = .23$ ,  $SE = .07$ ,  $p < .001$ , 95% CI [.09, .36]), group efficacy ( $B = .22$ ,  $SE = .08$ ,  $p = .006$ , 95% CI

[.06, .37]), and concern for people in risk groups ( $B = .23$ ,  $SE = .05$ ,  $p < .001$ , 95% CI [.14, .32]) independently predicted group-protection behavior ( $R^2 = .46$ ,  $SE = .06$ ,  $p < .001$ ).<sup>1</sup>

In order to test whether our model is unique for group-protection and cannot explain personal self-protection, we tested whether the same variables would also explain personal self-protection, and found that the coefficients approached significance for identification ( $B = .23$ ,  $SE = .12$ ,  $p = .057$ , 95% CI [-.01, .47]), group efficacy ( $B = .25$ ,  $SE = .14$ ,  $p = .061$ , 95% CI [-.01, .52]) and concern for risk groups ( $B = .15$ ,  $SE = .08$ ,  $p = .072$ , 95% CI [-.01, .32])<sup>2</sup>.

Taken together, we demonstrate that compliance with governmental restrictions during the pandemic consists of (at least) two motivations, which are associated with different psychological processes: self- and group-protection. We found support for the idea that people with strong existential and epistemic needs perceived the coronavirus as more threatening, which was in turn associated with reporting more personal self-protection behavior. Further, we demonstrate that these individual-level predictors are unique for distancing behaviors aimed at protecting the self from infection: they did not predict group-protection. Group-protection, in contrast, was consistently predicted by group-based variables, namely identification, perceptions of group efficacy, and concern for people in risk-groups. Although these group-level variables did not significantly predict personal self-protection, the effects approached significance. One limitation that might explain this finding is that our items for identification and group efficacy did not refer to protecting risk groups per se, but to slowing the spread of the coronavirus, which might also be relevant for personal self-protection. Therefore, we aimed to assess identification and group efficacy more appropriately in Study 2. In addition, the non-representative nature of our sample did not allow us to estimate how prevalent these behaviors were in the German population. We addressed this limitation in Study 2.

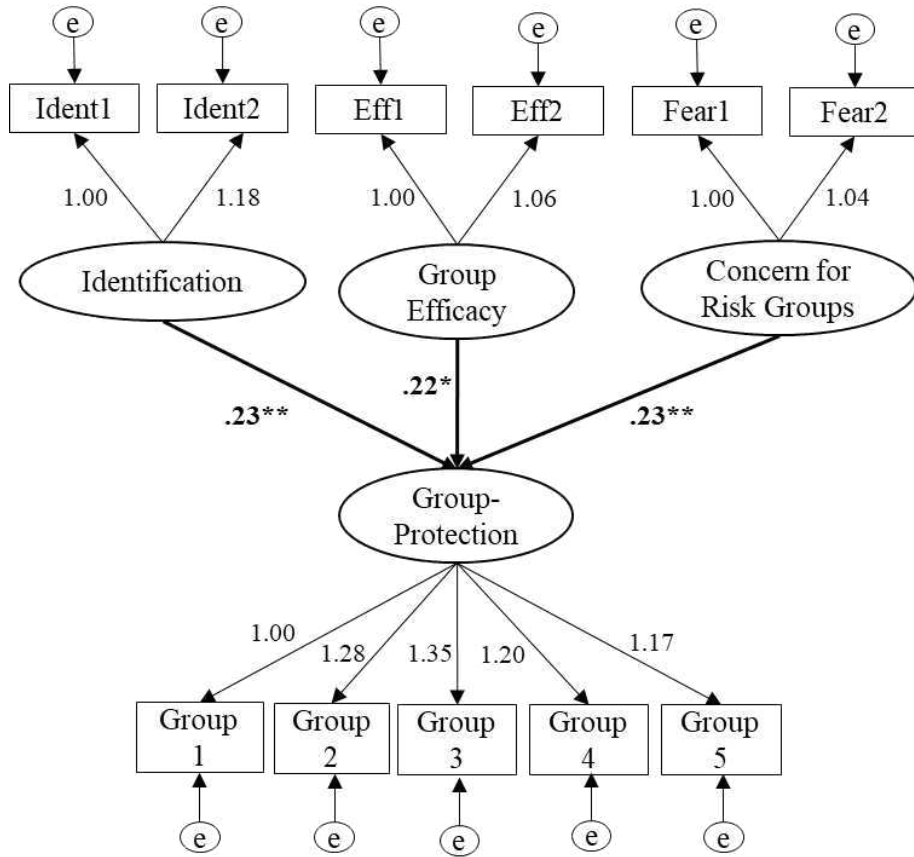
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<sup>1</sup> We also tested whether the effect of identification on group-protection would be mediated by efficacy, and whether the effect of efficacy on group-protection would be mediated by identification (see Tables S3 and S4 in the SOM). Both indirect effects were significant. We come back to this in the General Discussion.

<sup>2</sup> We also tested our models in the reversed causal order, and found support for these models (see Table S2 in the SOM). We come back to this in the General Discussion.

**Figure 2**

*SEM for Group-Protection Behavior from Study 1*



*Note.* Coefficients presented are unstandardized linear regression coefficients; \*\*  $p < .001$ , \*  $p < .050$ .

## Study 2

### Method

#### *Participants and Procedure*

We instructed a survey company to collect a sample of  $N = 1000$  that would be representative of the German population with regards to age, gender, level of education (same measures as in Study 1), and region of residence and who had not been infected with COVID-19. After excluding  $N = 297$  participants who self-identified as members of a risk group, we retained a sample of  $N = 715$  (47% females; mean age = 40.77,  $SD = 17.19$ ). The majority had German nationality (94.5%).

## *Measures*

For the following measures, we used the same scales as in Study 1: epistemic needs ( $\alpha = .87$ ); existential needs ( $\alpha = .92$ ); perceived threat ( $r = .61$ ); concern for people in risk groups ( $r = .79$ ).<sup>3</sup>

**Identification.** Identification was measured by two self-developed items “I identify with the effort to protect vulnerable groups in our society”, and “It is important to me to be a part of the effort to protect vulnerable groups in our society” ( $r = .74$ ).

**Group Efficacy.** Group efficacy was measured by two self-developed items: “The movement to protect people in risk groups is strong”, and “The movement to protect people in risk groups is effective” ( $r = .81$ ).

**Personal Self-Protection.** Participants answered the following two items: “I comply with governmental restrictions in order to protect myself”, and “I comply with governmental restrictions in order to avoid infection” ( $r = .87$ ).

**Group-Protection.** Participants answered the following two items: “I comply with governmental restrictions in order to protect people with previous medical conditions”, and “I comply with governmental restrictions in order to protect the elderly” ( $r = .86$ ).

**Priority Ranking.** Participants answered the following question: “All in all, why do you comply with restrictions?”. Participants ranked the following three reasons (1 = most important, 2 = second important, 3 = least important): 1) because I want to protect myself, 2) because I want to protect people in risk groups, and 3) because the government mandated it.

## **Results and Discussion**

### **Preliminary Analysis**

Because self- and group-protection behaviors were highly correlated in Study 2, we ran a confirmatory factor analysis to compare a one-factor with a two-factor solution. Even though the two factors are highly correlated ( $r = .73$ ), the fit indices show that a 1-factor-solution cannot adequately depict the data (RMSEA = .63 (95% CI [.59, .67]), CFI = .78, TLI = .33, SRMR = .08). The two-factor-solution, however, provides good fit (RMSEA = .04 (95% CI [.00, .10]), CFI = 1.00, TLI = 1.00, SRMR = .00). This indicates that both scales share a considerable

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<sup>3</sup> The survey included some additional measures, which are reported (but not analyzed) in the SOM.



amount of variance, but that systematic, specific variance for self- and group-protection behavior can be identified.

Descriptive statistics and correlations are presented in Table 2. We examined the prevalence of self- and group-protection-behavior. In our sample, 39.6% indicated that personal self-protection was their primary motive; 42.4% found protecting people in risk groups most important, and 18.8% indicated that they complied primarily because the government mandated it. As in Study 1, women were more likely to report personal self-protection ( $t(710) = -2.31, p = .021$ ) and group-protection behavior ( $t(711) = -2.61, p = .009$ ). Age was uncorrelated with both dependent variables. Level of education was positively correlated with group-protection ( $r = .08, p = .043$ ). Political orientation was positively correlated with personal self-protection ( $r = .12, p = .002$ ), and negatively with group-protection ( $r = -.11, p = .003$ ). Again, we included correlated covariates into our models (this did not change the pattern of results, see Table S5 in the SOM).

### **Personal Self-Protection Behavior**

We conducted the same SEM as in Study 1 (see Figure 3). The model fit was acceptable: RMSEA = .08 (95% CI [.07, .08]), CFI = .95, TLI = .93, SRMR = .06). Existential needs predicted perceived threat ( $B = .44, SE = .05, p < .001, 95\% CI [.34, .54]$ ), whereas the effect of epistemic needs was marginally significant ( $B = .09, SE = .05, p = .089, 95\% CI [-.01, .20], R^2 = .54, SE = .06, p < .001$ ). Existential needs had a positive indirect effect on personal self-protection behaviors through perceived threat ( $B = .13., SE = .03, p < .001, 95\% CI [.07, .17]$ ), whereas the indirect effect of epistemic needs was not significant ( $B = .03., SE = .02, p = .145, 95\% CI [-.01, .05]$ )<sup>4</sup>.

Again, we tested whether the individual-level predictors would also predict group-protection. In this sample, perceived threat was negatively associated with group-protection ( $B = -.10, SE = .05, p = .020, 95\% CI [-.24, -.02]$ ), once personal self-protection was controlled for. Existential needs had a negative indirect effect on group-protection ( $B = -.07, SE = .03, p = .024, 95\% CI [-.12, -.01]$ ), whereas the effect of epistemic needs was not significant ( $B = -.01, SE = .01, p = .426, 95\% CI [-.02, .01]$ ).

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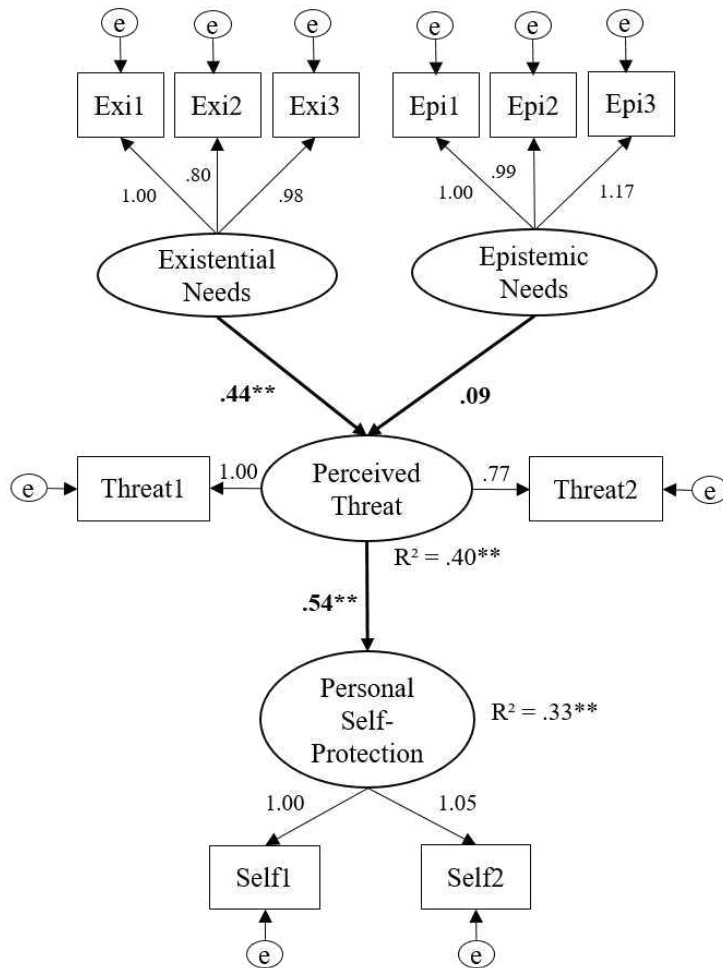
<sup>4</sup> An additional analysis showed that epistemic needs indirectly predicted personal self-protection when existential needs were not included in the model (see Table S9 in the SOM).

**Table 2***Descriptive Statistics and Bivariate Correlations from Study 2*

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1 Epistemic Needs	4.62	1.18	1	.43**	.25**	.15**	.09*	.28**	.14**	.17**	.14**	-.10**	-.01	-.01
2 Existential Needs	2.76	1.51		1	.54**	.08*	-.07	.24**	.06	-.05	.05	-.06	-.18**	.11**
3 Perceived Threat	3.30	1.67			1	.19**	.06	.43**	.28**	.10**	.04	.00	-.11**	.08*
4 Identification	4.34	1.71				1	.45**	.45**	.34**	.44**	.03	-.04	.07*	-.18**
5 Group Efficacy	4.50	1.41					1	.30**	.34**	.46**	0.05	-.01	.07	-.12**
6 Concern for Risk Groups	4.67	1.68						1	.33**	.44**	.17**	-.04	.08*	-.07
7 Personal Self-Protection	5.25	1.80							1	.67**	.09*	0.07	0.03	-.02
8 Group-Protection	5.71	1.55								1	.10**	.02	.08*	-.11**
9 Gender	40.77	17.19									1	-.04	.06	-.10*
10 Age	1.47	0.50										1	-.22**	.12**
11 Education	3.38	1.09											1	-.16**
12 Political Orientation	3.90	1.20												1

**Figure 3**

*SEM for Personal Self-Protection Behavior from Study 2*



*Note.* Coefficients presented are unstandardized linear regression coefficients; \*\*  $p < .001$ , \*  $p < .050$ .

### **Group-Protection Behavior**

We conducted the same SEM as in Study 1 (see Figure 4). Model fit was good: RMSEA = .05 (95% CI [.04, .06]), CFI = .99, TLI = .98, SRMR = .05. Again, identification ( $B = .07$ ,  $SE = .04$ ,  $p = .056$ , 95% CI [.00, .14]), group efficacy ( $B = .25$ ,  $SE = .04$ ,  $p < .001$ , 95% CI [.17, .32]),

and concern for people in risk groups ( $B = .16$ ,  $SE = .03$ ,  $p < .001$ , 95% CI [.10, .23]) independently predicted group-protection behavior<sup>5</sup>.

We tested whether the group-level predictors would also predict personal self-protection. The effect of identification on personal self-protection again approached significance ( $B = .07$ ,  $SE = .04$ ,  $p = .098$ , 95% CI [-.01, .15]). Group-efficacy ( $B = -.01$ ,  $SE = .04$ ,  $p = .797$ , 95% CI [-.11, .08]) and concern for risk-groups ( $B = -.02$ ,  $SE = .04$ ,  $p = .562$ , 95% CI [-.10, .05]) were unrelated to personal self-protection<sup>6</sup>.

Thus, we replicated most of our findings from Study 1 in a nationally representative sample. A confirmatory factor analysis emphasized that self- and group-protection need to be considered two distinct dimensions. Further, existential needs were positively associated with personal self-protection through perceived threat, and even negatively associated with group-protection, once personal self-protection was accounted for. This demonstrates the importance of differentiating between the two motives. In contrast to Study 1, epistemic needs did not have an indirect effect on personal self-protection in this sample (we come back to this finding in the general discussion). Group-protection again was consistently predicted by identification, group-efficacy and concern for people in risk-groups. There was no longer an effect of group efficacy and concern for people in risk groups on personal self-protection, but again, the effect of identification on personal self-protection approached significance.

### **General Discussion**

This article sought to contribute to our understanding of the psychological processes that shaped compliance with physical-distancing guidelines during the lockdown in the coronavirus pandemic. We reasoned that although many people engaged in similar behaviors by adhering to the new distancing guidelines, they did it for (at least two) different reasons: to protect the self, or to protect groups most in danger. Overall, we found strong support for this idea by showing in a representative sample that, for almost 40% of Germans, the most important reason to adhere to physical distancing was to protect the self, while for 42% the most important reason was to

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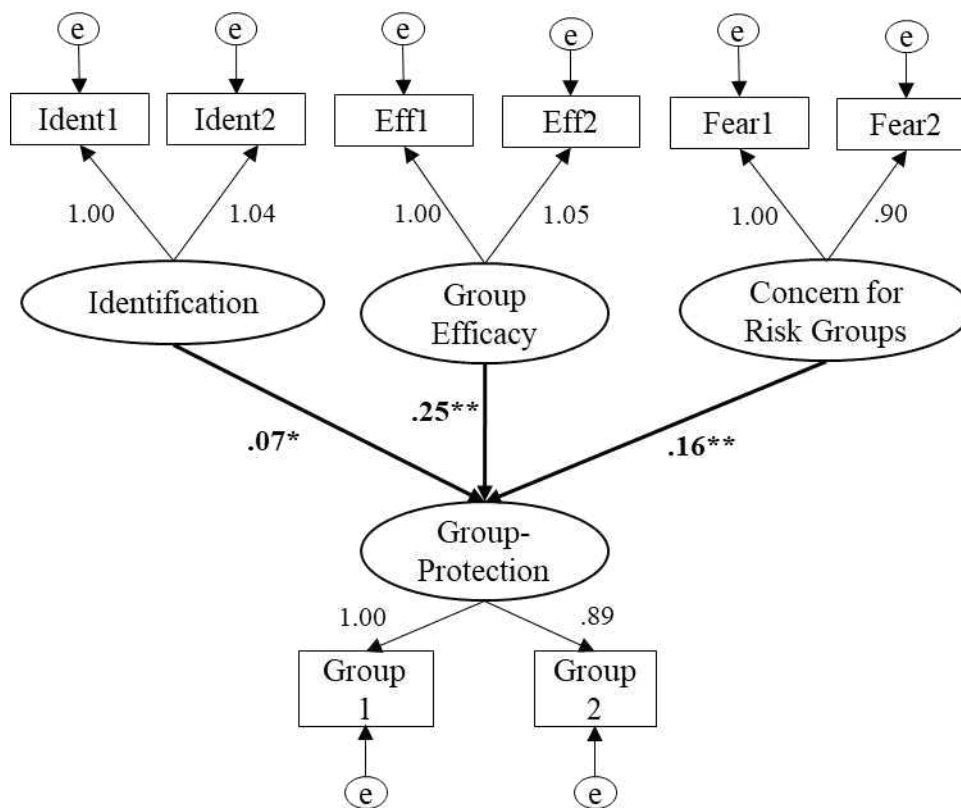
<sup>5</sup> Again, we find indirect effects from identification through efficacy, and vice versa (see Tables S7 and S8 in the SOM). We come back to this in the General Discussion.

<sup>6</sup> Again, we find support for models in the reversed causal order (see Table S6 in the SOM). We come back to this finding in the General Discussion.

protect people in risk groups. Furthermore, we illustrated that self- and group protection were predicted by different variables. People with an intolerance toward existential threats (in both studies) and an aversion toward uncertainty (in Study 1) were more likely to feel personally threatened by the virus, and in turn, more likely to report personal self-protection behaviors. Group-protection, in contrast, was unrelated to personal needs for security and certainty.

**Figure 4**

*SEM for Group-Protection Behavior from Study 2*



*Note.* Coefficients presented are unstandardized linear regression coefficients; \*\*  $p < .001$ , \*  $p < .050$ .

We find strong support for the idea that adherence to restrictions out of solidarity with people in risk groups has an intergroup component: among those who did not themselves identify as belonging to a risk group, it was strongly related to concern for people in risk groups, identification with the collective effort to protect them, and feeling capable of stopping the virus and protecting people in risk groups. Moreover, group-based variables did not predict personal

self-protection behavior. However, in both studies, identification approached significance in predicting personal self-protection. One explanation could be that a common identity with the effort to stop the virus and protect vulnerable people heightens the sensitivity to be careful and to show behavior that protects the self and others in general. Group-efficacy and concern for risk groups were unrelated to personal self-protection in Study 2, which supports the idea that they represent pathways that are specific to behaviors aimed at protecting vulnerable others.

The present work makes several theoretical contributions. Returning to the opening quote: did people stay at home and comply with the governmental restrictions out of LOVE in order to protect the weaker ones? Based on the current research, we can provide a clear answer: yes, some – but definitively not all. About 40% of people stayed at home to protect the “weaker ones”, whereas the same amount stayed at home primarily to protect themselves. However, for many people, both self- and group-protection seem to be important motives, given that they were highly correlated in Study 2. Our research further points to important and unique correlates of these two motivations: First, it contributes to an understanding of intergroup solidarity during the coronavirus pandemic (Jetten et al., 2020). We found evidence for the idea that identifying with a larger collective that works toward the goal of protecting people in risk groups makes solidarity-based behavior more likely (Drury, Cocking, & Reicher, 2009; Reicher et al., 2006). Our findings thereby add to the literature on collective behavior in disasters by showing that concepts from collective action theories (such as identification, efficacy and group-based emotions) can be applied to collective behaviors in emergencies (Drury et al., 2016). Even though solidarity in emergencies might not be identical with collective action (there is no grievance or illegitimacy aspect), “much of it is nevertheless purposive, meaningful and involves coordination and solidarity with strangers in an unstructured situation—very much like many examples of collective action” (Drury et al., 2016, p. 219).

Further, our results contribute to the rare literature on emotions as correlates of political solidarity. Although group-based anger is a key predictor of collective action intentions of disadvantaged groups, there is only little work on emotions as predictors of solidarity-based collective action among advantaged-group members (Radke et al., 2020). The present work illustrates that worry and concern for people in need were associated with solidarity-based actions, presumably because they shift the focus to the disadvantaged group’s plight and promote attempts to reduce their suffering.

Second, we contribute to an understanding of coping with personal anxiety regarding the coronavirus, and its associated behavioral outcomes (Asmundson & Taylor, 2020). Previous research has examined the role of perceived threat, and an intolerance toward uncertainty in determining protective behaviors (Bish & Michie, 2010; Blakey et al., 2015). However, none of these studies differentiated between behaviors aiming for personal self-protection or solidarity with others, respectively. Our research can show that the effects of important predictors of health-related behaviors depend on the individual's motive behind these behaviors: they were relevant only for behaviors motivated by personal self-protection, but unrelated, or even negatively related, to solidarity-based behaviors.

### **Social and Political Implications**

Motivating people to comply with restrictions requires an understanding of psychological factors that facilitate or impede compliance (van Bavel et al., 2020; West et al., 2020). Our study indicates that perceptions of personal threat can relate to intentions to comply with restrictions. On this basis, one might derive the conclusion that appeals to citizens' fear should be disseminated to generate compliance (Jorgensen et al., 2020). It is certainly important to inform the public openly about the threat of COVID-19, especially since we know that it has harmful consequences to conceive the public as 'vulnerable' and prone to 'mass panic', and thus refrain from clear communication (Drury et al., 2013). But our data indicate that messages focusing solely on personal threat would primarily motivate compliance for personal self-protection purposes. Yet, there are a number of important protective measures that protect others instead of the self. For instance, face masks primarily stop exhaled breath from being spread too far, but do not protect the wearer from infection. Further, sneezing or coughing into one's elbow does not serve personal self-protection, but that of others. Some studies also indicate that, to increase health and safety behaviors, it is more effective to focus on the consequences for vulnerable others or society as a whole, rather than personal self-protection (Grant & Hofmann, 2011; J. J. Jordan et al., 2020; Walzer et al., 2016). Therefore, when analyzing psychological variables that make compliance more likely, it is important to distinguish between these motives, so that behavioral interventions and public messages can be designed in a way that targets the desired outcome. Our research contributes to that by identifying predictors of behaviors that are specifically oriented toward solidarity with people in risk groups, and that can provide a starting

point for interventions that aim to increase this type of compliance. Authorities should focus on the collective nature of the situation, increase a sense of common identity – for example, by frequently referring to “what is best for all”, and emphasize the shared relevance of compliant behaviors (Bonell et al., 2020; Drury et al., 2020; Jetten et al., 2020). Further, a sense of group efficacy should be increased by giving clear instructions for recommended behaviors, educating the public about the effectiveness and consequences of these behaviors, and making necessary materials (such as disinfectants, hand tissues, masks) readily available for everyone. When informing the public about (potential) successes of their measures, authorities should not merely present positive results, but identify specific efforts that resulted in this success, and present outcomes in a manner that develops confidence, while still recognizing that there will be challenges in the future. In addition, messages that enhance empathy and concern on behalf of people in risk groups should be beneficial for increasing behaviors aimed at protecting risk groups (Pfattheicher et al., 2020).

### **Limitations and Future Research**

One hypothesis was only partly supported. Previous research highlighted the role of epistemic needs for certainty in reactions toward pandemics (Taha et al., 2014; Taylor, 2019). Though (weakly) correlated with personal self-protection in both studies, epistemic needs did not explain additional variance beyond existential needs in predicting personal self-protection in Study 2. We argue that one reason for this lack of effect could be the shared variance of epistemic and existential needs: If a virus is surrounded by uncertainty, it turns into a greater existential threat, because people have more difficulty controlling its consequences. Thus, it is conceivable that existential needs represent a more proximal predictor of threat, and that previous findings on epistemic needs might, at least in part, have resulted from unaccounted covariance with existential needs.

A second limitation is the cross-sectional nature of our data, which does not permit causal conclusions. We tested our models in the reversed causal order and found partial support for these models (see Tables S2 and S5 in the SOM). This indicates that protection behaviors might be part of a dynamic process, in which the action (or lack thereof) might feed back to reappraisals of threat and individual needs (regarding personal self-protection), and group-level variables (regarding group protection). In fact, some studies found that engaging in health behaviors (e.g.,



avoiding public contaminants) caused individuals to become more concerned about the risk of infection (Deacon & Maack, 2008; Olatunji et al., 2011). Similarly, it has been suggested that collective action can be understood as an approach-oriented coping strategy, in which the undertaking of action feeds back to its antecedents. Engaging in collective action can thus serve as a strategy to affirm and strengthen group identity, group efficacy and group emotions (van Zomeren et al., 2012). Similarly, we find significant indirect effects from identification through efficacy, as well as from efficacy through identification to group-protection, indicating a potential dynamic relationship between both variables (van Zomeren et al., 2010; van Zomeren et al., 2008). Future research should test in experimental settings the causal and dynamic nature of these effects.

A further limitation concerns the operationalization of our dependent variables. Given that we were interested in the specific combination of protection behavior and self-, or solidarity-oriented motivations, items contained both the respective behavior (compliance with restrictions) and the motive behind this behavior (self-, or group-protection). For future studies, it would be of interest to measure these concepts separately. In addition, we focused only on two major motivations to comply with restrictions. However, alternative motivations might play a role: for example, sectional group interests might influence the motivation and capability to comply (Templeton et al., 2020). For example, Donald Trump has frequently referred to COVID-19 as ‘the Chinese virus’ (Levine, 2020), and thus likely contributed to the notion of protecting “us” (the Americans) versus “them” (the Chinese).

Using a nationally representative sample in Study 2 adds to the generalizability of our findings. However, we only tested our predictions in German samples. Yet, we would argue that results can be replicated in other countries as well, given that people in most countries were faced with the same situation (Sohrabi et al., 2020). However, it is possible that people in more collectivist societies might be more likely to comply with restrictions for the purpose of group protection, because people in more collectivist societies are more likely to care for in-group members and to uphold group harmony (Biddlestone et al., 2020; Markus & Kitayama, 1991).

## **Conclusion**

The present work provides an exploration of psychological processes that shape compliance with physical distancing guidelines aiming to slow down the spread of COVID-19. Coming back

to the post quoted at the beginning of this manuscript, we demonstrated that many people (42%) did indeed comply with restrictions primarily to protect people in risk groups in society, and that these behaviors were associated with shared identification, group efficacy and concern for people in risk groups. However, personal self-protection motives were also highly prevalent – almost 40% adhered to the restrictions primarily to protect themselves from infection. These people were in need to cope with personal threat and to satisfy needs for security and certainty. We point to the importance of creating a sense of common identity, being collectively capable to cope with the virus and empathy with risk groups in order to promote compliance and solidarity during the crisis.

**3 Manuscript 2: Hippies Next to Right-Wing Extremists?  
Identifying Subgroups of Anti-Lockdown Protestors in Germany Using Latent Profile  
Analysis**

Liekefett, L., Bürner, A.-K., & Becker, J. C. (2023). Hippies Next to Right-Wing Extremists? Identifying Subgroups of Anti-Lockdown Protestors in Germany using Latent Profile Analysis. *Social Psychology*. Advance online publication. <https://doi.org/10.1027/1864-9335/a000509>

## **Abstract**

To reduce the spread of COVID-19, adherence to protective measures was crucial around the world. While most complied with these measures, a vocal minority protested against them. Early reports emphasized the unusual heterogeneity of these protests: Hippies and esoterics marched alongside conspiracy theorists and neo-Nazis. We examined what these protestors might (and might not) have in common. A large study with anti-lockdown protestors in Germany ( $N = 1,700$ ) revealed four subgroups: Centrists, Politically-Undifferentiated, Left-wingers and Right-wingers. Beyond that, these subgroups demonstrated striking similarities: all endorsed conspiracy beliefs, misinformation, esotericism, and vaccine hesitancy to a similar extent. These beliefs share that they are scientifically unfounded and epistemically unwarranted. They may unite individuals from diverse political backgrounds in the anti-lockdown protests.

**Keywords:** Anti-lockdown protests, Coronavirus restrictions, conspiracy beliefs, vaccine hesitancy, esotericism

## **Hippies Next to Right-Wing Extremists? Identifying Subgroups of Anti-Lockdown Protestors in Germany Using Latent Profile Analysis**

In response to the Coronavirus pandemic, governments around the world announced far-reaching restrictions of private and public life. Quickly after these measures were implemented, a number of people organized protests against them. Such demonstrations have emerged in many countries, including Australia, the United States, UK, the Netherlands and Germany (BBC, 2020; Carothers, 2020; Milburn, 2020). Media reports about the anti-lockdown movement in Germany, (the “Querdenken” [“diagonal thinking”] initiative), strongly emphasized its unusual heterogeneity: Rainbow flags were hoisted next to German Imperial flags (a symbol used by the far-right) (Koos, 2021b). Some protestors attacked the police aggressively, while others meditated or chanted “Hare Krishna” (Merker, 2021; Röther, 2020). Joachim Herrmann, minister of the interior in Bavaria, described the movement as a mix of esoterics, anti-vaxxers, conspiracy theorists, right-wing extremists and so-called “Reichsbürger” (a group who claims that the German Empire continues to exist in its pre-World War II form) (Oswald, 2021).

However, it was also frequently emphasized that not all protestors should be considered a danger to democracy, or be dismissed as ‘crazy’, ‘paranoid’ or ‘hysterical’ (Oswald, 2021; RND/dpa, 2020, 2021). Instead, a more moderate, bourgeois camp of protestors seemed to exist within the movement, which may have participated predominantly to express their concerns about the economic impact of the lockdown measures (such as the “honk for hope” initiative, which attempted to save the coach industry) (Deutschlandfunk, 2022; La Riva, 2022). Such observations caused many to ask: Why do such contradictory groups meet up and protest together? What unites these diverse groups? The present research was set up to explore the ostensible heterogeneity of the anti-lockdown movement in Germany, and examine what protestors might (or might not) have in common. In the following, we describe the variables we believe particularly relevant.

### **Conspiracy Beliefs and Coronavirus Downplaying**

Conspiracy beliefs are attempts to explain significant social or political events through alleged conspiracies: a plot initiated by malevolent individuals or groups who are powerful and act in secret (Douglas et al., 2019; Imhoff & Bruder, 2014). Different conspiracy beliefs have

developed in response to the Coronavirus pandemic, for example the idea that the virus was created in a lab, that it served to distract from other political scandals, or that it does not exist at all (Imhoff & Lamberty, 2020; Nocun & Lamberty, 2020). Coronavirus downplaying is a related concept that refers to frequent claims that the virus is not as dangerous as it is proclaimed to be, and that it is, in fact, not worse than the common flu (Küppers & Reiser, 2021; Latkin, Dayton, Moran, et al., 2021). Such conspiracy beliefs and misinformation appear to be wide-spread among the anti-lockdown protestors. The majority of participants that were surveyed by Nachtwey et al. (2020) agreed or completely agreed that “the Coronavirus is no more dangerous than a severe flu”, and about half of the sample voiced conspiracy suspicions. Further, prominent individuals that are known to endorse conspiracy beliefs have been present at protests, such as the celebrity TV chef Attila Hildmann (Connolly, 2020).

### **Esotericism and Anthroposophy**

People with a propensity toward esotericism and spiritual beliefs appear to be strongly represented in the German anti-lockdown movement (Speit, 2021). Esotericism is an umbrella term for diverse practices and beliefs that are rejected by mainstream science, among them paranormal and superstitious beliefs such as astrology, fortunetelling, or belief in spirits (Dyrendal et al., 2018; Lobato et al., 2014). In Germany, a particularly prominent esoteric school of thought is anthroposophy, which was developed by Rudolf Steiner and claims the existence of an invisible, spiritual world that is deeply intertwined with the ‘visible’ world (Sebastini, 2011; Uhrmacher, 1995). An important principle in anthroposophy is that the causes of illness are not primarily physical, but spiritual and the result of a patient’s ‘karma’. Accordingly, interfering with the illness would be unwise, because the patient would have to compensate for it in a later life (Rawlings, 2012; Steiner & Barton, 2013). Prominent supporters of anthroposophy took part in and publicly spoke at anti-lockdown protests (Düker, 2021), and anthroposophical beliefs about “natural self-healing powers” or alternative medicine were strongly endorsed among protest participants (Nachtwey et al., 2020).

Esoteric beliefs are closely linked with conspiracy beliefs, a phenomenon which has been termed ‘conspirituality’ (Ward & Voas, 2011). Conspirituality consists of two components: the conviction that “a secret group covertly controls, or is trying to control, the political and social order” and that “humanity is undergoing a ‘paradigm shift’ in consciousness, or awareness (Ward

& Voas, 2011, p. 104). Both components are tied together by shared themes of ‘awakening’, exposing (and deposing of) a shadow government and ‘revealing truth’ (Ward & Voas, 2011).

### **Opposition to Vaccination**

Opposition to the COVID-19 vaccines is wide-spread in the anti-lockdown movement (Belghaus et al., 2020; Stark, 2020). Interviews in which the safety of the vaccines is explicitly drawn into doubt are among the most frequently shared videos on the protestors’ networks (Holzer, 2021). Many opponents of the vaccines believe that they are not necessary, or even more dangerous than the disease itself (Jennings et al., 2021). Koos (2021a) found that 57% of the interviewed participants of an anti-lockdown demonstration identified as vaccination critics, and most protestors who participated in the survey by Nachtwey et al. (2020) feared that the government introduced compulsory vaccination as well as immunity cards for all citizens.

Vaccine hesitancy is closely linked to conspiracy beliefs and esotericism: Several conspiracy theories target vaccinations directly (e.g., by claiming that the vaccines implant microchips that serve to control humans), and conspiracy beliefs appear to be the strongest psychological predictor of anti-vaccination attitudes (Hornsey et al., 2018). Members of esoteric communities often adhere to a pseudoscientific ‘lay theory of immunity’ which views a natural diet and lifestyle as sufficient to ensure immunity, and vaccines as a harmful disruption of the workings of the immune system (Halafoff et al., 2022). Thus, it seems unsurprising that alternative spirituality consistently predicts vaccine hesitancy across multiple countries (Rutjens et al., 2022; Rutjens & van der Lee, 2020). Vaccine hesitancy, esotericism, anthroposophy and unwarranted conspiracy beliefs can all be considered examples of anti-science attitudes: their adherents ignore the majority of scientific evidence in favor of claims about the existence of powerful, invisible forces that are undetectable by current scientific methods (Lobato et al., 2014; Swami et al., 2011).

### **Economic Anxiety**

In reports about the anti-lockdown protests, it was frequently emphasized that not all are conspiracy theorists, esoterics and anti-vaxxers, and that some may participate predominantly because they are worried about the consequences the protective measures may have for the economy or their own financial situation (e.g., small business owners) (Callison & Slobodian,

2021). Indeed, the pandemic has led to a disruption of global economic activity (Fernandes, 2020). Evidence shows that economic anxiety has increased significantly after the outbreak of SARS-CoV-2 (Fetzer et al., 2021), and is comparable in scope to health anxiety (Bareket-Bojmel et al., 2021). Further, the amount of self-employed people appears to be higher in the protesting population than in the general population (Nachtwey et al., 2020) and many of the leaders of anti-lockdown protests worldwide are entrepreneurs or self-employed (Callison & Slobodian, 2021). These people may be particularly concerned over the economic impact of protective measures, since they may lack financial security and support from labor unions. Therefore, economic anxiety may be a factor motivating opposition to the protective measures (Flade et al., 2020).

### **Socio-Political Ideology**

Among the most controversial topics with regard to the anti-lockdown protestors is the issue of their political orientation. Protest participants have frequently been described as being politically very diverse (M. Fiedler & Starzmann, 2020). Protestors themselves often claim to represent the middle of society (Grande et al., 2021). Similarly, the founder of the German anti-lockdown movement, Michael Ballweg, has emphasized that the movement stems from the ‘center of society’ and has officially distanced himself from any kind of extremism (Querdenken 711, 2022). Nevertheless, right-wing flags and symbols have been frequently spotted during protests (Callison & Slobodian, 2021; Hippert & Saul, 2021). Prominent members of right-wing extremist groups were present at the demonstrations, spoke on stages and appear well connected to Michael Ballweg (Mertens, 2020; Speit, 2021). Due to these observations, it seems important to examine the extent to which protestors endorse radical right-wing beliefs. Central aspects of right-wing ideology are ideas of inequality between different social groups, such as ethnic or religious groups (Decker et al., 2013). It is not uncommon in Germany that individuals who describe their political attitudes as centrist endorse right-wing ideologies, such as a devaluation of minority groups (e.g., refugees, Muslims, Jews) (Zick et al., 2019). Therefore, we not only examine the extent to which protest participants identify as left-wing, right-wing or centrist, but also their agreement to racist and antisemitic statements as indicators of right-wing political ideology.



## The Present Research

The goal of this research is to explore the composition of the anti-lockdown movement in Germany. Media reports painted the picture of a diverse mix of protestors: while adherents of conspiracy theories, esoteric communities, anti-vaxxers and right-wing extremist groups were obviously present at protests, the movement also attracted a more moderate, bourgeois crowd, thereby raising the question of how such contradictory groups can come together (Deutschlandfunk, 2022; La Riva, 2022). These observations suggest that protestors differ in the extent to which they endorse conspiratorial, esoteric or right-wing extremist ideas. This study investigates whether the movement is indeed as heterogeneous as initially thought. For this purpose, we examine similarities and differences in protestors' belief systems, and explore whether empirically distinct subgroups of protestors can be identified (e.g., "right-wing extremists", "esoterics", "moderates"). We address these questions by using latent profile analysis, a person-centered technique that groups people with similar response patterns on the latent profile indicators into one profile (Nylund-Gibson & Choi, 2018).

We examine a variety of variables relevant for understanding the anti-lockdown protests: conspiracy beliefs, downplaying of the dangers of the Coronavirus, esotericism, opposition to vaccination, economic anxiety, and socio-political ideology. Although we do not have clear hypotheses as to what the profiles specifically look like, some preliminary suggestions can be derived: first, we expect that some protestors will be characterized by right-wing political self-identification, racism and antisemitism ("right-wingers") (Callison & Slobodian, 2021; Hippert & Saul, 2021; Mertens, 2020; Speit, 2021). Second, some protestors will likely be characterized by opposition to vaccination, esotericism and anthroposophical beliefs (i.e., "esoterics"), but not necessarily right-wing beliefs (Düker, 2021). Both of these groups presumably believe in conspiracies: on the one hand, racist and antisemitic attitudes are often justified by conspiratorial stereotypes (Bilewicz & Krzeminski, 2010; Kofta et al., 2020; Uenal, 2016), on the other hand, esotericism, anthroposophy and vaccine hesitancy are related to conspiracy beliefs through their rejection of science and belief in hidden and supernatural forces (Lewandowsky et al., 2013; Lobato et al., 2014; Rutjens & van der Lee, 2020; Swami et al., 2011). Lastly, we expect to find at least one group of protestors that is more moderate and does not hold conspiracy, esoteric or right-wing beliefs, since it was often emphasized that not all are extremists and conspiracy

theorists (RND/dpa, 2021), and that a more moderate, bourgeois camp exists within the movement (Koos, 2021b).

## **Method**

### **Procedure**

Between February 23 and March 11 2021, an online questionnaire was distributed amongst Telegram groups that were previously identified as related to anti-lockdown protests (Salheiser & Richter, 2020). We started with the most popular, largest channels, and added smaller groups over time, a convenience sampling method that is commonly applied when the target group is difficult to approach (Naderifar et al., 2017). The questionnaire was posted approximately one to two times a day on varying time points in a total of 58 groups. Participants had the chance to win one out of four 50 EUR vouchers if they completed the survey.

### **Participants**

A total of  $N = 2,651$  participants completed the survey. We included only those who had indicated that they had already been at an anti-lockdown protest ( $n = 1,705$ ). To ensure data quality, we excluded participants who completed the questionnaire unreasonably fast, that is, those who, on any page, spent less than an average of 2 seconds per item ( $n = 5$ ) (Huang et al., 2012). A sample of  $N = 1,700$  remained, of which 35.57% identified as male, 63.55% as female and .01% as diverse. The mean age was 50.75 ( $SD = 11.16$ ). Overall, the sample was highly educated, and most participants identified themselves as middle class (see Supplement for details).

### **Analytic Strategy**

In order to identify distinct clusters of anti-lockdown protestors in Germany, we use a person-centered approach, namely latent profile analysis (LPA). LPA identifies unobserved, or hidden subgroups in a population, and groups individuals that share similar response patterns on the latent profile indicators into one profile (Nylund-Gibson & Choi, 2018; Osborne & Sibley, 2017). Before conducting the LPA, we subject all items to an exploratory factor analysis. Since a number of our items were self-developed or subsets from a larger measure, their factorial structure cannot be taken for granted. Items that a) load onto their primary factor above 0.40, b)

load onto alternative factors below 0.30 and c) demonstrate a difference of at least 0.20 between their primary and alternative factor loadings will be retained (Howard, 2016) and combined into mean scores, which will be used as indicators in the LPA.

A major challenge in LPA consists in selecting the appropriate number of profiles and variance-covariance matrix specification (Johnson, 2021). To guide this decision, it is recommended to jointly consider statistical fit indices, substantive interpretability and utility, and classification diagnostics (Nylund-Gibson & Choi, 2018). We consider the following indices: Bayesian Information Criterion (BIC), Sample-size adjusted BIC (SABIC), the Vuong-Lo-Mendell-Rubin likelihood test (VLMR) and the Bootstrapped Likelihood Ratio Test (BLRT). We also consider entropy (an overall measure of classification accuracy), sample proportions assigned to the smallest and largest profiles, and theoretical utility of the emerging profiles (Johnson, 2021). We follow recommendations from Johnson (2021) in determining the appropriate variance-covariance specification. This involves systematically varying and evaluating two conditions, namely whether the variance in each profile is equal, or allowed to differ, and whether the indicators are allowed to co-vary over and above the relationship they share due to being in the same profile (along with an increasing number of profiles).

## Measures

All items were answered on a seven-point scale from 1 (do not agree at all) over 4 (neutral) to 7 (agree completely). The following measures are based on the results of a Promax-rotated exploratory factor analysis, which is described in detail in the Supplement.

**Conspiracy Beliefs.** Conspiracy beliefs were measured using five items from the Conspiracy Mentality Questionnaire (Bruder et al., 2013), e.g., “I think that many very important things happen in the world, which the public is never informed about”, and four items that measured belief in specific conspiracy theories regarding the Coronavirus, e.g., “I believe that Bill Gates was involved in putting the Coronavirus in the world”) (Liekefett et al., 2023). The scale demonstrated good internal consistency ( $\alpha = .85$ ).

**Coronavirus Downplaying.** To measure Coronavirus downplaying, we used three self-developed items, such as “I think that the Coronavirus is no worse than a normal flu”. The Cronbach’s alpha for this scale was .68.

**Esotericism.** We used a variety of items to measure esoteric beliefs: two items from the Revised Paranormal Belief Scale (e.g., “A person’s thoughts can influence the movement of a physical object”) (Tobacyk, 2004), two items that measure anthroposophical beliefs (e.g., “Alternative medicine should be equated with conventional medicine) (Nachtwey et al., 2020), and three items from a short version of the Personality Styles and Disorder Inventory to measure schizotypy (e.g., “I believe in thought transference”) (Hain et al., 2016). Internal consistency for this scale was good ( $\alpha = .89$ ).

**Opposition to Vaccination.** We used three self-developed items to measure skepticism toward the COVID-19-vaccine, particularly regarding compulsory vaccination (e.g., “I am scared that I might be forced to get a vaccination against COVID-19”). The scale’s Cronbach’s alpha was .75.

**Financial Worries.** Two self-developed items measured participants’ financial concerns (e.g., “In the context of the Coronavirus pandemic, I worry that I will have financial losses”,  $r = .81$ ).

**Economic Anxiety.** Two self-developed items measured participants’ anxiety about the impact of the pandemic on the economy (e.g., “In the context of the Coronavirus pandemic, I worry that there could be an economic crisis”,  $r = .67$ ).

**Political Ideology.** Participants indicated their agreement to the following statements: 1) I am left-wing, 2) I am right-wing, and 3) I am directly in the center. Including each item as a separate dimension allows to differentiate complex patterns of political self-identification. For instance, if forced to place themselves on a single left-right scale, participants who reject any political label would most likely choose the scale midpoint. Similarly, participants who identify as directly in the center (as many protest supporters do, see Grande et al., 2021) would also choose the midpoint.

**Racism.** Racism was measured using five items from the Questionnaire on Right-Wing Extremist Attitudes – Leipziger form (Decker, Hinz, et al., 2013, e.g. “Foreigners only come here to take advantage of our welfare state”), and from Zick et al. (2016), e.g., “Because of the many Muslims, I feel like a stranger in my own country” ( $\alpha = .92$ ).

**Antisemitism.** We used three items from Imhoff (2010), for example “With the policies that Israel is pursuing, I can well understand that people have something against Jews”, to measure antisemitism. We constructed a mean score of these items ( $\alpha = .80$ ).

## Results

All data and analysis scripts relevant for reproducing these results can be found on OSF: [https://osf.io/v56ra/?view\\_only=97f6316e16d9401e9cfe3ae333e02658](https://osf.io/v56ra/?view_only=97f6316e16d9401e9cfe3ae333e02658).

### Preliminary Analyses

#### *Descriptive Statistics and Correlations*

Table 1 displays descriptive statistics and correlations for the variables of interest. Overall, agreement to conspiracy beliefs, Coronavirus downplaying, esotericism, vaccine hesitancy, financial worries, economic anxiety and center ideology was high – all means were above the scale mean. Many scales were positively correlated with each other, for instance conspiracy beliefs, downplaying, and esotericism. Most negative correlations emerged with left-wing ideology (e.g., with conspiracy beliefs, downplaying, economic anxiety, center ideology, racism and antisemitism). Figure 1 shows histograms for all variables. It can be seen that there are some variables with only very little variance, namely Coronavirus downplaying, vaccine hesitancy and economic anxiety. These appear to be beliefs that most protestors agree on.

### Latent Profile Analysis

#### *Identifying the Best-Fitting Model*

We used Mplus Version 7.4 to estimate four model types with different variance-covariance specifications (Bauer & Curran, 2003; Johnson, 2021; Pastor et al., 2007; Rosenberg et al., 2018). We present results for all models (Table S2) and a detailed description of the model selection process in the Supplement. From all models that could be estimated successfully, the four-profile model with equal covariances and variances provided the best fit, as indicated by lowest BIC and SABIC values, and well-differentiated profiles with balanced profile sizes (see Tables S3 and S4 for detailed model results).

#### *Description of the Best-Fitting Model*

A visual depiction of this model is shown in Figure 2. All four profiles are characterized by high mean scores on conspiracy beliefs, Coronavirus downplaying, vaccine hesitancy, financial worries and economic anxiety. These appear to be beliefs that most protestors share. Regarding esotericism, all profiles have moderately high scores. However, there appears to be

some variance within the profiles on esotericism, as indicated by the relatively large standard deviation around the mean. The variables most important for differentiating between the profiles appear to be socio-political. The largest profile ( $n = 650$ , 38.24%) is characterized by low scores on left- and right-ideology, high scores on center ideology, and moderate scores on racism and antisemitism. We label this class Centrists. The second largest profile ( $n = 421$ , 24.77%) is similar to the Centrist profile, with the exception that it moderately agrees to left-, right- and center-ideology. We label this profile Politically Undifferentiated. The third largest profile ( $n = 407$ , 23.94%) consists of participants who identify most strongly as left-wing, reject right-wing ideology, and score lowest on racism and antisemitism. We label this profile Left-wingers. The smallest profile consists of Right-wingers ( $n = 222$ , 13.06%). These participants reject left-wing ideology, and score highest on right-wing ideology, racism and antisemitism.

### ***Differences in Demographic Variables***

We explored whether the profiles differed in important demographic characteristics, namely gender, age, level of education and subjective social status. To do so, we applied a three-step procedure developed by Lanza et al. (2013), which computes the conditional distribution of the distal variable (i.e., the demographic characteristics) given class membership (Osborne & Sibley, 2017). In the Centrist and Left-wing profile, the probability of identifying as female was significantly greater than in the Right-wing and Politically Undifferentiated profile. Regarding age, Centrists ( $\chi^2(1) = 17.36, p < .001$ ) and Left-wingers ( $\chi^2(1) = 11.18, p = .001$ ) were significantly older than the Politically Undifferentiated. Further, Left-wingers were significantly higher educated than Right-wingers ( $\chi^2(1) = 15.59, p < .001$ ) and Centrists ( $\chi^2(1) = 30.56, p < .001$ ). Politically Undifferentiated were significantly higher educated than Right-wingers ( $\chi^2(1) = 5.84, p = .016$ ) and Centrists ( $\chi^2(1) = 11.75, p = .001$ ). Right-wingers ( $M = 5.67, SE = .11$ ) indicated a significantly higher subjective social status than Left-wingers ( $\chi^2(1) = 4.61, p = .032$ ) and Centrists ( $\chi^2(1) = 15.52, p < .001$ ). Politically Undifferentiated indicated a significantly higher social status than Centrists ( $\chi^2(1) = 8.52, p = .044$ ).

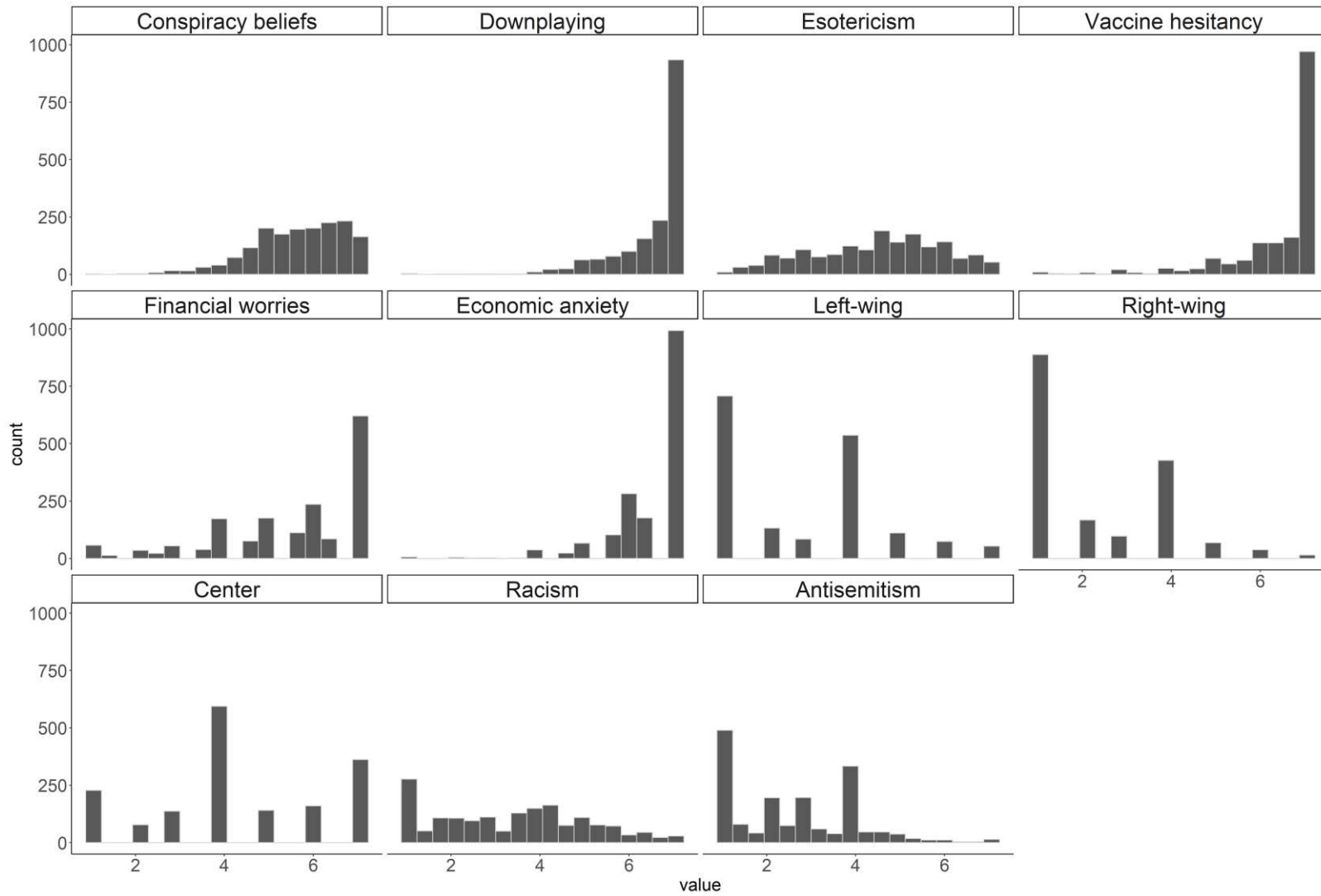
**Table 1***Means, Standard Deviations, and Correlations with Confidence Intervals*

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10
1. Conspiracy beliefs	5.64	1.01										
2. Downplaying	6.51	0.79	.42** [.38, .46]									
3. Esotericism	4.49	1.45	.41** [.37, .45]	.17** [.13, .22]								
4. Vaccine hesitancy	6.41	1.03	.14** [.10, .19]	.16** [.12, .21]	-.09** [-.14, -.04]							
5. Financial worries	5.50	1.63	.22** [.18, .27]	.09** [.04, .13]	.01 [-.04, .06]	.31** [.26, .35]						
6. Economic anxiety	6.46	0.86	.26** [.22, .30]	.17** [.13, .22]	.00 [-.04, .05]	.31** [.27, .35]	.49** [.45, .52]					
7. Left-wing	2.79	1.78	-.19** [-.23, -.14]	-.09** [-.14, -.05]	-.08** [-.13, -.03]	-.00 [-.05, .04]	-.09** [-.14, -.04]	-.08** [-.13, -.03]				
8. Right-wing	2.29	1.56	.04 [-.00, .09]	-.01 [-.06, .03]	-.08** [-.13, -.03]	-.01 [-.06, .04]	.03 [-.01, .08]	.02 [-.03, .06]	.08** [.03, .13]			
9. Center	4.34	1.93	.08** [.03, .12]	.07** [.02, .12]	.06* [.01, .10]	.03 [-.01, .08]	.09** [.04, .14]	.06* [.01, .10]	-.22** [-.27, -.18]	-.03 [-.07, .02]		
10. Racism	3.38	1.67	.43** [.39, .47]	.17** [.13, .22]	.10** [.05, .14]	.03 [-.02, .08]	.18** [.13, .22]	.16** [.11, .20]	-.37** [-.41, -.33]	.30** [.25, .34]	.09** [.04, .13]	
11. Antisemitism	2.62	1.45	.36** [.32, .40]	.11** [.06, .15]	.20** [.16, .25]	-.00 [-.05, .04]	.12** [.07, .16]	.04 [-.00, .09]	-.15** [-.20, -.11]	.16** [.11, .20]	.02 [-.02, .07]	.44** [.40, .47]

*Note.* Values in square brackets indicate the 95% confidence interval for each correlation. \* indicates  $p < .05$ . \*\* indicates  $p < .01$ .

**Figure 1**

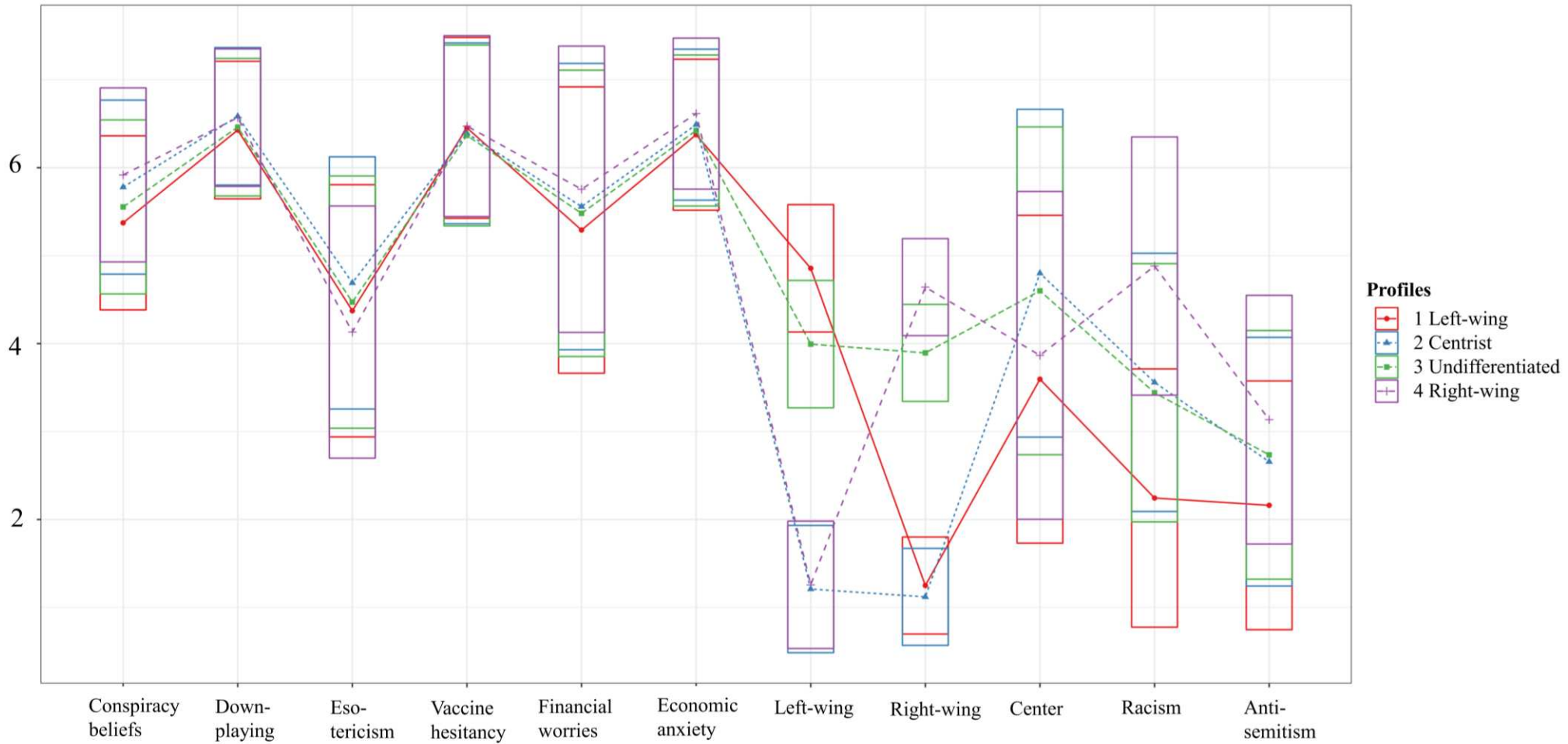
*Histograms*





**Figure 2**

*Item Profile Plot*



*Note.* To produce this plot we used the Mplus Automation in tidyLPA (Rosenberg et al., 2018)

## Discussion

Media reports about the anti-lockdown protests in Germany described a diverse mix of protestors: conspiracy theorists, anti-vaxxers, esoterics and right-wing extremists appeared to be marching side by side (Pantenburg et al., 2021). However, it was also frequently emphasized that not all participants agreed with the more radical ideas endorsed by some protestors, and that some mainly wanted to express economic concerns about the impact of the protective measures (Callison & Slobodian, 2021; Deutschlandfunk, 2022; RND/dpa, 2020). This suggests that protestors should vary in the degree to which they endorse conspiracy beliefs, esotericism, vaccine hesitancy and right-wing beliefs. The goal of this research was to investigate this ostensible heterogeneity of anti-lockdown protestors in Germany, and examine what they might (or might not) have in common. We conducted a latent profile analysis, which identified subgroups of protestors with similar response patterns on a number of variables relevant to the protests. In some regards, the protestors in our sample demonstrated striking similarities: almost all indicated an openness towards conspiracy theories, misinformation, vaccine hesitancy, esotericism and alternative medicine. Differences between the subgroups were largely determined by socio-political ideology.

About one quarter of participants could be described as **Left-wingers**: they identified most strongly with left-wing political ideology and scored relatively low on racism and antisemitism. We also observed a smaller profile of **Right-wingers**: these participants most strongly endorsed right-wing ideology, and scored highest on racism and antisemitism. Members of this profile were more likely to be male, less educated and to indicate a higher subjective social status. However, the majority of protestors could be described as either **Centrists** or **Politically Undifferentiated**. Centrists rejected both left- and right-wing ideological labels and positioned themselves directly in the center, whereas Politically Undifferentiated moderately endorsed all political labels. Both of these profiles took an ‘undecided’ stance toward racism and antisemitism: overall, they neither agreed nor disagreed with these constructs.

The distinction between Centrists and Politically Undifferentiated is interesting. On the traditional left-right self-placement scale, it is often unclear what the center position means (Rodon, 2015): On the one hand, people may interpret the center as the midpoint of what left and right stand for, and choose this position to express their genuinely moderate ideology (consistent with our Centrist profile, whose members endorse the center position and reject left- and right-wing labels). On the other hand, it may reflect an undifferentiated ideological stance, and express “citizens struggle to use ideology with both sophistication and

coherence”. This may correspond to our Politically Undifferentiated profile, whose members do not appear to possess a clear ideological identification and moderately agree to all positions. Thus, these two profiles appear to capture distinct political stances that are in between the traditional labels of left and right (Rodon, 2015). Instead of using the traditional left-right scale, we asked protestors for their endorsement of being left, being right and being center separately in this study. This allowed us to capture these complexities in the movement’s political orientation.

Beyond these ideological differences, almost all participants downplayed the dangers of the Coronavirus, were concerned about compulsory vaccinations, worried about the financial and economic consequences of the protective measures. Perhaps more surprisingly, conspiracy beliefs and esotericism were, on average, endorsed to a similar extent across all four profiles. That is, no profile emerged that clearly rejected esoteric or conspiracy beliefs. These beliefs are connected by common themes. For example, they may indicate a desire to defend the status quo from change: the dangers of the Coronavirus may be downplayed, new vaccines may be rejected, or economic concerns may be put front and center in order to avert the changes that the lockdown measures may introduce to the status quo (Jost et al., 2017). Such a resistance toward change can motivate protests in defense of the status quo (Jost et al., 2017; Osborne et al., 2019). However, conspiracy beliefs and esotericism are less likely to reflect an endorsement of the status quo: they rather indicate an alternative worldview that is detached from official, mainstream explanations (Ward & Voas, 2011). Conspiracy beliefs, esotericism, downplaying of the Coronavirus, and vaccine hesitancy can all be considered examples of anti-science attitudes (Philipp-Muller et al., 2022): their adherents reject mainstream scientific knowledge, distrust official institutions, and claim to possess secret, special or higher knowledge that is undetectable by current scientific methods (Pöhlmann, 2021). Consistent with the notion of ‘conspirituality’, such unwarranted claims about society and the nature of the universe appear to be a commonality of protestors with diverse socio-political backgrounds.

Notably, across the whole sample, esotericism was positively correlated with racism and antisemitism (see Table 1). The link between esotericism and right-wing ideology has a long history in Germany (Klump, 2007). Right-wing groups often refer to irrational or mythical ideas to justify beliefs about inequalities between groups. For example, they perceive the German (‘Germanic’) people as spiritually or morally superior, and in need of protection from outside influences. Further, a narrative of a glorified ‘return to nature’ becomes connected to ideas of ‘ancestral purity’ (Klump, 2007). As such, esoteric beliefs may

represent a dangerous gateway to misanthropic, right-wing ideologies – a dynamic that may be fueled within the anti-lockdown movement (Pöhlmann, 2021).

### **Strengths, Limitations and Future Research**

A strength of this study is the large sample of anti-lockdown protest participants – a population that is difficult to recruit for scientific surveys. Relying on participants’ actual past behavior (whether they had attended a protest before) further accounts for the potential gap in peoples’ intentions and behaviors (Webb & Sheeran, 2006).

However, more research is required to replicate our findings, particularly in other countries. Anti-lockdown protests around the world likely differ in composition and motives (Haddad, 2021). Consistent with our observations, protests in wealthy, developed countries like Germany, the US, UK, Italy and France, have been described as “big tent” demonstrations that attracted diverse audiences, including vaccine critics and far-right advocates (Carothers, 2020). Yet in poorer, developing countries (e.g., Malawi), anti-lockdown protests appear to have been more focused on the impact the lockdowns had on people’s livelihoods. From a global perspective, anti-lockdown protests appear diverse, and our findings may predominantly apply to affluent Western countries. Further, the relatively high endorsement of esoteric beliefs, particularly regarding anthroposophy, may be specific to German-speaking countries: Anthroposophy is predominantly practiced in Germany and Switzerland (Ammon et al., 2012). However, other types of complementary and alternative medicine (CAM) share similar principles and are popular around the world (Harris et al., 2012; Peltzer & Pengpid, 2018).

In addition, our sample was most likely not representative of all protest participants. Participation in the study was voluntary and may be subject to self-selection biases. Recruitment largely happened via one specific messenger service (Telegram). Future research should supplement our findings with on-site investigations of protestors who do not use social media.

Due to the centrality of political ideology in differentiating between latent profiles, future research should include more extensive measures of political ideology that capture attitudes to a variety of issues in addition to ideological self-placement (Azevedo & Bolesta, 2021). Although ideological self-placement items are considered “common, economical and intuitive” (Imhoff et al., 2022, p. 394), there are limitations associated with them: they may be influenced by context-specific interpretations, and may be interpreted differently as referring to social or economic issues (Imhoff et al., 2022). Therefore, future research would ideally

examine subgroups of protestors on attitudes toward specific political issues, such as immigration, LGBTQI+ rights, and economic redistribution.

The LPA approach chosen here is associated with some limitations. In particular, the profile enumeration process entails some subjectivity (Curran & Bauer, 2021), since there is no single fit index that can guide this decision in isolation (Johnson, 2021; Nylund-Gibson & Choi, 2018). Especially in large samples, it happens frequently that fit indices keep getting better and better as more profiles are added to the model, and bootstrapped likelihood ratio tests keep giving significant results (Curran & Bauer, 2021). It remains possible that models with more profiles, or with varying variances and covariances, would have provided an even better fit than the chosen solution. However, the goal of LPA is not necessarily to recover the “literally true” number of latent profiles (in many cases, there may not be a true number of latent profiles), but to evaluate “different possible approximations to the data, trying to discern how many classes it takes to recover the primary structure without taking so many that we are starting to capture noise or nuisance variation” (Curran & Bauer, 2021). In that sense, we believe that the four-profile model presents an interpretable and useful approximation of the heterogeneity among protest participants at the time that our survey was conducted.

Lastly, the anti-lockdown movement is probably dynamically changing. Our subgroup analysis represents a snapshot of the movement from the time where our survey was conducted, and should ideally be supplemented with longitudinal investigations (e.g., latent transition analyses) of how these subgroups relate to each other over time. Relatedly, future research should examine radicalization processes within the movement. The “Querdenken” movement has been described as being in the process of radicalization, as evidenced by more negative and violent encounters with the police (Bingener & Soldt, 2022). Our finding that most protest participants were open to conspiracy beliefs adds to this concern: conspiracy beliefs have been associated with violent extremist intentions, and the perpetrators of many recent terrorist attacks have referenced conspiracy beliefs in their manifestos (Rottweiler & Gill, 2020).

## **Conclusion**

Anti-lockdown movements in Europe and the United States have been described as a strange *mélange* of hippies, anti-vaxxers, conspiracy theorists, and neo-Nazis. The present research sheds some light on the heterogeneity of participants in such protests. We used latent profile analysis to derive subgroups of protest participants, and observed that participants

mostly differed in socio-political ideology, while conspiracy beliefs, downplaying of the Coronavirus, esotericism, and vaccine hesitancy did not differentiate between protestors. These beliefs share a rejection of scientific evidence, and claim to possess a secret, higher knowledge or ‘enlightenment’ that sets its adherents apart from the mainstream (Pöhlmann, 2021). Belief in such alternative knowledge appears to be a common thread that unites protestors from diverse political backgrounds (Pantenburg et al., 2021).

**4 Manuscript 3: Can Conspiracy Beliefs Be Beneficial?  
Longitudinal Linkages Between Conspiracy Beliefs, Anxiety, Uncertainty Aversion,  
and Existential Threat**

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## **Abstract**

Research suggests that conspiracy beliefs are adopted because they promise to reduce anxiety, uncertainty and threat. However, little research has investigated whether conspiracy beliefs actually fulfill these promises. We conducted two longitudinal studies ( $N_{\text{Study 1}} = 405$ ,  $N_{\text{Study 2}} = 1,012$ ) to examine how conspiracy beliefs result from, and in turn influence, anxiety, uncertainty aversion and existential threat. Random-Intercept Cross-Lagged Panel analyses indicate that people who were, on average, more anxious, uncertainty averse and existentially threatened held stronger conspiracy beliefs. Increases in conspiracy beliefs were either unrelated to changes in anxiety, uncertainty aversion and existential threat (Study 2), or even predicted increases in these variables (Study 1). In both studies, increases in conspiracy beliefs predicted subsequent increases in conspiracy beliefs, suggesting a self-reinforcing circle. We conclude that conspiracy beliefs likely do not have beneficial consequences, but may even reinforce the negative experience of anxiety, uncertainty aversion and existential threat.

**Keywords:** Conspiracy beliefs; anxiety; uncertainty aversion; existential threat; Random-Intercept Cross-Lagged Panel Model



## **Can Conspiracy Beliefs Be Beneficial? Longitudinal Linkages Between Conspiracy Beliefs, Anxiety, Uncertainty Aversion, and Existential Threat**

In an influential television address in March 2020, Angela Merkel, the German chancellor, described the Coronavirus pandemic as the largest societal challenge since World War II (Merkel, 2020). Most people experienced drastic changes in their every-day-lives, and voiced questions like: Where did COVID-19 come from? Is the vaccine dangerous? Is the government really acting in our best interest? Many people found the official answers to these kinds of questions unsatisfactory, and started to look for alternative explanations, for instance, in conspiracy theories (Nocun & Lamberty, 2020).

Conspiracy theories are attempts to explain significant social or political events (Douglas et al., 2019) that usually contradict common and official explanations (Nocun & Lamberty, 2020). They assume that events are the result of plots initiated by malevolent individuals or groups who act in secret (Bruder et al., 2013; Douglas et al., 2017; Imhoff & Bruder, 2014). In most cases, the conspirators are assumed to be powerful (although not necessarily, see Nera et al., 2021). Many different conspiracy theories developed during the Coronavirus pandemic, such as that the virus was fabricated in a lab, or that it served to distract from the alleged dangers of the 5G mobile network (Nocun & Lamberty, 2020).

Research suggests that conspiracy beliefs are adopted in response to the experience of anxiety, uncertainty and threat, most likely in an attempt to reduce these negative states (Douglas et al., 2017). Yet, it has been suggested that conspiracy beliefs are “more appealing than satisfying” (Douglas et al., 2017, p. 538), and might not actually help deal with anxiety, uncertainty and threat. Instead, conspiracy beliefs may represent a “self-defeating form of motivated social cognition” (Douglas et al., 2017, p. 541), and may ultimately reinforce the negative experiences that led to their adoption in the first place (Douglas et al., 2020; Douglas et al., 2017). We aim to investigate this potential negative feedback loop in a longitudinal design. Longitudinal studies are especially suited for this purpose, because they separate stable between-person differences from changes occurring *within* persons over time (Curran & Bauer, 2011). This allows to examine whether within-person changes in conspiracy beliefs relate to subsequent changes in anxiety, uncertainty aversion and existential threat (and vice versa).

Although there are many other variables related to conspiracy beliefs (e.g., thinking styles, Pytlik et al., 2020; paranoia, Imhoff & Lamberty, 2018; narcissism, Cichocka et al., 2016; or ideology, Nera et al., 2021), the focus of this research is on variables related to

uncertainty and fear. These were particularly relevant in the Coronavirus pandemic: almost everyone experienced substantial uncertainties (e.g., whether another lockdown would occur), existential threats (e.g., becoming infected, losing their job), and heightened levels of anxiety (Schwinger et al., 2020). So, within-person changes in these variables can be expected (whereas personality or ideology variables might be more stable over time). In sum, the pandemic provides a unique opportunity to study how uncertainty and fear-related variables relate to conspiracy beliefs over time: can conspiracy beliefs be beneficial by reducing anxiety, uncertainty aversion, and existential threat, or do they, instead, reinforce these negative experiences?

### **Uncertainty Aversion, Anxiety and Existential Threat Predict Conspiracy Beliefs**

Previous research has demonstrated that conspiracy beliefs are associated with uncertainty aversion, anxiety and existential threat. Whereas official accounts of important events like the Corona crisis are often complex and ambiguous (e.g., there is still uncertainty surrounding the origin of the virus, Gordon et al., 2021), conspiracy beliefs offer seemingly simple and all-embracing answers to complex questions (Douglas et al., 2017; McHoskey, 1995; Nyhan & Reifler, 2010). Therefore, they appeal to people who are uncertainty averse by proposing a clear account of why events occurred. In addition, they allow to hold onto one's belief in the face of counterevidence: all disconfirming evidence can simply be construed as part of the conspiracy (Keeley, 1999). Research has found that the need for cognitive closure (i.e., the need to arrive at a certain view quickly and then maintain this view) fosters conspiracy beliefs in situations where clear explanations are lacking (Marchlewska et al., 2018), and that making uncertainty salient increases conspiracy beliefs (van Prooijen & Jostmann, 2013).

Conspiracy beliefs may also develop in response to the experience of anxiety. They are more likely to emerge in societal crises (van Prooijen & Douglas, 2017) and in anxiety-inducing situations: participants who were waiting for an examination indicated heightened conspiracy beliefs (Grzesiak-Feldman, 2013), and participants who received an anxiety prime were more likely to suspect a conspiracy behind a fictional ambiguous scenario (Radnitz & Underwood, 2017). Lastly, participants who experienced a lack of control, which likely induced anxiety, were more likely to perceive conspiracies behind unrelated stimuli (Whitson & Galinsky, 2008).

Conspiracy beliefs are also associated with the experience of existential threat, defined as the subjective experience of insecurity and danger (Douglas et al., 2017). For existentially

threatened people, conspiracy beliefs appear attractive, because they promise a certain amount of security: Conspiracy beliefs assume that the world is controlled by a small group of malevolent actors. They thereby imply that the world is, in fact, controllable, which may seem less threatening than an unpredictable world, where nobody is fully in control (Keeley, 1999; Sullivan et al., 2010). Conspiracy beliefs further provide clearly identifiable enemies, which can be managed and understood more easily than random, diffuse perils (Sullivan et al., 2010). Recent research found that greater threat perceptions in the context of the Coronavirus pandemic predicted an increase in believing conspiracy claims one month later (Heiss et al., 2021). This suggests that existentially threatened individuals may turn to conspiracy beliefs in an attempt to establish a compensatory sense of security (Douglas et al., 2017).

### **Can Conspiracy Beliefs Be Beneficial?**

Although conspiracy theories may promise to help deal with uncertainty, and reduce anxiety and existential threat on the surface, research so far indicates that they may not actually provide these benefits (Douglas et al., 2017; Douglas et al., 2020). The contents of conspiracy beliefs are inherently threatening: Conspiracy theories allege that people are at the mercy of malevolent forces (Bruder et al., 2013). Such a worldview may provide many triggers for worry and anxiety (Douglas et al., 2017; Peitz et al., 2021). For instance, people who believe that the government is secretly controlled by malevolent groups will likely fear the consequences of these groups' political influence, which should contribute to both anxiety and existential threat. In addition, it seems plausible that conspiracy beliefs further increase the aversion toward uncertainty: Conspiracy theories consist of a complex system of interdependent beliefs. In order to maintain belief in this system in the face of counterevidence, more and more people and institutions need to be drawn into the conspiracy theory (Keeley, 1999). This results in a highly fragile system in which even the smallest doubt about one of the theory's elements might bring down the whole system of beliefs. As a result, people might become more and more averse to uncertainty as they attempt to uphold the beliefs to which they have become attached.

This implies that conspiracy beliefs might be part of a negative feedback loop, similar to for example obsessive compulsive disorder (OCD)<sup>7</sup>. In OCD, the experience of distressing thoughts, images or impulses triggers obsessive compulsions in an attempt to reduce anxiety.

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<sup>7</sup> We thank an anonymous reviewer for this example.

Engaging in these compulsions, however, paradoxically increases preoccupation with the intrusion, and serves to maintain a vicious cycle of negative emotions (Calkins et al., 2013). Similarly, conspiracy beliefs may be adopted in an attempt to alleviate negative states, but may ultimately reinforce anxiety, perceived threat and uncertainty.

Previous research provides initial evidence for this idea. Some studies found that exposure to convincing conspiracy theories increased people's levels of uncertainty and distrust, and suppressed their sense of autonomy and control (Einstein & Glick, 2015; Jolley & Douglas, 2014). Further, COVID-19 conspiracy beliefs predicted greater compliance with governmental restrictions through increased anxiety (Peitz et al., 2021). In line with this, Leibovitz et al. (2021) found that greater COVID-19 conspiracy beliefs were associated with more anxiety one month later. However, these studies are limited for several reasons: First, they are mostly cross-sectional, and thus provide only information about between-person relations. The only longitudinal study (Leibovitz et al., 2021) used only two waves of data, and did not separate between-person from within person effects. Yet the processes of interest are specifically concerned with what happens at the within-person level, that is, whether the adoption of conspiracy beliefs reduces or increases distress *for the individual*. Since relations observed at the between person level do not necessarily imply a similar relation within persons, longitudinal research that separates these two levels of effects is required (Curran & Bauer, 2011). Further, previous research has mostly relied on experimental designs that manipulate exposure to conspiracy theory materials in a laboratory setting. Thereby, they compared people who were exposed to conspiracy theory materials with people who were exposed to neutral materials. However, reading conspiracy materials does not mean that people believe this information. In addition, the consequences of conspiracy beliefs may not develop right after one-time exposure in the lab, but rather over longer periods of time as people integrate these beliefs into their everyday lives. To overcome these limitations, longitudinal designs that separate between-person from within-person effects are needed.

### **The Present Research**

The present research aims to investigate how conspiracy beliefs result from, and in turn influence, anxiety, uncertainty aversion, and existential threat in a longitudinal setting. We use a Random-Intercept Cross-Lagged Panel Model (Hamaker et al., 2015), which separates stable between-person differences from within-person changes in a naturalistic setting. This allows us to test directly if changes in conspiracy beliefs are associated with subsequent

changes in anxiety, uncertainty aversion and existential threat (and vice versa) within the same person.

We expect that people who believe in conspiracies are, in general, more prone to uncertainty aversion, anxiety and existential threat (between-person level). We further expect that people who experience increased uncertainty aversion, anxiety and existential threat are more likely to subsequently report increased conspiracy beliefs (within-person level). We also propose that the adoption of conspiracy beliefs does not effectively reduce these negative states – instead, increased conspiracy beliefs should predict subsequent increases in uncertainty aversion, anxiety and existential threat (within-person level).

We examine both shorter- (2 weeks; Study 1) and longer-term (4 months; Study 2) associations across four waves of measurements. We capture different phases of the pandemic: Study 1 ranged from before the first lockdown in Germany (March 2020) until the end of April 2020 (first lockdown: 22<sup>nd</sup> March - 11<sup>th</sup> May 2020). Study 2 started at the end of the first lockdown (May 2020), continued during the time without lockdown (September 2020) and the second lockdown (January 2021; second lockdown: 25<sup>th</sup> November 2020 – 8<sup>th</sup> March 2021), and ended at a time where many restrictions were relieved (May 2021). Our data therefore represent a unique opportunity to examine longitudinal linkages between conspiracy beliefs, anxiety, uncertainty aversion and existential threat during the course of a major societal crisis.

## Study 1

### Method

Materials, data, analysis code and codebooks can be found at [https://osf.io/dgzj6/?view\\_only=ee7d6a2755da475a83da8a95798a287e](https://osf.io/dgzj6/?view_only=ee7d6a2755da475a83da8a95798a287e). No studies in this manuscript were preregistered.

### *Participants and Procedure*

We recruited participants with a German nationality using Prolific. A total of  $N = 405$  participated in the first measurement wave (T1), of which 188 identified as female, 215 as male, and 2 as diverse. The mean age was 30.24 ( $SD = 9.98$ ). The sample was highly educated: 231 had a university degree, 129 had completed the Abitur (high school diploma), and 45 had completed secondary school. Every second week, participants were invited to take part in the second ( $n = 334$ ), third ( $n = 300$ ), and fourth wave ( $n = 231$ ).

To confirm that sample size was sufficient, we conducted a Monte Carlo power analysis with 1,000 replications to determine the power for  $\alpha = .05$ , with a sample size of  $N = 405$  and missing data patterns corresponding to the dropout we observed, for our most complex model (anxiety model). In such simulations, a large number of samples is drawn from a hypothesized population model, and power is assessed by examining the percentages of replications for which the null hypothesis is rejected for non-zero parameters. We chose plausible population values for factor loadings (.70), residual variances of observed variables (.51), variances (1.00) and covariances (.40) of random intercepts, and covariances between residuals of within-person components (.10; see OSF for details). Results indicated that power for a medium-sized lagged regression effect (.30) was sufficient (.81 - .93). Further, bias in parameter estimates (-.01 - .03) and standard errors (-.04 - .05) was small (according to Muthén & Muthén, 2002, bias should not exceed .10). This strengthens our confidence that the sample size is sufficient.

### ***Measures***

If not indicated otherwise, all items were answered on a seven-point-scale from 1 (do not agree at all) to 7 (agree completely; see Supplemental Online Materials [SOM] for full scales). We report additional measures from the survey in the SOM. Instead of Cronbach's alpha, we report the less restrictive coefficient omega (Dunn et al., 2014). The use of Cronbach's alpha as a measure for internal consistency has been criticized, because it relies on assumptions that are rarely met in psychological research (i.e., that the true score variance is constant across all items; Dunn et al., 2014). When these conditions are met, omega performs at least as well as alpha - when they are violated, omega outperforms alpha (Dunn et al., 2014; Flora, 2020; McNeish, 2018).

**Conspiracy Beliefs.** We used the Conspiracy Mentality Questionnaire (CMQ, Bruder et al., 2013). It consists of five items that measure an individual's general tendency to believe that important societal phenomena are the result of conspiracies, such as "I think that many very important things happen in the world, which the public is never informed about" (omega .89 - .90). An advantage of this scale is that it does not refer to the content of specific conspiracy theories, which may vary across different temporal or cultural contexts. Further, items that describe specific conspiracy theories are often highly transparent: people can immediately recognize them as conspiracy theories, and might be motivated to answer in a socially desirable manner. In an attempt to reduce this problem, the CMQ uses items that are more abstract, and that capture a general propensity to attribute societal outcomes to

conspiracies. Bruder et al. (2013) provide evidence for the scale's convergent, discriminant and predictive validity: it correlates positively with related measures like paranoid ideation, paranormal beliefs and schizotypal personality, and negatively with measures of socio-political control and agreeableness. It predicts endorsement of a variety of specific conspiracy theories over and above other individual difference measures (Bruder et al., 2013).

**Anxiety.** We used the German version of the Generalized Anxiety Disorder Scale (Spitzer et al., 2006). The scale measures the degree to which participants had been bothered by a variety of symptoms in the last two weeks, such as “Feeling nervous, anxious or on edge”, or “Not being able to stop or control worrying” on a scale from 0 (not at all) to 7 (nearly every day; omega .92 -.94). Higher scores on the scale are related to stronger functional impairment in multiple domains, as well as more disability days and health care use (Spitzer et al., 2006).

**Uncertainty Aversion.** We used three items from the Uncertainty Response Scale that capture our notion of uncertainty aversion most directly, namely responding to uncertainty with hesitancy and negative emotional experiences (Greco & Roger, 2001). A sample item is “I get worried when a situation is uncertain” (omega .84 - .86)<sup>8</sup>.

**Existential Threat.** To our knowledge, there is no agreed upon measure for existential threat. For this reason, we developed three items that capture our notion of existential threat, namely the subjective experience of insecurity and danger to one's own person (Douglas et al., 2017; Hirschberger et al., 2016), e.g. “I often feel in danger” (omega .92 - .94).

### *Analytic Strategy*

**Random-Intercept Cross-Lagged Panel Model.** Since we are interested in reciprocal relations of our variables over time, the cross-lagged panel model (CLPM) would be the traditional model of choice. However, the CLPM does not differentiate stable between-person differences from fluctuating within-person changes (Hamaker et al., 2015). As a result, the estimated parameters are confounded by the relationship that exists at the between-person level. For variables that are to some extent trait-like, the random-intercept cross-lagged panel model (RI-CLPM) is more appropriate (Hamaker et al., 2015). The RI-CLPM decomposes the observed variance into a stable, between-person component (“trait-like”) and a time-variant within-person component (“state-like”; see Figure 1). For each variable, a random intercept

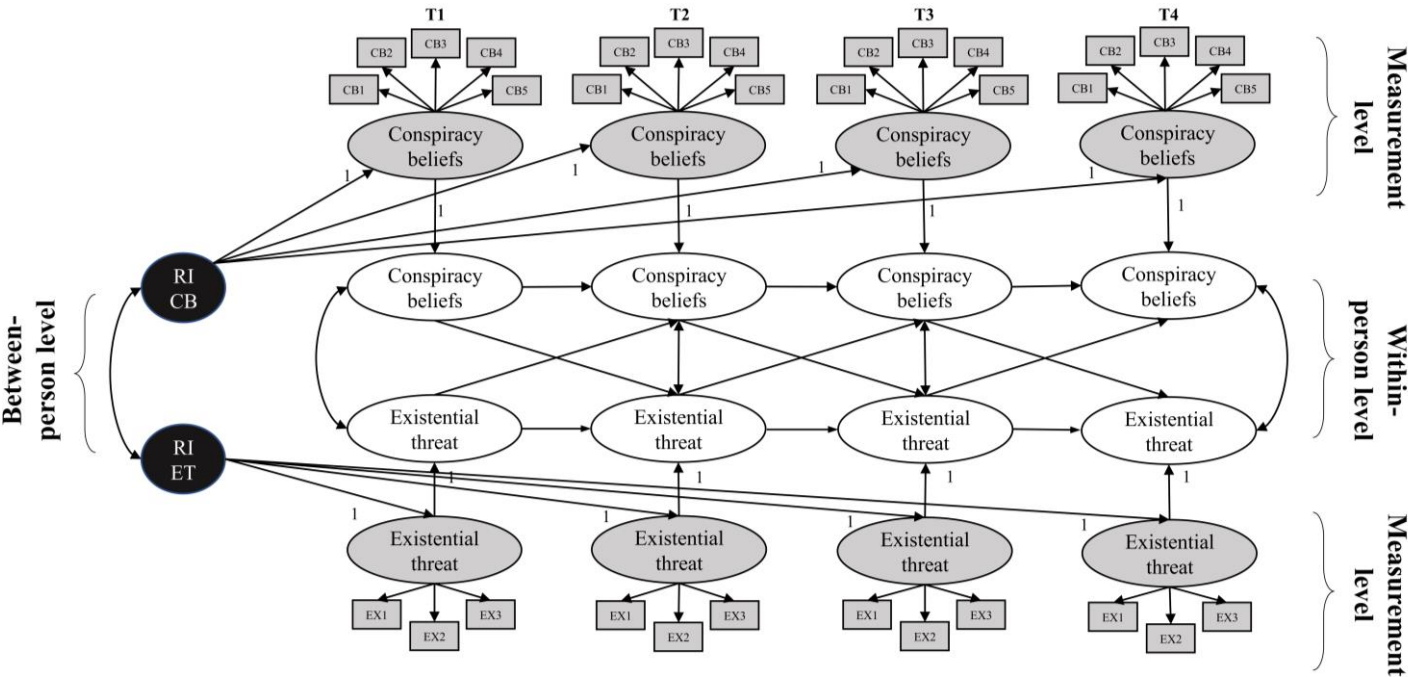
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<sup>8</sup> We report additional evidence for convergent and discriminant validity of our measures for uncertainty aversion and existential threat in the SOM.

(RI) is included that captures a person’s time-invariant deviation from the grand means, and thus represents stable, trait-like variance. Correlations between RIs inform about relations on the between-person level: a positive correlation between the RIs of, for instance, anxiety and conspiracy beliefs would indicate that a person who, on average, reports higher anxiety also, on average, reports higher conspiracy beliefs.

The auto-regressive and cross-lagged parameters pertain to the within-person level. The auto-regressive parameters indicate how within-person deviations from expected scores (based on the grand means and RIs) at one time are related to further deviations at a later time. A positive auto-regressive parameter for anxiety would indicate that a person who experiences higher anxiety than usual will likely experience a further increase in anxiety at the next time point. The cross-lagged parameters indicate whether different-than-usual scores on one variable will likely be followed by different-than-usual scores on the other variable (Mulder & Hamaker, 2021). A positive cross-lagged parameter from anxiety to conspiracy beliefs would indicate that a person who reports higher anxiety than usual at one time will likely report higher conspiracy beliefs than usual at the next time point.

**Figure 1**  
*Exemplary Random-Intercept Cross Lagged Panel Model*



*Note.* RI CB = random intercept conspiracy beliefs, RI ET = random intercept existential threat.



**Covariation of Variables of Interest.** Anxiety, uncertainty aversion, and existential threat are related, though conceptually distinct variables. Anxiety focusses on the frequency of various symptoms over the last two weeks (i.e., nervousness, worrying, restlessness, and irritability). It is more state-like and agnostic toward what caused the anxiety. Uncertainty aversion focusses on negative experiences due to uncertainty, and existential threat captures a general sense of feeling insecure and in danger. However, they have a certain amount of overlap, which could be described as a vulnerability for negative emotional experiences. Therefore, it is important to decide whether their relations to conspiracy beliefs should be analyzed simultaneously, or in separate models. We argue that removing the variance that anxiety, uncertainty aversion and existential threat have in common (by considering them in one model) produces variables that are difficult to interpret. For instance, what do individual differences in uncertainty aversion mean after partializing out shared variance with anxiety and existential threat (which may arise due to a general emotional vulnerability)? In order to keep our results easy to interpret, we decided to examine the relations of anxiety, uncertainty aversion, and existential threat to conspiracy beliefs in separate models. However, we report results for a full model which includes all variables simultaneously in the Supplemental Online Materials (see Tables S5, S6, S11 and S12 in the SOM)<sup>9</sup>.

## **Results and Discussion**

### ***Preliminary Analyses***

We conducted all analyses using R 4.0.3 (R Core Team, 2020) in RStudio 1.3.1090 (RStudio Team, 2020). Our main analysis was conducted with lavaan (Rosseel, 2012). We included all participants in the analysis using Full Information Maximum Likelihood Estimation, which has been found to outperform casewise and listwise deletion, and produces unbiased estimates even when missing of data is not completely at random (Enders & Bandalos, 2001). We tested whether dropout was systematic (for details, see SOM). Older people were less likely to drop out. Otherwise, the variables of interest were unrelated to dropout.

We tested longitudinal measurement invariance in a model that included all variables (Little et al., 2007). To begin, we tested a factor model with configural invariance (i.e., factor loadings were estimated freely over time). We allowed item-specific residual covariances.

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<sup>9</sup> Results from Study 1 vary slightly in this model - however, the overall conclusions remain similar.

The model fit was acceptable:  $\chi^2 (2256) = 3293.28, p < .001$ , RMSEA = .05, CFI = .93. TLI = .92, SRMR = .06. Next, we constrained factor loadings to be equal over time and compared this model to the previous one with a chi-square difference test. This yielded a difference of  $\Delta \chi^2 (41) = 38.91, p = .564$ , and we concluded that this model did not fit significantly worse. So we assumed weak invariance which is sufficient to test relations between variables over time (van den Schoot et al., 2012).

Table 1 provides all descriptive statistics. Table 2 presents correlations between measures during T1 (see Tables S1-4 in the SOM for correlations during all waves). All correlations were significant, except for the association between uncertainty aversion and conspiracy beliefs at T4.

In order to examine the proportion of between- and within-person variance in our variables, we calculated the Intraclass Correlation Coefficients (ICC; see SOM). All variables had ICCs between .70 and .80, indicating that substantial within-person changes (20-30%) occurred.

**Table 1**

*Descriptive Statistics for All Measurements, Study 1*

	T1	T2	T3	T4
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Conspiracy Beliefs	3.69 (1.28)	3.56 (1.31)	3.37 (1.37)	3.27 (1.33)
Anxiety	3.89 (1.47)	3.61 (1.44)	3.38 (1.49)	3.36 (1.43)
Uncertainty Aversion	4.37 (1.26)	4.37 (1.32)	4.25 (1.38)	4.29 (1.44)
Existential Threat	2.57 (1.37)	2.67 (1.44)	2.61 (1.46)	2.52 (1.42)

**Table 2**

*Concurrent Correlations for Measures during T1, Study 1*

	1	2	3	4
1 Conspiracy Beliefs	1			
2 Anxiety	.26**	1		
3 Uncertainty Aversion	.15*	.57**	1	
4 Existential Threat	.34**	.60**	.44**	1

\* $p < .050$ , \*\* $p < .001$

### ***Conspiracy Beliefs and Anxiety***

First, we tested a latent RI-CLPM assessing the linkages between conspiracy beliefs and anxiety. This model fit the data well:  $\chi^2(1027) = 1454.74, p < .001, RMSEA = .03, CFI = .97, TLI = .96, SRMR = .05$ . There was a significant auto-regressive effect for conspiracy beliefs, indicating that increases in conspiracy beliefs predicted even further increases in conspiracy beliefs at the next measurement wave ( $B = .69, SE = .12, p < .001, 95\% CI [.45; .93]$ ). In addition, we observed a significant cross-lagged effect from conspiracy beliefs to anxiety: increases in conspiracy beliefs predicted subsequent increases in anxiety ( $B = .37, SE = .14, p = .012, 95\% CI [.08; .65]$ ). Increases in anxiety did not predict increases in conspiracy beliefs ( $B = .05, SE = .05, p = .297, 95\% CI [-.05; -.15]$ ). The RIs of conspiracy beliefs and anxiety were significantly correlated ( $r = .29, SE = .07, p < .001, 95\% CI [.15; .43]$ ), indicating that people who were, on average, more anxious, also reported greater conspiracy beliefs.

### ***Conspiracy Beliefs and Uncertainty Aversion***

We tested a latent RI-CLPM assessing the linkages between conspiracy beliefs and uncertainty aversion. This model fit the data well:  $\chi^2(423) = 695, p < .001, RMSEA = .04, CFI = .97, TLI = .96, SRMR = .06$ . Again, there was a significant auto-regressive effect for conspiracy beliefs ( $B = .53, SE = .15, p = .001, 95\% CI [.23; .83]$ ). In addition, we observed a significant cross-lagged effect from conspiracy beliefs to uncertainty aversion: increases in conspiracy beliefs predicted subsequent increases in uncertainty aversion ( $B = .30, SE = .14, p = .027, 95\% CI [.03; .56]$ ). Increases in uncertainty aversion did not predict increases in conspiracy beliefs ( $B = .02, SE = .09, p = .854, 95\% CI [-.17; .20]$ ). The RIs of conspiracy beliefs and uncertainty aversion were significantly correlated ( $r = .18, SE = .06, p = .003, 95\% CI [.06; .30]$ ), indicating that people who were, on average, more uncertainty averse, also reported greater conspiracy beliefs.

### ***Conspiracy Beliefs and Existential Threat***

We tested a latent RI-CLPM assessing the linkages between conspiracy beliefs and existential threat. This model fit the data well:  $\chi^2(423) = 658.43, p < .001, RMSEA = .04, CFI = .97, TLI = .97, SRMR = .06$ . Again, there was a significant auto-regressive effect for conspiracy beliefs ( $B = .77, SE = .10, p < .001, 95\% CI [.56; .97]$ ). In addition, we observed a significant cross-lagged effect from conspiracy beliefs to existential threat: increases in conspiracy beliefs predicted subsequent increases in existential threat ( $B = .24, SE = .11, p = .026, 95\% CI [.03; .45]$ ). Increases in existential threat did not predict increases in conspiracy

beliefs ( $B = -.04$ ,  $SE = .05$ ,  $p = .457$ , 95% CI [-.14; .06]). The RIs of conspiracy beliefs and existential threat were significantly correlated ( $r = .42$ ,  $SE = .06$ ,  $p < .001$ , 95% CI [.30, .54]), indicating that people who were, on average, more existentially threatened also reported greater conspiracy beliefs.

### ***Discussion***

The goal of this study was to examine how conspiracy beliefs result from, and in turn influence, uncertainty aversion, anxiety and existential threat. Consistent with previous research, people who, overall, experienced more anxiety, uncertainty aversion and/or existential threat were also more likely to report higher conspiracy beliefs (between-person level). Also consistent with expectations, increases in conspiracy beliefs predicted subsequent increases in anxiety, uncertainty aversion, and existential threat on the within-person level. This indicates that conspiracy beliefs actually do make people feel worse by intensifying the experience of anxiety, uncertainty and threat. This may be because conspiracy beliefs promote a threatening worldview filled with suspicion and mistrust.

Contrary to expectations, we did not observe the same effect vice versa: increases in anxiety, uncertainty aversion and/or existential threat did not predict increases in conspiracy beliefs. Conspiracy beliefs are only one of many ways in which people may respond to increased anxiety, uncertainty aversion and existential threat. Perhaps, especially in the context of the pandemic, other strategies seemed more promising in the attempt to reduce uncertainty and fear-related states, such as strictly adhering to Coronavirus guidelines, and protecting oneself and others from the risk of infection.

Increases in conspiracy beliefs predicted even further increases in conspiracy beliefs two weeks later. This is in line with research indicating that belief in one conspiracy theory reinforces other conspiratorial ideas (Goertzel, 1994; Swami et al., 2010; Wood et al., 2012) and points to a self-reinforcing spiral of conspiracy beliefs.

We address several limitations in Study 2. First, we used short-term time intervals (i.e., two weeks); yet it is possible that effects may be different over longer periods of time. Second, we include Coronavirus conspiracy beliefs (starting from T2 in Study 2). It may be that specific conspiracy beliefs have different consequences than general conspiracy beliefs (Imhoff & Lamberty, 2020).

## Study 2

### Method

#### *Participants and Procedure*

We instructed a survey company to collect a sample that would be representative for the German adult population regarding age, gender, level of education and region of residence. The first measurement wave was in May 2020 (at the end of the first Coronavirus lockdown in Germany). A total of  $N = 1012$  participated in the first measurement (T1), of which 520 identified as female, 491 as male, and 1 as diverse. The mean age was 44.72 ( $SD = 16.85$ ). Participants were invited to take part in three additional measurements in September 2020 ( $n(T2) = 698$ ), January 2021 ( $n(T3) = 518$ ), and May 2021 ( $n(T4) = 437$ ).

#### *Measures*

For general conspiracy beliefs (omega .98 - .90), anxiety (omega .93 - .94), uncertainty aversion (omega .84 - .86), and existential threat (omega .92 - .94), we used the same measures as in Study 1.

**Coronavirus Conspiracy Beliefs.** We included five items that measured belief in specific conspiracy theories or misinformation regarding the Coronavirus (starting from T2). These captured content that was particularly relevant at the time of our study (Nocun & Lamberty, 2020). Items were 1) I believe that the Corona crisis was fabricated by powerful actors with malicious intentions, 2) I believe the Corona crisis exists so that other political scandals can be covered up, 3) I believe that Bill Gates was involved in putting the Coronavirus in the world, 4) I believe that there are secret organizations that put the Coronavirus in the world intentionally, and 5) I believe that the Coronavirus does not exist.

We tested the factorial structure of these items. A model with all items loading on one factor did not fit the data well:  $\chi^2(80) = 466.36, p < .001$ , RMSEA = .11, CFI = .94, TLI = .93, SRMR = .09. We excluded two items which had weak factor loadings (Bill Gates involved in CV and CV does not exist). These items had the lowest agreement overall, so their weak loadings might be due to floor effects. Excluding those items resulted in acceptable model fit:  $\chi^2(19) = 45.86, p = .001$ , RMSEA = .06, CFI = .99, TLI = .99, SRMR = .03 (omega .93 - .95).

## Results and Discussion

### *Preliminary Analyses*

Again, we included all participants in the analysis using Full Information Maximum Likelihood (Enders & Bandalos, 2001). Older people and those with greater uncertainty aversion were less likely to drop out (see SOM). Thus, dropout did not occur systematically for almost all variables of interest, while the association with uncertainty aversion should be considered a potential limitation. Again, we tested measurement invariance following the same procedure as in Study 1. The Chi Square test was significant:  $\Delta \chi^2 (42) = 71.36, p = .003$ . Given that the Chi Square difference test is known to be overly sensitive in large samples, we followed recommendations by F. F. Chen (2007). He recommends that a change of  $\geq -.010$  in CFI, supplemented by a change of  $\geq .015$  in RMSEA or a change of  $\geq .030$  in SRMR would indicate noninvariance. Adding the constraints in the factor loadings yielded  $\Delta CFI = -.001, \Delta RMSEA = .000$ , and  $\Delta SRMR = .003$ . Thus, weak measurement invariance can be assumed.

Table 3 presents an overview of the means and standard deviations of all variables across the four measurements. Table 4 presents correlations between measures during T2 (see Tables S7-10 in the SOM for correlations during all waves; we use T2 to present correlations with the Coronavirus conspiracy beliefs). Again, we calculated the ICC. All ICC were between .63 and .75, indicating that substantial within-person changes occurred (see SOM).

**Table 3**

*Descriptive Statistics for All Measurements, Study 2*

	T1	T2	T3	T4
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Anxiety	3.15 (1.43)	2.96 (1.46)	2.89 (1.47)	2.93 (1.48)
Conspiracy beliefs	4.22 (1.55)	4.01 (1.57)	3.89 (1.61)	3.70 (1.63)
Uncertainty avoidance	4.19 (1.44)	4.11 (1.47)	4.10 (1.46)	4.09 (1.53)
Existential threat	2.82 (1.54)	2.87 (1.60)	2.84 (1.52)	2.86 (1.61)
Coronavirus conspiracy beliefs	-	2.45 (1.82)	2.36 (1.81)	2.45 (1.88)

**Table 4***Concurrent Correlations for Measures during T2, Study 2*

	1	2	3	4	5
1 Conspiracy beliefs	1				
2 Anxiety	.19**	1			
3 Uncertainty aversion	.10*	.54**	1		
4 Existential threat	.24**	.64**	.49**	1	
5 Coronavirus conspiracy beliefs	.64**	.16**	.02	.19**	1

Note. \* $p < .050$ , \*\* $p < .001$ .

### ***Conspiracy Beliefs and Anxiety***

The RI-CLPM for conspiracy beliefs and anxiety fit the data well:  $\chi^2(1027) = 1852.79$ ,  $p < .001$ , RMSEA = .03, CFI = .97, TLI = .97, SRMR = .05. We observed significant auto-regressive parameters for both conspiracy beliefs ( $B = .18$ ,  $SE = .08$ ,  $p = .031$ , 95% CI [.02; .33]) and anxiety ( $B = .25$ ,  $SE = .07$ ,  $p < .001$ , 95% CI [.11; .40]). Neither did increases in conspiracy beliefs predict increases in anxiety ( $B = -.09$ ,  $SE = .08$ ,  $p = .267$ , 95% CI [-.26; .07]), nor did increases in anxiety predict increases in conspiracy beliefs ( $B = .02$ ,  $SE = .04$ ,  $p = .655$ , 95% CI [-.07; .11]). On the between-person level, the RIs for conspiracy beliefs and anxiety were significantly correlated ( $r = .26$ ,  $SE = .01$ ,  $p < .001$ , 95% CI [.18; .34]).

### ***Conspiracy Beliefs and Uncertainty Aversion***

The RI-CLPM for conspiracy beliefs and uncertainty aversion fit the data well:  $\chi^2(423) = 821.49$ ,  $p < .001$ , RMSEA = .03, CFI = .98, TLI = .97, SRMR = .05. We observed significant auto-regressive parameters for conspiracy beliefs ( $B = .18$ ,  $SE = .08$ ,  $p = .020$ , 95% CI [.03; .34]). Increases in conspiracy beliefs did not predict increases in uncertainty aversion ( $B = .02$ ,  $SE = .08$ ,  $p = .771$ , 95% CI [-.13; .17]). However, we observed a significant cross-lagged relation from uncertainty aversion to conspiracy beliefs: increases in uncertainty aversion predicted increases in conspiracy beliefs at the next measurement ( $B = .11$ ,  $SE = .05$ ,  $p = .023$ , 95% CI [.02; .21]). On the between-person level, the RIs for conspiracy beliefs and uncertainty aversion were significantly correlated ( $r = .11$ ,  $SE = .04$ ,  $p = .008$ , 95% CI [.03; .19]).

### ***Conspiracy Beliefs and Existential Threat***

The RI-CLPM for conspiracy beliefs and existential threat fit the data well:  $\chi^2(423) = 938.06, p < .001, RMSEA = .04, CFI = .97, TLI = .96, SRMR = .06$ . We again observed significant auto-regressive parameters for conspiracy beliefs ( $B = .19, SE = .06, p = .002, 95\% CI [.04; .35]$ ). Beyond that, no significant within-person associations emerged: increases in conspiracy beliefs did not predict increases in existential threat ( $B = -.03, SE = .08, p = .712, 95\% CI [-.19; .13]$ ), and neither did increases in existential threat predict increases in conspiracy beliefs ( $B = -.01, SE = .04, p = .811, 95\% CI [-.08; .06]$ ). On the between-person level, the RIs for conspiracy beliefs and existential threat were significantly correlated ( $r = .36, SE = .04, p < .001, 95\% CI [.28; .43]$ ).

### ***Coronavirus Conspiracy Beliefs***

**Coronavirus Conspiracy Beliefs and Anxiety.** The RI-CLPM for Coronavirus conspiracy beliefs and anxiety fit the data well:  $\chi^2(381) = 716.88, p < .001, RMSEA = .04, CFI = .98, TLI = .98, SRMR = .04$ . We observed significant auto-regressive parameters for anxiety ( $B = .35, SE = .11, p = .001, 95\% CI [.14; .51]$ ). Beyond that, no significant within-person associations emerged: increases in Coronavirus conspiracy beliefs did not predict increases in anxiety ( $B = -.03, SE = .09, p = .768, 95\% CI [-.21; .15]$ ), and increases in anxiety did not predict increases in Coronavirus conspiracy beliefs ( $B = .04, SE = .11, p = .726, 95\% CI [-.18; .26]$ ). On the between-person level, the RIs for Coronavirus conspiracy beliefs and anxiety were significantly correlated ( $r = .19, SE = .06, p = .001, 95\% CI [.08; .30]$ ).

**Coronavirus Conspiracy Beliefs and Uncertainty Aversion.** The RI-CLPM for Coronavirus conspiracy beliefs and uncertainty aversion fit the data well:  $\chi^2(115) = 151.39, p = .013, RMSEA = .02, CFI = 1.00, TLI = 1.00, SRMR = .03$ . No significant within-person associations emerged: increases in Coronavirus conspiracy beliefs did not predict increases in uncertainty aversion ( $B = .01, SE = .11, p = .930, 95\% CI [-.20; .21]$ ), and increases in uncertainty aversion did not predict increases in Coronavirus conspiracy beliefs ( $B = .18, SE = .18, p = .304, 95\% CI [-.17; .54]$ ). On the between-person level, the RIs for Coronavirus conspiracy beliefs and uncertainty aversion were not significantly correlated ( $r = .03, SE = .05, p = .589, 95\% CI [-.07; .13]$ ).

**Coronavirus Conspiracy Beliefs and Existential Threat.** The RI-CLPM for Coronavirus conspiracy beliefs and existential threat fit the data well:  $\chi^2(115) = 200.23, p < .001, RMSEA = .03, CFI = .99, TLI = .99, SRMR = .04$ . No significant within-person associations emerged: increases in Coronavirus conspiracy beliefs did not predict increases in



existential threat ( $B = .07$ ,  $SE = .10$ ,  $p = .466$ , 95% CI [-.12; .27]), and increases in existential threat did not predict increases in Coronavirus conspiracy beliefs ( $B = -.01$ ,  $SE = .11$ ,  $p = .921$ , 95% CI [-.23; .21]). On the between-person level, the RIs for Coronavirus conspiracy beliefs and existential threat were significantly correlated ( $r = .25$ ,  $SE = .05$ ,  $p < .001$ , 95% CI [.16; .34]).

## ***Discussion***

The goal of Study 2 was to replicate findings from Study 1 with greater temporal distances in a sample representative for the German adult population, and to include specific Coronavirus conspiracy beliefs. Again, we found consistent between-person associations: people who, on average, experienced more anxiety, uncertainty aversion and existential threat tended to report higher general conspiracy beliefs. At the within-person level, we observed that an increase in uncertainty aversion predicted an increase in general conspiracy beliefs, but not vice versa. This suggests that people turn to conspiracy beliefs when they experience greater uncertainty aversion than usual, perhaps in an attempt to avert this negative state. Beyond that, no within-person associations with general conspiracy beliefs emerged.

Relations with Coronavirus conspiracy beliefs pertained mostly to the between-person level: people who, on average, experienced more anxiety and existential threat were more likely to believe in a variety of unfounded beliefs about the Coronavirus. We found no within-person associations for Coronavirus conspiracy beliefs and anxiety, uncertainty aversion and existential threat. Overall, Study 2 supports the claim that conspiracy beliefs likely do not reduce uncertainty, and reduce anxiety and existential threat. Yet, we did not replicate the finding that conspiracy beliefs increase anxiety, uncertainty aversion and existential threat.

## **General Discussion**

This research aimed to examine whether conspiracy beliefs can provide personal benefits by reducing uncertainty aversion, anxiety and existential threat, or whether conspiracy beliefs instead reinforce these negative experiences. Two longitudinal studies with different time intervals (two weeks and four months, respectively) demonstrate that conspiracy beliefs likely do not reduce the negative experience of anxiety, uncertainty aversion and existential threat, but may sometimes even reinforce them. We extend previous research by separating stable between-person effects from within-person changes in these variables for the first time.

## **Within-Person Changes Over Time**

### ***Are Conspiracy Beliefs Beneficial or Harmful for the Individual?***

In both studies, within-person increases in conspiracy beliefs did not predict reduced anxiety, uncertainty aversion and existential threat. Increases in conspiracy beliefs were either unrelated to changes in these variables (Study 2), or even predicted increases in uncertainty aversion, anxiety and existential threat (Study 1). This indicates that conspiracy beliefs are likely not beneficial in this regard. However, we cannot answer conclusively whether conspiracy beliefs, instead, reinforce the negative experience of anxiety, uncertainty and threat: we observed these harmful effects only in Study 1. It may be that the time intervals in Study 2 were too long to observe these effects. It has been argued that the optimal time intervals to observe longitudinal relations are relatively short, especially for within-person effects (Dormann & Griffin, 2015), and that effect sizes typically decrease as time intervals get larger (Atkinson et al., 2000; A. Cohen, 1993; Dormann & Griffin, 2015; Hulin et al., 1990). This may explain why we observed only few within-person associations in Study 2.

We did not find within-person consequences of Coronavirus-related conspiracy beliefs in Study 2. This may also be due to long time intervals, but also to opposing effects that cancel each other out: most Coronavirus conspiracy beliefs contain some element that downplays the dangers of the virus, which might relieve distress. Yet, most of them also describe threatening scenarios of malevolent, secret forces, which should increase distress.

We revealed an additional way in which conspiracy beliefs may be harmful for the individual: both studies found that increases in conspiracy beliefs predicted even further increases in conspiracy beliefs at the next measurement wave. This effect emerged for both short- and longer-term distances, and indicates that conspiracy beliefs are part of a self-reinforcing cycle that results in more and more extreme attitudes (Goertzel, 1994; Swami et al., 2010; Wood et al., 2012).

### ***Do Anxiety, Uncertainty Aversion and Existential Threat Predict Conspiracy Beliefs?***

We observed only few within-person associations going from anxiety, uncertainty aversion and existential threat to conspiracy beliefs. Increases in these variables were unrelated to increases in conspiracy beliefs in Study 1, and only increases in uncertainty aversion were associated with subsequent increases in conspiracy beliefs in Study 2. The absence of these within-person associations does not rule out that within-person effects were present in earlier life stages: the within-person effects we observed pertain only to processes that occurred during our study. All processes that happened earlier in the participants' lives

would be captured by the between-person variance. Future research should examine these relations over different time intervals, and during different developmental phases.

Bearing in mind that this effect occurred only in Study 2, the cross-lagged effect from uncertainty aversion to conspiracy beliefs might tentatively point to a downward spiral that unfolds over time: people might turn to conspiracy beliefs in an attempt to alleviate the negative experience of uncertainty, but do not succeed in in this attempt. Instead, they may even experience short-term increases in uncertainty aversion, anxiety and existential threat.

### **Stable Between-Person Differences**

On the between-person level, both studies revealed that people who were, on average (i.e., across all measurements), more anxious, more averse to uncertainty, and/or more existentially threatened than other people, were also more likely to hold conspiracy beliefs. These findings are in line with previous work indicating that conspiracy beliefs are related to anxiety, uncertainty aversion and existential threat (Douglas et al., 2017; Grzesiak-Feldman, 2013; Swami et al., 2016).

Coronavirus conspiracy beliefs were correlated with anxiety and existential threat on the between-person level. People who were, on average, more anxious and existentially threatened also agreed more to a range of unfounded beliefs about the Coronavirus. No correlations with uncertainty aversion emerged. It may be that uncertainty averse people found other explanations for the Corona crisis that better matched their desire for certainty.

### **Strengths, Limitations and Future Research**

We observed the negative impact of conspiracy beliefs on uncertainty aversion, anxiety and existential threat only in Study 1. This may be due to different time intervals. In general, it is not uncommon that researchers who study the same phenomenon with different time intervals come across different estimates of lagged effects (Kuiper & Ryan, 2018). The selection of appropriate time intervals is of crucial importance in longitudinal research, yet the actual time interval required for an effect to unfold is rarely known to researchers (Bollen, 1989). Instead, “decisions about when to measure and how frequently to measure critical variables are left to intuition, chance, convenience, or tradition” (Mitchell & James, 2001, p. 533). Choosing anything other than the actual time interval can lead to important biases in estimation. For instance, Bollen (1989) points out that in cases where one variable influences another, and measurement intervals are longer than the actual time intervals, this relation may sometimes be approximated by a reciprocal causal relation, although the one-way nature of

the effect would become visible in shorter time lags. Further, Cole and Maxwell (2009) argue that choosing the wrong interval may result in gross underestimations of relations over time.

Thus, an important goal for future research consists in identifying the ‘optimal’ time lag for observing potential effects of conspiracy beliefs, that is, the time lag that yields a maximum effect of conspiracy beliefs on anxiety, uncertainty aversion and/or existential threat (Dormann & Griffin, 2015). Dormann and Griffin (2015) propose an algebraic procedure to do so for traditional CLPMs. This involves collecting data with a time lag that is presumably smaller than the optimal time lag, calculating the optimal time lag (based on effect sizes of stability and cross-lagged parameters), and repeating data collection. Yet so far, this procedure has not been extended to designs that focus on within-person effects. Dormann and Griffin (2015) suspect, however, that such an extension will reveal very short optimal time lags for most persons, and call for more ‘shortitudinal’ studies.

There are alternative explanations for why results were inconsistent across studies, for instance, differences in sample composition. Douglas et al. (2017) argue that conspiracy beliefs may be beneficial for some people, and detrimental for others. In particular, they argue that conspiracy beliefs may provide benefits for people who are disadvantaged and alienated from society, while people who are not disadvantaged may find them distressing. This coincides with our pattern of results: we observed the harmful consequences of conspiracy beliefs only in Study 1, which consisted of highly educated participants. Future research should investigate potential moderators of the consequences of conspiracy beliefs, such as social status or level of education.

Further, future research should investigate whether conspiracy beliefs provide personal benefits in areas that were not the focus of this study. For example, conspiracy beliefs might boost self-esteem by promoting a sense of uniqueness (Imhoff & Lamberty, 2017). Conspiracy beliefs might also provide a community of fellow conspiracy believers and a subsequent positive social identity (Douglas et al., 2017). Yet conspiracy beliefs can also be stigmatizing: others might avoid or exclude former friends who openly advocate conspiracy beliefs (Lantian et al., 2018). Future research should investigate these potentially opposing personal consequences of conspiracy beliefs.

Another limitation of our research is that results may be biased due to unmeasured confounding variables. This prevents us from drawing causal conclusions about the observed processes (Bollen, 1989). For instance, there might be omitted variables that are common causes of conspiracy beliefs, anxiety, uncertainty aversion and existential threat. This might bias the regression parameters we observed. For example, if conspiracy beliefs were, in fact,

not causally related to anxiety, but both were caused by an omitted third variable, a spurious relation between conspiracy beliefs and anxiety might arise (Bollen, 1989). A potential common cause might be, for example, right-wing media consumption<sup>10</sup>. It is plausible that watching more right-wing television resulted in both increased anxiety (because concerns about economic crises were raised) and conspiracy beliefs (because convincing conspiracy claims were made). Yet it would still be plausible that conspiracy beliefs additionally reinforce anxiety, uncertainty aversion and existential threat, because they promote a threatening worldview filled with suspicion and mistrust. Future research that aims to establish causality should consider these potential common causes (Bollen, 1989).

Recently, the RI-CLPM has been criticized because it does not capture the potential effects of causes that explain differences between persons over time, and focuses only on fluctuations around individual person means (Lüdtke & Robitzsch, 2021). Yet, we argue that for our purposes, this focus on within-person dynamics is appropriate: if conspiracy beliefs had harmful consequences for the individual, then they should produce higher anxiety as compared to that persons usual (average) levels of anxiety, regardless of whether that person is more or less anxious than others. Nevertheless, future research could profit from considering different aspects of change from competing methodological approaches. For example, the traditional CLPM might provide insights on potential causes that make one person different from another over time (Lüdtke & Robitzsch, 2021). Further, the Latent Curve Model with Structured Residuals examines both interindividual differences in change over time on the between-person level, and intraindividual change on the within-person level (Curran & Hancock, 2021). Systematically comparing these different models of change could further our understanding of the processes at hand.

In addition, future research should apply continuous-time models that treat time as a continuous variable which may take an infinite number of values (Voelkle et al., 2018). These models assume that the processes of interest influence each other at every moment in time, not only at the times of measurement (Kuiper & Ryan, 2018). By using differential calculus, it becomes possible to compute the effects of interest as a function of any arbitrary time interval. Future research should systematically compare results obtained from discrete time models (such as the RI-CLPM) to continuous time approaches (Voelkle et al., 2018).

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<sup>10</sup> We thank an anonymous reviewer of a previous version of this article for this example.

The pandemic represents an advantage for our research. During normal circumstances, peoples' conspiracy beliefs are likely relatively stable (Bruder et al., 2013), making it more difficult to observe within-person changes. During the pandemic, however, many new conspiracy theories emerged, thus providing suitable circumstances to study the within-person associations of changes in such beliefs. In addition, the fact that we did not find evidence for any beneficial effects of conspiracy beliefs despite differences in sample composition, time intervals and phases of the pandemic adds to the robustness of this finding.

### **Conclusion**

Previous research concluded that conspiracy beliefs are attractive for people who are anxious, uncertainty averse, and existentially threatened. However, no prior research examined whether conspiracy beliefs actually help deal with uncertainty, and reduce anxiety and perceived threat. We conducted two studies to explore the longitudinal relationships between conspiracy beliefs, uncertainty aversion, anxiety and existential threat. Findings suggest that conspiracy beliefs are likely not beneficial for the individual, at least with regard to the variables we studied: within-person increases in conspiracy beliefs were either unrelated to within-person changes in uncertainty aversion, anxiety and existential threat (Study 2, four months intervals), or even predicted subsequent increases in uncertainty aversion, anxiety and existential threat (Study 1, two weeks intervals). Our results further suggest that increases in conspiracy beliefs predict even further increases in conspiracy beliefs at the next measurement (both studies). This demonstrates that conspiracy beliefs are part of a self-reinforcing circle. These findings did not extend to Coronavirus conspiracy beliefs: the specific content of conspiracy beliefs seems to be crucial for their consequences. Future longitudinal research on the potential harmful effects of conspiracy beliefs for their adherents is required.

**5 Manuscript 4: The Effect of Brooding about Societal Problems on Conspiracy Beliefs: A Registered Report**

Liekefett, L., Sebben, S., & Becker, J. C. (2023). The Effect of Brooding about Societal Problems on Conspiracy Beliefs: A Registered Report. Stage 1 in-principle-accepted (<https://osf.io/y82bs>), Stage 2 under revision at *Peer Community in Registered Reports*.

### **Abstract**

This Stage 2 Registered Report concerns the relationship between rumination, a repetitive style of negative thinking, and conspiracy beliefs (Stage 1 protocol: <https://osf.io/y82bs>, date of in-principle-acceptance: 23/05/2023). Based on four pilot studies, we tested in a fifth, registered study whether brooding, a particularly dysfunctional form of rumination, contributes to conspiracy beliefs using a repeated-measures within-person experiment ( $N = 1,638$ ). Mean difference scores (conspiracy beliefs at T2 minus conspiracy beliefs at T1) were significantly greater in the brooding condition than in the control condition. However, we could neither confirm that this effect was larger than the specified smallest effect size of interest of  $d = 0.20$ , nor conclude that it was too small to be of interest (i.e., smaller than  $d = 0.20$ ). We explored how reflection, an analytic form of rumination, impacted conspiracy beliefs. We further discuss implications for theories about the formation of conspiracy beliefs, and efforts aimed at preventing or reducing unfounded conspiracy beliefs. Hopefully, this article sparks a discussion among conspiracy belief researchers about how smallest effect sizes of interest could be determined in a principled way based on real-world outcomes.

**Keywords:** Conspiracy beliefs, rumination, brooding, reflection



## **The Effect of Brooding about Societal Problems on Conspiracy Beliefs: A Registered Report**

Worrisome events are all over the news: Reports about multiple societal crises, such as the COVID-19 pandemic, war, climate change, and political division, dominate the current information landscape (Gabbatiss, 2019; Grynspan, 2022; United Nations, 2022). When exposed to such distressing information, people may respond in various ways. They may accept or reappraise the situation, avoid the stressor, or engage in dysfunctional rumination. Here, we focus on the consequences of dysfunctional rumination about worrisome societal events. Rumination is a style of thinking that is repetitive, difficult to disengage from, and focused on negative content (Ehring & Watkins, 2008; Nolen-Hoeksema et al., 2008). It consists of repeatedly asking oneself “why” and “what if” types of questions in an unproductive manner (Zetsche et al., 2009). A large body of evidence links rumination to negative affect, depression and other undesirable psychological consequences (Lyubomirsky & Tkach, 2004).

This research program investigates how rumination may affect the formation of conspiracy beliefs. Several theories about the formation of conspiracy beliefs predict that rumination should increase the tendency to believe in conspiracies, e.g., via negative affect or negative attention and interpretation biases. Below, we describe these theories, and outline the rationale for our pilot studies (one observational, three experimental), which investigated the causal link from rumination to conspiracy beliefs. Based on these pilot studies, we outline subsequently that rumination needs to be further differentiated: Whereas reflection is a deliberate and analytic form of rumination, brooding consists of dwelling on negative thoughts and emotions. This Registered Report tests the hypothesis that specifically the brooding subtype of rumination increases conspiracy beliefs.

### **Defining Conspiracy Beliefs**

A conspiracy is a secret plot by a powerful group that aims to achieve a common goal. Importantly, the conspirators pursue this goal regardless of the consequences for others: Malicious intentions are not required, but the goal is pursued even if this harms others. Thus, conspiracies tend to have harmful consequences for many people (Douglas & Sutton, 2023). A conspiracy belief is the conviction that a conspiracy has taken (or is currently taking) place (Douglas et al., 2019). Some well-known examples include the belief that Bill Gates is using the Coronavirus vaccines as a ploy to gain control over the world population, or that the

American government was responsible for the 9/11 terrorist attacks. There are other conspiracy beliefs that many would consider more plausible, such as beliefs about the tobacco industry having concealed evidence (Francey & Chapman, 2000), or the Volkswagen emissions scandal (where the corporation eventually plead guilty to charges of conspiracy, Carey, 2017).

Understanding causes and enabling conditions of conspiracy beliefs is important. It lies in the public interest to disprove false, and uncover true conspiracies, particularly because conspiracy beliefs can have harmful consequences for individuals and societies: they negatively affect psychological well-being (Leibovitz et al., 2021; Liekefett et al., 2023), and decrease institutional trust, societal engagement, as well as compliance with important health behaviors (Bertin et al., 2020; Hornsey et al., 2020; Jolley & Douglas, 2014; Pummerer et al., 2020; van Mulukom et al., 2022). So, arguably, it would be ideal if people only believed in conspiracies that actually took place and not in any that did not take place. For the present purposes, however, we do not differentiate between true and false, or plausible and implausible conspiracy beliefs. We focus entirely on subjective beliefs that fulfill the criteria of a conspiracy belief. That is, we consider conspiracy beliefs as a superordinate category that may entail both warranted and unwarranted beliefs (Nera & Schöpfer, 2022).

### **Possible Pathways from Rumination to Conspiracy Beliefs**

Several theories on the formation of conspiracy beliefs, as well as on the consequences of rumination, imply that rumination should increase conspiracy beliefs. In this section, we summarize these theories and their predictions. Our goal is not to test these models against each other, or to identify the specific pathways through which rumination impacts conspiracy beliefs. Instead, our goal is to show that multiple theoretical approaches would suggest a causal link from rumination to conspiracy beliefs.

### ***Rumination, Negative Affect and Conspiracy Beliefs***

Current theories about the formation of conspiracy beliefs suggest that they result, at least in part, from the experience of negative affect. In a highly influential review paper, Douglas et al. (2017) argue that conspiracy beliefs emerge when people's fundamental needs for security, certainty, and belonging are frustrated. Such negative affective states make conspiracy beliefs appear attractive: Conspiracy beliefs offer ostensibly simple answers to complex questions, allow to shift the blame to clearly identified enemies, and provide a positive image of the self and ingroup (Douglas et al., 2017). In a similar vein, the existential

threat model of conspiracy theories suggests that existential threat, defined as feelings of anxiety and uncertainty, is at the root of conspiracy beliefs (van Prooijen, 2020). Existential threat prompts a sense-making process in which people aim to identify simple causal relations between and explanations for phenomena. When antagonistic outgroups that can be blamed for social problems are present, this sense-making process leads to conspiracy beliefs (van Prooijen, 2020). So, according to both Douglas et al. (2017) and van Prooijen (2020), experiencing negative affect is conducive to the formation of conspiracy beliefs.

Crucially, it is well-established that rumination in response to distress increases negative affect. Rumination has been described as an “emotional magnifier” that amplifies existing negative affective states (Watkins & Roberts, 2020, p.2). A number of experiments have shown that ruminating about distressing events prolongs negative mood. These studies have typically used a repeated measures design in which a rumination condition was compared to a distraction condition, and negative affect was measured before and after the manipulation. In a comprehensive review of research on the link between rumination and negative affect, Kirkegaard Thomsen (2006) concludes that 15 out of 20 studies that used such a design found the predicted group difference between rumination and distraction, two reported a trend in the expected direction, and three reported null results (which may, in part, be attributable to a failed manipulation). However, these studies did not examine whether effects resulted from an increase in negative affect due to rumination, or a decrease due to distraction (Kirkegaard Thomsen, 2006). As such, one can conclude that rumination increases negative affect compared to distraction, while its effects alone are less well studied experimentally.

Beyond these experimental results, a number of longitudinal studies provide evidence for a link between rumination and negative affect: the tendency to ruminate has consistently been found to predict longer and more severe periods of depression at a later time (Nolen-Hoeksema et al., 1997; Nolen-Hoeksema et al., 1994). Similarly, a recent experience-sampling study found evidence for a reciprocal relation between rumination and negative affect: within-person increases in rumination predicted subsequent within-person increases in negative affect, and vice versa (Blanke et al., 2022). Converging findings have been obtained by researchers using similar designs (Brans et al., 2013; Lennarz et al., 2019; Moberly & Watkins, 2008; Pavani et al., 2017).

Taken together, rumination and negative emotion appear to reinforce each other in a vicious cycle (Lyubomirsky & Tkach, 2004). Given that theories on the formation of conspiracy beliefs state that they are more likely to emerge when people experience negative

affect (Douglas et al., 2017; van Prooijen, 2020; van Prooijen & Douglas, 2018), rumination in response to distressing events should increase conspiracy beliefs. A similar line of thought can be found in recent research that suggests that emotion dysregulation, which is a general inability to regulate negative emotions, is correlated with conspiracy beliefs (Molenda et al., 2023; Scandurra et al., 2022). The following mechanism is proposed: Dysfunctional emotion regulation results in negative affect which, in turn, leads people to interpret ambiguous stimuli as threatening and hostile. This bias, in turn, contributes to the adoption of conspiracy beliefs (Molenda et al., 2023). Since rumination is a dysfunctional emotion regulation strategy (Aldao et al., 2010), the same argument can be applied to justify the effect of rumination on conspiracy beliefs.

### ***Rumination, Negative Cognitive Biases, and Conspiracy Beliefs***

Research demonstrates that rumination leads to negatively biased thinking (Lyubomirsky & Tkach, 2004). For example, experiments have shown that dysphoric participants induced to ruminate made more pessimistic attributions about upsetting experiences, made more negative predictions about future events, retrieved more negative memories from their past, and judged negative events as having occurred more frequently than dysphoric individuals that were distracted (Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky et al., 1999). A more recent study using a thinking-aloud paradigm further found that participants with higher trait rumination scores (specifically, trait brooding scores) demonstrated longer periods of negative thoughts in a resting state, and their negative thoughts were linked to a stronger narrowing in conceptual scope over time, as indicated by higher semantic similarity (Raffaelli et al., 2021). This converges with Andrews-Hanna et al. (2022)'s finding that, during a free association task, trait ruminators are more strongly attracted to negative conceptual spaces and more likely to remain there longer.

Conspiracy beliefs are negative explanations of often ambiguous, meaningful events: powerful groups or individuals that act in secret are made responsible for societal problems. Therefore, the negative attention and interpretation biases induced by rumination can be expected to contribute to conspiracy beliefs. In line with this, recent research has shown that conspiracy beliefs are related to a general suspicious processing style, that is, an intuitive tendency to perceive negative intentionality and secrecy in both conspiracy-related and -unrelated events (Frenken & Imhoff, 2022). Further, conspiracy beliefs are associated with several other thinking biases, such as the tendency to attribute agency and intentionality to inanimate objects (Douglas et al., 2016). An anxious attachment style, which entails an

exaggerated perception of threat and a negatively biased view of others, has also been found to predict conspiracy beliefs (Green & Douglas, 2018). These findings show that styles of thinking that share properties with rumination contribute to the formation of conspiracy beliefs.

### **Analogous Evidence from Research on Persecutory Delusions**

Lastly, rumination has been identified as an important precursor of persecutory delusions, defined as false beliefs about a malevolent persecutor who intends to commit harm (Westermann & Lincoln, 2011). Several studies provide evidence for an association between rumination (or closely related forms of repetitive negative thinking, such as worrying) and persecutory delusions (Freeman & Garety, 2014; Freeman et al., 2008; Hepworth et al., 2011; Ludwig et al., 2020; Martinelli et al., 2013; McKie et al., 2017). Importantly, the presence of worry predicts delusional episodes longitudinally (Freeman et al., 2012), and interventions targeting a worry thinking style were effective in reducing persecutory delusions, which provides evidence for a causal relationship (Foster et al., 2010; Freeman et al., 2015). The suggested causal mechanism again refers to a narrowing of attention to negative stimuli, and subsequent threat-related interpretation biases. These biases prevent the consideration of non-threatening information that could potentially disprove the delusion (e.g., Bortolon & Raffard, 2021).

Importantly, we do not equate conspiracy beliefs with persecutory delusions: Persecutory delusions are a form of psychopathology and conspiracy beliefs are not. Nonetheless, similar to persecutory delusions, conspiracy beliefs entail the conviction that harm is going to occur (or already has occurred), and that a threatening agent (persecutor or group of conspirators) will cause (or already has caused) harm (Freeman, 2007)<sup>11</sup>. Further, both conspiracy beliefs and persecutory delusions are firmly held, resistant to change, and highly distressing (Douglas et al., 2019; Freeman, 2007). Because of these substantial similarities, it appears worthwhile to investigate whether they may be enabled by analogous conditions and brought about by analogous causes. This kind of analogous reasoning has previously been used to motivate research on the link between narcissism and conspiracy belief (Cichocka et al., 2016).

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<sup>11</sup> Please note that not all conspiracy beliefs contain an anticipation of harm. Some are conspiratorial interpretations of ongoing or past events (e.g., 9/11 conspiracy beliefs).

## **Preliminary Predictions for the Current Research**

In sum, major theories directly concerned with the formation of conspiracy beliefs, combined with theories on the affective and cognitive consequences of rumination, strongly imply that rumination should increase the likelihood of conspiracy beliefs. Further support for this idea comes from research on persecutory delusions, which share key characteristics with conspiracy beliefs.

## **Pilot Studies**

We conducted four pilot studies to test the causal role of rumination (broadly conceived) in conspiracy beliefs. Pilot Study 1 tests the idea that the habitual tendency to ruminate is correlated with conspiracy beliefs. Pilot Studies 2a and 2b aimed to test the causal effect of experimentally induced rumination on conspiracy beliefs using hypothetical scenarios. Pilot Study 3 aimed to test the causal effect of rumination on conspiracy beliefs using real-world issues that were dynamically matched to participants based on which issue caused them the most concern. All Pilot Studies were administered in German language, and sampled participants that currently live in Germany and speak German fluently. The samples and results from all Pilot Studies are described in detail in the Supplement:

[https://osf.io/rdpz4/?view\\_only=91e958b982d64379a2c94e13859151a7](https://osf.io/rdpz4/?view_only=91e958b982d64379a2c94e13859151a7)

### **Pilot Study 1**

Pilot Study 1 (218 participants, recruited by the survey company respondi) tested correlations between two rumination measures (the Perseverative Thinking Questionnaire [PTQ], Ehring et al., 2011, and the Rumination Subscale of the Heidelberg Form of Emotion Regulation Strategies [HFERST], Izadpanah et al., 2019) and three conspiracy belief measures (Brotherton et al., 2013; Bruder et al., 2013; Wood, 2017). Both rumination scales measure the broad tendency to engage in repetitive negative thinking. The PTQ focusses on the general characteristics of the thinking process (i.e., whether it is repetitive, unproductive, and/or intrusive), whereas the rumination subscale of the HFERST refers specifically to distressing events and ruminating about the causes of one's negative emotions.

Pilot Study 1 was preregistered ([https://aspredicted.org/77Y\\_QYF](https://aspredicted.org/77Y_QYF)). Any deviations from the preregistration are described in the Supplement. Results demonstrated that both rumination measures were significantly correlated with all conspiracy belief measures (see

Table 1)<sup>12</sup>. This supports the idea that the tendency to ruminate is related to conspiracy beliefs<sup>13</sup>.

**Table 1**

*Bivariate correlations between conspiracy beliefs and rumination Pilot Study 1*

	<i>M</i>	<i>SD</i>	1	2	3	4	5
1 – Conspiracy Mentality Questionnaire	4.00	1.58	1				
2 – Generic Conspiracist Belief Scale	2.99	1.58	<b>.82**</b>	1			
3 – Flexible Inventory of Conspiracy Suspicions	3.49	1.84	<b>.79**</b>	<b>.74**</b>	1		
4 – Perseverative Thinking Questionnaire	3.49	1.34	<b>.26**</b>	<b>.27**</b>	<b>.19**</b>	1	
5 – Rumination Subscale	4.09	1.21	<b>.22**</b>	<b>.17*</b>	<b>.16*</b>	<b>.64**</b>	1

*Note.* \* $p < .050$ , \*\* $p < .010$ ; correlations between rumination and conspiracy beliefs are in bold.

### **Pilot Studies 2a and 2b**

Pilot Studies 2a ( $N = 401$ ) and 2b ( $N = 249$ , both recruited by respondi) aimed to test the causal effect of rumination on conspiracy beliefs using hypothetical scenarios, i.e., mock newspaper articles that raised the possibility of a conspiracy. In Pilot Study 2a, two scenarios were used: The first referred to claims about social media corporations wiretapping users' smartphones in secret for personal gains (social media scenario), the second described a controversial politician dying in a plane crash (plane crash scenario). In Pilot Study 2b, only the social media scenario was used. For each scenario, participants were randomly assigned to a rumination or a control condition. In the rumination condition, participants were asked to repeatedly think about and write down their thoughts and concerns about the events described in the scenario. Conspiracy beliefs and non-conspiratorial explanations about the scenario were measured, and participants indicated the extent to which they ruminated as a manipulation check (see Table 2).

<sup>12</sup> These correlations remain significant using Holm (1979) or Hommel (1988) correction for multiple testing. Using a Bonferroni correction, the two smallest correlations fail to reach significance. However, it can be argued that no correction for multiple testing is necessary: To confirm our expectation, all correlations between rumination and conspiracy beliefs need to be significant, not only one of them.

<sup>13</sup> Note that, given our sample size, the achieved power for some of these correlations (assuming that they reflect the true correlation) was not that high (e.g., we would have had a power of 66% for a correlation of .16 with  $\alpha = 0.05$ ). Future research attempting to replicate these correlations should ideally use larger samples.

**Table 2***Descriptive Statistics per Condition Pilot Studies 2a and 2b*

<b>Pilot Study 2a</b>			
<b>Scenario 1 (Social Media)</b>			
	Total ( $N = 193$ ), $M (SD)$	Rumination ( $n = 82$ ), $M (SD)$	Control ( $n = 111$ ), $M (SD)$
State Rumination	3.00 (1.34)	3.19 (1.37)	2.86 (1.30)
Conspiracy Beliefs	3.60 (1.55)	3.94 (1.60)	3.35 (1.47)
Non-Conspiratorial Explanations	4.70 (1.37)	4.52 (1.52)	4.84 (1.24)
<b>Scenario 2 (Plane Crash)</b>			
	Total ( $N = 208$ ), $M (SD)$	Rumination ( $n = 78$ ), $M (SD)$	Control ( $n = 130$ ), $M (SD)$
State Rumination	2.62 (1.40)	2.76 (1.51)	2.54 (1.33)
Conspiracy Beliefs	3.19 (1.68)	3.32 (1.79)	3.10 (1.60)
Non-Conspiratorial Explanations	4.55 (1.55)	4.35 (1.75)	4.67 (1.41)
<b>Pilot Study 2b: Scenario 1 (Social Media)</b>			
	Total ( $N = 228$ ), $M (SD)$	Rumination ( $n = 101$ ), $M (SD)$	Control ( $n = 127$ ), $M (SD)$
State Rumination	2.87 (1.65)	3.02 (1.71)	2.75 (1.59)
Conspiracy Beliefs	3.45 (1.68)	3.44 (1.76)	3.46 (1.63)
Non-Conspiratorial Explanations	4.85 (1.38)	4.96 (1.45)	4.75 (1.31)

*Note.* All items were answered on a 7-point Likert scale.

Pilot Studies 2a and 2b were preregistered (Pilot 2a: [https://aspredicted.org/CPG\\_NW2](https://aspredicted.org/CPG_NW2), Pilot 2b: [https://aspredicted.org/16G\\_642](https://aspredicted.org/16G_642)). Any deviations from the preregistration are described in the Supplement. Results revealed that, in the social media scenario of Pilot Study 2a, rumination was successfully induced ( $d = 0.25$ )<sup>14</sup>. As predicted, the rumination condition also scored significantly higher on conspiracy beliefs

<sup>14</sup> Note that the p-value for this one-sided test was close to .05 (specifically, .048), and can thus only provide tentative evidence of a successful manipulation (Benjamin et al. (2018).



than the control group ( $d = 0.39$ ). However, in the plane crash scenario of Pilot Study 2a ( $d = 0.16$ ), and in the social media scenario of Pilot Study 2b ( $d = 0.16$ ), we failed to successfully induce rumination. In both cases, we found no evidence that participants in the rumination condition ruminated significantly more or more intensely than those in the control group, which precluded a meaningful test of our hypothesis. We further did not find any statistically significant differences in conspiracy beliefs between the conditions ( $d$  Pilot Study 2a = 0.13,  $d$  Pilot Study 2b = -.01).

However, in all scenarios of these pilot experiments, the extent to which participants ruminated during the manipulation (i.e., the manipulation check) was positively correlated with conspiracy beliefs ( $r$ 's between .34 and .57). This suggests that not only habitual rumination, but also the spontaneous use of rumination in an experimental setting is correlated with conspiracy beliefs. Nevertheless, these results cannot provide evidence for a causal relationship. It may be that unobserved confounding variables that are related to both state rumination and conspiracy beliefs introduced a spurious correlation (Bollen, 1989).

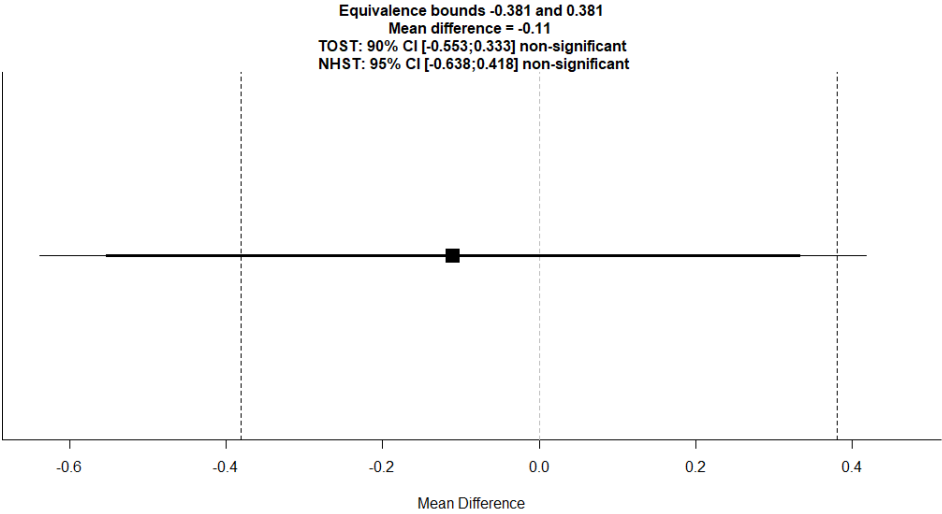
### **Pilot Study 3**

Overall, the results of Pilot Studies 2a and 2b highlighted the necessity to reconceptualize the experiment, especially since we failed to reliably induce rumination. First, our manipulation was considerably shorter than those typically used in clinical research. Second, the hypothetical scenarios may not have been considered real and/or worrisome by all participants. This may have resulted in a failure to induce rumination, or in effects that, assuming a monotonic dose-response relationship, were too small to be detected with adequate power. For these reasons, we designed a new rumination manipulation that was a) considerably longer and b) focused on real-world issues that caused actual worries to our participants. Participants were randomly assigned to rumination and control conditions, and were dynamically matched with the societal topic (out of a list of six topics, e.g., growing gap between rich and poor) that caused them the most concern. The list of the six topics was based on a pre-test: We selected topics that were worrisome to our participant pool and allowed for the interpretation of a conspiracy (see Supplement for details).

Results from Pilot Study 3 ( $N = 297$ , recruited from Prolific) revealed that this strategy was successful: The new rumination condition scored consistently and significantly higher than the control group on an entire range of manipulation checks (e.g., estimated and subjective length of time spent ruminating, intensity of rumination, thoughts growing more and more negative, perceived increases in frustration and negative mood). However,

conspiracy beliefs were not affected in the theoretically expected direction ( $d = -0.05$ ). An equivalence test, which examines whether effects larger than a specified smallest effect size can be rejected (for details, see below) revealed that an effect larger than  $d = 0.20$  could be rejected ( $p = .034$ , see Figure 1). Assuming  $d = 0.20$  as the smallest effect size of interest (for a justification of this smallest effect size of interest, see below), we can conclude that rumination did not meaningfully increase conspiracy beliefs. Nevertheless, conspiracy beliefs were again significantly correlated with a variety of manipulation checks (e.g., intensity of rumination, thoughts growing more and more negative, negative mood and frustration,  $r$  ranging from .22 to .37; although conspiracy beliefs were not significantly correlated with estimated and subjective length of time spent ruminating). It must be considered that these correlations may be due to the influence of third variables that are related to both the predictor and the outcome but not included in the current model.

**Figure 1**  
*Equivalence Bounds for Key Hypothesis Test*



*Note.* On the x-axis, unstandardized mean differences are depicted. The dashed vertical lines indicate the equivalence interval. The bold horizontal line indicates the 90% CI.

***Insights from Pilot Studies***

Overall, our Pilot Studies produced an inconclusive pattern of results. Out of two experiments that successfully induced rumination, only one showed the predicted effect on conspiracy beliefs (Pilot Study 2a, social media scenario). Pilot Study 3 provided evidence against the hypothesis that rumination increases conspiracy beliefs: Although rumination was

successfully induced, conspiracy beliefs did not meaningfully increase (assuming  $d = 0.20$  as the smallest effect size of interest). Our Pilot Studies provide several valuable insights for our Registered Report. First, Pilot Study 3 demonstrated that using real-world issues that are dynamically matched to participants is an effective procedure for inducing rumination. Second, they provide reason to suspect that rumination broadly conceived does not reliably impact conspiracy beliefs. A more fine-grained understanding of rumination may be necessary (see below). Lastly, our Pilot Studies are limited in that they only examined between-person effects. Yet the predicted effect explicitly takes place at the within-person level: If a person ruminates, that same person is thought to be more likely to believe in a conspiracy subsequently. Since between-person data are limited with regard to the evaluation of within-person hypotheses (Curran & Bauer, 2011), we plan to include within-person measures of change in the Registered Report.

### **Two Subtypes of Rumination: Brooding and Reflection**

Although initially thought of as a unitary construct (e.g., Lyubomirsky & Nolen-Hoeksema, 1995), advances in research on rumination suggest the existence of at least two subtypes: reflection and brooding (Treyner et al., 2003). Reflection is defined as a purposeful style of thinking aimed at cognitive problem solving, and brooding as a passive, unproductive dwelling on negative information (Armey et al., 2009; Treyner et al., 2003). More recent definitions state that reflection is purposeful, self-distanced, and solution-focused, whereas brooding is self-immersed, problem-focused, and passive (Satyshur et al., 2018).

For the present purposes, we define reflection as a deliberate, analytic, and controlled form of thinking that aims to achieve an epistemic goal, such as a better understanding of the problem at hand. It entails a critical evaluation of one's beliefs and conclusions and, potentially, updating one's belief of what is true and why. Engaging in reflection requires cognitive resources. Reflection is self-distanced in the sense that the focus of attention is on the matter at hand, and not on the self and one's emotions. Brooding, in contrast, consists of unproductive dwelling on one's worries and distressing emotions. The attention is focused on negative self-relevant information without pursuing any clear epistemic goal (Armey et al., 2009; Junkins & Haeffel, 2017). It can be difficult to disengage from brooding: The process can be thought of as a downward-spiral that pulls you deeper and deeper into negative circles of thoughts (Moberly & Watkins, 2008). For a comparison of reflection and brooding, see Table 3.

We argue that, depending on contextual factors, reflection may increase, decrease, or not affect conspiracy beliefs. For brooding, however, a clear prediction can be theoretically derived: it should increase the likelihood of adopting conspiracy beliefs. Our experimental manipulations so far induced rumination in the broader sense, and allowed for a mix of brooding and reflection: Although participants were instructed to write down their worries, and imagine their worry topic to get even worse, they were also asked about causes and consequences of their worry topic in a rather neutral and analytical way. Depending on the context, the reflective aspects of this manipulation may have counteracted the effect of brooding on conspiracy beliefs. This may have contributed to the inconclusive results. We summarize evidence pertaining to the distinct consequences of brooding and reflection below.

**Table 3**

*Comparison of Brooding and Reflection*

	<b>Brooding</b>	<b>Reflection</b>
Focus of attention	Self-focused; one's negative emotions and worries	Self-distanced; the concrete matter at hand
Processing style	Bias toward negative information; no critical evaluation of one's conclusions; uncontrolled; downward-spiral toward more negative thoughts	Ideally neutral, unbiased; critical evaluation of one's conclusions; deliberate; clear epistemic goal (e.g., understanding, problem-solving...)
Cognitive resources	Requires fewer resources to engage in, but difficult to disengage from	Requires more resources to engage in, but easier to disengage from
Consequences	Negative affect, negative attention and interpretation biases	Context-dependent

***Distinct Consequences of Brooding and Reflection***

Studies show that brooding and reflection are differentially related to negative affect, as well as negative attention and interpretation biases. Brooding is consistently and positively related to depression and negative affect, even among participants currently not suffering from a psychiatric disease (e.g., Arney et al., 2009; Burwell & Shirk, 2007; Joormann et al.,

2006; Watkins, 2009). With regard to reflection, however, it does not seem possible to make as clear a prediction as for brooding. While some studies find no correlation between reflection and depression, others observe that reflection constitutes a protective factor. Yet others observe that reflection, similar to brooding, is positively associated with depression (for a summary, see Allard & Yaroslavsky, 2019). Some have argued that reflection has detrimental consequences only when it is combined with brooding (Junkins & Haefel, 2017). One reason for this pattern of results may be that the consequences of reflection are highly context dependent: Reflection entails engaging with information about the issue at hand and relating it to one's background knowledge and relevant existing beliefs. As such, reflection combined with different types of background knowledge and pre-existing beliefs would produce different outcomes.

Further, brooding is consistently related to negative attention and interpretation biases, whereas reflection is not. For instance, brooding, but not reflection, is correlated with difficulties to disengage from sad faces, and quick disengagement from happy faces (Allard & Yaroslavsky, 2019; Joormann et al., 2006; Owens & Gibb, 2017). Brooding, but not reflection, is related to impaired executive functions (i.e., slowed refreshing). This suggests that brooders (but not reflectors) attribute greater relevance and allocate more cognitive resources to negative emotional stimuli (Bernblum & Mor, 2010). Further, Lo et al. (2008) observed that brooding was positively, and reflection even negatively associated with a negative cognitive style, defined as making more negative attributions in the Attributional Style Questionnaire (a self-report measure that assesses attributions of internality, stability and globality regarding hypothetical events).

These findings suggest that specifically brooding can be expected to increase negative affect and lead to a negatively biased processing of information. Since these are the processes that are relevant for the formation of conspiracy beliefs (see above), we predict that brooding should increase conspiracy beliefs. For reflection, we do not make a clear prediction. Some evidence suggests that reflective forms of thinking (e.g., deliberation) may even counteract conspiracy beliefs directly (Pennycook et al., 2015; Rizeq et al., 2021; Swami et al., 2014), yet this effect may also depend on contextual variables, such as the plausibility of a conspiracy in the respective domain, or the extent to which one is already invested in the idea of a conspiracy (van Prooijen et al., 2020, see Supplement for details on this idea).

## Registered Report

This Registered Report conducted a comprehensive test of the hypothesis that brooding about distressing societal issues increases conspiracy beliefs. We also explored how reflection impacts conspiracy beliefs. We experimentally manipulated both brooding and reflection by adapting the experimental procedure from Pilot Study 3: Participants were again dynamically matched with a societal topic that caused them concern. In the brooding condition, participants focused on their worries and negative emotions related to this issue. In the reflection condition, participants were instructed to think about potential explanations for their worry topic in an analytical way. Further, we focused on within-person changes: We included a baseline assessment (T1) 5-10 days prior to the experiment (T2) where participants' conspiracy beliefs about their worry topic were measured. At T2, participants were randomly assigned to three conditions (brooding, reflection, control), went through their respective manipulations, and again indicated their conspiracy beliefs about their worry topic. We predicted that participants in the brooding condition would experience a greater increase (or smaller decrease) in conspiracy beliefs from T1 to T2 than participants in the control group.

By incorporating equivalence and minimum effect tests (for details, see below), we ensured that results are informative and interpretable regardless of whether the hypothesized effect exists or not (Lakens, 2017). Further, we increased the efficiency of our sampling procedure by using a sequential design (Lakens et al., 2021). The last stage of the sequential design had 90% power to detect our smallest effect of interest.

### Method

Drafts of the questionnaires for T1 and T2 can be found in the Supplement (English translations) on OSF:

[https://osf.io/rdpz4/?view\\_only=91e958b982d64379a2c94e13859151a7](https://osf.io/rdpz4/?view_only=91e958b982d64379a2c94e13859151a7). All materials presented to participants were in German.

### *Time Point 1 (T1)*

**Identification of Worry Topic.** To begin, participants were presented with six societal issues and asked to rank them according to which worries them most: (a) Growing gap between rich and poor, (b) Growing division in society, (c) Mass surveillance on the internet, (d) Censorship and restriction of freedom of expression, (e) Political influence of large corporations, and (f) Exploitation by global capitalism. Based on a pre-test (see Pilot

Study 3 in the Supplement), we selected topics that were worrisome to participants and, at the same time, allowed for the interpretation of a conspiracy. It may be that some topics lend themselves more easily to the interpretation of a conspiracy than others, which could have introduced some bias in between-person comparisons. However, due to randomization, the distribution of selected topics in the conditions should be similar between conditions. All in all, we believe that, for the present purposes, it was more important that all participants received a topic that actually caused them concern, than to keep the actual topic constant across conditions. Nevertheless, we conducted robustness checks to investigate whether effects are similar for different topics, and estimated mixed models that include a random effect for societal topic (exploratory analyses).

**Conspiracy Beliefs.** Participants indicated the extent to which they believe that their worry topic could be explained by a conspiracy. They answered three items on a 7-point scale, each of which entailed all defining characteristics of a conspiracy: X exists because powerful actors secretly advance their own interests, even if they harm others in this process; X is caused by influential groups that keep their actions covert and are concerned only with their own advantage; X can be traced back to the fact that certain key players ruthlessly pursue their own goals in secret (X will be replaced by the topic participants chose as most worrisome at T1).

**Depression and Suicidality Screening.** Participants who did not pass a depression and suicidality screening were not able to complete T2. This is because we did not want to expose vulnerable participants to the brooding manipulation. Participants answered the Patient-Health-Questionnaire-9 (PHQ-9), and a four-item suicide screening tool (Horowitz et al., 2012). Participants who scored 10 or higher on the PHQ-9 (Levis et al., 2019), or answered yes to any of the suicide screening items, were filtered out.

**Exploratory Measures.** Some measures were included for exploratory purposes, namely participants' trait tendency to brood and reflect (self-developed items), the Conspiracy Mentality Questionnaire (Bruder et al., 2013), the Generic Conspiracist Belief Scale-5 (Kay & Slovic, 2023), and some demographic items (age, gender, level of education, subjective social class, political orientation).

### ***Time Point 2 (T2)***

**Overall Procedure.** First, participants were randomly assigned to brooding, reflection, or control conditions. Then, participants in the brooding and reflection conditions were reminded of the topic they selected at T1 as most worrisome and proceeded to their

respective manipulations. Participants in the control condition proceeded directly to the dependent variable. We deliberately chose a control group that proceeds directly to the dependent variable (baseline control group) over a distraction control group because only the baseline control group allows for the conclusion that it was actually brooding that affected conspiracy beliefs. In a distraction control group, it would be impossible to disentangle whether brooding increased, or whether the alternative task given in the distraction control group actually decreased conspiracy beliefs. Nevertheless, this creates a minor limitation: The participants in the brooding and reflection conditions spent extra time answering open-ended, repetitive questions – a task that most participants presumably did not enjoy. As such, the possibility remains that this feature of the manipulation increased frustration, which could, in theory, affect conspiracy beliefs. Yet we believe that the advantages of this design (isolating the causal effect of brooding) outweigh this disadvantage.

After the manipulations, participants answered the dependent variable again (see T1), manipulation checks about the extent to which they brooded, reflected or thought about an unrelated topic during the manipulation (see below), as well the German version of the SPANE (Rahm et al., 2017), which is a short measure of positive and negative affect.

**Brooding Manipulation.** In the brooding condition, participants were instructed to repeatedly think about the concerns that their worry topic causes them, and how this makes them feel. They answered a series of questions that build onto each other and simulate a downward spiral of worries and negative thoughts. To begin, all participants answered seven questions. Subsequently, all participants answered one cycle of repetitions. Then, the repetition questions were repeated one after the other until five minutes have passed. As soon as five minutes had passed, the “continue” button brought participants to the dependent variable instead of to the next question. Participants received the following instructions: You indicated that X worries you the most. The following is for you to reflect on your concerns about this topic (X will be replaced by the topic participants chose as most worrisome at T1):

1. What concerns do you have about X? Please take a moment to think about this before writing down your concerns.
2. Which of these concerns makes you feel particularly bad?
3. Why does this concern make you feel so bad?
4. How do you feel as you think about this concern? Please describe these feelings in as much detail as possible.
5. Which of these feelings do you find most uncomfortable?
6. Why is this feeling the most uncomfortable for you?



7. What would happen to you if you felt such feelings very intensely for a long time?

Repetitions (until 5 minutes have passed; at least one cycle of repetitions):

1. What other concern about X makes you feel particularly bad?
2. (questions 3-7 as above)

**Reflection Manipulation.** The goal of the reflection manipulation was for participants to analytically think about the topic and try to achieve an epistemic goal, namely evaluating potential explanations for their worry topic. An important aspect of reflection is that one critically evaluates one's beliefs and interpretations. For this reason, participants generated potential explanations of their worry topic, evaluated the plausibility of these explanations, and thought about alternatives. As in the brooding condition, participants answered seven questions and went through at least one cycle of repetitions. If five minutes had not passed by then, the repetition questions were presented one by one until five minutes were over. They received the following instructions: You indicated that X worries you the most. In the following, you should think about this topic.

1. What could be possible explanation for X? Please take a moment to think about this before writing down the possible explanations.
2. Which of these explanations do you think is the most plausible?
3. What speaks for or against this explanation actually being true?
4. What is a particularly compelling argument **for** this explanation being true?
5. What is a particularly compelling argument **against** this explanation being true?
6. Now that you have thought about this, please make a final judgement: How plausible do you think it is that this explanation is actually true?
7. What could influence your judgement in one direction or the other?

Repetitions (until 5 minutes have passed, at least one cycle of repetitions):

1. What could be another explanation for X that you think is plausible?
2. (questions 3-7 as above)

**Manipulation Checks.** To ensure that our manipulations achieved what was intended, all participants indicated the extent to which they (a) brooded about their worries and emotions in relation to their worry topic, (b) reflected on potential explanations for their worry topic, and (c) did not think about their worry topic in a particular way *in the five minutes before they answered the dependent variable (DV)*. As such, for participants in the brooding condition, the manipulation checks (MCs) indicated the extent to which they brooded, reflected or thought about something else during the brooding manipulation; in the reflection condition, the MCs captured participants' style of thinking during the reflection

manipulation; and in the control condition, the MCs referred to whatever participants did in the 5 minutes before they answered the DV, thus capturing participants' 'thinking as usual'. So, in all conditions, the MCs capture participants' style of thinking in the five minutes before they answered the DV.

Participants read: *When answering the following questions, think about the 5 minutes before you answered the previous page of the questionnaire.* In addition, a timeline will graphically display the 5 minutes participants should refer to (see Supplement for details).

All items were introduced with "During these five minutes...". Brooding was measured with three items: I was constantly thinking depressing thoughts about X, I have been ruminating about unpleasant thoughts and feelings that X triggers in me, and I have thought a lot about how bad my worries about X make me feel. Reflection was measured with three items: I thought analytically about possible explanations for X, I have tried to arrive at the most correct estimate of possible explanations for X, I systematically questioned different explanations for X. 'Thinking as usual' was measured with three items: I did not spend any thought on X, I did not think about X, I have not thought specifically about X.

## **Analysis Plan**

In order to ensure that our final study is informative regardless of whether the hypothesized effect actually exists, we complemented conventional null-hypothesis significance tests with equivalence and minimum effect tests for both the main hypothesis and the manipulation checks (Lakens, 2022; Lakens et al., 2018).

Equivalence tests determine whether effects large enough to be of interest can be rejected. Since it is never possible to demonstrate that an effect is *exactly* zero, performing an equivalence test requires the specification of a range of values that are considered equivalent to zero, that is, a smallest effect size of interest (SESOI): the smallest effect that would still be considered theoretically interesting (Lakens et al., 2018). If the lower and upper limits of the confidence interval of the effect size fall completely within the equivalence range, one would consider the effect equivalent to zero.

Minimum effect tests determine whether effects smaller than the SESOI can be rejected, that is, whether an effect is not just statistically significant, but also practically meaningful. If the confidence interval of the effect size would fall completely beyond the SESOI, one would consider the effect practically meaningful (Lakens, 2017, 2022). All t-tests that will be conducted will be Welch's t-tests.

### ***Justification of Smallest Effect Size of Interest***

We begin with defining the SESOI of our main hypothesis test: the effect of brooding on conspiracy beliefs. Subsequently, we outline our rationale for the SESOI of our manipulation checks. To our knowledge, the question of what constitutes a meaningful effect has not yet been addressed in the conspiracy beliefs literature. For this reason, we considered several potential justifications for our SESOI (see Table 4), which are described in detail in the Supplement. This leaves us with five plausible SESOIS that range from  $d = 0.15$  to  $d \sim .30$ , with a median of  $d = 0.20$ . Based on this median, we suggest  $d = 0.20$  as our SESOI for the effect of brooding on conspiracy beliefs. Since we test a directional hypothesis, we will conduct one-sided equivalence and minimum effect tests. This means that we will consider our effect practically meaningful if the lower limit of the 90% confidence interval of the effect size falls beyond  $d = 0.20$ , and practically negligible if the upper limit falls below  $d = 0.20$ .

We argue that the SESOI for our manipulation check (i.e., the SESOI that determines whether the manipulation produced a meaningful effect on brooding) should be larger than that of the main hypothesis test: Presumably, a change of a certain magnitude in brooding would lead to a respectively smaller change in conspiracy beliefs. Thus, a larger change in brooding would be required to observe an effect of  $d = 0.20$  on conspiracy beliefs. We are unaware of any recommendations for how the SESOI of a manipulation check should relate to the SESOI of the main effect of interest. Most likely, the manipulation check should show a stronger effect. We propose that the SESOI for the manipulation check should be at least 50% larger, which results in  $d = 0.30$ . So, we would consider the effect of the manipulation check practically meaningful if the lower limit of its 90% confidence interval falls beyond  $d = 0.30$ , and practically negligible if the upper limit falls below  $d = 0.30$ .

**Table 4**

#### *Set of Plausible Approaches to Setting the SESOI*

Approach	Effect size $d$
Small standardized effect (Cohen, 1992)	0.20
Small effect based on empirically derived effect size distributions (Lovakov & Agadullina, 2021)	0.15
Small telescope approach: what the original study had 33% power to detect (Simonsohn, 2015), in this case: Pilot Study 2a	0.18
Meta-analysis of related research (Biddlestone et al., 2022)	0.26
Raw mean difference of within-person changes of .50	$\sim 0.30$

### ***Manipulation Checks***

The following pattern of results would be ideal for our manipulation checks (see also Figure 2): (a) the brooding condition should score meaningfully higher on the brooding MC than both reflection and control conditions, (b) the reflection condition should score meaningfully higher on the reflection MC than both brooding and control conditions, (c) the control group should score meaningfully higher on the ‘thinking as usual’ MC than both brooding and reflection conditions, (d) reflection and control conditions should not differ on the brooding MC, (e) brooding and control conditions should not differ on the reflection MC, (f) brooding and reflection conditions should not differ on the ‘thinking as usual’ MC, (g) within the brooding condition, brooding scores should be higher than reflection and ‘thinking as usual’ scores, (h) within the reflection condition, reflection scores should be higher than brooding and ‘thinking as usual’ scores, and (i) within the control condition, ‘thinking as usual’ scores should be higher than brooding and reflection scores.

However, testing each of these hypotheses (which would, ideally, all be supported at the same time) at the usual alpha level would result in a very conservative test of the overall pattern. Further, not all aspects of this pattern are equally important for the analyses we intend to conduct. For this reason, we do not make the entire pattern of results a condition for accepting (or rejecting) our manipulation as effective. Instead, we focus on the most relevant criteria (see also the stopping rules specified in the sampling plan). That is, we will consider the brooding manipulation effective if (1) the brooding condition scores meaningfully higher on the brooding MC than the control group, that is, the lower limit of the 90% CI falls above  $d = 0.30$ , AND (2) the control group scores meaningfully higher on the ‘thinking as usual’ MC than the brooding condition, that is, the lower limit of the 90% CI falls above  $d = 0.30$  (see also MC 1 and MC 2 in Figure 2). We will nonetheless evaluate the full pattern and discuss how deviations from the optimum might limit the interpretation of the findings.

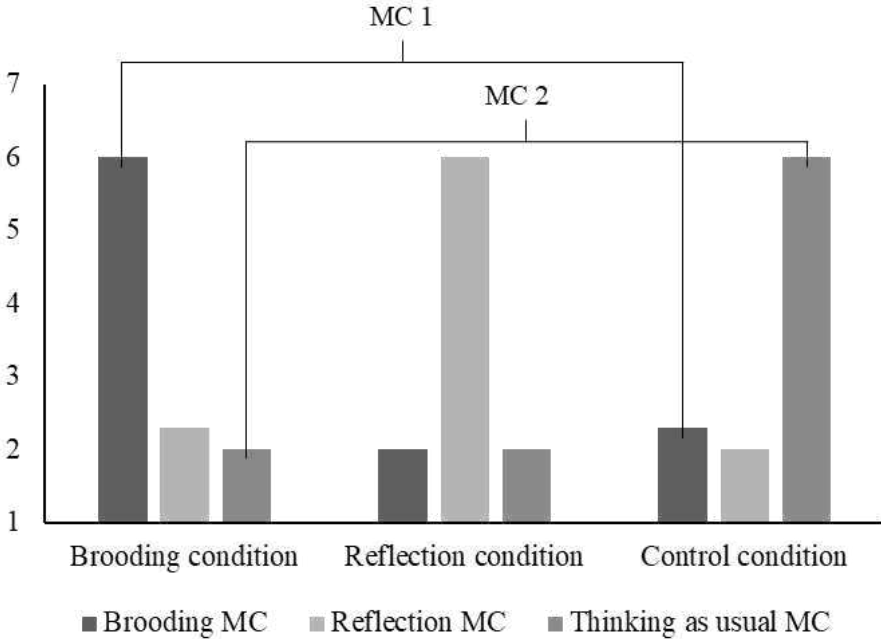
Should this manipulation check fail, we will nonetheless explore the data and report results for the main hypothesis test. However, we will not draw any confirmatory conclusions about our hypothesis, since it will not be possible to conclude whether it was actually brooding that increased (or failed to increase) conspiracy beliefs (see also K. Fiedler et al., 2021).

### ***Main Hypothesis Test***

To test our main hypothesis, we computed difference scores by subtracting T1 conspiracy belief scores from T2 conspiracy belief scores. We then evaluated whether the

brooding condition reported a greater increase (or smaller decrease) in conspiracy beliefs from T1 to T2 than the control group. A one-sided minimum effect test determines whether the effect of the brooding manipulation was practically meaningful (i.e., whether the lower limit of the 90% confidence interval of  $d$  falls beyond  $d = 0.20$ ), which would confirm our hypothesis. If not, a one-sided equivalence test determines whether the effect of brooding is practically negligible (i.e., the upper limit of the 90% confidence interval of  $d$  falls below  $d = 0.20$ , equivalence test), which would disconfirm our hypothesis. If neither the equivalence nor the minimum effect test yields a conclusive result (i.e., the 90% CI of  $d$  overlaps with  $d = 0.20$ ), a conventional one-sided Welch’s t-test determines whether we can at least reject zero. In this case, we would conclude that most likely there is an effect, but it is unclear whether it is practically meaningful.

**Figure 2**  
*Ideal Pattern of Manipulation Check Results*



*Note.* On the y-axis, mean scores on the brooding, reflection and ‘thinking as usual’ manipulation checks are depicted. MC1 and MC2 are the key tests on which the testability of our main hypothesis depends.

**Exploratory Analyses**

Several exploratory analyses were conducted, e.g., concerning negative affect and the role of potential moderators (e.g., it may be that effects of brooding on conspiracy beliefs are

stronger for those participants with a high tendency to brood or with high levels of conspiracy mentality at T1), and whether the within-person change in the reflection condition differs from the within-person change in the control group. We also conducted a variety of robustness checks: e.g., mixed models that include a random effect for which worry topic participants chose, ANCOVA testing for mean differences in T2 conspiracy beliefs using T1 scores as a covariate, bias-corrected effect size estimates instead of Cohen's  $d$  (such as Hedge's  $g$  and Glass'  $\delta$ ), and Bayes factors that quantify the relative evidence for the null and alternative hypothesis.

### **Sampling Plan**

We aimed to achieve 90% power to detect our smallest SESOI ( $d = 0.20$ ) with  $\alpha = .05$  in a one-sided Welch's  $t$ -test. In order to design our study as efficiently as possible, we used a sequential design. This means that data were analyzed repeatedly during data collection and data collection could be stopped, either because sufficient evidence for a meaningful effect had been obtained (the minimum effect test was significant), or because sufficient evidence for the absence of a meaningful effect had been obtained (the equivalence test was significant). Due to the possibility of stopping data collection early, sequential designs lead to a lower average expected sample size than fixed designs, and can thus be considered more efficient (Lakens et al., 2021). In contrast to optional stopping, which is a questionable research practice, the average type I and type II error rates are controlled across looks.

### ***Sequential Design***

Using the `rpack` package (Wassmer & Pahlke, 2022) we have designed a sequential study with 90% power for  $d = 0.20$  in a one-sided test, an alpha level of 5%, and two equally spaced looks (the first look after approximately 50% of data have been collected). The Type I error rate is kept at 5% across both looks using a Pocock-like alpha spending function, and the Type II error rate is kept at 10% using a Pocock-like beta spending function.

An a priori power analysis showed that at most 546 participants per condition were needed (total  $N = 1,638$ ). The first look was planned after approximately 820 participants had been collected.

Using the Pocock like alpha spending function, we can calculate the alpha levels at each look that would lead to a rejection of the respective null hypotheses of equivalence, minimum

effect and conventional t-test. At the first look (50% of data), the alpha level is .031. At the last look (100% of data), the alpha level is .030.

In case of deviations from the pre-planned number or timing of looks, the alpha spending function allows to recalculate the alpha levels based on the exact amount of information that has been observed. So, it is not strictly necessary to analyze the data *exactly* after 50% have been collected (Lakens et al., 2021).

### ***Power for Equivalence and Minimum Effect Test***

We planned the design to be able to detect the SESOI of  $d = 0.20$  with 90% power in a one-sided Welch's t-test. We conducted additional sensitivity analyses for the power of the equivalence and minimum effect tests. The power of both of these tests depends on the true effect size, and how close it is to the SESOI: If the true effect size happened to be identical to the SESOI, neither the null hypothesis of the equivalence test (i.e., an effect as large or larger than  $d = 0.20$ ) nor that of the minimum effect test (i.e., an effect below  $d = 0.20$ ) could be correctly rejected: every significant result would be a type I error. The closer the true effect is to  $d = 0.20$ , the more participants are needed for a high-powered equivalence and minimum effect test.

Assuming a true effect of zero, the one-sided equivalence test at the final stage of the sequential design would have 99% power (with  $n = 1092$  [for two conditions] and alpha = 5%). Assuming a true effect of  $d = 0.1$ , the equivalence test would have 75% power. Assuming a true effect of  $d = 0.35$ , the minimum effect test at the final stage would have 97% power (with  $n = 1092$  and alpha = 5%). Assuming a true effect size of  $d = 0.30$ , the minimum effect test would have 76% power.

### ***Stopping Rules***

We would have terminated data collection if any of the following conditions had been met (see also the Design Table in the Supplement): (a) the brooding manipulation was ineffective, that is, the equivalence test for the brooding MC was significant (the upper limit of the 90% CI fell below  $d = 0.30$ ), OR the equivalence test for the 'thinking as usual' items was significant (the upper limit of the 90% CI falls below  $d = 0.30$ ); (b) the presence of a meaningful effect of brooding on conspiracy beliefs could be rejected (significant equivalence test: the upper limit of the 90% CI falls below  $d = 0.20$ ); (c) the manipulation was effective AND the effect of brooding on conspiracy beliefs was practically meaningful (significant minimum effect test: the lower limit of the 90% CI falls above  $d = 0.20$ ).

### ***Recruitment of Participants***

Participants were recruited from the non-commercial SoSci Panel (Leiner, 2016). This panel provides two major advantages compared to other providers: First, its participants have signed up for the panel because they are genuinely interested in participating in surveys, which should increase data quality and compliance (Leiner, 2016). Second, the panel provides a large pool of German-speaking participants: In August 2019, more than 80,000 active panelists were registered in the SoSci Panel, the majority of which is resident in Germany (SoSci Panel, 2023). This clearly outnumbers the pool of German-speaking participants on Prolific.

We planned data collection as follows: In a first step, recruit approximately 1,000 participants for T1. Then, invite these participants to T2 5-10 days later and filter out those who did not pass the depression or suicidality screening, or did not complete T1 until the end at the beginning of T2. We hoped that, from this first round of invitations, about 820 participants (i.e., about 50% of the full sample) would complete T2 and pass the exclusion criteria, allowing us to perform the first look. Had this not been the case, more participants would have been recruited, until about 820 could be included in T2. In case of an inconclusive result at the first look, we planned to recruit another batch of 800 participants for T1 and to invite them to T2 5-10 days later. Had this strategy not been sufficient to achieve the full sample ( $N = 1,638$ ), more participants would have been added successively until the full sample size was achieved.

As planned, participants were excluded from data analysis if they (a) cancelled their participation and requested their responses to be deleted, (b) did not provide complete data on all necessary measurements (i.e., the manipulations, dependent variable, and manipulation checks), or (c) if they indicated at the end of the survey that they did not participate seriously. Participants (including those who were filtered out in the depression and suicidality screening) were able to participate in a raffle of 5 vouchers worth 100 €.

Three further participants had to be excluded due to unforeseeable technical errors: one person completed T1 twice (which should not have been technically possible). Two other participants completed T2, then restarted the survey and were randomized again. Data from these participants are uninterpretable, which is why we excluded them from analysis.



## Results

All data, analysis scripts, and study materials (German original and English translation), can be found on OSF:

[https://osf.io/rdpz4/?view\\_only=91e958b982d64379a2c94e13859151a7](https://osf.io/rdpz4/?view_only=91e958b982d64379a2c94e13859151a7).

### *Look 1*

The first look was conducted with 50% of the required sample size per condition. Specifically, the first look was conducted with the first  $n = 273$  participants, respectively, in the brooding and control condition. Note that, because early termination of the study was more frequent in the brooding condition than in the control condition, the target sample size was achieved earlier in the control condition than in the brooding condition.

**Stopping Rules.** We checked whether any of the stopping rules for our manipulation checks were applicable. Regarding the brooding MC, the effect size was clearly beyond our SESOI of  $d = .30$ :  $d = 1.38$ , 90% CI [1.22, 1.53]. Similarly, the effect size of the ‘thinking as usual’ MC was clearly beyond this SESOI:  $d = 1.06$ , 90% CI [0.91, 1.21]. This confirms the success of our manipulations and does not warrant a stop of data collection.

Regarding our main hypothesis test, the 90% CI of the effect of brooding on conspiracy beliefs overlapped with our SESOI of  $d = 0.20$ :  $d = 0.18$ , 90% CI [0.04, 0.34]. As such, neither the equivalence nor the minimum effect test could provide a conclusive result. For this reason, we continued data collection.

### *Look 2*

**Sample.** To achieve the desired level of power for our confirmatory test, 546 participants per condition were needed for the final look. To match the planned analysis as closely as possible, we conducted the final look with the first 546 participants, respectively, that completed each condition. This resulted in a sample of  $N = 1,638$ , out of which 893 identified as female, 736 as male, and 9 as diverse. The average age was 52.12, ( $SD = 14.14$ ). The sample was highly educated: 172 completed a PhD, 975 completed a university degree, 251 completed high school (“Abitur”), 209 completed higher secondary school (“Realschule”), and 31 completed lower secondary school (“Hauptschule”) as their highest degree of education.

At the time when the brooding condition reached the sample size required for the registered analysis ( $n = 546$ ), the control condition already contained 703 participants that passed the inclusion criteria, and the reflection condition contained 499. This suggests that

early termination of the study was more frequent in the brooding and reflection conditions than in the control condition. We will investigate dropout more closely in the exploratory analyses.

More participants than required for the final look completed the survey. Until October 15, 2023,  $N = 2,007$  completed the study and passed the inclusion criteria. We report results of this full sample in the Supplement (this did not change any conclusions of the registered analyses).

**Manipulation Checks.** We first tested whether our manipulation worked as intended. Both confirmatory manipulation checks, on which the testability of our main hypothesis depends, were successful: the brooding condition scored meaningfully higher on the brooding MC compared to the control condition:  $t(1023) = 17.53, p < .001, d = 1.36, 90\% \text{ CI } [1.25, 1.47]$ . Similarly, the control condition scored meaningfully higher on the ‘thinking as usual’ MC compared to the brooding condition:  $t(986.7) = 13.12, p < .001, d = 1.09, 90\% \text{ CI } [0.99, 1.20]$ .

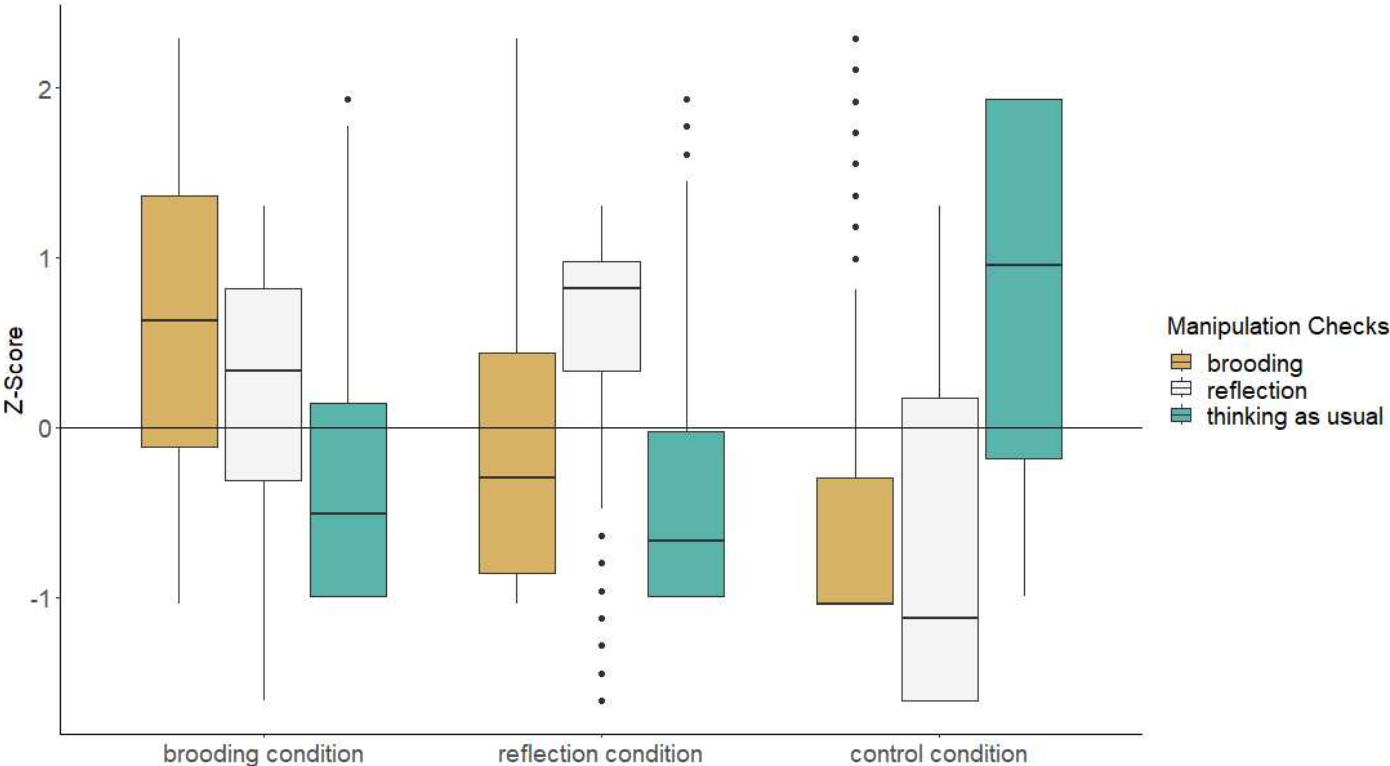
Next, we examined how much time people spent with the experimental manipulations: The median time spent with the brooding manipulation was 14.30 minutes. The median time spent with the reflection manipulation was 18.39 minutes. The median number of iterations that participants went through was two for both brooding and reflection manipulations.

Direct comparisons of mean values across brooding and reflection MC scales may be difficult to interpret due to potential differences in item difficulties. Therefore, for an exploratory analysis of the full pattern of manipulation checks, we z-standardized the brooding MC, reflection MC, and ‘thinking as usual’ scores and plotted them in boxplots for each condition (see Figure 3). Results were largely in line with the idealized pattern of MCs described in the Analysis Plan: The brooding condition scored highest on the brooding MC, the reflection condition scored highest on the reflection MC, and the control condition scored highest on the ‘thinking as usual’ MC. Also, within the brooding condition, scores on the brooding MC were highest; within the reflection condition, scores on the reflection MC were highest; and within the control condition, ‘thinking as usual’ scores were highest. However, it is notable that the brooding condition also reported relatively high reflection scores. We will return to this observation in the General Discussion.

**Main Hypothesis Test.** Our main hypothesis concerns the difference score in conspiracy beliefs between the brooding and control condition. Notably, all conditions reported a decrease in conspiracy beliefs from T1 to T2, resulting in difference scores with a negative sign in all conditions (for descriptive statistics by condition, see Table 5).

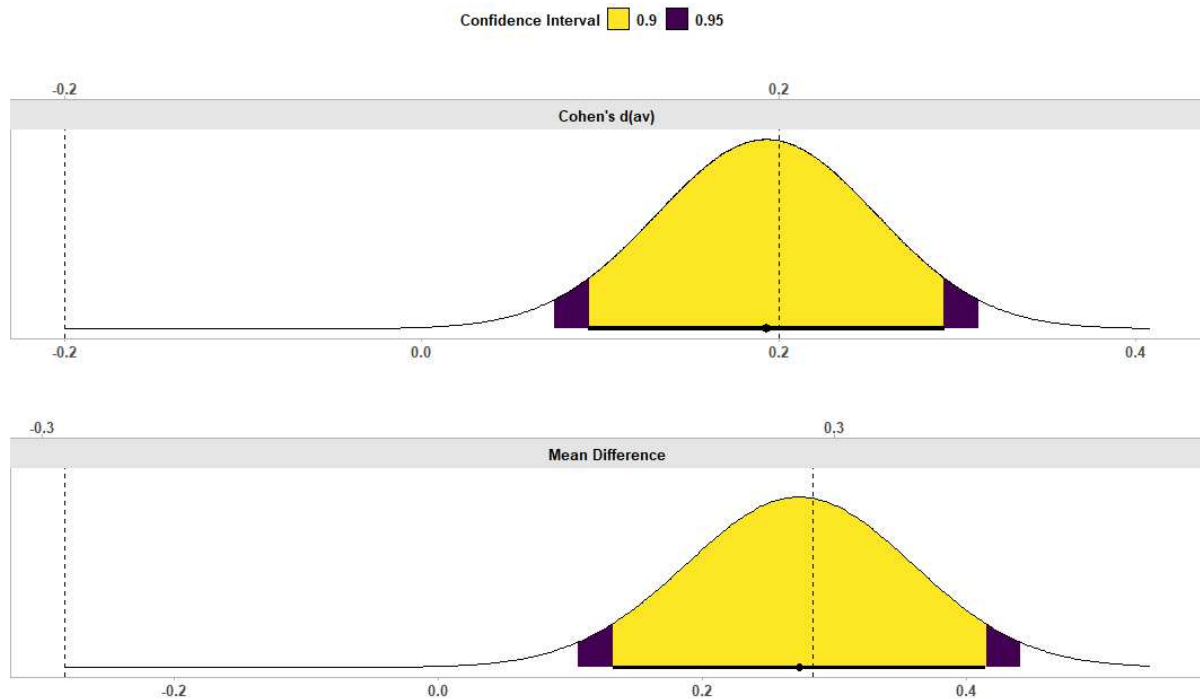
A one-sided Welch’s t-test comparing difference scores between the brooding and control condition yielded a statistically significant result:  $t(1078.8) = -3.19, p < .001, d = 0.19, 90\% \text{ CI } [0.09, 0.29]$ . This demonstrates that brooding resulted in significantly smaller decreases in conspiracy beliefs compared to the control group. However, the confidence interval of this effect overlapped with  $d = 0.20$  (see Figure 4), suggesting that neither the minimum effect test ( $t(1079) = -0.11, p = .545$ ) nor the equivalence test could yield a significant result ( $t(1079) = -0.11, p = .455$ ). Thus, our hypothesis of a meaningful effect could not be confirmed. We can conclude that brooding resulted in higher conspiracy beliefs compared to the control group, but it is unclear whether this effect is practically meaningful regarding our proposed SESOI of  $d = 0.20$ .

**Figure 3**  
*Full Pattern of Manipulation Checks*



**Table 5*****Descriptive Statistics for Conspiracy Beliefs by Condition***

	Control condition ( <i>n</i> = 546)	Brooding condition ( <i>n</i> = 546)	Reflection condition ( <i>n</i> = 546)
T1 Conspiracy Beliefs: <i>M</i> ( <i>SD</i> )	3.93 (1.94)	4.03 (1.92)	3.97 (2.01)
T2 Conspiracy Beliefs: <i>M</i> ( <i>SD</i> )	3.02 (1.71)	3.39 (1.94)	3.24 (1.91)
T2-T1 Difference Score: <i>M</i> ( <i>SD</i> )	-0.92 (1.49)	-0.64 (1.34)	-0.73 (1.42)

**Figure 4*****Consonance Density Plot for the Effect of Brooding on Conspiracy Beliefs******Exploratory Analyses***

We conducted exploratory analyses pertaining to the effect of reflection on conspiracy beliefs, and to the role of positive and negative affect. We further conducted a variety of robustness checks concerning the effect of brooding on conspiracy beliefs, and investigated whether early termination of T2 during the manipulations was predicted by T1 conspiracy beliefs and/or condition. For these analyses, we used the largest sample we had available (i.e., all participants that passed the inclusion criteria and completed the study until October 15,

2023). We summarize the results of these analyses here, and present details in the Supplement.

**Reflection.** We were interested to explore how reflection impacted conspiracy beliefs. Descriptively, the reflection condition reported a smaller decrease in conspiracy beliefs from T1 to T2 than the control condition ( $M_{\text{reflection}} = -0.74$ ,  $SD_{\text{reflection}} = 1.42$ ,  $M_{\text{control}} = -0.94$ ,  $SD_{\text{control}} = 1.49$ ). This mean difference was statistically significant in a two-sided Welch's t-test. We will come back to this finding in the General Discussion.

**Negative and Positive Affect.** Brooding and reflection significantly increased negative affect, and significantly decreased positive affect compared to the control group. In addition, brooding induced more negative and less positive affect than reflection. These results are consistent with the idea that brooding increases negative affect.

**Robustness Checks.** Several analyses confirmed the robustness of the effect of brooding on conspiracy beliefs: between-person analyses testing for mean differences in T2 conspiracy belief scores, a mixed model including a random effect for participants' worry topic, an ANCOVA testing for mean differences in T2 conspiracy beliefs using T1 scores as a covariate, bias-corrected effect size estimates, and Bayes Factors all yielded the same conclusion reported in the main analysis.

**Potential Moderators.** Participants' trait tendency to brood (measured at T1) and their baseline conspiracy beliefs (CMQ and GCBS, both measured at T1) did not significantly moderate the effect of brooding on conspiracy beliefs. However, power for these tests was likely low (Sommet et al., 2023).

**Dropout Analyses.** We analyzed whether early termination of T2 during the manipulations (i.e., after being randomized to a condition) was predicted by T1 conspiracy beliefs and/or condition. Results revealed that T1 conspiracy beliefs did not predict early termination during T2. However, being in the brooding (vs. control) and reflection (vs. control) condition significantly decreased the likelihood of completing T2. This is consistent with the observation that the target sample sizes for the planned analyses were achieved earlier in the control than in the two experimental conditions.

## General Discussion

Several influential psychological models on the formation of conspiracy beliefs would predict that rumination, a repetitive style of thinking about negative content (Nolen-Hoeksema et al., 2008; Watkins & Roberts, 2020), should increase conspiracy beliefs (Douglas et al., 2017; Molenda et al., 2023; van Prooijen & Douglas, 2018). Building on a

series of correlational and experimental pilot studies, this Registered Report disentangled the causal effects of two subtypes of rumination on conspiracy beliefs: brooding and reflection. Whereas brooding entails dwelling on one's worries and negative emotions, reflection is a more deliberative, analytic, and controlled form of processing. We predicted that brooding about societal problems increases conspiracy beliefs. We did not derive a specific prediction for reflection: we argue that its impact on conspiracy beliefs depends on further, sometimes difficult to assess or quantify factors.

To investigate the effects of brooding and reflection on conspiracy beliefs, we designed a repeated-measures within-person experiment. We tested whether participants in the brooding condition experienced a significantly greater increase (or smaller decrease) in conspiracy beliefs than those in the control group. Results revealed that brooding led to a significantly smaller decrease conspiracy beliefs. That is, participants that brooded over the worries and negative emotions that their topic caused them reported a significantly smaller decrease in conspiracy beliefs from T1 to T2 than those in the control condition. However, it remains unclear whether that effect exceeds the prespecified smallest effect size of interest: The 90% CI of the observed effect size estimate overlapped with our proposed SESOI ( $d = 0.20$ ). That is, we could neither confirm that the effect is practically meaningful, nor conclude that it is too small to be of interest. Nonetheless, we can conclude that the effect is significantly different from zero. Thus, the result of this experiment is consistent with brooding contributing to conspiracy beliefs.

We further explored how reflection impacted conspiracy beliefs. We did not have a clear prediction for reflection: Depending on further factors (e.g., the plausibility of a conspiracy in the respective domain), arguments could be made that reflection should increase, decrease, or not affect conspiracy beliefs. Results showed that reflection, too, led to a significantly smaller decrease in conspiracy beliefs from T1 to T2 compared to the control group. We discuss potential explanations for this finding below.

### **Theoretical and Practical Implications**

The finding that brooding increased conspiracy beliefs is consistent with current psychological theories on conspiracy beliefs, which emphasize the role of negative affective experiences and cognitive biases (Douglas et al., 2017; Frenken & Imhoff, 2022; Green & Douglas, 2018; van Prooijen & Douglas, 2018). Brooding induces negative affect, which could, in turn, make people more susceptible to conspiracy beliefs (Molenda et al., 2023). However, negative affect might not be the only factor at play here: Brooding narrows the

attention to negative information, which facilitates negative attributions and makes negative events appear more likely (Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky et al., 1999). This negatively distorted view of the world could also make conspiracies appear more likely. However, more research is needed to investigate the precise mechanism through which brooding impacts conspiracy beliefs.

The present research also emphasizes the overlap between paranoia and conspiracy beliefs: A worry-thinking-style (which is similar to brooding) has been proposed as a causal factor involved in the development and maintenance of paranoid delusions (Foster et al., 2010; Freeman et al., 2015; Freeman et al., 2012). Based on our findings, it appears likely that brooding is a causal factor that conspiracy beliefs and paranoid delusions share. As such, this research adds to the literature that places conspiracy beliefs in the context of mental health. Rumination in general, and brooding in particular, represent a risk factor for many psychological disorders (Aldao et al., 2010), and could explain why conspiracy believers tend to be more vulnerable to a variety of mental health problems (Barron et al., 2018; X. Chen et al., 2020; Coninck et al., 2021; Furnham & Grover, 2021; Leibovitz et al., 2021).

Exploratory analyses showed that reflection may also have increased conspiracy beliefs. What does this mean? Ultimately, this remains an open question that requires further investigation. Several explanations appear plausible. First, it may be that brooding and reflection impacted conspiracy beliefs independently through different mechanisms. Reflecting about the societal topics may have made participants aware that a conspiracy is not such an unplausible explanation after all. When reflecting about a topic where a conspiracy is plausible, then reflection should illuminate that a conspiracy constitutes a suitable explanation. Perhaps the societal topics we used were examples of areas where one could reasonably suspect (elements of) a conspiracy (e.g., certain interest groups working secretly to further enable the exploitation of poor countries). Brooding, in contrast, might have increased conspiracy beliefs through a less deliberate and more emotional process, i.e., by inducing negative affect and narrowing the attention on negative content.

It is also possible that brooding and reflection increased conspiracy beliefs through similar mechanisms: Perhaps merely thinking about the societal topics we used in a repetitive manner is sufficient for increasing conspiracy beliefs about them. Participants in both the brooding and reflection condition engaged repetitively with a topic that caused them concern. So, despite their differences, both manipulations can be considered examples of repetitive negative thinking (Ehring & Watkins, 2008), which may be the driving force behind the effects. However, since results for reflection were based on exploratory analyses, we refrain

from drawing confirmatory conclusions about this effect and call for further research on the topic.

The finding that brooding increased conspiracy beliefs implies that interventions aimed at reducing conspiracy beliefs could focus on brooding as a potential cause and facilitator. For this purpose, inspiration can be found in cognitive-behavioral techniques like psychoeducation, identification of meta-beliefs about worrying, awareness of initiation and triggers, as well as learning to ‘let go’ of worries (Freeman et al., 2015). Such interventions would have the advantage that they do not have to address the content of conspiracy beliefs directly and may avoid backfire effects that are sometimes associated with misinformation correction (Lewandowsky et al., 2012).

Further, politicians, journalists, and other public communicators should be aware that framing news topics in a manner that facilitates brooding may promote the formation of conspiracy beliefs. News reports, especially on social media, are often geared toward eliciting shock, outrage, and other negative emotions (Brady et al., 2017; Crockett, 2017). Exposure to such news presumably increases the likelihood of dysfunctional brooding about societal events. A more neutral presentation of news topics could prevent the adoption of unfounded conspiracy beliefs among the public. This is not to say that the media should avoid presenting facts that speak for real conspiracies – when these facts are well-grounded in evidence, the public should be informed about and encouraged to believe in them.

### **Practical Meaningfulness and Generalizability**

With this Registered Report, we hope to initiate a discussion about smallest effect sizes of interest in the domain of conspiracy beliefs. We settled on a SESOI of  $d = 0.20$  as a median of several somewhat justifiable candidate values. However, in our opinion this SESOI should be treated as preliminary. So far, it remains unknown how large an effect on conspiracy beliefs in a controlled experiment must be to make a meaningful difference in the real world. To further complicate things, even in the real world different SESOIs could be set depending on what criterion is used to judge the meaningfulness of an effect: subjective experience, prevalence of unsubstantiated conspiracy beliefs in target populations, or relevant behaviors all come to mind. A useful next step in this endeavor could be to determine the smallest change in an outcome of interest that participants still rate as actually different (Anvari & Lakens, 2021). A similar approach can be found in clinical research under the name of ‘minimal clinically important difference’. In contrast, this approach does not rely on



global ratings of change provided by the participants themselves, but rather on evaluations of expert observers (Anvari & Lakens, 2021).

In addition, standardized effect sizes are not inherently meaningful without further context. Funder & Ozer (2019) argue that effect sizes should not simply be labeled as small, medium, or large without specifying the implied comparison (i.e., small or large compared to what?). In our case, the observed effect of  $d = 0.18$  would traditionally be considered a small effect (J. Cohen, 1992). It would also be considered a small effect compared to the average effect sizes published in social and personality psychology (Gignac & Szodorai, 2016; Lovakov & Agadullina, 2017). However, a small effect that appears reliably in an experimental setting can be expected to accumulate over time in people's real lives (Funder & Ozer, 2019). Importantly, our experiment induced brooding only once, and measured the effect of that single instance on conspiracy beliefs. If every time a person broods over a certain problem in their daily lives the degree of belief in a conspiracy increases by a small amount, then this can accumulate over time and situations to a consequential effect (Funder & Ozer, 2019).

For ethical considerations, we excluded participants who did not pass a depression and/or suicidality screening test. Although we still consider this the preferable approach, it does introduce a potential confounding factor. It is possible that participants dealing with concurrent depression or suicidality might have found it easier to engage with the brooding manipulation, potentially amplifying the effect of brooding on conspiracy beliefs if they had been included. Conversely, it is also possible that the brooding manipulation might not have significantly affected those who were already experiencing depression, diminishing the effect of brooding if they had been included. To address this potential confounding, future non-experimental research (using, for example, longitudinal designs) is required.

Importantly, the results reported here depend on the specific societal topics that were used to induce brooding and reflection. This is an unavoidable feature of our study design. It is possible that brooding or reflection about other topics might have yielded different results. Future research should examine whether the effects we observed depend on specific characteristics of the topics that one broods or reflects about. Of course, not only the selection of topics may result in limited generalizability, but also the specifics of the experimental paradigm as a whole (e.g., Bless & Burger, 2016).

## **Limitations and Directions for Future Research**

The repeated-measures design used here might have made it easier for participants to guess what the study is about, introducing the possibility of biases due to demand- or reactance-effects. This could be a potential explanation for why conspiracy beliefs, on average, decreased between measurements: At T2, participants might have suspected what the study was about and corrected their responses downward (to not feel like they were influenced into reporting higher conspiracy beliefs).

The decrease in conspiracy beliefs from T1 to T2 might also be attributed to the way they were measured at both time points. During T1, participants were asked to choose the societal issue that concerned them the most from a list of six topics. Being confronted with numerous social issues might have in itself contributed to higher scores on the conspiracy belief measure. Perhaps, the plurality of social problems has been interpreted as evidence for a conspiracy or being confronted with multiple worry topics resulted in spontaneous brooding.

A further limitation concerns the fact that both brooding and reflection manipulations consisted of rather long, demanding open-text questions that most participants presumably did not enjoy. It is conceivable that this induction of irritation and/or frustration could have influenced conspiracy beliefs. Future research should complement our study design with an additional control condition engaging in equally unpleasant but unrelated tasks.

The relation between brooding and reflection is a topic of ongoing debate (Bartoskova et al., 2018; Junkins & Haeffel, 2017). Interestingly, we observed that our brooding manipulation also led to higher self-reported reflection compared to the control condition. On the one hand, this may be due to differences in item difficulties, resulting, for example, from social desirability or self-serving biases that render it more appealing to score high on reflection. On the other hand, this finding may indicate that brooding and reflection co-occur with one another, at least in participants subjective perceptions. Research on meta-beliefs about worrying demonstrate that people tend to believe that worrying is useful (Borkovec et al., 1999). For example, people believe that worrying helps them prepare for the future or prevent bad things from happening to them. Such meta-beliefs about the functional nature of worrying might lead to brooding being genuinely experienced as a sort of reflection. Further, it seems very unlikely that our experimental manipulations resulted in “pure” forms of brooding and reflection. Some overlap is presumably unavoidable.

Relatedly, it has been argued that, in real life, people do not simply fall into one of two categories of “brooders” or “reflectors”. Instead, most people report matching levels of

brooding and reflection, that is, they tend to score low, medium, or high on both reflection and brooding (Junkins & Haeffel, 2017). Future research should examine the extent to which brooding and reflection can be considered independent processes.

Psychological theories and research on conspiracy beliefs may profit from a higher level of formalization that allows for the derivation of precise predictions (see, e.g., Oberauer & Lewandowsky, 2019). For example, especially in the context of our reflection manipulation, we encouraged participants to reason about potential explanations for their worry topics, with conspiracies being one of the many types of candidate explanations. Specifically, participants were asked to reason about potential causes, weight evidence, and evaluate the plausibility of several more or less likely explanations. In this regard, we see great potential for synergies between the literature on conspiracy beliefs and work from cognitive psychology on causality, reasoning under uncertainty, and explanations (e.g., Douven & Mirabile, 2018; Gerstenberg, 2022; Over & Cruz, 2018; Sebben & Ullrich, 2021). This work may prove useful to, for example, better understand and formalize the effects of reflection on conspiracy beliefs and the boundary conditions of these effects.

Lastly, it is important to consider the possibility of an effect in the reversed causal direction: Conspiracy beliefs might also lead to increased levels of brooding. Conspiracy beliefs are inherently negative in content and provide a lot of additional content that one can brood about. Relatedly, longitudinal research has found initial evidence that conspiracy beliefs are under some circumstances followed by increases in uncertainty- and fear-related states: In one out of two studies, increases in conspiracy beliefs predicted increases in anxiety, uncertainty aversion, and existential threat (Liekefett et al., 2023). Another study using two measurements found that COVID-19 conspiracy beliefs predicted higher levels of anxiety one month later (Leibovitz et al., 2021). Apparently, conspiracy beliefs may hold the potential to reinforce negative cognitive-affective experiences – a finding that could extend to brooding.

### **Conclusion**

This Registered Report investigated the role of two subtypes of rumination in the formation of conspiracy beliefs: brooding and reflection. Results of a repeated-measures within-person experiment revealed that participants who brooded over a societal topic that caused them concern reported a significantly smaller decrease in conspiracy beliefs from T1 to T2 than participants in the control group. This finding supports the idea that brooding enables or causes conspiracy beliefs. However, a combination of minimum effect and equivalence tests could neither confirm nor reject the hypothesis that this effect exceeds our

proposed smallest effect size of interest ( $d = 0.20$ ). We call for further research and discussion about meaningful smallest effect sizes of interest in the conspiracy belief literature.

## 6 General Discussion

### 6.1 Summary of Findings

This dissertation set out to investigate psychological responses to a major societal crisis of our current time: the Coronavirus pandemic. For this purpose, three phenomena that were of particular interest in the context of the pandemic were explored: (1) compliance with governmental restrictions aimed at mitigating the spread of the virus, (2) the characteristics of people who participated in anti-lockdown protests, and (3) conspiracy beliefs in the context of and as explanations for societal crises. As such, the manuscripts that comprise this dissertation advance our knowledge on the psychological factors that promoted or hindered the collective effort to overcome the pandemic, and hopefully provide insights that can be applied to societal crises more broadly.

#### 6.1.1 *What Motivated Compliance during the Coronavirus Pandemic?*

Manuscript 1 combined two strands of theory relevant for understanding compliance during the pandemic: theories on health-related behaviors (Rogers, 1975) and social identity perspectives on solidarity during emergencies (Drury, Cocking, & Reicher, 2009). We suggested that people complied with protective measures for (at least) two distinct reasons: to protect themselves from infection or to protect people in risk groups. Two studies revealed that compliance for reasons of self-protection vs. solidarity were empirically distinct from one another. Further, whereas compliance for self-protection was predicted by perceptions of self-related uncertainty and threat, compliance for reasons of solidarity was associated with shared group identity, collective efficacy, and concern for vulnerable others.

This emphasizes that compliance in the context of the Coronavirus pandemic has parallels with solidarity-based collective action: Compliance can be motivated by shared identity, collective efficacy, and concern for the disadvantaged (in that case, members of risk groups) – variables that are well-established antecedents of political solidarity (Radke et al., 2020). These findings advance the literature on collective behavior during crises (Drury et al., 2016) by showing that concepts from collective action theories can be applied to predict compliance in health crises. More broadly, these findings demonstrate that, in situations that require the population to adopt evidence-based behavior change, both self- and solidarity-oriented processes can be leveraged to facilitate the desired behavioral change. This research further adds to the emerging literature that conceptualizes the Coronavirus pandemic as a social dilemma in which compliance becomes, at least in part, a form of cooperative and

prosocial behavior (Campos-Mercade et al., 2021; Romano et al., 2021; van Lange & Rand, 2022).

### ***6.1.2 What are the Characteristics of Anti-Lockdown Protestors?***

Manuscript 2 concerns the ostensible heterogeneity of anti-lockdown protestors in Germany. Media reports about the protests had described a strange mix of participants: Conspiracy theorists, antivaxxers, esoterics, and right-wing extremists appeared to be marching side by side with “regular” citizens against the governmental protective measures (e.g., Carothers, 2020). This suggests that protestors should vary in the extent to which they endorse conspiracy beliefs, esotericism, vaccine hesitancy, and right-wing extremist beliefs. To explore this idea, we collected a large sample of anti-lockdown protestors and conducted a latent profile analysis – a technique that identifies unobserved subgroups in a population. Results revealed that differences between protestors pertained predominantly to their socio-political ideology: We identified four subgroups that could be described as Centrists, Politically Undifferentiated, Left-wingers and Right-wingers. These subgroups did not only vary in their political self-placement, but also in their agreement on indicators of racism and antisemitism. However, despite these differences in socio-political beliefs, protestors expressed surprisingly similar attitudes on a range of variables that contain anti-science elements: conspiracy beliefs, downplaying of the dangers of the Coronavirus, esotericism, and vaccine hesitancy. Scientifically unfounded and epistemically unwarranted beliefs seem to have united contrarians with diverse political backgrounds in the anti-lockdown protests. Such anti-science beliefs have the potential to exacerbate crises like the pandemic by uniting and radicalizing individuals that would, presumably, otherwise not work together.

### ***6.1.3 What are the Antecedents and Consequences of Conspiracy Beliefs in the Context of Societal Crises?***

Manuscript 3 tests and extends social psychological theories on the formation of conspiracy beliefs in the context of societal crises. More precisely, we investigated how negative cognitive-affective experiences that are common during crises (i.e., anxiety, uncertainty aversion, and existential threat) influence and are influenced by the formation of conspiracy beliefs. For this purpose, we conducted two longitudinal studies using state-of-the-art methods for longitudinal designs, namely random-intercept cross-lagged panel models. These models differentiate stable between-person differences from within-person changes over time (Hamaker et al., 2015). Results revealed two major insights: First, they challenge

the idea that anxiety- and uncertainty-related experiences are temporal antecedents of conspiracy beliefs. Except for uncertainty aversion in Study 2, these variables did not predict within-person changes in conspiracy beliefs over time (despite being consistently correlated on the between-person level). This casts doubt on the idea that anxiety, uncertainty aversion, and existential threat causally influence conspiracy beliefs. Previous research may have overestimated their influence by relying in large parts on cross-sectional data, and neglecting the possibility of an effect in the reversed direction.

Second, this manuscript sheds light on the psychological consequences that conspiracy beliefs have for the individuals that hold them. Results suggest that conspiracy beliefs are not beneficial for the individual regarding the experiences of anxiety, uncertainty aversion, and existential threat: Increases in conspiracy beliefs were either unrelated to changes in anxiety, uncertainty aversion, and existential threat (Study 2, longer-term temporal distances), or even predicted increases in these negative experiences (Study 1, short-term temporal distances). In addition, in both studies, increases in conspiracy beliefs predicted further increases in conspiracy beliefs later, pointing to a potential self-reinforcing cycle. In sum, conspiracy beliefs are most likely not beneficial for the individual, at least not with regard to the variables investigated here. If anything, they make people feel worse, thereby exacerbating the negative impact of societal crises on individuals' mental health and well-being.

Building on the finding that anxiety, uncertainty aversion, and existential threat did not consistently predict within-person changes in conspiracy beliefs, we reasoned that other cognitive-affective processes may prove more relevant. Therefore, Manuscript 4 investigated the role of rumination, a repetitive and negative style of thinking, in conspiracy beliefs. Integrating theories from both social and clinical psychology, we predicted that ruminating about societal problems should increase the likelihood of explaining events by means of a conspiracy. Based on the results of four pilot studies, a Registered Report tested whether one subtype of rumination, namely brooding, increased conspiracy beliefs. We combined conventional null hypothesis significance testing with equivalence and minimum effect tests to determine whether that effect was not only statistically significant, but also larger than a prespecified smallest effect size of interest (SESOI).

Results revealed that brooding significantly influenced conspiracy beliefs in the predicted direction: A repeated-measures within-person experiment revealed that participants that brooded about a societal problem reported a significantly smaller decrease in conspiracy beliefs from T1 to T2 than participants in the control group. However, it remains unclear whether that effect exceeds the SESOI. That is, we could neither confirm that the effect is

larger than our SESOI, nor conclude that it is too small to be of interest. Nonetheless, the result of this experiment is consistent with the idea that brooding causes or enables conspiracy beliefs. We induced brooding only once and measured the effect of that single instance of brooding on conspiracy beliefs. In real life, people likely brood repeatedly over longer periods of time, which may accumulate to an influential effect.

Our findings imply that (a) public communicators should be aware that presenting current issues in a manner that facilitates brooding might increase conspiracy beliefs, and (b) interventions targeting brooding might prove effective in reducing and/or preventing conspiracy beliefs. We further emphasize the importance of well-justified smallest effect sizes of interest and hope to spark a discussion among conspiracy belief researchers about how smallest effect sizes of interest could be determined in a principled way based on real-world outcomes.

## 6.2 Integration of Findings

Cumulatively, the present research illustrates the complex and reciprocal connections between prevalent cognitive-affective experiences during the pandemic (i.e., anxiety, uncertainty, threat, and brooding), and behaviors and beliefs that either facilitate (compliance) or impede (conspiracy beliefs, anti-lockdown protests) an effective overcoming of the crisis. Further, our findings illustrate the heterogeneity of (a) motives for compliance with governmental restrictions, and (b) the socio-political worldviews that underpin anti-lockdown protests. Returning to the model proposed at the outset of this dissertation (see Figure 2 below), one can draw the following conclusions:

1. **Cognitive-Affective Experiences and Compliance:** Negative cognitive-affective experiences prevalent during the pandemic (i.e., self-related uncertainty and threat) positively predict individuals' intentions to comply with governmental restrictions primarily for self-protection, thus fostering a cooperative response that facilitates the overcoming of the crisis.
2. **Socio-Political Beliefs and Compliance:** Socio-political beliefs that developed within the crisis context (i.e., shared identity, collective efficacy, and concern for vulnerable populations) predict intentions to comply for reasons of solidarity, thereby further facilitating a cooperative crisis response. This may be particularly useful in cases where self-related threat is absent.
3. **Socio-Political Beliefs of Anti-Lockdown Protestors:** Individuals opposing the governmental protective measures in the form of anti-lockdown protests exhibit



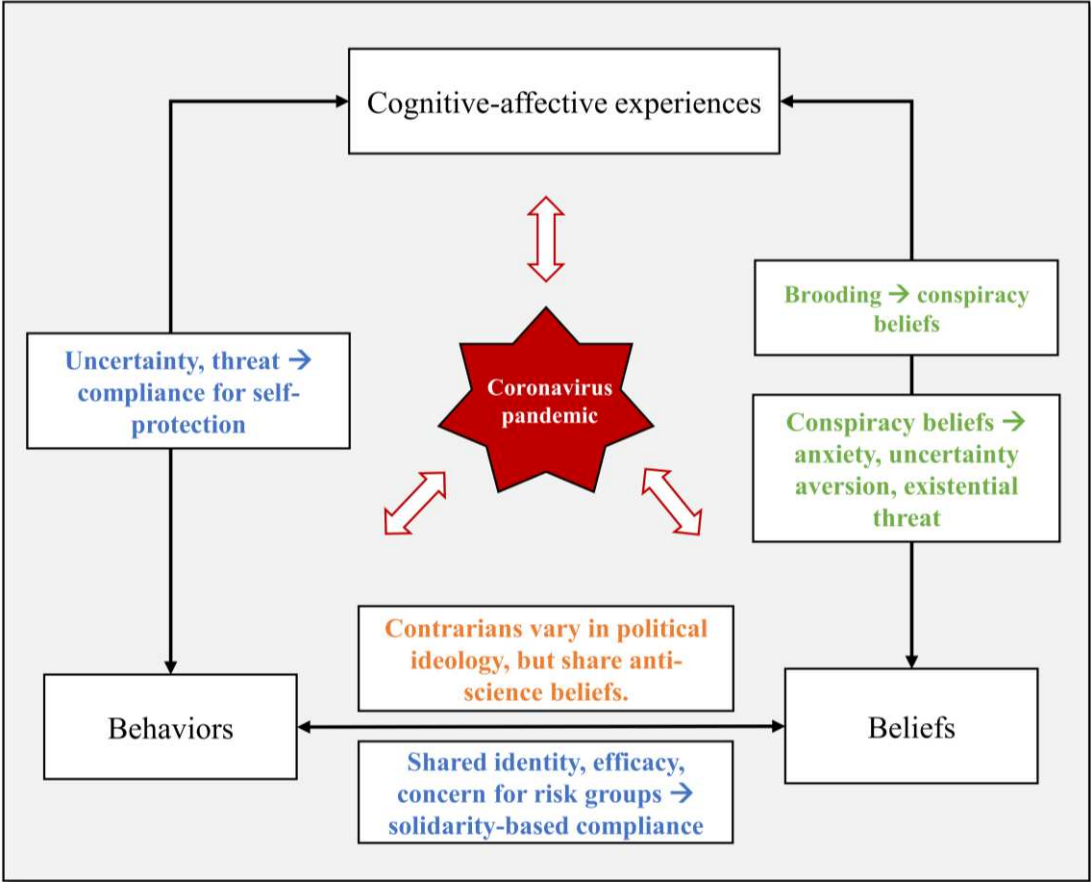
considerable diversity in their beliefs regarding political ideology and self-reported racism and antisemitism. Nevertheless, they share an endorsement of anti-science and conspiracy beliefs – a phenomenon that bears a potential for heightened societal alienation and radicalization.

4. **Cognitive-Affective Experiences and Conspiracy Beliefs:** Changes in anxiety, uncertainty aversion, and existential threat did not consistently predict within-person changes in conspiracy beliefs over time. Instead, in one out of two studies, increases in conspiracy beliefs predicted increases in these negative experiences over time. Conspiracy beliefs may have the potential to exacerbate negative cognitive-affective experiences during crises.
5. **Brooding and Conspiracy Beliefs:** One particularly dysfunctional style of thinking, namely brooding, appears to be causally relevant in the formation of conspiracy beliefs. However, it has yet to be determined whether this effect is sufficiently large to be practically meaningful in real life. Nevertheless, brooding appears to enable or cause conspiracy beliefs.

In sum, these findings demonstrate that cognitive-affective experiences and socio-political beliefs in the context of societal crises can promote both functional (compliance) and dysfunctional (anti-lockdown protests, unfounded conspiracy beliefs) responses among individuals. On the one hand, variables related to threat and uncertainty can motivate efforts to comply with governmental restrictions for reasons of self-protection, thereby facilitating an effective overcoming of the crisis. On the other hand, anxiety, uncertainty aversion, and existential threat tend to be associated with conspiracy beliefs, with brooding in particular being causally relevant for the formation of such beliefs. The experience of fear and uncertainty during crises can be indicative of an appropriate response in the face of a real danger that ultimately helps protect the individual and society. However, these experiences can also be a symptom of unwarranted mistrust and doubt directed at authorities and fundamental societal institutions, for example in the form of unfounded conspiracy beliefs. Results also suggest that the *absence* of appropriate fear and threat perceptions during crises plays an important role: a tendency to downplay the dangers of the Coronavirus appears to be an important characteristic that anti-lockdown protestors share (Manuscript 2). Ideally, the public should feel sufficiently threatened by societal dangers that are real (e.g., the health risks of the Coronavirus), and not feel threatened by dangers that are not real (e.g., unfounded conspiracy claims).

**Figure 2**

*Overview of Findings*



Importantly, the consequence of compliance, contrarian protests, and conspiracy beliefs are context dependent. It should be kept in mind that the relations outlined above pertain to the German pandemic context, in which the governmentally prescribed protective measures were in line with the best available scientific evidence (e.g., Talic et al., 2021). However, there may be other crisis contexts in which compliance would be detrimental, and contrarian protests and/or plausible conspiracy beliefs would be beneficial for the overcoming of the crisis. These may be contexts in which governmentally prescribed measures are misguided in relation to the best available scientific evidence, or contexts that suffer from large-scale governmental corruption, oppression, or human rights violations.

Returning to the findings of the present research, Manuscripts 1 and 2 reveal that not only motives for compliance with governmental restrictions, but also the socio-political worldviews of anti-lockdown protestors are heterogeneous. Compliance with protective measures can be motivated by diverse psychological experiences and beliefs, including (but presumably not limited to) self-related threat and uncertainty, and concern for vulnerable

others. Similarly, opposition to protective measures appears to be underpinned by diverse socio-political beliefs, including centrist, undifferentiated, and left- and right-wing ideologies. Manuscripts 1 and 2 emphasize that individuals interested in increasing compliance, and decreasing opposition to protective measures, should take a range of motives and worldviews into account – an endeavor that provides both opportunities and challenges for effective crisis communication and the promotion of evidence-based behavior change.

Further, the findings of this dissertation highlight the role of social identity and group processes in shaping psychological responses to societal crises. Comparisons between members of risk groups and the rest of the population were highly prevalent, with the dominant narrative being that the pandemic was largely a problem for older adults and others vulnerable groups (Xiang et al., 2020). Early data on COVID-19 mortality showed a case-fatality rate of 20% for those over 80, whereas the risk of dying for young and healthy people appeared close to zero (Onder et al., 2020). This common narrative divided people in groups of “risk groups” and “rather safe people” in the public’s eye (although, as the pandemic progressed, it became clear that young and healthy people could get seriously affected from COVID-19 too). As Manuscript 1 argues, creating a sense of shared identity, efficacy, and empathy toward this newly emerged outgroup of vulnerable people is crucial for motivating compliance among people who do not see themselves as belonging to a risk group.

Relatedly, people who are convinced of a conspiracy perceive the world as being split between a secretive and powerful group of elites that controls society, and the general population, which is viewed as being oblivious to these machinations (this is much related to populist notions of the good people vs. evil elites, see for example Mudde & Rovira Kaltwasser, 2017). Further, conspiracy beliefs create a distinction between “awakened” or “enlightened” individuals who have managed to see through the alleged conspiracy, and the masses who continue to be fooled by them.

In a similar vein, the anti-lockdown contrarians often positioned themselves as champions of freedom and basic human rights (Reichardt, 2021). The protests created a division between those who supported and those who opposed the protective measures, giving rise to new social identities that transcended ideological divides between the political left and right. The emergence of these new social identities (risk groups vs. rather safe people; alleged conspirators vs. the good people; those who support vs. reject the protective measures) reflects the complex social dynamic that can arise during times of crisis.

Another important feature of compliance, conspiracy beliefs and anti-lockdown processes is that they shape and are shaped by the dynamic societal consensus surrounding the

pandemic. Indeed, how the majority views the pandemic, how the pandemic itself and key actors (e.g., prominent epidemiologists, contrarian media figures) are portrayed by the media, the necessity of protective measures, and many further relevant factors change over time, across regions and communities. For instance, as of the present moment, the prevailing public consensus regarding the severity of the Coronavirus has shifted significantly. Individuals who continue to engage in protective behaviors like mask-wearing constitute a minority, and their actions are, presumably, no longer perceived as contributing to a climate of solidarity and support. Instead, such individuals might be perceived as over-careful or exaggerating, and sometimes have to face aggression (Kuster, 2022).

### **6.3 Practical Implications**

This dissertation offers valuable insights into how compliance, solidarity, and behavior change can be facilitated during crises. First, the results of Manuscript 1 indicate that messages focusing solely on personal threat are more likely to motivate compliance for self-protection purposes. However, many important behaviors necessary for mitigating societal crises primarily benefit others rather than the self. For instance, face masks primarily stop exhaled breath from being spread too far and sneezing or coughing into one's elbow safeguards others. To increase the adoption of such behaviors, authorities should emphasize the collective nature of the situation, foster a sense of shared identity, promote group efficacy through clear instructions and readily available resources, and enhance empathy and concern for people in disadvantaged groups.

Results from Manuscript 3 indicate that interventions aimed at reducing conspiracy beliefs should not focus on generalized anxiety, uncertainty aversion, and existential threat. Instead, they would do better to focus on brooding specifically, which appears to be causally relevant for the formation of conspiracy beliefs (Manuscript 4). Inspiration for such interventions can be found in cognitive-behavioral techniques like psychoeducation, identification of meta-beliefs about worrying, awareness of initiation and triggers, as well as learning to 'let go' of worries (Freeman et al., 2015). In general, interventions that focus on more functional emotion regulation strategies, such as reappraisal, social support, or distraction (Aldao et al., 2010) might prove effective in preventing conspiracy beliefs.

It is important to recognize the potential of a causal effect in the reversed direction: conspiracy beliefs might induce negative affective-cognitive experiences in certain circumstances (see Manuscript 3). This could also apply to brooding: Conspiracy beliefs provide a lot of additional negative content that one can brood about. Thus, people who aim to

reduce belief in unfounded conspiracies in the population should take the affective states of their adherents into account, and approach proponents of conspiracy beliefs with empathy and sensitivity. Further, interventions could effectively warn individuals about the negative mental health consequences associated with conspiracy beliefs, which could have the potential to reduce their appeal.

The finding that conspiracy beliefs are most likely not beneficial for individuals regarding anxiety, uncertainty aversion, and existential threat suggests that there must be other factors at play that fuel and maintain people's engagement with conspiracy theories. One promising candidate may be social identity (Sutton & Douglas, 2022). For example, sustained commitment to conspiracy beliefs may ultimately fulfill important psychological needs through the inclusion in a community of like-minded others (Sutton & Douglas, 2022). The benefits provided by this community may outweigh the negative psychological impact that conspiracy beliefs can otherwise have for the individual. Interventions aimed at preventing or reducing the appeal of conspiracy beliefs might do well to focus on group membership, and could find inspiration in social identity approaches to health that target the development and maintenance of positive social group relationships (Haslam et al., 2016).

Manuscript 2 demonstrates that anti-science beliefs, including unfounded conspiracy beliefs, misinformation, vaccine hesitancy, and esoteric beliefs, can unite individuals with diverse political backgrounds against governmental measures. This finding likely extends beyond the context of the pandemic: Esoteric movements in Germany (e.g., Anthroposophy) have been known to be sociologically, religiously, and ideologically very heterogeneous and compatible with specific variants of both left- and right-wing worldviews (Zander, 2019). To counteract such cross-ideological alliances, policy makers should prioritize the promotion of scientific literacy and trust in science among the public. Strategies for achieving this include (1) clearly communicating that scientific disagreement and belief revision are inherent parts of the scientific process, (2) presenting scientific information in accessible yet precise language, and (3) fostering trust in scientists by emphasizing the presence of a superordinate identity that recipients identify with (Philipp-Muller et al., 2022). In cases where anti-science beliefs are deeply entrenched, additional strategies such as affirming shared values (e.g., caring for one's family) may prove effective (Philipp-Muller et al., 2022).

In conclusion, this dissertation underscores the importance of tailored interventions and policies that account for diverse motives, affective states, and ideological worldviews among the public. To promote societal cohesion and collaboration during crises, public policies and interventions should (a) emphasize the collective nature of the crisis, (b) prevent

dysfunctional brooding about societal problems, (c) warn individuals about the negative mental health consequences associated with conspiracy beliefs, (d) foster possibilities for positive social identities and group memberships, and (e) promote trust in science through effective communication and the cultivation of shared values.

However, it should be kept in mind that these recommendations hinge on the assumption of causal relations between variables that were not always directly investigated in the present research. Apart from Manuscript 4, no manuscript investigated causal effects directly, yet specific assumptions about causal effects motivated the research questions and/or underlie the practical implications derived here. These assumptions are that (a) personal threat-related and group-based variables cause compliant behavior intentions, (b) conspiracy beliefs cause anxiety, uncertainty aversion, and existential threat, and (c) anti-science beliefs cause rejection of the protective measures and participation in anti-lockdown protests.

#### **6.4 General Limitations and Outlook**

Beyond the limitations discussed in each manuscript, there are overarching limitations worth mentioning here. By design, this research was conducted during a time of societal disruption and change. On the one hand, this provided the unique opportunity to investigate the dynamic development of constructs that are otherwise quite stable over time (e.g., conspiracy mentality, Bruder et al., 2013). On the other hand, it is possible that the specific phases of the pandemic during which the research was conducted impacted the results. Particularly in Manuscripts 1 and 2, associations between variables were examined as cross-sectional ‘snapshots’ at a specific time, and results might have turned out differently in other phases of the pandemic. For example, whether strict or lenient protective measures are currently in place may impact which psychological variables predict compliance. Wright and Fancourt (2021) found that the association between younger age and risk-taking tendencies with compliance, respectively, was greater in later months of the pandemic (July/August 2020), when less stringent lockdown measures were in place, as compared to April 2020. This may be due to differences in ‘situational strength’: the influence of individual differences on behavior is thought to increase when behavioral options are less constrained or normative behavior is less proscribed (Wright & Fancourt, 2021). Similarly, another study conducted in Belgium found that in June 2020, when substantial lockdown measures had been lifted, compliance became more contingent on stable personal characteristics (e.g., pro-socialness) than on fear of the virus and respect for rules, both of which had been found to be more influential in the beginning of the pandemic (Six et al., 2021). Future research should explore

whether the predictive role of personal threat-related and group-based variables in compliance diminishes, amplifies, or remains consistent during different phases of the crisis, and whether these variables are also relevant for predicting sustained compliance over time.

In a similar vein, the anti-lockdown movement has not remained unchanged as the crisis progressed. As of this writing, the pandemic has officially been declared over, and there are no more protective measures in place. Nevertheless, the “Querdenken” movement persists. It has attached itself to new political issues, first and foremost the war in Ukraine. Many individuals that were formerly active in the “Querdenken” movement now defend Putin as a ‘resistance fighter against the Western elite’ (Reveland & Siefert, 2022). This implies that anti-establishment and conspiracy-related worldviews can flexibly adapt to current societal issues. Identifying such transitions in social movements over time may provide novel insights into the underlying motivations of their adherents. Indeed, anti-science worldviews may be grounded in a broader contrarian sentiment that transcends specific issues. Their adherents may oppose and reject whatever is currently identified as the “mainstream” or “official” narrative. As Jonathan Howard described in the context of anti-vaxx doctors: “One gets the sense that if mainstream doctors were *against* vaccines [emphasis added], these doctors would (rightly) call them a ‘suppressed miracle cure’. Pharma makes more money from treating diseases than preventing them, after all” (Howard, 2023).

On a more general note, research on psychological responses to societal crises would profit from incorporating context more deeply into their analyses (Cikara et al., 2022). This may include both temporal dynamics (as outlined above), and the broader social, cultural, or political context that a person is embedded in. For instance, the cultural dimensions of individualism and collectivism may shape peoples’ compliance with protective measures. Specifically, people with a more individualistic orientation choose their actions more freely depending on their own preferences, intentions, and motives, whereas people with a more collectivist or interdependent mindset are more concerned with other people’s needs (Feng et al., 2023). Regarding the protective measures, individualistically oriented people might be more likely to disregard the threat that noncompliance poses for others and society in general and go about their lives however it suits them best. Collectivist people, in contrast, might be more concerned about the impact that their behavior has on others.

However, there are also reasons to believe that collectivist people might have a harder time following social distancing rules: Their orientation toward other peoples’ needs might motivate them to visit their friends and family (especially if requested to do so), whereas individualistic people might feel less pressured by others in that regard (Feng et al., 2023). In

contrast to this latter perspective, a large study across 79 countries and regions found that in areas where residents scored higher on individualism, people were less likely to follow distancing rules (Feng et al., 2023). This effect was driven by individualistic peoples' greater selfishness and willingness to relieve their boredom during lockdowns (Feng et al., 2023). These findings would profit from the distinction between self- and solidarity-related compliance introduced in Manuscript 1. Likely, the relation between collectivist values and compliance pertains predominantly to solidarity-based compliance, whereas the relation between individualism and compliance might reverse if one specifically investigated self-protection: As Feng et al. (2023) already conjecture, individualistic people that feel themselves threatened by the virus might even be more motivated than collectivist individuals to comply for reasons of self-protection. Tailored persuasion attempts that take these motives into account could provide an impactful way to enhance compliance across cultures.

Cultural differences undoubtedly also shape the characteristics of anti-lockdown protests. The focus on freedom, civil liberties, and opposition to the mainstream that one could witness in Western countries might not generalize to the rest of the world. In other parts of the world, particularly in less democratic and/or poorer nations, protests may revolve around different issues, such as the absence of economic aid, inhumane working conditions during lockdowns, or civil rights abuses (Carothers, 2020; Haddad, 2021). As such, it is important to keep in mind that the findings described in Manuscript 2 pertain predominantly to the German cultural context.

There are many ways in which context may play a role in the causes and consequences of conspiracy beliefs. Whether conspiracy beliefs have a detrimental impact on the well-being of the individual may depend both on the social context in which the individual finds itself (e.g., the extent to which the conspiracy belief is endorsed in the person's social network), and on the characteristics of the conspiracy that the individual believes in: A conspiratorial interpretation of a (subjectively perceived) societal problem that is more dire and provides less hope and potential for agency may be more unsettling than one that allows the believer to feel like they can still stop the conspiracy (Schöpfer et al., 2023). While it is a strength of the present research that both general and specific conspiracy beliefs across a range of societal issues were investigated, future research should consider the heterogeneity of conspiracy beliefs (which range from relatively benign conspiracy beliefs about Bigfoot to Holocaust denial) more systematically.

In one way or another, all Manuscripts are influenced by the way that temporal variables were incorporated into the research design. Manuscript 3 emphasizes the importance



of selecting appropriate time intervals for longitudinal research. However, the optimal time interval required to detect and accurately measure an effect is rarely known (Bollen, 1989), and choosing the wrong time interval can seriously bias parameter estimation (Cole & Maxwell, 2009). A strength of Manuscript 3 is that both shorter- and longer-term temporal distances were used and compared. It is crucial for future research to expand on this approach, for example by repeating data collection with different plausible time lags and calculating the optimal time lag for the effect under investigation (Dormann & Griffin, 2015).

Relatedly, in Manuscript 4, a decision had to be made about the temporal distance between T1 and T2. Varying this distance could potentially impact the results. We had selected a length of 5-10 days hoping that this would be sufficiently long so that participants do not remember the answer they gave at T1, and sufficiently short so that the results are not systematically impacted by larger contextual changes regarding the societal topics of interest.

Manuscript 4 further highlights the dependence of the brooding manipulation's success on the time spent brooding. Choosing an incorrect time frame for this manipulation might interfere with the results: Assuming that an actual effect of brooding on conspiracy beliefs exists, a manipulation that is too short might not exert a strong enough influence to make this effect observable. Conversely, a manipulation that is too long might induce boredom, frustration, and/or fatigue, thus interfering with the impact of brooding. Despite these difficulties, our experimental manipulation in Manuscript 4 proved successful in manipulating brooding. Hopefully, future research on the consequences of brooding can profit from the experimental procedure that was developed here.

The variables investigated in this dissertation have differing levels of specificity, which introduces some complexity when drawing generalizable conclusions across manuscripts. For example, Manuscripts 1 and 3 both examined threat-related perceptions, but with varying degrees of specificity: In Manuscript 1, threat was specifically measured in relation to the Coronavirus, whereas Manuscript 3 measured a general sense of feeling insecure and in danger. Similarly, conspiracy beliefs were measured both in a general fashion using the Conspiracy Mentality Questionnaire (Bruder et al., 2013) and specifically in relation to the Coronavirus pandemic (Manuscript 3) or other specific worrisome societal topics presented in Manuscript 4 (e.g., the growing wealth gap). It is yet unclear whether similar processes are involved in the formation of a generalized conspiracy mindset and specific conspiracy beliefs, and future research should systematically compare their distinct causes and consequences.

The same limitation is relevant for the relation between predictors and outcomes, or independent and dependent variables. For most psychological theories, it remains unknown

which degree of “matching” between the levels of specificity of predictor and outcome variables would be ideal to capture the effect of interest. In Manuscript 3, generalized fear- and uncertainty related states were linked with both generalized conspiracy beliefs and specific beliefs about the Coronavirus pandemic. Manuscript 4, in contrast, estimated the effect of brooding about a specific problem on conspiracy beliefs directly related to that specific problem. This higher degree of matching between dependent and independent variable might explain why we observed a significant effect of brooding on conspiracy beliefs in Manuscript 4, but none of anxiety, uncertainty aversion, and existential threat in Manuscript 3. Future research on this topic, and psychological theories in general, should aim to be more precise about the level of specificity at which they expect processes to take place (e.g., do conspiracy beliefs increase generalized anxiety, or specific worries related to that belief?).

A further limitation of the present research relates to potential biases due to self-selection. Most samples were convenience samples and cannot claim to be representative for the general population. The impact of self-selection is particularly relevant in Manuscript 2, which investigated the composition of the anti-lockdown movement. If specific subgroups within the movement chose not to participate in the survey, they would be missing from the picture. It is possible that those individuals who are most alienated from society and who are most distrusting in science would have chosen not to participate in the survey (since it was administered by a scientific institution). It is also conceivable that these individuals were particularly motivated to participate to make their voices heard. So, Manuscript 2 might, at least to some extent, over- or underestimate the prevalence of anti-science attitudes in the anti-lockdown movement.

Similarly, individuals with very strong conspiracy beliefs might not have participated in the studies, due to their suspicions about the researchers’ or university’s motives. Overall, mean levels of conspiracy beliefs were frequently below the scale mean, raising the question of whether results can be generalized to individuals with very strong conspiracy convictions. This issue is not unique to the present research. Indeed, it is a well-known problem in the conspiracy beliefs literature that relatively little is known about people who are strongly convinced of conspiracies, at least in part because these people are difficult to recruit as study participants (Sutton & Douglas, 2022). Future research should assess systematic differences in the causes and consequences of more moderate conspiracy suspicions (that is, beliefs with a lower degree of conviction) and beliefs that are strongly held.

In addition, the research reported here relies on self-reports, which are susceptible to various biases that may impact results. For instance, individuals may have different subjective standards when evaluating their level of compliance with protective measures. The same behavior might be perceived as highly compliant by one person but considered only minimally compliant by another. Additionally, we measured participants' intentions to comply rather than their actual behaviors, raising the potential for biases due to the intention-behavior gap. Furthermore, when measuring conspiracy and anti-science beliefs, social desirability bias may come into play: Given the stigma associated with conspiracy beliefs (Lantian et al., 2018), individuals may underreport such beliefs to avoid being perceived negatively. A lack of awareness or insight into one's emotional experiences might further reduce the validity and reliability of self-report measures of anxiety and other fear- and uncertainty related states. Future research should complement the findings reported here with (a) behavioral observations, (2) third-party reports (e.g., from family members or acquaintances), and/or (3) physiological measures (e.g., related to stress).

As should be well known by now, absence of evidence does not imply evidence of absence (Altman & Bland, 1995). This frequently overlooked fact represents a limitation for some of the conclusions drawn here. Specifically, only Manuscript 4 was designed to render results meaningful and interpretable also in case of an insignificant finding by including a test for statistical equivalence. Equivalence tests determine whether the presence of a meaningful effect can be rejected (Lakens, 2017). Some findings from other manuscripts (such as the finding that anxiety, uncertainty aversion, and existential threat did not significantly predict increases in conspiracy beliefs, Manuscript 3) would ideally have been backed up by an equivalence test against a meaningful smallest effect size of interest. Some of the main results would also have profited from a minimum effect test (as in Manuscript 4) that determines whether an effect is not only statistically significant, but also practically meaningful (Lakens, 2022). Future research should be designed in a way that makes null results meaningful and interpretable and discuss what the smallest effect size of interest in each domain would be.

Another area of potential limitations concerns the possibility of confounders that we may not have adequately incorporated into our assumed causal models. Consider the finding that anxiety, uncertainty aversion, and existential threat did not predict within-person changes in conspiracy beliefs but were consistently correlated with conspiracy beliefs at the between-person level (Manuscript 3): This raises the question of potential confounding variables that might cause both uncertainty- and fear-related experiences and conspiracy beliefs. Based on findings of Manuscript 4, one obvious candidate for this is brooding: A tendency to brood

likely impacts both conspiracy beliefs and other negative cognitive-affective states. Other confounding variables are conceivable, such as economic deprivation and financial insecurity (Adam-Troian et al., 2023), loneliness (Bierwiazzonek, 2023), social exclusion (Graeupner & Coman, 2017), or a search for meaning in life (Schöpfer et al., 2023). People may turn to conspiracy beliefs to explain negative life experiences in a self-serving manner (by blaming them on external factors [the conspiracy] instead of themselves). Future research should, where possible, employ experimental designs to uncover the causes of conspiracy beliefs. In cases where experiments are unfeasible or unethical, future research should include alternative methods for estimating causal effects, for example instrumental variables estimation (Pokropek, 2016), or graphical causal models with appropriate control of third variables and explicitly stated assumptions about causal relations (Rohrer, 2018).

Lastly, it would be insightful to study whether the psychological processes investigated here generalize to other societal crises, particularly human behavior in the context of climate change. Research has already demonstrated that self-related threat perceptions impact pro-environmental intentions and behaviors (Bockarjova & Steg, 2014; Bubeck et al., 2018; Keshavarz & Karami, 2016; Kim et al., 2013). However, similar to the pandemic, climate change is a crisis that requires global and intergenerational solidarity (Bazzani, 2023). At this point, it is predominantly the case that carbon emissions must be reduced by wealthy countries for the benefit of developing countries and their descendants, who will suffer the most from the negative impact of climate change (Bazzani, 2023). As such, future research on climate change could profit from considering pro-environmental behaviors as a form of solidarity with others. Ultimately, the distinction between self- and solidarity-oriented compliance may prove fruitful for all societal contexts that require public behavior change for the benefit of the collective.

## 7 Conclusion

Psychological responses to societal crises can range from compliance and solidarity to mistrust, conflict, and even violence. What motivates individuals to comply with governmental restrictions during societal crises? What are the characteristics of contrarian protestors? And what are the causes and consequences of conspiracy beliefs in the context of societal crises? The present research investigated these questions in the context of the Coronavirus pandemic. Four manuscripts that comprise a total of 10 empirical studies provide the following answers:

Both compliance with and opposition to the Coronavirus protective measures were underpinned by heterogeneous motives and belief systems: People complied with governmental restrictions for reasons of self-protection, solidarity, or both; and opposition to the protective measures in the form of anti-lockdown protests was found compatible with diverse socio-political beliefs that are united by a shared anti-science sentiment.

The adoption of conspiracy beliefs during societal crises is most likely not beneficial for the individual, at least when it comes to the experience of anxiety, epistemic uncertainty, and existential threat. Instead, conspiracy beliefs might even reinforce negative fear- and uncertainty-related states, thereby making people feel worse. Lastly, brooding, a dysfunctional type of repetitive negative thinking, appears to be a causal factor involved in the formation of conspiracy beliefs: A Registered Report revealed that brooding about societal problems significantly contributed to conspiracy beliefs. This suggests that interventions targeting brooding could be successful in preventing or reducing conspiracy beliefs.

Taken together, this dissertation illustrates that cognitive-affective experiences (e.g., perceived threat, anxiety, brooding) and socio-political beliefs (e.g., shared group identity, anti-science beliefs, and conspiracy beliefs) relate in complex and reciprocal ways to individual behavior in the context of societal crises. How individuals respond to societal crises in terms of (a) their social group identities, (b) their perceptions of threat to themselves and others, (c) the explanations they endorse within the crisis context, and (c) their trust in scientific information influence whether the crisis can be successfully overcome, or instead exacerbates societal conflicts and divisions. Policies and interventions that aim to facilitate public behavior change, and to mitigate the negative impact of societal crises in the future, should take these dynamics into account.

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## 10 Erklärung über die Eigenständigkeit der erbrachten wissenschaftlichen Leistung

Ich erkläre hiermit, dass ich die vorliegende Arbeit ohne unzulässige Hilfe Dritter und ohne Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe. Die aus anderen Quellen direkt oder indirekt übernommenen Daten und Konzepte sind unter Angabe der Quelle gekennzeichnet.

Bei der Auswahl und Auswertung folgenden Materials haben mir die nachstehend aufgeführten Personen in der jeweils beschriebenen Weise unentgeltlich geholfen.

1. Manuskript 1: Luisa Liekefett: Konzeptualisierung, Datenerhebung und Analyse, Schreiben. Julia C. Becker: Konzeptualisierung, Schreiben.
2. Manuskript 2: Luisa Liekefett: Konzeptualisierung, Datenerhebung und Analyse, Schreiben. Ann-Kathrin Bürner: Datenerhebung, Schreiben. Julia C. Becker: Konzeptualisierung, Schreiben.
3. Manuskript 3: Luisa Liekefett: Konzeptualisierung, Datenerhebung und Analyse, Schreiben. Oliver Christ: Analyse. Julia C. Becker: Konzeptualisierung, Schreiben.
4. Manuskript 4: Luisa Liekefett: Konzeptualisierung, Datenerhebung und Analyse, Schreiben. Simone Sebben: Konzeptualisierung, Datenerhebung und Analyse, Schreiben. Julia C. Becker: Konzeptualisierung, Schreiben.

Weitere Personen waren an der inhaltlichen materiellen Erstellung der vorliegenden Arbeit nicht beteiligt. Insbesondere habe ich hierfür nicht die entgeltliche Hilfe von Vermittlungs- bzw. Beratungsdiensten (Promotionsberater oder andere Personen) in Anspruch genommen. Niemand hat von mir unmittelbar oder mittelbar geldwerte Leistungen für Arbeiten erhalten, die im Zusammenhang mit dem Inhalt der vorgelegten Dissertation stehen.

Die Arbeit wurde bisher weder im In- noch im Ausland in gleicher oder ähnlicher Form einer anderen Prüfungsbehörde vorgelegt.

.....  
(Ort, Datum)

.....  
(Unterschrift)