Perspectives on Risk in a Public Health Crisis: Self-Regulation, Gendered Leadership Stereotypes, and Conspiracy Mentality

Dissertation

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"No matter what accomplishments you make, somebody helped you."

− Althea Gibson

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Abstract

The present thesis investigates a series of hypotheses relating to risk in the COVID-19 pandemic. The research covers three different domains, namely risky health behavior, COVID-19-related conspiracy mentality, and finally the evaluation of public health measures and political leaders in the pandemic. The thesis applies an integrated framework to these domains that encompasses both the individual level of health beliefs and behavior and the systemic level of perception of public health policies to investigate risk in the public health context.

The first research paper tested whether forming if-then plans to avoid touching one's face, especially the mucous membranes, could successfully reduce this risky health behavior to prevent the spread of infectious diseases like COVID-19. The results showed that the use of if-then plans successfully reduced the duration, but not the frequency of face touching. The results of the first research paper thus suggest that if-then plans can help to regulate the duration of an involuntary risky health behavior but should be tested further to reduce not only the duration but the frequency of said behavior.

The second research paper focused on general and pandemic-related conspiracy mentality, which has become a subject of great relevance in the context of COVID-19. Conspiracy mentality has been linked to paranoia in previous research. Similarly, the jumping to conclusions (JTC) bias, a tendency to make hasty decisions based on little information that affects information acquisition, has also been associated with paranoia and delusional ideation. It is assessed using a probabilistic reasoning task known as the beads task. Further dispositional factors that affect information acquisition include reasoning styles. The focus of this research paper was thus to investigate the associations of both types of conspiracy mentality with JTC and different reasoning styles in two studies. The results showed that actively open-minded thinking and cognitive reflection ability negatively predicted holding conspiracy mentality, while the need for cognitive closure positively predicted conspiracy mentality. Personal fear of invalidity showed mixed results, however, it always positively predicted COVID-19 conspiracy beliefs. JTC was positively predictive of conspiracy beliefs, even when controlling for the influence of reasoning styles. Imperatively, we showed that the occurrence of JTC remains stable and is not affected by the content of the beads task.

The third and final research paper investigated the perception of public health strategies, as well as the effects of a political leader's gender and the participant's political ideology. The COVID-19 pandemic sparked debate about gender differences in leadership in a public health crisis, an impression that may have resulted from associating women with risk-aversion and men with risk-seeking behaviors. While men's leadership has frequently been viewed as superior, the pandemic's particular challenges might have led to stereotypically risk-averse women being viewed as superior leaders. We conducted three experiments on evaluating public health strategies in the pandemic, investigating the effect of the politician's gender and the participants' political ideology. The results showed that a risk-averse strategy was viewed more favorably overall. Moreover, political ideology is a stronger predictor than the politician's gender. Conservative participants favored a more risk-seeking strategy, while liberals favored a more risk-averse strategy. Participants adhered to gender stereotypes of risk-seeking/aversion in their own behavior but did not project them onto the political leaders.

Overall, these research papers add to the research on risk in the pandemic and take an integrated approach to the subject. The research papers in the present thesis outlined links between public health and risk-related behavior, beliefs, and policy. Their results showed a) that self-regulation through implementation intentions helped to reduce the duration but not the frequency of involuntary risk behavior, b) that conspiracy mentality is associated with reasoning styles and the jumping-to-conclusions-bias, and finally, c) that risk averse public health strategies are generally supported in a large sample, and this support remains unaffected by a policy maker's gender but is affected by a subject's political ideology.

Zusammenfassung

In der vorliegenden Dissertation wird eine Reihe von Hypothesen zum Thema Risiko in der COVID-19-Pandemie untersucht. Die Forschung umfasst die drei Bereiche risikoreiches Gesundheitsverhalten, COVID-19-bezogene Verschwörungsmentalität und schließlich die Bewertung von Gesundheitsmaßnahmen im Bereich der öffentlichen Gesundheit und politischer Führungspersonen in der Pandemie. Die Arbeit wendet für diese Bereiche einen integrierten Rahmen an, der sowohl die individuelle Ebene der Gesundheitsüberzeugungen und des Gesundheitsverhaltens als auch die systemische Ebene der Wahrnehmung von Gesundheitsmaßnahmen umfasst, um den Bereich Risiko im Kontext der Pandemie zu untersuchen.

Im ersten Forschungsartikel wurde getestet, ob die Bildung von Wenn-dann-Plänen zur Vermeidung der Berührung des Gesichts, insbesondere der Schleimhäute, eine effektive Strategie darstellt, um die Verbreitung von Infektionskrankheiten wie COVID-19 zu verhindern. Die Ergebnisse zeigten, dass die Anwendung von Wenn-dann-Plänen erfolgreich die Dauer, aber nicht die Häufigkeit der Berührungen reduzierte. Die Ergebnisse dieses Artikels deuten also darauf hin, dass Wenn-dann-Pläne dazu beitragen können, die Dauer eines unfreiwilligen riskanten Gesundheitsverhaltens zu regulieren, dass sie aber weiter getestet werden sollten, um nicht nur die Dauer, sondern auch die Häufigkeit besagten Verhaltens zu reduzieren.

Der zweite Forschungsartikel befasste sich mit allgemeiner und pandemiebezogener Verschwörungsmentalität, die im Zusammenhang mit COVID-19 zu einem Thema von großer Bedeutung geworden ist.

Verschwörungsmentalität wurde in vorausgegangener Forschung mit paranoidem Denken in Verbindung gebracht. Auch die Tendenz zu voreiligen Schlüssen, die sich auf die Informationssuche auswirkt, wurde mit paranoidem Denken und Wahnvorstellungen in Verbindung gebracht. Zu den weiteren dispositionellen Faktoren, die sich auf die Informationssuche auswirken, gehören verschiedene Denkstile. Der Schwerpunkt dieser Forschungsarbeit lag daher auf der Untersuchung der Zusammenhänge zwischen beiden Arten von Verschwörungsmentalität und der Tendenz zu voreiligen Schlüssen sowie verschiedenen Denkstilen im Rahmen von zwei Studien. Die Ergebnisse zeigten,

dass die aktive Neigung zu offenem Denken und kognitive Reflexionsfähigkeit negativ mit Verschwörungsmentalität

zusammenhingen, während das Bedürfnis nach kognitivem Abschluss positiv mit Verschwörungsmentalität zusammenhing. Hinsichtlich der Angst davor, dass eigene Entscheidungen invalide sein könnten, zeigten sich gemischte Ergebnisse. Die Angst war jedoch immer positiv mit COVID-19-Verschwörungsüberzeugungen assoziiert. Die Tendenz zu voreiligen Schlüssen war ein positiver Prädiktor für Verschwörungsüberzeugungen, selbst wenn der Einfluss von Denkstilen kontrolliert wurde. Die Ergebnisse zeigten, dass das Auftreten von JTC stabil bleibt und nicht durch den Kontext des *Beads Task* beeinflusst wird.

Der dritte und letzte Forschungsartikel untersuchte die Wahrnehmung von Strategien im Bereich der öffentlichen Gesundheit sowie die Auswirkungen des Geschlechts einer politischen Führungskraft und der politischen Ideologie der Teilnehmenden. Die COVID-19-Pandemie löste eine Debatte über geschlechtsspezifische Unterschiede bei der Führung in Gesundheitskrisen aus; eine Debatte, die möglicherweise daraus resultierte, dass Frauen mit risikoaversem und Männer mit risikofreudigem Verhalten in Verbindung gebracht wurden. Die besonderen Herausforderungen der Pandemie könnten dazu geführt haben, dass stereotyp risikoaverse Frauen als überlegene Führungspersönlichkeiten wahrgenommen wurden, obwohl männliche Führungskräfte in der Vergangenheit häufig als überlegen angesehen wurden. Wir führten drei Experimente zur Bewertung von Strategien im Bereich der öffentlichen Gesundheit während der Pandemie durch und untersuchten dabei die Auswirkungen des Geschlechts der Führungsperson und der politischen Ideologie der Teilnehmenden.

Die Ergebnisse zeigten, dass eine risikoaverse Strategie insgesamt positiver bewertet wurde. Außerdem ist die politische Ideologie ein stärkerer Prädiktor als das Geschlecht der Führungsperson. Konservative Teilnehmende bevorzugten eine eher risikofreudige Strategie, während Liberale eine eher risikoaverse Strategie bevorzugten. Die Teilnehmenden hielten sich in ihrem eigenen Verhalten an geschlechtsspezifische Stereotypen in Bezug auf Risikobereitschaft und -vermeidung, projizierten diese jedoch nicht auf die politische Führungskraft.

Insgesamt trägt diese Dissertation zur Erforschung von Risiko im Zusammenhang mit der Pandemie bei und verfolgt einen integrierten Ansatz zu diesem Thema. In den Forschungsartikeln in der vorliegenden Arbeit wurden Zusammenhänge zwischen öffentlicher Gesundheit und risikobezogenem Verhalten, Überzeugungen und Politik aufgezeigt. Ihre Ergebnisse zeigten, a) dass Selbstregulierung durch Wenn-Dann-Pläne dazu beiträgt, die Dauer, nicht aber die Häufigkeit unfreiwilligen Risikoverhaltens zu verringern, b) dass Verschwörungsmentalität mit Denkstilen und der Tendenz zu voreiligen Schlüssen zusammenhängt, und schließlich c) dass risikoaverse Strategien im Bereich der öffentlichen Gesundheit in einer großen Stichprobe generell unterstützt werden, wobei diese Unterstützung nicht vom Geschlecht der Entscheidungsträger, wohl aber von der politischen Ideologie der Teilnehmenden abhängt.

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Synopsis

The COVID-19 pandemic has represented one of the most significant global challenges of the 21st century thus far and has affected most domains of life. In its wake, perspectives on public health have gained relevance, and numerous questions surrounding public health as it relates to risk have arisen. (How) can behavior that is harmful to personal and public health be self-regulated? What psychological factors affect people's belief in pandemic-related conspiracy theories that are associated with less engagement in protective health behavior? Which public health measures are considered appropriate by the public in a health crisis, and is it relevant who implements them? The present thesis offers a broad perspective on different aspects of risk in the face of the pandemic, covering behaviors and perceptions from an individual to a systemic level. Its goal is to highlight various psychological and behavioral facets of risk related to the COVID-19 pandemic and contribute to new insights at the intersection of public health and risk, which may be advantageous in this pandemic and in future health crises or other risk-related situations. To do so, this thesis capitalizes on large samples and a broad range of methods and (experimental) designs across three different lines of research.

In the first line of research, I investigated whether implementation intentions (P. M. Gollwitzer, 1999, 2014), a self-regulation strategy, present an effective tool to reduce face-touching − a risky health behavior in the context of infectious disease prevention (Heinicke et al., 2020). The second line of research focuses on general and COVID-19-related conspiracy beliefs and how they are related to the jumping-to-conclusions bias and different reasoning styles linked to information acquisition (Ross et al., 2016). The third and final line of research investigated the perception and evaluation of political leaders relating to their gender and the risk level of their public health policy during the COVID-19 pandemic. In this synopsis, three pertinent aspects of a public health framework constructed on two levels (individual vs. systemic level) will be taken into consideration: risk behavior, beliefs regarding the pandemic, and pandemic-related policies.

First, I will outline uncertainty and risk in the context of public health and the COVID-19 pandemic, clarifying what makes the pandemic a unique context in which to study risk. I will then define a framework of the three levels of risk within which the three lines of research are placed, moving from the micro – to

the macro level. Subsequently, I will provide summaries of the three research papers contained in this thesis. Finally, I will conclude with a general discussion, including implications for related research and providing an outlook for future directions.

Risk in a Public Health Crisis

How we perceive and confront risk is an important factor in informing and directing human behavior. While risk is inherently part of life, previous research has shown that a variety of factors influence how we process risk and react in the face of it, such as emotions, perceived feelings of control, risk domain, domain-specific knowledge of the hazard in question, demographic variables and many more (Hogarth et al., 2011; Nordgren et al., 2007; Shou & Olney, 2020; Siegrist & Árvai, 2020; Slovic et al., 1982; Slovic, 2016; Slovic & Peters, 2006; Turner & McClure, 2003; Wachinger et al., 2013; Yang & Chu, 2018). As a result, risk behavior and perception can vary widely depending on individual factors as well as context.

The COVID-19 Pandemic: A Unique Context

The COVID-19 pandemic presents a rare context in which to study risk, as it creates conditions drastically different from many commonly studied domains such as financial or personal decisions (Blais & Weber, 2008; Grable, 2016). Some have (mis)represented or (mis)interpreted COVID-19 as an ordinary risk of everyday life (Beer, 2021; cf. Doan, 2021; cf. Niemi et al., 2021). However, unlike a seasonal influenza outbreak, the pandemic be categorized as an extreme event (Brammer et al., 2020; Tenreiro Machado & Lopes, 2020) for various reasons.

In contrast to other common illness that one may contract as a 'usual' risk of everyday life, COVID-19 comes with unique characteristics that set it apart. Early on, little was known about the short-term and long-term effects of COVID-19, its spread, treatment, and prevention (Galbadage et al., 2020; Rismanbaf, 2020; Weston & Frieman, 2020) making risk assessment and forecasting more difficult (Ale, 2009; Luo, 2021). Furthermore, as the novel virus emerged, there was practically no herd immunity in the population (i.e., most people were vulnerable to contracting the disease), and no vaccine was available until the end of 2020 (Hatcher et al., 2022) followed by a lengthy vaccine rollout, and the emergence of virus mutations, some of which lowered the efficacy of existing vaccines

(Vasireddy et al., 2021). This shows that control over the course of the pandemic was limited. Moreover, it constitutes an uncertain situation of extreme duration, given that the pandemic was declared on March 11th, 2020 (World Health Organization, 2020a) and its end is yet to be officially declared as of January 2023. In addition, it harbored the risk of far-reaching potential political consequences (Davies et al., 2021; Jørgensen et al., 2022; Plümper et al., 2021; Vieten, 2020) threats to the functioning of a globalized society and economy (Aday & Aday, 2020; Pujawan & Bah, 2022), and large-scale physical and mental health costs beyond COVID-19 itself (Adams-Prassl et al., 2022; Fiorillo et al., 2020; Jacobsen, 2020; Killgore et al., 2020) that needed to be weighed against one another to minimize overall damage.

Thus, the pandemic created conditions for unique patterns of risk perception and behavior to arise. This thesis will take advantage of this unique context as an opportunity to study risk in an extraordinary situation, in an integrated manner, and across three different domains, all of which are embedded in a public health context.

Overarching Framework

To achieve this objective, this thesis takes the approach of investigating three phenomena related to risk and COVID-19 that were especially widely discussed in the media, by the public, and in research throughout the pandemic, and all of which will be viewed from a perspective rooted in social-psychology and motivation science: risky health behavior, (Centers for Disease Control and Prevention, 2020; Devlin, 2020; López-Bueno et al., 2020) beliefs about COVID-19 (Imhoff & Lamberty, 2020; Suciu, 2022), and evaluations of public health policies and leaders implementing them (Park, 2022; Windsor et al., 2020; Wittenberg-Cox, 2020). These lines of research were selected to cover this integrated approach and shed light on contexts from the micro level (i.e., close to the individual) to the macro level (i.e., affecting society on a systemic level), thus covering some of the most extensively debated domains of risk behavior and perception in this health crisis.

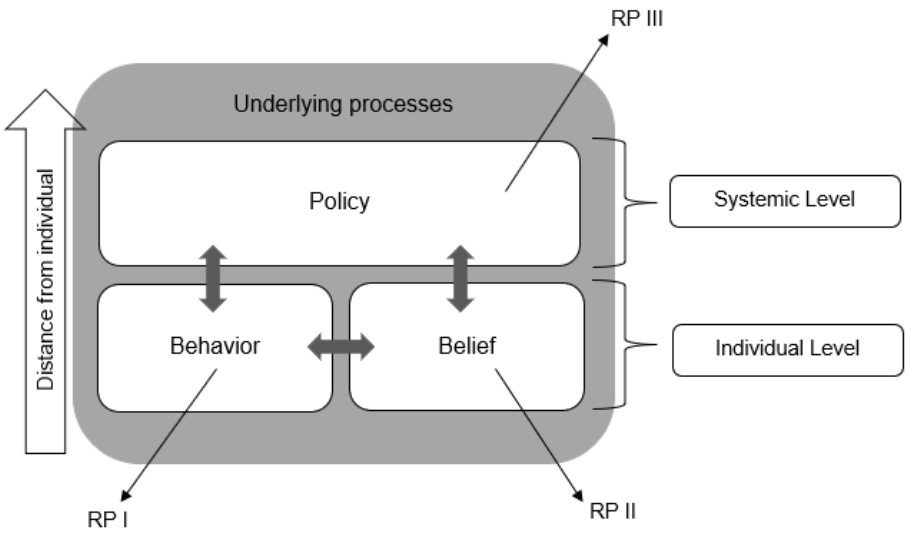
For the present thesis, I thus propose a framework that ties the three threads of behavior, beliefs, and policy together. Figure 1 showcases the framework, which is structured into two levels (individual and systemic) and depicts how they build upon one another. The framework contains the three aspects of risk relevant to the

present research: behavior, beliefs, and policy. As behaviors and beliefs are displayed by and formed within the individual, and the individual has a higher level of control over them, they are categorized at the individual level. In contrast, as policy is more dependent on the actions and decisions of others and its effects affect people on a larger rather than just an individual scale, it is located on the systemic level. Moreover, the framework depicts the interconnectedness of the three areas: beliefs can influence behavior (Ajzen, 2020), while past experiences, which can be related to exhibiting a certain behavior (e.g., getting a flu vaccine or not) may, in turn, affect beliefs (Shahrabani & Benzion, 2012). Both beliefs and behavior can also (if indirectly) influence the systemic level (Deutsche Welle, 2022; Plümper et al., 2021). The systemic level can, in turn, influence behavior (e.g., by mandating or banning certain behaviors) and beliefs (Huang & Cruz, 2022; The Lancet Infectious Diseases, 2020).

Lastly, the framework outlines that these three levels are influenced by underlying cognitive processes, some of which will be studied in more detail in the three research papers (e.g., plans to automate behavior, reasoning styles, cognitive biases, and stereotypes). The proposed categories each link back to a variety of the factors that influence risk perception and behavior, such as (perceived) level of control, emotions, or knowledge of the relevant hazard. Figure 1 also places each research paper into the proposed framework.

Figure 1

Overview of the proposed framework showing which parts are addressed in Research Papers I –III (RP I – III)



In sum, this thesis aims to add to the body of literature on COVID-19, focusing on three specific, relevant areas, and take advantage of the unique and vast context presented by the pandemic. Its strength lies in the inclusion of risk behavior and perception within these different categories, ranging from self-regulation of individual behavior and the investigation of beliefs that may influence such behaviors all the way to political leadership and public health policies on a systemic level, thereby taking a micro to macro level approach. The following sections will outline the three lines of research in more detail, further demonstrating the background and relevance of each individual line of research.

Research Paper I: Self-Regulation of Face Touching

At the beginning of the COVID-19 pandemic, establishing and maintaining good hygiene habits was among the first recommendations to protect oneself and others from the novel virus (World Health Organization, 2020b). While mask-wearing and physical distancing are conscious behaviors, one of those hygiene habits that was particularly difficult to follow was avoiding touching one's face, especially the eyes, nose, and mouth, as it is a frequent (Kwok et al., 2015) but usually involuntary behavior (Perl et al., 2020). Therefore, finding a way to control it may be especially difficult. Not following hygiene recommendations can be viewed as a potential health risk to oneself and others (Heinicke et al., 2020), making it an important aspect of risk behavior in a public health crisis.

In Research Paper I, my coauthors and I tested implementation intentions, a self-regulation strategy, as a potential approach to help reduce face-touching behavior with the goal of avoiding the introduction of pathogens into the body through the mucous membranes. Forming implementation intentions (Bieleke et al., 2021; P. M. Gollwitzer, 1999, 2014) seemed a suitable strategy for this objective, as it goes beyond simply setting a goal for oneself; rather, it specifies when, where, and how one plans to act on an intention, following the format "If situation X occurs, then I will perform the goal-directed response Y!" The use of this self-regulation strategy is simple and accessible, as no material resources are required to form and follow an implementation intention. Previous research has found them to be successful in various other health-related domains like reducing alcohol consumption (Wittleder et al., 2019), snacking (Adriaanse et al., 2009), smoking (Mutter et al., 2020; Webb et al., 2009), and bedtime procrastination (Valshtein et al., 2020). Furthermore, there is a large body of research showing

that implementation intentions can be a useful tool for behavior change in various other domains (P. M. Gollwitzer, 2014). The success of implementation intentions is rooted in two main mechanisms: they specify a critical situational cue, thereby making it accessible and easily detectable as an opportunity to display the desired behavior. Additionally, they forge a link between the situational cue and the desired goal-directed behavior, which makes the occurrence of the situational cue an automatic trigger for the desired behavior, outpacing any antagonistic responses that may hinder goal pursuit (P. M. Gollwitzer, 2015). The success of this self-regulation strategy in so many areas, including health, led us to believe that they could be equally successful in controlling this risky health behavior.

Behavioral observation is a crucial pillar of social psychology and motivation science (Baumeister et al., 2007), yet physical distancing measures during the pandemic made this instrument rather inaccessible. We tested the effectiveness of implementation intentions to reduce face touching using a methodologically novel experimental approach, which allowed us to observe more than 150 participants' actual behavior in a remote setting. We equipped participants with implementation intentions targeting different aspects of face touching: frequency and duration. As large-scale, in-person observations were not feasible, we observed participants' face-touching behavior through their webcams using an online video recording and processing service while they performed engaging tasks to mimic an everyday situation in which they would not be focusing on their hands; a baseline level of face touching was assessed for each participant. Participants were assigned to one of three conditions (a control condition and two different implementation intention conditions); all participants were asked to adopt the goal of avoiding touching their faces, but one group received an additional implementation intention aiming to reduce the duration of face touching, while the third group received an implementation intention aiming to reduce the frequency of face touching. We hypothesized that supplementing a mere goal with an implementation intention would reduce face-touching behavior. To operationalize and accurately measure face-touching, we created a manual on how to rate the frequency and duration of each individual face-touching event. We had all videos rated by two independent raters blind to the hypotheses and experimental conditions.

The results of our experiment showed that despite high goal commitment, participants touched their faces about 0.8 times per minute, again underlining how difficult this risky behavior is to control. We found a baseline difference between the duration-focused condition and the frequency-focused condition. Interestingly, participants assigned to the duration-focused condition then reduced the duration of their face-touching events compared to the goal condition, suggesting the duration-focused implementation intention may have been effective, while this was not the case for the frequency-focused implementation intention. While the effect of the duration-focused implementation intention is promising, no effect of implementation intentions to reduce the frequency of face-touching behavior was found.

Conclusion. Research Paper I uses a methodologically novel experimental design, which facilitates the observation of actual behavior in a remote setting. The findings of this study suggest that face-touching duration was successfully reduced with the help of an implementation intention, while face-touching frequency was not. Numerous potential reasons for these findings, such as the wording of the implementation intention or the setting of the experiment, are discussed in Research Paper I. We conclude that forming implementation is a promising approach to facilitating behavior change on a micro level, which could greatly impact the individual layer of the framework suggested in this thesis, and thus help foster good hygiene habits and reduce the spread of infectious disease in the future. However, further investigation, particularly field research, is necessary to conclude whether implementation intentions can effectively reduce the frequency of unwanted behavior.

Research Paper II: Conspiracy Mentality & Jumping to Conclusions

In the context of the COVID-19 pandemic, people's inclination to adopt conspiracy beliefs has become a topic of public interest (Byford, 2020; Willingham, 2020). One's proneness to hold conspiracy beliefs can be affected by various situational and dispositional factors, and it has been found that holding conspiracy beliefs, particularly regarding COVID-19, can lead to engaging in fewer health protective behaviors (Allington et al., 2020), increasing one's risk of contracting and spreading the disease. How one draws conclusions from available information is a relevant factor regarding the adoption and maintenance of conspiracy beliefs. In this context, the concept of jumping to conclusions (JTC), which is a cognitive

bias characterized by drawing conclusions from insufficient information, may be an important contributor (Pytlik et al., 2020). To date, it has mostly been studied in relation to paranoia and delusional ideation (Freeman et al., 2014), potentially linking it to conspiracy beliefs, which are also linked to paranoia (Imhoff & Lamberty, 2018). JTC may thus be associated with adopting certain world views (e.g., world views that offer a simple, direct explanation for complex issues) over others, despite contradictory evidence. Other concepts that could affect the adoption and maintenance of conspiracy beliefs include different reasoning styles. Individual differences in cognitive styles can affect an individual's information acquisition and processing strategies, impacting their behavior in a variety of tasks (Stanovich & West, 1997; Thompson et al., 2001). Moreover, these reasoning styles may be antecedents to JTC (Ross et al., 2016).

We, therefore, investigated a further aspect of the individual layer of risk as it relates to public health in Research Paper II. Our aim was to examine whether and how JTC and different reasoning styles are linked to general conspiracy beliefs and conspiracy beliefs specific to COVID-19 (Studies 1 and 2), as these beliefs can affect the extent to which one engages in risky personal and public health behaviors (Bierwiaczonek et al., 2020). Furthermore, we wanted to assess whether there was any meaningful relationship between JTC and conspiracy beliefs beyond the association with the included cognitive styles.

Conspiracy Mentality. Conspiracy theories describe the idea of important social or political events being coordinated by powerful actors out of self-interest (Douglas et al., 2019). There is often an increase in their popularity during times of instability or crisis, and it is believed that regaining a feeling of control over events is a major reason for this phenomenon (van Prooijen & Acker, 2015). This also occurred throughout the COVID-19 pandemic (Bierwiaczonek et al., 2020). Previous research shows that believing in one conspiracy theory increases the probability of believing in others, even if the subject is unrelated (Wood et al., 2012). This gave rise to the concept of a general conspiracy mentality, which suggests that some individuals are generally more inclined towards conspiracy theories than others (Goertzel, 1994). This latter association supports the idea that cognitive styles may be related to conspiracy mentality. Furthermore, conspiracy beliefs are associated with paranoia (Imhoff & Lamberty, 2018). While some conspiracy theories are considered harmless, the belief in certain conspiracy

theories can result in serious consequences, such as less engagement in health-protective behavior (Allington et al., 2020; Earnshaw et al., 2020). As health is a frequent subject of conspiracy theories (Bogart et al., 2010; Earnshaw et al., 2019; Thorburn & Bogart, 2005), a better understanding of the mechanisms behind conspiracy beliefs is crucial. Thus, both general and COVID-19-specific conspiracy beliefs were included and examined in these studies.

Jumping to Conclusions. A commonly studied phenomenon in the context of information acquisition is the jumping to conclusions bias (JTC). It describes an information processing pattern characterized by drawing conclusions based on insufficient data. Those exhibiting JTC thus make hasty decisions based on little information, potentially leading to erroneous results (Hemsley & Garety, 1986). In psychological research, JTC has been found to be associated with paranoid ideation to some extent in clinical and non-clinical populations (Freeman et al., 2008; McLean et al., 2017). It is thought to contribute to the adoption and maintenance of delusional beliefs (Bell et al., 2006), and it has been linked to a failure to accept information that contradicts one's belief system (Woodward et al., 2006) as well as a more pronounced belief in conspiracy theories (Pytlik et al., 2020).

JTC is assessed using the so-called beads task (Huq et al., 1988): Participants are presented with two jars containing beads of different colors in equal but opposing proportions (e.g., 40:60 red vs. blue beads in Jar A and 60:40 red vs. blue beads in Jar B). Participants sample beads from one of the two jars and are then asked to decide whether the beads have been drawn from Jar A or Jar B. Participants may draw up to 20 beads before making a decision; deciding too early is considered JTC. This task constitutes decision-making in the face of uncertainty, as one must rely on the available information. For Study 2, we created a modified version of the beads task, in which participants drew positive or negative COVID-19 rapid test results instead of beads of different colors. They were told these results came from intensive care wards with different distributions of vaccinated versus unvaccinated patients (e.g., 40:60 vaccinated vs. unvaccinated patients) to test whether modifying its content would change behavior in the task (i.e., whether sampling information, which is more aligned with one’s beliefs would lead to a hastier decision).

Cognitive Styles. Cognitive styles are rather stable thinking dispositions affecting thought processes, behaviors, or decisions in various ways (Thompson et al., 2001). They have frequently been studied in conjunction with JTC (Ross et al.,

2016; Webster & Kruglanski, 1994) and have even been proposed as possible underlying mechanisms of the JTC bias (Corlett & Fletcher, 2014). Studying them may, therefore, contribute to our understanding of interindividual differences in information search and processing as well as decision-making, which can, in turn, help to explain differences in inclination toward conspiracy mentality. In the studies in Research Paper II, actively open-minded thinking (AOT; Studies 1 and 2), personal fear of invalidity (PFI; Studies 1 and 2), need for cognitive closure (NFCC; Study 2) and cognitive reflection (CRT; Study 2) were investigated as potential predictors of conspiracy mentality, as all have empirically or theoretically established links to JTC (Ross et al., 2016; Webster & Kruglanski, 1994).

The aim of the present studies was to examine whether and how different reasoning styles and JTC may be linked to both general conspiracy mentality and conspiracy beliefs specific to COVID-19. Moreover, we aimed to assess whether JTC on its own had any predictive value beyond that of reasoning styles. In two studies, we investigated whether JTC, different reasoning styles (AOT, PFI, NFCC and CRT) predicted general and COVID-19-related conspiracy beliefs.

In Experiment 1 ($N = 532$), participants first completed the beads task followed by measures of different reasoning styles and general and COVID-19-specific conspiracy beliefs. We found that AOT was negatively correlated with JTC.

Moreover, thinking styles as well as jumping to conclusions predicted both general and COVID-19-related conspiracy beliefs. AOT was a negative predictor for all conspiracy beliefs, while JTC (i.e., fewer draws to decision) and PFI positively predicted all conspiracy beliefs. The association of all conspiracy beliefs and JTC was statistically meaningful beyond their association with reasoning styles, all present associations can be found in Table 1.

Table 1

Summary of the relationships between cognitive styles, conspiracy beliefs and JTC in Studies 1 and 2

	Expected Direction	Conspiracy Belief Measure		
Study 1		CMQ	Single-Item	COVID-19-related
AOT	↓	✓	✓	✓
PFI	↑	✓	✓	✓
JTC	↑	✓	✓	✓
Study 2				
AOT	↓	X	✓	✓
PFI	↑	X	X	✓
NFCC	↑	✓	✓	✓
CRT	↓	✓	✓	✓
JTC	↑	X	X	✓

Note. ↑ denotes an expected positive association, ↓ denotes an expected negative association. ✓ shows the association in the expected direction was present, X shows that no association was found.

In Experiment 2 (N = 551), participants additionally reported their political ideology and were randomly assigned to one of two experimental conditions: either the traditional beads task or a COVID-19-themed beads task. This was done to test whether the theme of the beads task would affect JTC. We found no effect of the experimental manipulation, suggesting that JTC remains unaffected by the content of the beads task. We replicated the negative correlation of AOT with JCT and its role as a negative predictor of single-item general and COVID-19-related conspiracy beliefs, but not the CMQ. Furthermore, we found that PFI was negatively correlated with JTC and positively predicted COVID-19-related but not general conspiracy beliefs. NFCC positively predicted all conspiracy beliefs. Participants' political ideology also emerged as a significant predictor for all conspiracy beliefs. However, JTC only predicted COVID-19-related conspiracy beliefs, but not general conspiracy beliefs beyond their relationship with reasoning styles.

Conclusion. In sum, our findings highlight the role of JTC and interindividual differences in thinking styles in the susceptibility to COVID-19-related and general conspiracy beliefs. AOT seems to be linked with fewer conspiracy beliefs and seeking more information before drawing conclusions. A higher NFCC appears to be associated with holding more conspiracy beliefs. PFI shows a less clear-cut pattern, but the general trend suggests a positive relationship with conspiracy beliefs, which should be further examined in future research. Participants exhibiting JTC arrive at a conclusion too early, and they seem to do so regarding information related to COVID-19 as well. Thereby, JTC was able to explain variance in conspiracy beliefs beyond the contribution of thinking styles. These findings provide important insights into the underlying processes related to the adoption conspiracy beliefs, thus shedding light on factors influencing beliefs on the micro level. Due to its game-like and easy-to-understand application, assessing individual differences in JTC can be fruitful in furthering the understanding of potentially maladaptive judgment and decision-making, like the endorsement of conspiracy beliefs. Crucially, we found that performance in the beads task remains unaffected by the content of the task. A summary of the associations between variables can be found in Table 1.

Research Paper III: Gendered Leadership Perception

Another area in which risk perception intersects with public health is the domain of public health policy and leadership in a crisis. Especially in the early phases of the pandemic, numerous media outlets (Dudman, 2020; Wittenberg-Cox, 2020) and scientific studies (Aldrich & Lotito, 2020; Garikipati & Kambhampati, 2021) reported that countries with women leaders outperformed male-led countries in their public health responses. These countries (e.g., New Zealand, Taiwan, Finland, Iceland) were seen to have better public health outcomes (i.e., fewer infections and deaths). Their successes were usually linked to risk-averse public health responses involving measures such as lockdowns, physical distancing, and mask mandates found to be successful measures (Kasahara et al., 2020; Oraby et al., 2021). The implementation of such measures was often associated with the risk-aversion of women leaders (Kwan et al., 2020; Luoto & Varella, 2021). While risk-aversion and caring are stereotypically often associated with women, decisiveness, risk-seeking, and other leadership stereotypes are more often associated with men (Corrêa Varella et al., 2016). In addition to many leadership stereotypes being masculine, male leadership is often perceived as preferable and more successful (Koenig et al., 2011). However, in light of the COVID-19 pandemic, a risk-averse strategy appears to have been the more successful approach from a public health perspective (Habersaat et al., 2020; Priesemann et al., 2021). Such reports may not align with people's expectations. Hence, we wondered whether these claims could influence people's views of male versus female political leaders in the context of the COVID-19 pandemic.

Research Paper III thus investigated whether a politician's gender and COVID-19 response (risk-seeking vs. risk-averse) would influence people's evaluations of the politician and that politician's crisis management. We aimed to test whether stereotypical patterns would be maintained (i.e., male leaders being evaluated more positively than female leaders) or whether they would change given the recent narrative shift surrounding COVID-19 (Rudman & Glick, 2001). In our experiments, we had participants evaluate a political leader after reading an interview about their management of COVID-19, in which we varied the pandemic response's risk level and the politician's gender (Experiments 1 – 3). Further, considering the political polarization surrounding COVID-19 policy (Baccini & Brodeur, 2021; A. Gollwitzer et al., 2020), we also wanted to assess

whether political orientation would moderate these evaluations (Experiments 2 and 3).

In the first experiment ($N = 390$), we found that the risk level of the politician's pandemic response significantly predicted how they were evaluated, suggesting that most people viewed a pandemic response that focuses on minimizing public health risk as more appropriate than a response that prioritizes other factors like economic outcomes over public health. This result indicates that the public views risk-averse strategies as the more appropriate course of action in the absence of other public health interventions like vaccines, which were not yet available at the time. We found no effects regarding gender. Political ideology was not assessed in this first experiment.

Experiment 2 ($N = 804$) again showed that a risk-averse pandemic response is evaluated more positively than a risk-seeking response, along with the politician implementing it. Moreover, we found that women overall gave more favorable evaluations than men, regardless of the risk level. As previously, there was no effect of the politician's gender. Furthermore, we found that political orientation was a strong predictor and that liberals and conservatives held strongly opposing views regarding risk-averse pandemic policies. While liberals support a risk-averse pandemic response, conservative participants favor a leader implementing a risk-seeking pandemic response. In sum, political ideology seems to be much more influential than gender. Interestingly, the participants' gender seems more relevant than the politician's gender. There was some evidence that the gender manipulation in the experiment may have been too subtle, so this was addressed in the third experiment.

In a third and final experiment ($N = 801$), we added a stronger gender manipulation in the form of images to ensure that participants noted the politician's gender. We were able to replicate our previous findings and show that a risk-averse strategy is viewed as more effective. Moreover, we confirmed the effect of political ideology found in Experiment 2. This is in line with research showing that liberals were more likely to engage in pandemic safety measures compared to conservatives (Gelfand et al., 2022). Once more, there was no effect of the political leader's gender, confirming the findings in Experiments 1 and 2. Political ideology was found to be much more influential than gender.

Conclusion. Our experiments provided new insights into the (presence or absence of) effects of public health risk level, gender, and political ideology on evaluating a COVID-19 response and a political leader. We showed that a risk-averse pandemic response was widely viewed as effective and necessary and that political leaders following such a strategy were evaluated more positively. We found this to be true even in samples that were balanced in terms of ideology. Experiments 2 and 3 revealed that conservative participants were more supportive of a more risk-seeking pandemic response than liberals. The opposite was the case for liberals. These findings highlight that in the case of COVID-19, risk-aversion appears to be the preferred strategy on a macro level (i.e., the systemic layer within the proposed framework), suggesting that a political leader's risk behavior affects how they are perceived in the context of the pandemic. The results further suggest that political ideology is an influential underlying factor on a systemic level.

Several questions remain open for future research. One of them is whether the absence of an effect of the politician's gender may be due to the strong political polarization surrounding the subject of the pandemic (Kerr et al., 2021), which may cause participants to focus more strongly on policy than they otherwise would, thus obscuring any potential effects of gender. The absence of gender effects is notable, given the frequent evidence of such findings (Koenig et al., 2011; Rudman & Glick, 2001). Future research should further investigate this question by using a similar experimental design but basing evaluations on less politically charged subjects. Finally, we must mention that economic impacts and public health risks were often portrayed as orthogonal constructs in the context of the pandemic, thus an economically oriented approach was seen as risk-seeking in terms of public health. It is yet to be addressed, whether they are truly mutually exclusive.

General Discussion

The three research papers in the present thesis outlined links between public health and risk-related behavior, beliefs, and policy. Their findings showed a) that self-regulation through implementation intentions can help control the duration of involuntary risk behavior on an individual level, b) that conspiracy mentality is associated with reasoning styles and the jumping-to-conclusions-bias, and finally, c) that risk averse public health strategies are widely supported in a large sample,

and this remains unaffected by a policy maker's gender but is affected by a subject's political ideology. I will now discuss the contributions these research papers make, implications for the risk framework presented, and its interplay with behavior, beliefs, and policies. I will close by delineating directions for future research.

Contributions and Implications

The findings in this thesis make several important contributions that further research on risk and public health. Overall, this research provides an integrated view of three different areas related to risk in the context of a public health crisis that can be classified as a once-in-a-century event. It includes individual and systemic aspects in its approach.

Research Paper I builds on and adds to the vast literature on implementation intentions by testing them as a potential intervention for a behavior that constitutes a health risk on the micro level. The findings showed that implementation intentions were successful in reducing face touching duration but did not reduce face touching frequency beyond the effects of a simple goal in this case. This is only partially consistent with the large body of research showing that implementation intentions can help reduce risky health behaviors (Adriaanse et al., 2009; Wittleder et al., 2019). However, much of this research uses not only implementation intentions alone, but the extended strategy of Mental Contrasting with Implementation Intentions (Mutter et al., 2020; Oettingen et al., 2013; Wittleder et al., 2019), an extended, more elaborate self-regulation strategy that includes identifying internal obstacles that may hinder goal attainment and tailoring the implementation intention to said obstacles. Thus, adding mental contrasting, as well as further specifying the wording of the plan, may help to further reduce face touching frequency.

In sum, implementation intentions show promise as an approach to facilitating individual behavior changes in this context, thus supporting the fostering of hygiene habits in the general population. This could, eventually, help support the spread of infectious disease in the future, especially as implementation intentions are extremely accessible, thus providing a useful supplement to other, often costly, health measures (e.g., masks, vaccines, etc.).

While the hypotheses in this research paper were only partially confirmed, the study tests a novel methodological approach, which allows for the observation of

actual behavior in a remote setting. The experiment has relevant practical implications, as it demonstrated that behavioral experiments can be successfully conducted from afar, thus decreasing barriers to participation in scientific research and increasing the number of people that might be reached and included in experiments. Beyond its use during times of physical distancing, this method could also be used to remotely observe other behaviors (e.g., work, media consumption, etc.). Research Paper I, in addition to its findings, thus provides a methodological tool that may be suitable for research during future health crises and in other contexts.

Research Paper II provides additional evidence regarding the association of JTC and different reasoning styles that are in line with previous research (Bronstein et al., 2019; Ross et al., 2016). Further, it shows associations of both reasoning styles and JTC with different types of conspiracy mentality. Importantly, the studies also provide evidence that the predictive ability of the JTC bias is not solely driven by the underlying reasoning styles but that the association remains even when controlling for reasoning styles. Moreover, it shows that the context of the task that requires decision-making under uncertain conditions does not affect the JTC bias but that it remains stable throughout. Importantly, these studies further the understanding of underlying factors that contribute to the formation and maintenance of conspiracy beliefs, which are extremely relevant in the context of COVID-19 but are also common in other areas (Douglas et al., 2019). These findings are accompanied by important practical implications, as a more in-depth understanding of the adoption of conspiracy beliefs on an individual level could help identify ways to inhibit the negative effects of misinformation and disinformation. This could, in turn, support more protective health behavior in future health crises (Allington et al., 2020) and, in extreme cases, even have social ramifications beyond health, like the prevention of radicalization (Kruglanski et al., 2022).

Research Paper III provides robust evidence that, overall, a pandemic strategy focusing on minimizing health risk was evaluated more positively alongside the politician implementing it. Such a strategy has been found to be most successful at keeping the pandemic in check (Kasahara et al., 2020; Oraby et al., 2021; Shay, 2020) and thus appears to be supported by the majority of the public. This suggests a tendency toward risk-aversion on the macro level in the face of this

public health crisis. However, political ideology plays a relevant role, as those with a more conservative ideology were less likely to endorse a risk-averse strategy, while the opposite was the case for liberals. This is in line with evidence showing that liberals show more risk aversion in the face of collective threats (Choma et al., 2013) and constitutes another critical finding regarding the contributing factors of demographic variables and underlying values and beliefs. Moreover, gender stereotypes regarding the political leader were not found to play a role in these experiments; however, participants were found to respond in accordance with stereotypes regarding their own gender, as women expressed a stronger preference toward risk-aversion than men. This is in line with gender effects surrounding risk behavior (Charness & Gneezy, 2012) as well as observations regarding gender differences in behavior during the pandemic (Tan et al., 2022).

Additionally, a more thorough understanding of the underlying elements and processes could be vital in understanding what shapes and affects the reception of policies and political leaders in a future crisis, rendering these findings decidedly insightful. While the last research paper investigated underlying stereotypes in a systemic context, further investigation of the effects of reasoning styles or automatic behavior, as assessed on a micro level in Research Papers I and II respectively, could help to advance this understanding on a macro level and further interconnect the systemic and individual levels of the proposed framework.

Finally, such an interconnected grasp of individual behaviors, beliefs, and perceptions of policies on a systemic level, linking all aspects of the framework, will be tremendously useful in the future and should be developed further. It has been predicted that climate change will likely lead to more frequent extreme events, like extreme weather and epidemics (McMichael, 2015). Investigating and creating tools that will allow us to better direct and control the course of extreme events by understanding behavior, beliefs, and policy perception is thus in the interest of public health.

Limitations and Future Directions

This thesis represents a point of departure for furthering knowledge of COVID-19-related risk behavior, beliefs, and policies and contributes to the existing body of research through its wide variety of research questions and its integrated approach. Yet, the different levels that were investigated could be linked further as a next step for future research, in line with the proposed framework. The research papers in this thesis assessed at least one aspect related to risk; however, risk perception and behavior were not simultaneously included in each study. While a separation allows for an isolated image of risk perception and behavior, supporting a deeper understanding of each individually, investigating both aspects within the same setting would further broaden our insights into the interplay of risk perception and behavior, how they relate to one another, and the underlying processes that affect them.

Moreover, research could be advanced further by investigating risk behavior and perception on both layers (individual and systemic) of the proposed framework, as all levels must be considered to gain a complete perspective and, importantly, successfully overcome a health crisis like this pandemic. Additionally, it may eventually allow the prevention of risky health behaviors and beliefs. Beyond the considerations for further investigation to advance the general framework, each of the research papers, too, gives rise to relevant future research.

Regarding Research Paper I, the self-regulation of undesirable health behaviors should be investigated using Mental Contrasting with Implementation Intentions, which support the process of regulating automatic behavior by identifying obstacles to the desired behavior and forming implementation intentions to overcome them (Mutter et al., 2020; Oettingen et al., 2013; Wittleder et al., 2019).

Furthermore, field research is required to conclude whether self-regulation can effectively reduce risky health behavior in settings that harbor risks. The research method used in this research paper can, moreover, be used to observe any number of other behaviors in a remote setting.

Research Paper II mainly used correlative data to gain an initial overview of the associations between reasoning styles, JTC, and conspiracy mentality, manipulating only aspects of the beads task. Thus, experimental investigation of these phenomena should follow to establish the presence or absence of causal links between them. Moreover, methods of training or self-regulation strategies

may be employed to investigate whether reasoning styles can be promoted or inhibited to reduce conspiracy mentality, thereby reducing their undesirable effects.

Research Paper III also supplies avenues for further investigation from a systemic perspective. Firstly, the presence or absence of a gender effect should be further tested in the context of a less politically charged topic. Doing so would give insights into whether gendered leadership stereotypes are simply outdated and, therefore, no longer present or whether such an effect is simply overshadowed by the highly polarizing nature of COVID-19 prevention measures.

Moreover, it is essential to mention that the prioritization of the economy in the context of the pandemic is often portrayed as being orthogonal to a strategy oriented towards better public health outcomes. Whether this is truly the case or whether the two are more closely interlinked presents a promising research question for future study.

Summary and Conclusion

The present research investigated whether people can strategically regulate the risky health behavior of face touching using implementation intentions, how reasoning styles and the JTC bias are related to general and COVID-19-specific conspiracy mentality, and whether the risk level of a politician's COVID-19 response and their gender influence how the political leader in question and their policy are evaluated. Research Paper I found that implementation intentions could reduce the duration but not the frequency of face touching. Research Paper II found that reasoning styles are associated with conspiracy mentality, particularly COVID-19-related conspiracy mentality. Research Paper III found that there is more overall support for a risk-averse pandemic strategy regarding public health. While a political leader's gender had no effect, the studies showed that those with a conservative political ideology were less likely to endorse a risk-averse pandemic strategy, while the opposite was the case for liberals. In sum, these research papers add to the growing body of research on risk in the pandemic and take an integrated approach to the subject of social psychology in a public health crisis by investigating aspects of risk on an individual and a systemic level.

Research Paper I

Self-Regulation of Face Touching − A Preregistered Experiment Testing If-Then Plans as a Means to Promote COVID-19 Prevention

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Abstract

Objective. Reducing face touching could help slow COVID-19's spread. We tested whether implementation intentions, a simple-to-use behavior change intervention, reduce face-touching behavior effectively.

Design. In this pre-registered online study, we utilized a novel way to collect behavioral data during a pandemic. We obtained video recordings of 156 adults while performing three engaging tasks for four minutes each. After the baseline task, participants formed the goal to avoid touching their faces; some participants also formed implementation intentions, targeting either the frequency or duration of face touching.

Main Outcome Measures. The 468 videos were rated by two independent raters for face touching frequency and duration.

Results. Face touching was widespread. Compared to the baseline, there was a slight reduction in the frequency of face touching after the experimental manipulations. We observed a significant decrease in the length of face touching only for participants with duration-focused implementation intentions.

Conclusion. While implementation intentions have effectively downregulated other unwanted behaviors, they did not reduce the frequency of face-touching behavior. Still, duration-focused implementation intentions appear to be a promising strategy for face-touching behavior change. This highlights the need for further optimization and field research to test the effectiveness of implementation intentions in everyday life contexts.

Introduction

At the beginning of 2020, Ofer Perl and colleagues (2020) published a paper on a ubiquitous behavior that can be observed in all primates, including humans: face touching. The authors stated the hypothesis that frequent face touching subserves the purpose of self-smelling. As an innate behavior mainly executed without conscious intent, such self-smelling is also performed consciously to smell where one's hands have been. In an ironic twist, such frequent face touching became one of the most frequently discussed behaviors (Gross, 2020) when, a few weeks later, the relevance of good hygiene habits had surged due to the beginning of the COVID-19 pandemic. In addition to regular handwashing and covering coughs and sneezes, reducing face touching has long been suggested to reduce the spread of pathogens. When the World Health Organization declared COVID-19, which is caused by the SARS-CoV-2, a worldwide pandemic (World Health Organization, 2020a), these good hygiene habits were the focus of attention of public health experts, health professionals, and the general public.

Avoiding touching one's face with unwashed hands, particularly the mucous membranes of the eyes, nose, or mouth, is an effective measure to prevent self-inoculation (World Health Organization, 2020b). However, refraining from face touching is a behavior many find exceptionally difficult. It is often involuntary and done unconsciously (Perl et al., 2020) and, therefore, more challenging to regulate than increasing the time spent on hand washing. Hence, people are likely to find themselves rubbing their eyes or scratching their noses before remembering their goal to avoid such behavior. For instance, previous research has observed face-touching behavior among medical students. Even though they had taken an infection control course within the past six months and were therefore trained to avoid face touching, the medical students touched their faces almost every other minute on average. Furthermore, more than two-fifths of these touches involved contact with the mucous membranes (Kwok et al., 2015). This demonstrates that even future health professionals, that is, individuals who are, on the one hand, at increased risk of infection but, on the other hand, trained to avoid such behaviors that could lead to self-inoculation, have difficulties controlling face-touching behavior. With this in mind, another group of researchers went so far as to apply adhesive tape to care workers' arms in a way that does not allow elbow flexion above a 90° angle to avoid any contact between the hands and the

face (Senthilkumaran et al., 2020). While the method did show some promise regarding the reduction of face touching, this somewhat draconian measure is highly impractical, and it is not likely that many people will be willing to start their day by applying adhesive tape to their arms, restricting their freedom of (arm) movement.

In sum, face touching is a prevalent and widespread behavior that is especially important during a pandemic caused by a communicable respiratory virus disease. To date, there are no convenient, evidence-based strategies applicable in everyday life to help people change the widespread, involuntary behavior of face touching.

Implementation Intentions

A suitable candidate might be the strategy of forming specific if-then plans, so-called implementation intentions (Bieleke et al., 2021; P. M. Gollwitzer, 1999, 2014). Implementation intentions go beyond merely setting a goal since they specify when, where, and how one intends to act on these intentions. They follow the format: "If I encounter situation X, then I will perform the goal-directed response Y!" For instance, if one's goal were to reduce snacking, one might form the implementation intentions "If somebody offers me a snack, then I will politely decline!" or "If I crave a snack, then I will first eat an apple!" Such if-then plans are proven to help people follow health-related intentions and have, for instance, been successful in reducing snacking (Adriaanse et al., 2009), alcohol consumption (Wittleder et al., 2019), cigarette consumption (Mutter et al., 2020; Webb et al., 2009), and bedtime procrastination (Valshtein et al., 2020). Moreover, implementation intentions have supported successful behavior change in various other domains (P. M. Gollwitzer, 2014). Their unique features allow people to control unwanted cognitive, affective, and behavioral responses that are antagonistic to the set goal (P. M. Gollwitzer, 2015). Thereby, they are showing promise for controlling undesired behaviors, such as face touching, to slow the spread of infectious diseases.

Two mechanisms are mainly responsible for the effectiveness of if-then planning: First, by specifying a critical situation (i.e., the when and where), this critical situation becomes more accessible and is easily detected as an opportunity to act. Second, by establishing a link between a specified situation (e.g., being offered a snack) and the intended goal-directed behavior (i.e., the how, e.g., declining politely), the control of performing a goal-directed action is transferred

from the individual to the specified critical situation, which now automatically triggers the desired response, outrunning the unwanted antagonistic response. Numerous studies speak for this strategic automaticity, demonstrating that initiating the specified response is immediate (A.-L. Cohen et al., 2008), efficient (Brandstätter et al., 2001; Gawrilow & Gollwitzer, 2008), and does not require further conscious intent (Bayer et al., 2009).

Present Research

Given their success in reducing unwanted health-related behaviors, we tested whether implementation intentions help people reduce their face-touching behavior. The COVID-19 pandemic gives new urgency to the adherence to hygiene protocols in everyday life. Avoiding face touching is particularly difficult to control, as it mainly occurs outside of conscious control (Dimond & Harries, 1984; Kwok et al., 2015; Perl et al., 2020). Because large-scale in-person observations are not feasible, the present study applies a novel approach to observe actual behavior (Baumeister et al., 2007) using online participants' webcams to record their face-touching behavior. While being recorded, all participants performed several engaging tasks before and after being assigned a goal intention to reduce face touching. One-third of participants further formed an implementation intention targeting the frequency of face touching, while another third of participants formed an implementation intention targeting the duration of face touching. We hypothesized that supplementing a goal intention with a respective implementation intention will reduce face touching frequency and duration.

We added implementation intentions targeting two different aspects of face touching to determine whether if-then plans are specific to the targeted aspect of face touching or affect face touching in general. Because of the exceptional circumstances of the investigation, we discussed multiple options for suitable implementation intentions. Starting from the end, by first considering the then-part, we needed a goal-directed response applicable in any environment. Participants needed (at least one of) their hands to perform the tasks during the recording and to complete the study, so we refrained from applying a more restricting and impractical response, such as sitting on one's hands, and instead chose "*then I will rest it* [my hand] *somewhere else.*" This goal-directed response is adequate, efficient, and can be applied in any circumstance.

Regarding the if-part, we believed participants would likely see their hands moving toward their faces while working on a computer or when using a tablet computer or laptop. So, we first settled on this visual cue (i.e., "*If I see one of my hands going toward my face*"), and combined with the then-part, this became the first plan, the frequency-focused if-then plan. The frequency-focused plan was designed to help reduce the prevalence of the behavior in general: Participants formed the plan to move their hand somewhere else when they saw that their hand was going toward their face. However, reducing the frequency is not the only issue; reducing the duration of face-touching events is also essential in avoiding self-inoculation. The duration-focused plan was designed to interrupt the behavior right away once it had occurred to minimize the length of any contact. Feeling touch to the face was the only cue that would draw participants' attention to the critical behavior that had already been initiated. Therefore, "*if I feel one of my hands in my face*" became the second plan, the duration-focused if-then plan. Participants formed the plan to move their hands somewhere else when they felt their hands in their faces. It primarily served as a backup if the frequency-focused plan was ineffective, as preventing any contact would be preferable to reducing the duration of contacts from a public health viewpoint.

Method

We pre-registered our hypotheses, design, and analysis plan on AsPredicted.org (#41809). The preregistration and our materials can be found here: https://researchbox.org/206&PEER_REVIEW_passcode=MCNKFI. All procedures implemented were following the ethical guidelines of the Deutsche Forschungsgemeinschaft (DFG [German Research Foundation]). Furthermore, ethics approval for this study was obtained from the university's ethics committee.

Participants, Design, and Sample Size and Power Considerations

We recruited 254 participants from Amazon's MTurk via CloudResearch (Litman et al., 2017) in June and July of 2020. Of these participants, however, 74 did not pass the initial screening (i.e., because their videos did not show their faces or were substantially shorter than four minutes[1]), so 180 sets of video

[1] Until the last third of data collection, we had included a fail-safe so that Qualtrics would advance the survey after some time, even if there were some errors. However, while no such errors occurred, this produced videos shorter than four minutes every time the participant did not immediately begin the task. This means, with the fail-safe, only 61% of participants provided three successful video recordings, whereas, without the fail-safe, 93% did.

recordings were obtained successfully and passed on to the raters. Raters were blind to the experimental conditions and the purpose of the study. Further, they identified 24 video sets that were not usable because at least one of the recordings turned very dark, was cut short, or included only the upper half of the participants' faces. Accordingly, 468 videos of 156 participants (96 females, one preferred not to answer, one indicated other; median year of birth = 1989) were subjected to our statistical analyses. Participants received $3.25 for their participation and a bonus of up to $1.00 depending on their task performance, M = $0.50, SD = $0.23.

Participants were randomly assigned to one of the three conditions of our between-subjects design: They either only set a goal to avoid touching their face (goal condition) or supplemented this goal with a frequency-focused implementation intention (frequency-focused plan condition) or supplemented this goal with a duration-focused implementation intention (duration-focused plan condition). Descriptive variables as a function of the experimental condition can be found in Table 2.

We initially set out to recruit 180 participants, which allows for a reliable test of effects of $d \geq .47$ with 80% power (Faul et al., 2007) in an omnibus ANOVA. We would have recruited more participants if the number of usable video sets had fallen below 150 after being screened by the two independent raters. This number of participants is necessary for effect sizes comparable to the one reported in a meta-analysis of meta-analyses on the effects of implementation intentions (Keller et al., 2020).

Procedure

After giving their informed consent, participants set up their webcam and were given the opportunity to familiarize themselves with the webcam controls. They saw how they and their surroundings would appear in the recording, allowing them to remove any personal items or instruct other persons to stay away so that they did not inadvertently appear in the recordings. This setup phase was never recorded. After its completion, participants began the study with a randomly selected task; video capturing began and ended with the task. The video was captured during their performance without the participants themselves seeing the video feed to avoid the induction of self-awareness (Noah et al., 2018). After completing the first task, participants read that they would be taking a break before beginning the next task and that we would use this opportunity to present

them with relevant information regarding COVID-19 and how to stay safe during the pandemic. Immediately after that, participants were asked what they thought of this information, and then the goal or respective plan inductions followed. After adopting the goal to keep their hands out of their face and, depending on the condition, supplementing this goal with a respective plan, participants proceeded with the other two tasks while once again being recorded during their task performance. Subsequently, participants were asked to complete a final questionnaire, were informed of their scores (i.e., their task performance) on all three tasks, and which one was randomly determined to be relevant for the bonus payment and were fully debriefed. Following this debriefing, participants were given the chance to withdraw their data and video recordings from the experiment.

Materials

Tasks and Video Recordings

Throughout the study, participants performed three different tasks in random order. These tasks required participants to focus on them rather than their surroundings or their own body. All tasks were time-constrained to four minutes and accompanied by video recordings. The participants did not see the video feed while performing each task but only during an initial setup phase to give them the opportunity to familiarize themselves with what will be recorded. The video recordings were incorporated using an online video recording and processing service (https://addpipe.com/).

In the *reading task*, participants read a rather complicated text of 437 words in 20 sentences (i.e., an above-average sentence length of 21.9) about the formation of rainbows and subsequently answered eight multiple-choice questions about its content.

In the *picture task*, participants saw ten pairs of nearly identical pictures and were asked to find the minute differences between the two pictures. Participants could indicate between one and up to six differences per pair. The picture task was accompanied by a question probing participants for any type of color blindness.

In the *quiz task*, participants were confronted with 25 questions modeled on the Wonderlic Personnel Test (Wonderlic & Hovland, 1939), a cognitive ability test. At the end of the experiment, one task was randomly chosen to determine the size

of the bonus. Average performance across each task as a breakdown of experimental conditions can be found in Table 2.

Table 2

Descriptives for all Variables Assessed in the Final Questionnaire, Soft-Pedaling, Commitment, and Task Performance.

	Group			
	Goal Condition	**Frequency-Focused Plan**	**Duration-Focused Plan**	**Total**
Variable	(*n* = 51)	(*n* = 57)	(*n* = 48)	(*N* = 156)
Gender	59% female	68% female	56% female	62% female
Year of Birth	*M* = 1985.6 (*SD* = 11.6)	1985.6 (11.5)	1986.3 (10.2)	1985.7 (11.1)
Subjective SES	3.9 (1.0)	4.2 (1.0)	4.0 (1.1)	4.0 (1.0)
General Risk Taking	6.8 (2.7)	6.6 (3.0)	6.4 (2.8)	6.6 (2.9)
Self-Esteem	5.2 (1.5)	4.9 (1.7)	4.4 (1.9)	4.8 (1.7)
If-Then Planning Scale	5.4 (0.7)	5.6 (0.6)	5.2 (1.1)	5.4 (0.8)
Inattention	3.4 (1.1)	3.5 (1.1)	3.2 (1.0)	3.4 (1.1)
Hyperactivity	2.3 (0.9)	2.6 (0.9)	2.8 (0.9)	2.6 (0.9)
Soft-Pedaling	2.0 (1.1)	2.2 (1.2)	1.9 (0.9)	2.1 (1.1)
Commitment	4.6 (0.5)	4.6 (0.8)	4.3 (0.7)	4.5 (0.7)
Task performance				
- Reading task (/ 8)	5.0 (1.5)	5.4 (1.7)	5.1 (1.7)	5.2 (1.6)
- Picture task (/ 20)	5.5 (2.7)	5.5 (2.4)	5.4 (2.2)	5.5 (2.5)
- Quiz task (/25)	13.0 (3.9)	14.0 (4.7)	13.7 (4.9)	13.6 (4.5)
Bonus payment	$0.48 (0.21)	$0.52 (0.23)	$0.49 (0.26)	$0.50 (0.23)

Independent Variable: Goal and Plan Manipulation

Participants were presented with information regarding COVID-19 that highlighted washing one's hands often and avoiding touching one's eyes, nose, and mouth, taken from the (Centers for Disease Control and Prevention, 2020). They then answered eight questions on 5-point Likert scales ranging from *strongly disagree* to *strongly agree* about their worries relating to COVID-19 (e.g., "I fear

to get sick") and the information from the CDC's website that they had just read (e.g., "I think it is helpful to know more about how the disease may spread"). Most importantly, two of these questions probed for the participants' soft-pedaling of COVID-19 (i.e., "I think there's more smoke than fire when it comes to this disease," "I believe that this is all unnecessary and alarmist"). Correlation between the two items was high, $r = .684$, $p < .001$, and we pre-registered using them as a potential exclusion criterion (i.e., excluding participants that answered *strongly agree* to both questions). A further question gauged their potential goal and plan commitment (i.e., "I believe it is very important to avoid touching one's face," answered on the same 5-point Likert scale).

All participants then set the *goal intention* to avoid touching their faces: "I want to keep my hands out of my eyes, nose, and mouth!" Participants in the two plan conditions furthermore supplemented this goal with a respective plan. Participants in the *frequency-focused plan condition* formed the implementation intention "If I see one of my hands going toward my face, then I will rest it somewhere else." Participants in the *duration-focused plan condition* formed the implementation intention "If I feel one of my hands in my face, then I will rest it somewhere else." Whereas the goal-directed behavior specified in the then-part remained the same across both plans, the critical situation specified in the if-part was different. For participants in the frequency-focused plan condition, the plan addressed a potential contact or face-touching event by specifying a movement toward the face as the critical situation. In contrast, for participants in the duration-focused plan condition, the feeling of one's hands in one's face was addressed, so contact was already made.

Dependent Variable: Frequency and Duration of Face Touching as Coded by the Independent Raters

The number of times participants touched their faces (frequency of face touching) and the length of time they kept their hands in their faces (duration of face-touching events) serve as the dependent variables. Both were assessed by two independent raters blind to the hypotheses, experimental conditions, the timing of the task the participants worked on, and the task itself. We gave both raters the same manual that is available online among the preregistration and survey materials: https://researchbox.org/206&PEER_REVIEW_passcode=MCNKFI. Raters indicated the start and end of each face-touching event, indicated which

region of the face was touched, and which hand was used. Additionally, they coded whether or not the participants wore glasses, had a beard, or a hairstyle that may lead to more frequent face touching by (partially) covering the participants' eyes (e.g., when bangs were blocking the sight).

Furthermore, both raters evaluated a subset of 30 videos to analyze inter-rater reliability; concordance was high for both the frequency of face touching in each video, $r(28) = .95$, $p < .001$, and the duration of face-touching events, $r(16) = .84$, $p < .001$.

Final Questionnaire

Descriptive statistics (percentages, means, and standard deviations) of the variables and scales assessed in the final questionnaire broken down for each experimental condition can be found in Table 2.

Single-Item Measures of Willingness to Take Risks and Self-Esteem. The final questionnaire comprised two single-item assessments of general self-esteem (Robins et al., 2001) and general willingness to take risks (Dohmen et al., 2011). The first was answered on a seven-item scale that gauged the agreement to the statement "I have high self-esteem," with the scale ranging from *not very true of me* to *very true of me* with no other labels. The second question assessing the general willingness to take risks read "How do you see yourself: Are you generally a person who is fully prepared to take risks, or do you try to avoid taking risks?" It was answered on an eleven-item scale ranging from *not at all willing to take* risks to *very willing to take risks*, with no other labels present. Both measures were included to check for successful randomization.

If-Then Planning Scale. Furthermore, participants answered the If-Then Planning Scale (Bieleke & Keller, 2021), measuring individual differences in if-then planning. It comprises eight items that are designed to probe for various aspects of if-then planning but, in the end, provides a single average score. For instance, participants indicated their gradual agreement on a seven-item scale ranging from *strongly disagree* to *strongly agree* with the respective midpoint *neither agree nor disagree* regarding items like "I am concerned with what setbacks to expect," "I think about when and where decisive moments for the achievement of my goals could occur," or "I plan how to protect myself from distractions." The reliability of the eight-item scale was good, Cronbach's $\alpha = .843$, comparable to previously reported levels (Bieleke & Keller, 2021).

Measure of Inattention and Hyperactivity. Before moving on to the demographics, participants answered six items from the WHO's Adult ADHD Self-Report Scale (Kessler et al., 2005), which measure inattention and hyperactivity. For inattention, the items "How often do you make careless mistakes when you have to work on a boring or difficult project?" "How often do you have difficulty keeping your attention when you are doing boring or repetitive work?" and "How often are you distracted by activity or noise around you?" were included. All items were answered on the same five-item scale indicating increasingly from how much it applies to them: *never*, *rarely*, *sometimes*, *often*, *very often*. However, reliability for the three-item scale was poor, Cronbach's α = .554.

For hyperactivity, the items "How often do you fidget or squirm with your hands or your feet when you have to sit down for a long time?," "How often do you feel restless or fidgety?," and "How often do you feel overly active and compelled to do things, like you were driven by a motor?" were included and answered on the aforementioned scale in order to control for any levels of hyperactivity that may contribute to additional face touching. Reliability for the three-item scale was good, Cronbach's α = .827. Combining inattention and hyperactivity resulted in poorer reliability, Cronbach's α = .488, despite the higher number of items. Therefore, we report descriptive statistics for inattention and hyperactivity in Table 1 but will not use inattention or the combined scale in any analyses except to check whether the randomization was successful.

Demographics. Finally, we also assessed participants' gender, year of birth, subjective socioeconomic status (Adler et al., 2000), and whether participants had answered the questions in this study carefully, which was the case for all 156 participants. Participants furthermore had the chance to report any technical difficulties/problems they may have experienced during the survey.

Data Analysis

Our data structure allows for analyses with linear mixed-effects models using the lme4 package (Bates et al., 2015) for R (R Development Core Team, 2020) with respect to both dependent variables, the frequency of face touching and the duration of face-touching events. Instead of using a single mean per participant, this approach allows a more thorough test of the impact of the experimental conditions. By analyzing the data in this way, we can control aspects such as the

task at hand while simultaneously controlling for the individual as a source of random variation to better detect the potential effects of our experimental conditions.

Results

First, we tested whether randomization was successful by checking whether there were any significant differences between groups in the background variables listed in Table 2 (i.e., the final questionnaire, soft-pedaling, commitment, and task performance). Randomization can be seen as successful, as there were no significant differences between groups, Fs ≤ 2.23, ps $\geq .111$, for all but three variables. Commitment, which was assessed with a single item before the manipulation, was not significantly different between experimental conditions, but there was a trend, $F(2, 153) = 2.55$, $p = .082$, $\eta^2 = .032$. Descriptively, participants with a duration-focused plan indicated lower commitment, $M = 4.33$, $SD = 0.72$, than participants with a frequency-focused plan, $M = 4.56$, $SD = 0.76$, or participants with only a goal, $M = 4.63$, $SD = 0.53$. Across all conditions, only 10 out of the 156 participants did not (strongly) agree with the commitment statement. The three experimental conditions furthermore differed significantly in scores on the eight-item ITPS, $F(2, 94.5) = 3.21$, $p = .045$, $\eta^2 = .039$, as well as on the three items assessing hyperactivity, $F(2, 153) = 3.16$, $p = .045$, $\eta^2 = .040$. Although the latter two were assessed after the experimental manipulation and could therefore be influenced by the experimental manipulation itself (which is more plausible for the ITPS than the hyperactivity scale), more importantly, including all three in the analyses (as pre-registered for commitment and ITPS) does not change the pattern of results.

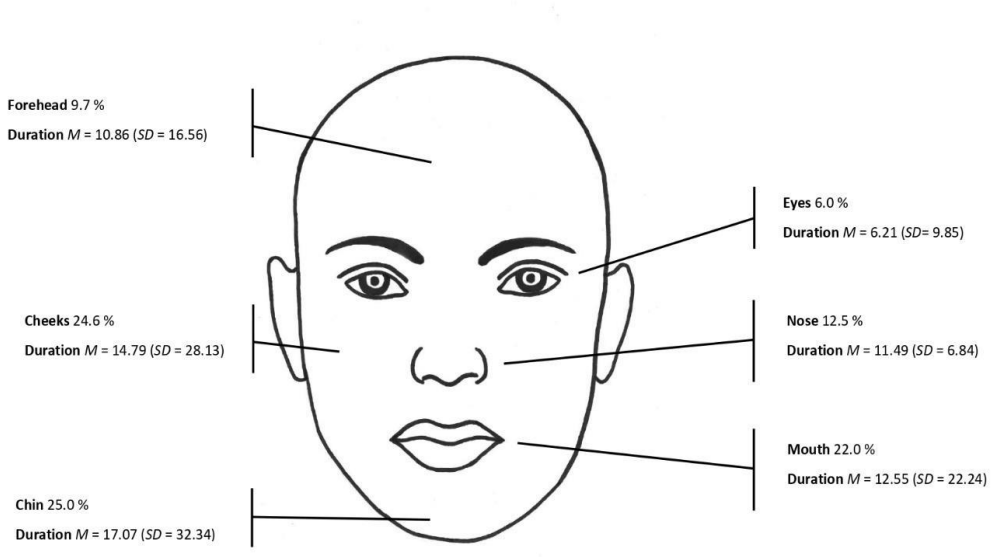
In the 468 videos, we counted 1571 face-touching events, which translates to roughly 0.84 touches per minute. These touches were, on average, 13.54 seconds long, $SD = 25.31$. Similar to other work (Kwok et al., 2015), 41% of touches involved contact with the mucous membranes (i.e., the eyes, mouth, or nose). A breakdown of areas of contact and average duration can be found in Figure 1. Descriptively, touches to the eyes were the least common and also the shortest, while touches to the cheeks, mouth, and chin were more common and considerably longer, with the chin being the most and longest-touched area.

When averaged per participant, the face touching rate per minute was slightly higher for baseline videos, $M = 0.95$, $SD = 1.23$, than for videos after the

experimental manipulation, $M = 0.78$, $SD = 1.03$, $t(155) = 2.14$, $p = .034$, $d = 0.172$. The average duration of face-touching events was descriptively higher for baseline videos, $M = 16.00$, $SD = 35.03$, than for videos after the experimental manipulation, $M = 9.42$, $SD = 12.39$. Because the paired t-test could only include averages when participants touched their face at least once in both the baseline video and the videos after the experimental manipulation, only the subset of participants who touched their face before and after the experimental manipulation was included, and the difference between before and after was not significant, $t(92) = 1.63$, $p = .106$, $d = 0.169$, probably because of the comparatively low statistical power. However, when coding the average duration of face-touching events as 0 for participants who have not touched their face, the paired t-test for the resulting larger sample was still not significant, $t(155) = 1.68$, $p = .095$, $d = 0.134$.

Figure 2

Distribution of Touched Areas and Average Duration (and Standard Deviations) of Touches in Each Area



Pre-Registered Analyses

To get an overall picture, we first ran linear regressions predicting the frequency of face touching and average duration of face-touching events after the experimental manipulation with dummy variables for the frequency-focused plan condition and the duration-focused plan condition (i.e., comparing their effects to the goal condition). We further controlled for baseline face touching, gender, commitment ("I believe it is very important to avoid touching one's face"), and other variables that potentially influence face touching (i.e., wearing glasses, having a hairstyle that partially covers one's eyes, and having a beard).

For frequency of face touching, no predictor other than baseline face-touching frequency ($b = 1.00$, $SE = 0.11$, $p < .001$) was significant, all other ps $\geq .149$. For the average duration of face-touching events, the same pattern emerged. Again, baseline average face-touching duration was a significant predictor ($b = 0.12$, $SE = 0.04$, $p < .001$), and all other predictors were not significant, all other ps $\geq .114$. Rerunning the analyses using the pre-registered exclusion criterion (i.e., excluding five participants who strongly agreed to both soft-pedaling items) did not lead to a different pattern of results; neither did including ITPS or hyperactivity scores. Neither ITPS nor hyperactivity were significant predictors[2]. Further, when limiting the analyses to only the most critical areas, the mucous membranes of the mouth, nose, and eyes, instead of including touches to the chin, cheek, and forehead, no different results were observed.

One of the reviewers of a prior version of this manuscript further requested that we test baseline by experimental condition interactions to examine whether the implementation intentions were effective for people who frequently touched their faces or touched their faces for higher durations during the baseline period. Please note that these analyses were not pre-registered but are very similar to how we will proceed below.

For frequency, no interaction between the baseline frequency and any plan condition was significant, all ps $\geq .960$. For the duration, the results were contingent on how we handled the average duration of participants who did not touch their faces during either the baseline or the treatment period. When dropping these participants from the analyses, no interaction was significant (see

[2] This pertains to the analyses when dropping participants who did not touch their face either before or after the experimental manipulation.

above). However, when we coded these participants' times as 0, we observed a significant interaction between the baseline duration and the duration plan (b = −0.28, SE = 0.13, p = .032), while the interaction between the baseline duration and the frequency plan was not significant, b = −0.22, SE = 0.13, p = .084. Additionally, adding the ITPS and hyperactivity scores rendered both interactions significant (ps ≤ .044), and hyperactivity itself became a significant predictor, b = 2.47, SE = 0.97, p = .012. Interactions between hyperactivity and the experimental conditions were not significant; neither were interactions between the ITPS and the experimental conditions or ITPS itself, all ps ≥ .231. So, when treating participants who did not touch their face as having an average duration of 0, especially the duration plan effectively reduced the average duration when there was room for improvement, as indicated by the significant interaction between the baseline duration and the duration plan condition. In contrast, higher hyperactivity scores were associated with longer average face touching.

Linear Mixed-effects Model Analyses

However, the structure of our data does allow for more fine-grained analyses. We fitted linear mixed-effects models for both frequency of face touching and duration of face-touching events. We pre-registered using this way of analyzing the data, but the exact specifications of these models were not pre-registered to avoid convergence or singular fit issues because we were not sure how frequently people would touch their faces or how diverse participants would be regarding other control variables.

Frequency of Face Touching. We regressed the frequency of face touching per video on whether the video is from the baseline, the participant's plan condition, the interaction between the two, hairstyle, beard, glasses, which task it is (i.e., picture, quiz, or reading task), and the participant's commitment while treating individual variation as a random effect.

The results showed that participants touched their faces less often in the picture recognition task and (not significantly) less often in the quiz task than in the reading comprehension task. Furthermore, participants with a duration-focused plan touched their faces in the baseline video significantly more often than participants with only a goal. No other effects were significant (see Table 2). The right side of Figure 2 depicts the frequency of face-touching events as a function

of whether the video is from the baseline and goal or plan condition as estimated by the model.

Duration of Face-Touching Events. For our second dependent variable, the duration of face-touching events, this analysis is even more potent as it allows treating every single face-touching event as an observation instead of averaging the duration of many events across one participant. Regressing each face touch's duration on the same set of variables as above reveals significant main effects of the duration-focused plan, the quiz task, the picture task, and a significant interaction between whether the video is from the baseline and the duration-focused plan (see Table 3). In combination with the results from the frequency analysis, the significant effects of the picture and quiz tasks indicate that although participants touched their faces less frequently in the picture recognition task and the quiz task, they touched their faces for longer in these two tasks when compared to the reading task. By design of the model, the duration-focused plan's main effect indicates a difference in duration in the baseline videos for this condition compared to the goal condition. At baseline, participants with a duration-focused plan had touched their faces for more extended periods than participants with only a goal. Notably, the significant within-between interaction between whether the video is from the baseline or a later recording and the duration-focused plan indicates that participants in this condition decreased the duration of face touching after making a duration-focused implementation intention compared to participants who only set a goal. The left side of Figure 2 depicts the duration of face-touching events as a function of whether the video is from before or after the experimental manipulation and the participants' goal or plan conditions as estimated by the model.

Table 3

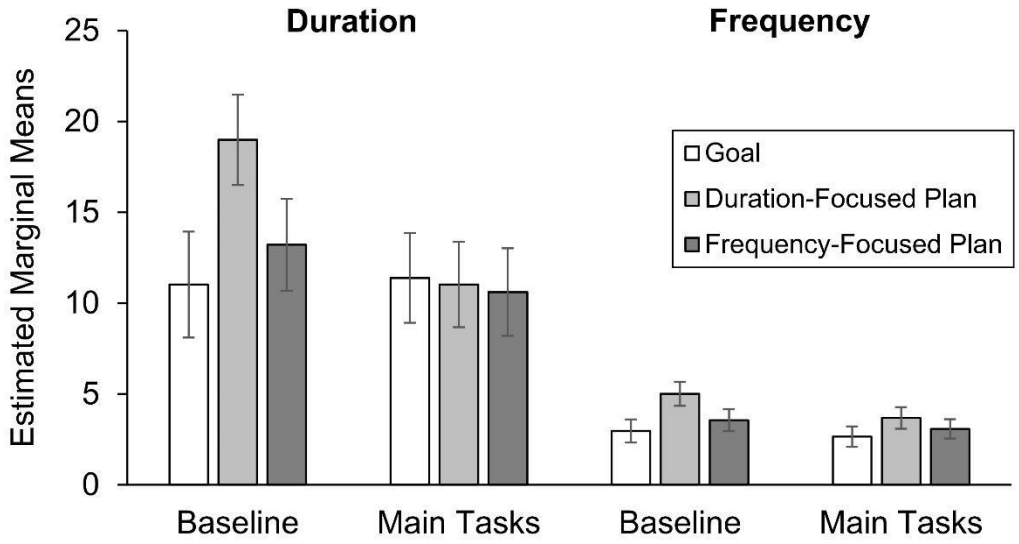
Estimates and Standard Errors for the Parameters of the Linear Mixed-Effects Models Predicting Frequency and Duration of Face Touching

	Frequency			Duration		
	b	*SE*	*p*	*b*	*SE*	*p*
(Intercept)	5.78	2.33	.014	22.90	9.65	.019
Time[a]	–0.31	0.50	.544	0.36	2.49	.883
Quiz Task[b]	–0.63	0.33	.057	3.00	1.49	.044
Picture Task[b]	–0.88	0.33	.009	5.30	1.51	< .001
Glasses	–0.43	0.65	.515	–1.10	2.79	.694
Bearded	0.92	0.68	.174	–4.04	2.74	.143
Hairstyle	1.22	0.81	.134	5.57	3.25	.089
Commitment	–0.60	0.47	.209	–3.12	1.94	.110
Frequency plan[c]	0.60	0.88	.496	2.19	3.84	.569
Duration plan[c]	2.05	0.93	.028	7.97	3.86	.040
Interaction: Time and						
Frequency plan	–0.18	0.69	.798	–2.96	3.35	.376
Duration plan	–1.02	0.72	.157	–8.33	3.21	.009

Note. For the frequency analysis, all three videos of each of the 156 participants are analyzed. For the duration analysis, all face-touching events are analyzed.
[a]Indicates the effect of the videos after the experimental manipulation compared to the videos at baseline.
[b]Indicates the effect of the respective task compared to the reading task.
[c]Indicates the effect of the respective plan compared to the goal condition.

Figure 3

Model Estimates for Duration and Frequency as a Function of Goal Condition and Time



Note. Error bars represent standard errors.

To rephrase, the significant effects of the duration-focused plan indicate that there is a) a baseline difference between the duration-focused plan condition and the goal condition and b) a significant decrease in the duration of face-touching events after the manipulation in the duration-focused plan condition.

Discussion

The present work aimed to assess whether implementation intentions can reduce face touching more effectively than simple goal intentions, both in terms of the frequency of face touching as well as the duration of each face-touching event. This question is particularly relevant in the face of the ongoing COVID-19 pandemic but applicable to any communicable disease transmissible through self-inoculation. Overall, participants were highly committed to reducing face touching, expressed by 94% of participants who either agreed (34%) or strongly agreed (60%) to the statement that it is very important to avoid touching one's face. However, the present study's participants touched their faces about 0.84 times per minute on average across conditions, with the number of face touches being, on average, slightly higher before the experimental manipulation than after. Moreover, participants touched their faces more frequently in a reading comprehension task than in an image and a quiz task. Though participants touched

their faces less frequently in a quiz and an image task, they did so for more extended periods during these tasks.

In more fine-grained pre-registered analyses, we further found baseline differences for both the frequency of face touching and the duration of face-touching events between participants who formed a duration-focused if-then plan and participants who formed only a goal to avoid face touching. Strikingly, participants with a duration-focused plan subsequently reduced the time their hands touched their faces significantly after the manipulation compared to the goal condition, indicating that this duration-focused implementation intention appears to have had an effect. While this finding shows promise for the successful self-regulation of seemingly uncontrollable behavior, it remains open whether this effect can be solely attributed to the duration-focused implementation intention or whether a significant reduction would have also appeared in the absence of the baseline difference highlighted by the mixed-model analysis. In the absence of such a baseline difference, potential differences in the effectiveness of goals versus (duration-focused) implementation intentions would have been more easily attributable to the respective experimental manipulation. Although we took great care to account for interindividual differences in face touching by including a baseline measure, implementing randomized allocation to experimental conditions, and assessing various background variables that may promote or hinder face touching, this question may be answered most convincingly through further investigation.

Overall, while the duration of face-touching events decreased in the duration-focused plan condition, no general effect of implementation intentions to aid the reduction of face-touching frequency in comparison to mere goal intentions was present in the data. A possible explanation of why the duration-focused plan was more successful than the frequency-focused plan may be a floor effect regarding frequency. While one can always reduce the duration of touches, especially given that the average duration of touches was 13.54 seconds, participants may be simply unable to further reduce the frequency of contacts to a lower level than 0.77 times per minute. If the minimum of touches per minute had already been reached with the goal intention alone, there was no further room for improvement by the frequency-focused implementation intention.

Moreover, due to the online assessment's nature, participants completed the survey from their homes rather than a public place like a psychological laboratory in a university. Therefore, although participants' reported commitment was remarkably high, participants' commitment to an immediate enaction of both goals and plans may have been lower, as they were in a relatively safe environment in which infection through self-inoculation is unlikely to occur after they have washed their hands and only interacted with the people with whom they share their lives and household. Although health professionals' earlier appeals were more general in how they addressed face touching, in later stages of the pandemic, this has been refined to face touching with unwashed hands, especially after contact with surfaces frequently touched by multiple people. Nevertheless, this could have negatively impacted goal commitment. Thus, field research might be more appropriate to assess whether face touching differs in public places or, for instance, during grocery shopping and can be more effectively targeted by self-regulation interventions. Nevertheless, the significant reduction in face-touching among participants with a duration-focused implementation intention and the fact that commitment was no significant predictor of either frequency or duration of face-touching events speaks against an overall lack of commitment that would readily explain our set of findings.

A further point of discussion is the wording of the implementation intentions: While participants can feel their hands in their faces once they have made contact, they may not be able to see their hands going toward their faces, as their hands often come from the lower half of their visual field and touch areas in the bottom half of the face, like the nose or mouth as participants are looking forward at the screen. As a result, their hands may only be visible in their peripheral vision, if at all, before making contact with an area of the face. As seeing one's hand going toward the face was the cue specified in the frequency-focused if-then plan, this cue may be lacking salience and, therefore, fail to trigger the linked response. One possible way to address this would be to tailor the if-part to the motoric perception of the initiation of movement of the arm instead of the visual perception (e.g., "If I feel my hand is moving toward my face"). Nevertheless, future studies must take this into account when tailoring frequency-focused implementation intentions to reduce face touching.

But not only the cue in the if-part of the frequency-focused if-then plan may be improved in further studies. Because we could not anticipate the participants' surroundings when they performed the study, we tried to use a then-part applicable in almost all circumstances (i.e., "then I will rest it [my hand] somewhere else"). However, this came at the expense of a more specific and potentially more readily applied goal-directed response (e.g., "then I will rest my hand on the desk"). Although previous research on implementation intentions provides numerous examples of effective then-parts that trigger subsequent thought instead of a specific behavioral response (Bieleke et al., 2017; Doerflinger et al., 2017), this non-specificity might have hindered the effectiveness of the implementation intentions in the current study by demanding that participants decide in the critical situation where to put their hand. This is arguably more demanding than already having a certain response in mind. We want to propose two ways to address this issue. First, in subsequent (laboratory) studies, a more controlled environment could allow for more specific then-parts, readily applied before the face-touching event may even occur. Second, both in controlled and field settings, participants could be asked to develop their goal-directed response after an initial briefing on what may constitute an appropriate then-part (Ahn et al., 2021).

Finally, we want to highlight another factor that might promote face touching, especially in social settings: mimicry (Chartrand & Lakin, 2013; Chartrand & van Baaren, 2009). Mimicry describes the involuntary mimicking of others' movements, gestures, or mannerisms during social interactions. Multiple individuals facing and mimicking each other, thereby triggering more face-touching behavior in one another, could plausibly lead to more face-touching behavior during social interactions in comparison with being alone. Furthermore, this may hold even if people adhere to social distancing guidelines. This reasoning further highlights why field research may be more suited to analyzing risky face-touching behavior in the future, primarily because implementation intentions were previously found to help control mimicry effects in line with one's goals (Wieber et al., 2014).

Conclusion

We conclude that while implementation intentions have been demonstrated to be an easily applicable, effective strategy in various life domains, the present data did not indicate that they helped participants reduce the frequency of face touching more effectively than mere goal intentions. However, they did help to achieve reduced durations of face-touching events compared to the baseline when there was room for improvement. While the innovative methods used in the present research allowed for the observation of actual behavior inside participants' homes, the observed behaviors might differ from those typically displayed in public places, which are said to pose a higher risk of infection. Moreover, various factors may contribute to less face touching inside the home, especially while working on a computer or performing an engaging task. Further investigation, both in the laboratory and particularly in the field, is required to conclude whether implementation intentions can effectively reduce face-touching behavior.

Research Paper II

Conspiracy Beliefs and Jumping to Conclusions

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Abstract

A person's proneness to holding conspiracy beliefs can be affected by various situational and dispositional factors. Jumping to conclusions (JTC), a tendency to make hasty decisions, may be among them. Typically studied in clinical samples, it affects information acquisition and is linked to delusional ideation, suggesting that it may relate to conspiracy mentality, which is also associated with paranoia. Other factors linked to information acquisition and frequently studied in conjunction with JTC include reasoning styles. We examined how JTC and reasoning styles relate to general and COVID-19-related conspiracy beliefs and whether JTC has any association beyond that of reasoning styles. In two online studies, we assessed JTC and four reasoning styles, actively open-minded thinking (AOT), personal fear of invalidity (PFI; Studies 1& 2), need for cognitive closure (NFCC) and cognitive reflection (CRT; Study 2). In Study 1, we found negative relationships between AOT and all conspiracy beliefs and positive relationships between PFI and all conspiracy beliefs. JTC was negatively associated with all conspiracy beliefs and had an association beyond that of reasoning styles. In Study 2, we additionally tested whether the content of the beads task mattered by adding a COVID-19-themed version of the task as an experimental manipulation. We replicated the negative relationships between AOT and all conspiracy beliefs and found positive relationships between NFCC and all conspiracy beliefs. PFI positively predicted COVID-19-related but not general conspiracy beliefs. JTC negatively predicted only COVID-19-specific conspiracy beliefs. We replicated the association of JTC beyond reasoning styles with COVID-19-related conspiracy beliefs. Crucially, we showed that the occurrence of JTC remains stable and is not affected by the content of the beads task.

Introduction

In recent years, people's inclination toward adopting conspiracy beliefs has dramatically increased in relevance and become a subject of great public attention (Byford, 2020; Willingham, 2020). At their core, conspiracy beliefs oversimplify complex mechanisms and provide easy answers to how the world works. While adopting conspiracy beliefs is by no means a new phenomenon, it has become a topic of public conversation, especially in relation to the COVID-19 pandemic (Bierwiaczonek et al., 2020; Jennings et al., 2021; Teufel et al., 2021), but also regarding political events like climate change (Lutzke et al., 2019) or the 2020 US presidential election (L. Cohen, 2021; Papasavva et al., 2022) and the January 6th US Capitol attack. While it may seem easy to dismiss conspiracy beliefs out of hand, some conspiracies are widely believed and can result in serious consequences both on an individual and a societal level, as they can affect public health behavior (Allington et al., 2020; Earnshaw et al., 2019), people's support of public policies (Earnshaw et al., 2019), or, in extreme cases, lead to violence or threats to democracy (Papasavva et al., 2022). Therefore, it is crucial to understand what may promote the adoption or maintenance of such beliefs, even when relevant conclusive, factual evidence remains absent.

Various situational and dispositional factors affect one's proneness to holding conspiracy beliefs (Douglas et al., 2017). How one searches for, retains, and draws conclusions from information may be among those factors. Mostly studied in research on delusional ideation and paranoia in clinical psychology, jumping to conclusions (JTC) describes an information processing pattern characterized by drawing conclusions based on insufficient data (Freeman et al., 2014; Moritz et al., 2007). Individuals exhibiting JTC thus tend to make hasty decisions based on little information, potentially leading to erroneous results. In the case of conspiracy beliefs which are also often linked to paranoia (Imhoff & Lamberty, 2018), it may be associated with adopting one view of the world over another, despite its actual veracity.

Other relevant concepts with the potential to affect the adoption and maintenance of conspiracy beliefs include different reasoning styles linked to information acquisition. These styles impact people’s behavior in a variety of tasks (Thompson et al., 2001) and may serve as antecedents of various phenomena, including jumping to conclusions (Ross et al., 2016).

The aim of the present studies was to examine whether and how JTC and different reasoning styles may be linked to both general conspiracy beliefs and conspiracy mentality specific to COVID-19 and whether JTC on its own has an association with conspiracy beliefs beyond reasoning styles. Therefore, we assessed JTC and individual differences in *actively open-minded thinking*, *personal fear of invalidity* (Studies 1 & 2), *cognitive reflection*, and *need for cognitive closure* (Study 2), that each may further contribute to biased decision-making and an inclination towards adopting conspiracy beliefs.

Conspiracy Beliefs

Conspiracy theories describe the belief that complex and important social or political events have been coordinated by two or more powerful actors with the objective of gaining political or economic power, withhold information, or infringe upon people's rights out of self-interest (Douglas et al., 2019). Their prevalence often increases during times of social or political instability or crisis, and it is thought that prevention of loss of control is a major motive behind the rise of conspiracy theories (van Prooijen & Acker, 2015). While conspiracies are often attributed to governments, other actors and groups that are perceived to hold power and have influence (e.g., scientists, political parties, religious groups, certain industries) are often accused of being involved in conspiracies (Douglas et al., 2019).

(General) Conspiracy Mentality

While a true conspiracy refers to a series of coordinated events (e.g., the Watergate scandal), a conspiracy theory describes allegations of conspiracies for which there is no evidence and which are often unfalsifiable (Clarke, 2002; Douglas et al., 2019; Kroke & Ruthig, 2022). Common conspiracy theories surround subjects such as the 9/11 terrorist attacks, the assassination of John F. Kennedy, the citizenship of Barack Obama, or climate change (Douglas et al., 2019). Conspiracy beliefs, in turn, describe the extent to which one believes in one or several such conspiracy theories (Douglas et al., 2019).

Once people believe in one conspiracy theory, they are more likely to believe in others, even if the subject is unrelated (Wood et al., 2012). This finding has led to the idea of a general conspiracy mentality or conspiracy thinking, which suggests that some people are generally more inclined towards believing in conspiracy theories than others (Goertzel, 1994), potentially due to an inherent

dislike of certain groups or a mistrust of institutions' official accounts (Imhoff & Lamberty, 2018; Wood et al., 2012). And indeed, general conspiracy mentality has been found to correlate with various other constructs, such as narcissism and self-esteem (Cichocka et al., 2016) as well as lower cognitive ability (Stasielowicz, 2022). While conspiracy beliefs are distinct from clinical delusions, they have also been found to be associated with paranoia and other characteristics of delusion (Acar et al., 2022; Barron et al., 2014; Kuhn et al., 2021).

While some conspiracy theories are considered harmless, the belief in certain conspiracy theories can result in serious consequences, such as less engagement in health-protective behavior (Allington et al., 2020; Earnshaw et al., 2020). Hence, a better understanding of the mechanisms behind conspiracy beliefs is crucial. As health is a frequent subject of conspiracy theories, one would be remiss not to pay particular attention to conspiracy mentality surrounding health-related matters in the middle of a public health crisis; therefore, the present research puts an additional focus specifically on health-related conspiracy mentality.

COVID-19-related Conspiracy Mentality

Conspiracy beliefs concerning various health matters such as fluoridation (Oliver & Wood, 2014), medications (Bogart et al., 2010; Thorburn & Bogart, 2005), as well as the origin of viruses or illnesses such as HIV/AIDS (Bogart & Bird, 2003), the Zika virus (Bode & Vraga, 2018; Venkatraman et al., 2016), or Ebola (Earnshaw et al., 2019; Jin et al., 2014; SteelFisher et al., 2015) to name a few, have been present for many years. During the COVID-19 pandemic, conspiracies surrounding personal and public health have gained traction and public attention once more, as many conspiracy theories called into question the origin of SARS-CoV-2, the virus that causes COVID-19, the disease's severity (Bierwiaczonek et al., 2020), the safety and efficacy of vaccines against the disease (Jennings et al., 2021), and, in some cases, denied the existence of the virus and disease altogether (Teufel et al., 2021). These beliefs can have far-reaching consequences, as they have been found to be associated with decreased protective behavior during the pandemic (Allington et al., 2020) and lower vaccination intentions as well as reduced support for policies aiming to reduce the spread of COVID-19 (Earnshaw et al., 2020).

The Jumping to Conclusions (JTC) Bias

As there is already pervious research connecting conspiracy mentality and paranoia/delusional ideation, JTC's origin in research on delusion and paranoia with clinical samples renders it a suitable construct to better understand the adoption and maintenance of conspiracy beliefs. JTC has predominantly been studied in clinical populations, especially in patients with psychoses (McLean et al., 2017), who tend to exhibit JTC at much higher rates than the general population (Freeman et al., 2008). In these patients, it is considered a type of cognitive bias that is thought to contribute to the formation and maintenance of delusional ideas and beliefs (Bell et al., 2006). It is linked to a frequent failure to accept information that is contrary to one's beliefs, as well as a tendency to accept information that is insufficiently supported by observable facts and empirical evidence when it supports existing beliefs (Woodward et al., 2006). While it is only one of several factors affecting the maintenance of delusions, there is a lot of evidence to support this link (Fine et al., 2007). Moreover, this makes an association with conspiracy mentality appear plausible. Given these mechanisms, it appears plausible that JTC could be linked to people's search for and processing of information beyond clinical delusions, particularly in the context of conspiracy beliefs.

In essence, JTC describes an information processing pattern that is characterized by basing decisions or judgments on insufficient amounts of data (Freeman et al., 2014; Moritz et al., 2007). As individuals who exhibit JTC typically rely on little or incomplete information, following this pattern can result in faulty judgments (Hemsley & Garety, 1986). It is most commonly assessed using the so-called beads task (Huq et al., 1988). In this task, participants are first presented with two different jars containing beads of two different colors in unequal proportions (e.g., 40 red and 60 blue beads vs. 60 red and 40 blue beads). They then can sample beads from a randomly selected jar for as long as they wish and, once they are ready to decide, are tasked to correctly identify which of the two jars has been selected. If participants sample too few beads before making a decision, they are considered to exhibit JTC. For instance, for the beads task in a 40:60 distribution, it is considered jumping to conclusions (Balzan et al., 2017) when they sample two or fewer beads as two beads, even when they are of the same color, do not contain enough information to make a decision.

There is a body of research, albeit much less extensive, investigating JTC in nonclinical populations. It reports indications that JTC is associated with higher levels of delusional and paranoid thoughts in the general population as well though the association is much less pronounced compared to clinical populations (Freeman et al., 2008; Juárez-Ramos et al., 2014). One of the largest studies on JTC in a nonclinical population (Ross et al., 2016) studied associations between cognitive abilities and JTC in addition to delusional ideation. In contrast to other studies, the authors found no association between how many beads participants sampled and the tendencies for delusional ideation or holding paranormal beliefs but one between the number of beads and some measures of cognitive ability. Given these previous findings, the studies at hand aim to further add to the literature on JTC in non-clinical populations by further investigating whether links between JTC and non-clinical delusional ideation in the form of conspiracy mentality are present.

To date, and to our knowledge, there is only a single study explicitly investigating the link between jumping to conclusions and belief in conspiracy theories (Pytlik et al., 2020). In their study, the authors assessed JTC in an adapted task and gauged the acceptance of 20 prominent conspiracy theories (e.g., regarding 9/11, contact with extraterrestrials, or the deaths of JFK and Princess Diana). While participants, on average, tended to disapprove of the conspiracy theories, this disapproval was weaker for participants exhibiting JTC compared to participants who did not exhibit JTC. Furthermore, it correlated negatively with the number of draws until the decision.

Cognitive Styles

While there is a lot of research on JTC and its links to delusional ideation, there is also disagreement on its interpretation. Some scholars doubt whether JTC has any explanatory value rather than being a mere manifestation or redescription of underlying cognitive processes (Corlett & Fletcher, 2014). A further aim of this research is, therefore, to examine whether JTC has any association beyond underlying processes, such as cognitive styles, that may serve as its antecedents.

Cognitive styles are thinking dispositions that determine one's thought processes, behaviors, and decisions in a variety of ways and across different tasks (Thompson et al., 2001). They are thought to be rather stable (Thompson et al., 2001) and have previously been studied in conjunction with JTC (Ross et al.,

2016; Webster & Kruglanski, 1994) due to their associations with different information gathering and processing patterns. Moreover, cognitive processes, including certain reasoning styles, have been suggested to be the drivers of JTC in the first place (Corlett & Fletcher, 2014). Further studying them may, therefore, help shed light on interindividual differences in information search, information processing, and decision-making and help explain differences in individuals' inclinations toward adopting conspiracy beliefs. Across our two studies, we focused on a set of four cognitive styles primarily due to their conceptual and empirical links to JTC. These span tendencies towards longer sampling and, therefore, against exhibiting JTC of positive and negative valence (i.e., actively open-minded thinking and personal fear of invalidity, respectively), tendencies towards shorter sampling and therefore towards exhibiting JTC (i.e., need for cognitive closure), and finally, the willingness and aptitude to engage in the reevaluation of intuitive answers, also potentially leading to longer sampling in the beads task (i.e., cognitive reflection).

Actively Open-Minded Thinking (AOT)

AOT is a reasoning style that has been found to be closely related to information acquisition and the formation of opinions or beliefs (Baron, 2008). It describes the tendency to invest effort into thinking, seek information in a very targeted manner, and weigh different pieces of evidence against each other when developing an opinion or belief (Bronstein et al., 2019; Stanovich & West, 1997). When faced with a problem or a new situation, people engaging in AOT tend to conduct a more unbiased search for information and have been found to be more open to information that contradicts or challenges their intuition or existing beliefs (Baron, 2008; Haran et al., 2013) compared to those who engage in it less. Additionally, AOT has been found to be relevant when determining the trustworthiness or quality of a source, which can affect one's belief in paranormal ideas or fake news (Bronstein et al., 2019; Pennycook et al., 2020).

Regarding behavior in the beads task, higher AOT scores should be associated with sampling more beads before making a decision, leading to less JTC. This would be in line with AOT and JTC's underlying conceptual assumptions, although there are no studies testing this link explicitly. As AOT, by nature of the concept, is closely related to the critical search for and consideration of information, as well as the evaluation of information sources, it is moreover very

plausible that engaging in AOT may be negatively related to conspiracy mentality. People scoring higher in AOT should therefore be less prone to adopt conspiracy beliefs in the first place.

Personal Fear of Invalidity (PFI)

In contrast to AOT, PFI does not focus on gathering, comparing, and weighing information to make an informed decision; rather, PFI is characterized by a heightened level of apprehension about making the wrong decision and the potential consequences of doing so (Thompson et al., 2001). PFI is therefore associated with difficulties in deciding and often leads to delays in or even complete avoidance of decision-making (Freund et al., 1985; Kruglanski & Freund, 1983; Neuberg et al., 1997; Rietzschel et al., 2007; Webster & Kruglanski, 1994). Additionally, when they do make a decision, those with high PFI tend to feel less confident (Freund et al., 1985) and more ambivalent about it (Thompson & Zanna, 1995) compared to those with low PFI.

Unfortunately, research on the link between PFI and both JTC and conspiracy mentality is sparse. In the beads task, participants with higher PFI scores should sample more beads, again leading to less JTC. Regarding conspiracy beliefs, however, there are two conflicting hypotheses. It is possible that people with high PFI seek out more information to reassure themselves regarding their decision. People scoring higher in PFI should therefore be less prone to adopt conspiracy beliefs in the first place. On the other hand, it is also possible that the simple answers to complex problems provided by conspiracy theories and their ostensible certainty may be appealing to participants high in PFI. Therefore, it is also conceivable that they may be more prone to adopt conspiracy beliefs.

Need for Cognitive Closure (NFCC)

NFCC (Webster & Kruglanski, 1994) describes the tendency to crave clear answers and closure to a problem as well as an aversion towards ambivalence. It is conceptualized as a spectrum ranging from a high need for closure to a high need to avoid closure; high NFCC is characterized by a desire for structure and order, whereas low NFCC is characterized by an aversion towards the very same (Chirumbolo, 2002; Webster & Kruglanski, 1994). Much like AOT and PFI, NFCC too has been found to affect people's information search strategies (Choi et al., 2008), as well as their information processing, generation of alternative hypotheses, the rejection of other opinions, and many more processes

(Kruglanski, 1996). Those with high NFCC may make snap judgments, base their decisions on insufficient amounts of information and act in a closed-minded manner, refusing to consider alternative courses of action in order to avoid ambivalence (Webster & Kruglanski, 1997). Additionally, there may be a link between NFCC and authoritarianism, conservatism, and right-wing political ideology (Chirumbolo, 2002).

Based on this evidence, we believe it is likely that NFCC may lead to quicker decisions and, therefore, more JTC In the beads task and that it may be a further potential predictor of conspiracy mentality. People scoring higher in NFCC should be more prone to adopt conspiracy beliefs in the first place.

Cognitive Reflection

One popular and quick way to measure cognitive reflection ability is the Cognitive Reflection Test (Frederick, 2005), a three-item measure of reflective reasoning. All three questions suggest an intuitive but false response and, therefore, require deeper reflection to be recognized as incorrect. While the operations required to solve the problems are not difficult, participants tend to perform poorly in the CRT, as they fall for the obvious, more intuitive, but ultimately incorrect answer to the problems. The underperformance observed in the CRT has been tied to dual process theory (Evans & Stanovich, 2013), which suggests that there are two types of information processing systems in the human brain. One of which is fast, autonomous, and requires little conscious effort, while the other is slower, more reflective, and requires more cognitive resources. Based on this idea, it is thought that the fast and automatic information processing system is dominant in this instance, leading to the selection of the intuitive answer and hence resulting in poor performance in the CRT. Furthermore, those scoring higher in AOT could be expected to perform better than those with lower scores (Toplak et al., 2011).

There are conceptual parallels between CRT and JTC, and previous research has shown CRT performance and JTC to be reasonably related (Ross et al., 2016). Participants who perform better on the CRT should sample more beads, leading to less JTC. Also, better CRT performances have been linked to being less likely to hold COVID-19-related conspiracy beliefs (Kantorowicz-Reznichenko et al., 2022).

Present Research

Previous research has shown that individual differences in certain cognitive styles, such as actively open-minded thinking, personal fear of invalidity, cognitive reflection, and need for cognitive closure, can affect how individuals search for and process information (Ross et al., 2016; Stanovich & West, 1997; Thompson et al., 2001). Due to the nature of these patterns and how they influence people's search for and processing of information, there are likely differences between individuals' proneness to holding conspiracy beliefs, depending on their expression of said cognitive styles.

An additional focus of the present research is on JTC, a cognitive bias frequently linked to the development and maintenance of delusional ideas (Bell et al., 2006). Delusional ideas are related to conspiracy mentality, despite the fact that they are distinct constructs (Imhoff & Lamberty, 2018). The goal of the present studies was to examine the relationship between cognitive styles, JTC, and general and COVID-19-related conspiracy beliefs. We assessed general conspiracy mentality with two different measures but expected them to be highly correlated. We included conspiracy beliefs specific to COVID-19 as they constitute an impactful (Allington et al., 2020) but also a very recent phenomenon. Findings may lead to a better understanding of the factors that contribute to or predispose individuals to conspiracy mentality surrounding COVID-19, thereby affecting their personal and public health behavior.

Going beyond previous research on JTC and conspiracy theories (Pytlik et al., 2020), we extend the scope by not only looking at the approval of specific conspiracy theories but at conspiracy mentality instead. While endorsing some of the conspiracy theories may appear harmless (e.g., believing that there was a cover-up about contact with extraterrestrials), having a conspiracy mentality makes one more vulnerable to new and maybe more harmful conspiracy theories (i.e., COVID-19-related ones). Finally, we expand on previous research by assessing whether JTC would predict conspiracy mentality beyond a set of cognitive styles, some of which, in turn, are conceived to be the primary motivators of behavior in the beads task (Ross et al., 2016).

To achieve these research aims, we ran a series of two studies. In Study 1, we investigated the relationship of cognitive styles and JTC with both general and COVID-19-specific conspiracy mentality in 532 participants. In the preregistered

Study 2, we replicated our results and additionally investigated whether decision-irrelevant content of the beads task would alter the relationship between JTC and conspiracy mentality. Our data, preregistration (for Study 2), and materials are available at https://researchbox.org/910&PEER_REVIEW_passcode=EUGPHY.

Study 1

In Study 1, we began by assessing whether and how the cognitive styles actively open-minded thinking (AOT) and personal fear of invalidity (PFI), as well as JTC relate to each other and predict general as well as COVID-19-specific conspiracy mentality. As mentioned, these concepts were selected based on their theoretical foundations and previous evidence relating them to biases (Baron, 2019). AOT is expected to be negatively correlated with conspiracy beliefs as well as JTC, as this cognitive style is characterized by a careful and thorough search for information as well as a critical view of information sources (Bronstein et al., 2019). Further, we expected PFI to be negatively correlated with JTC, as it is often characterized by difficulties making decisions and delaying rather than rushing them (Freund et al., 1985; Kruglanski & Freund, 1983; Neuberg et al., 1997; Rietzschel et al., 2007; Webster & Kruglanski, 1994). As outlined above, the association between conspiracy mentality and PFI could go both ways.

Most critically, Study 1 tested the idea that knowing whether a participant exhibits JTC will be helpful in predicting their conspiracy mentality even when controlling for and thus beyond AOT and PFI.

Study 1 included two experimental conditions, an incentivized versus an unincentivized version of the beads task. While the 'classic' version of the beads task is unincentivized, it has been argued that participants should be incentivized to solve the task correctly, thus creating a cost for an incorrect decision (van der Leer et al., 2015). This could help avoid ceiling effects of JTC created by the desire to get through the task more quickly. Hence, this condition was added to assess any differences between an incentivized and an unincentivized version of the task.

Methods

Participants, Design, and Sample Size Considerations.

Seven hundred and fifty participants were initially recruited via CloudResearch (Litman et al., 2017) to participate in Study 1. They were assigned either to a bonus condition or a no-bonus condition.[3] Participants received $1.80 for their participation, and participants in the bonus condition could earn an additional $0.20 for selecting the correct jar in the beads task. Only participants who indicated that they had completed the study carefully and answered two questions in a comprehension check for the beads tasks correctly were included in the data analysis. In total, 218 participants answered the comprehension check (partially) incorrectly. Hence 532 participants (296 men, 4 non-binary, 2 'prefer not to answer, ' M = 39.7 years old, SD = 10.0) remained for data analysis. This sample size should suffice for the meaningful interpretation of correlation coefficients (Schönbrodt & Perugini, 2013).

Procedure

At the beginning of the study, the survey software randomly assigned participants to either the bonus or no-bonus condition. All participants completed a computerized version of the beads task. Hereafter, they received feedback on their performance in this task. After the beads task, participants completed questionnaires assessing AOT and PFI, followed by the Conspiracy Mentality Questionnaire (Bruder et al., 2013), the Single-Item Conspiracy Belief Scale (Lantian et al., 2016), and a conspiracy belief scale specific to Covid-19 conspiracy beliefs (Pennycook et al., 2022). They then gave their basic demographics (e.g., age, gender) and indicated their self-esteem (Robins et al., 2001) and general willingness to take risks (Dohmen et al., 2011). Finally, they were thanked for their participation, debriefed, and compensated.

Materials

Beads Task

Participants were presented with two different jars with different ratios of colorful beads. One jar contained 60 red and 40 blue beads, while the other contained 40 red and 60 blue beads. They were informed that the computer would

[3] Participants were also randomly assigned to one of three experimental conditions (mindset manipulation: implemental mindset vs. deliberative mindset vs. no-mindset control; Keller et al. (2019) as part of an unrelated study. A manipulation check revealed this manipulation to have been unsuccessful and there were no differences in background variables between conditions, so this manipulation had no influence on the subsequent procedure and will therefore not be discussed further.

randomly select one of the two jars, draw a bead, present it to the participant and replace it in the jar before drawing the next. Participants were told that once a jar had been selected, beads would always be drawn from the same jar. Their task would be to decide which jar was selected by the computer. Deciding in favor of one jar ended the task, but participants could sample up to 20 beads before making a final decision. All participants were exposed to a fixed order of beads taken from previous research using the beads task in a nonclinical sample (Ross et al., 2016). In the bonus condition, selecting the correct jar was incentivized by adding a bonus to the participants' payout, while the task was not incentivized for participants in the no-bonus condition. After a decision was made but before receiving feedback on this decision, participants were asked how confident they were in making the correct decision ('How certain are you that you chose the correct jar'; measured on a scale from *not certain at all* to *completely certain*). This was followed by two questions that served as a comprehension check for the task and that they were asked to mark as *true*, *false*, or *not sure* ('Once the computer selected a jar, it always drew the beads from the same jar' and ‘There is no chance that a blue bead was chosen from Jar B'). Only participants who answered both questions correctly were included in the analyses.

Performance in the Beads Task. The beads task offers four outcome variables: whether participants selected the correct jar, their draws to decision, jumping to conclusions, and (over)confidence after the decision. The most straightforward variable is whether participants chose the correct jar (accuracy). Draws to decision (DTD) describes the number of beads that participants sampled before deciding. Jumping to conclusions (JTC) is commonly defined as making a decision before sampling at least three beads (Garety & Freeman, 2013). This means that participants who made their decision after seeing the first or second bead were classified as exhibiting JTC, while those who sampled three or more beads were not. Confidence is measured after a decision has been made and is related to the DTD, as higher numbers of DTD would justify higher levels of confidence, whereas high levels of confidence after sampling only a few beads (i.e., low number of DTD) would constitute overconfidence. Note that selecting the correct jar should become easier the higher the DTD and be the hardest among participants exhibiting JTC, as they have the least information on which to base their choice.

Conspiracy Mentality

Three different measures of conspiracy mentality served as dependent variables in this study: the Conspiracy Mentality Questionnaire, the Single-Item Conspiracy Beliefs Scale, and a measure of COVID-19-related conspiracy beliefs.

Conspiracy Mentality Questionnaire (CMQ). The CMQ (Bruder et al., 2013) is a five-item instrument designed to assess general conspiracy mentality unrelated to any particular topic. The questionnaire consists of statements (e.g., 'I think that there are secret organizations that greatly influence political decisions') for which participants indicated whether they agree on a slider scale ranging from 0 to 100 (*certainly not − certain*).

Single-Item Conspiracy Beliefs Scale. As the name suggests, this is a single-item scale (Lantian et al., 2016) measuring general conspiracy beliefs. Following a four-sentence introduction, the respondents answered the statement 'I think that the official version of the events given by the authorities very often hides the truth' on a nine-point scale ranging from *completely false* (1) to *completely true* (9).

COVID-19 Conspiracy Beliefs. COVID-19-related conspiracy beliefs were measured using a scale based on the work by Pennycook and colleagues (Pennycook et al., 2022). The nine items were related to common COVID-19-related conspiracies (BBC News, 2021; Wakabayashi et al., 2020) and were answered on a 7-point scale ranging from *strongly disagree* to *strongly agree*.

Cognitive Styles

Actively Open-Minded Thinking (AOT). This 11-item scale (Baron, 2019) gauges whether an individual thinks engaging in an active thinking process is generally favorable. Its items (e.g., 'True experts are willing to admit to themselves and others that they are uncertain or that they don't know the answer') are answered on a 5-point scale ranging from *completely disagree* to *completely agree*. Higher scores express an endorsement of an actively open-minded thinking style.

Personal Fear of Invalidity (PFI). This 14-item scale (Thompson et al., 2001) assesses whether an individual thinks heavily about the potential drawbacks of making a flawed decision. Its items (e.g., 'I tend to continue to evaluate recently made decisions') are answered on a 6-point scale ranging from *strongly disagree* to *strongly agree*. Higher scores express stronger indecisiveness and concern regarding the decision-making process.

Demographics

We assessed the participants' gender (male, female, non-binary/other, prefer not to answer), age, level of education, as well as their general willingness to take risks (Dohmen et al., 2011), and self-esteem (Robins et al., 2001).

Final Questionnaire

The final questionnaire comprised four questions regarding a potential history of mental problems and substance (ab)use due to their potential link to JTC and the question of whether participants had answered the questions in the study carefully, which served as one of the exclusion criteria.

Results

We first assessed whether randomization in the bonus versus no bonus condition was successful by testing for any significant differences in background variables (i.e., the final questionnaire, demographic variables). Overall, randomization was successful, as there were no significant differences between the bonus and no-bonus conditions, Fs ≤ 3.07, ps ≥ .080. Furthermore, there were no significant differences between all but two of the background variables based on mental health history, Fs ≤ 1.31, ps ≥ .252; There was, however, a highly significant difference in self-esteem, F (1, 530) = 18.47, p = .001, η^2 = .034, suggesting those with a history of mental illness or drug use had lower self-esteem compared to those without. Furthermore, there was a difference in age, F (1, 530) = 3.87, p = .050, η^2 = .007. Thus, we control for self-esteem and age in the subsequent analyses.

Beads Task

Overall, 467 (88%) of the participants chose the correct jar in the beads task. Furthermore, 356 (67%) participants did not exhibit JTC in the beads task, while 176 (33%) did. DTD were (by design) significantly lower for participants who exhibited JTC (M = 1.06, SD = 0.24) than for participants who did not, M = 9.84, SD = 4.17, p < .001. Neither accuracy nor JTC were a function of the bonus condition, χ^2s ≤ 1.10, p ≥.295. Neither were DTD, t(530) =0.77, p = .444. There was also no significant difference in DTD between participants with a history or diagnosis of mental illness compared to participants without any diagnoses, t(530) = − 0.54, p = .588, so participants with a diagnosis remained in the sample for analysis.

Correlations

Next, we calculated correlations between the cognitive styles, sampling behavior in the beads task, and general and COVID-19-related conspiracy mentality. The means, standard deviations, and correlation coefficients of these variables can be found in Table 4. As expected, we found a positive correlation between AOT and DTD, $p < .001$, meaning that participants with higher AOT scores also sampled more beads before making a decision. However, we did not observe the expected correlation between DTD and PFI, $p = .431$. Furthermore, AOT and all measures of conspiracy beliefs were negatively correlated, ps $< .001$, meaning that participants with higher AOT scores were less likely to endorse general and COVID-19-related conspiracy beliefs. In contrast, PFI and the general measures of conspiracy beliefs were positively correlated, ps $\leq .033$, but there was no correlation between PFI and COVID-19-related conspiracy beliefs, $p = .842$. We also found significant negative correlations between all measures of conspiracy mentality and DTD in the beads task; that is, participants who endorsed conspiracy beliefs sampled fewer beads, ps $< .001$.[4]

[4] All analyses were run once including and once excluding participants with a mental history. The pattern of results was the same.

Table 4

Means, standard deviations, and correlations for Study 1

Variable	*M*	*SD*	1	2	3	4	5
1. Actively Open-Minded Thinking (AOT)	3.94	0.48	α = .63				
2. Personal Fear of Invalidity (PFI)	3.61	0.88	.05	α = .89			
3. Conspiracy Mentality Questionnaire (CMQ)	57.69	22.85	−.25***	.11**	α = .89		
4. Single-Item Conspiracy Scale	5.03	2.57	−.26***	.09*	.72***		
5. COVID-19-related Conspiracy Beliefs	19.30	11.57	−.50***	−.01	.55***	.58***	α = .93
6. Draws to Decision (DTD)	6.93	5.36	.25***	.03	−.22***	−.19***	−.27***

Note. *: $p < .050$; **: $p < .010$; ***: $p < .001$

Regression Models

Conspiracy Mentality Questionnaire. Next, we ran a hierarchical regression predicting CMQ scores to see whether each additional block of predictors would improve model fit.[5] The first block of predictors included demographic variables (age, gender, and education level). The second block included willingness to take risks and self-esteem. The third block included the thinking styles (AOT and PFI), and the last block contained behavior in the beads task (DTD). The model containing only the demographic control variables was not significant, $p = .170$. After the demographic variables, each further block resulted in a significant regression model, ps $< .001$. Education level was the only demographic variable with any significant association, $p = .005$. Among the predictors in the second block, general willingness to take risks emerged as a significant predictor, $p < .001$. In the third block, both AOT and PFI were significant predictors, ps $<.001$. Finally, in the last block, DTD emerged as another significant predictor, $p= .002$. There was a significant increase in R^2 with each additional predictor (see Table 5).

COVID-19 Conspiracy Beliefs. The procedure was repeated using COVID-19 conspiracy beliefs as a dependent variable. In this case, gender emerged as a significant predictor, $p = .005$, meaning that women were more prone to COVID-19-related conspiracy beliefs. Moreover, education level was significant as well, $p = .05$, which suggests that those with higher levels of education were less likely to endorse COVID-19 conspiracies. Furthermore, self-esteem, $p <.001$, was a significant predictor. Once again, AOT, $p < .001$, and PFI, $p = .008$, were included as significant predictors. Lastly, DTD were a significant predictor, $p = .003$. As previously, each model had a significant increase in R^2 (see Table 5).

[5] The same procedure was conducted using the single-item measure of conspiracy beliefs as the DV. A similar pattern of results was found. The results can be found in Table 5.

Table 5

Regression coefficients (βs) for the hierarchical regression models predicting general and COVID-19-related conspiracy beliefs in Study 1

			Dependent Variable	
Step	Predictor	CMQ	Single-Item	COVID-19-related
1		R^2 = .01	R^2 = .01	R^2 = .01
	Age	−.07	−.07	.03
	Gender[a]	−.01	−.02	.05*
	Education level	−.06	−.02	−.01
2		R^2 = .07, ΔR^2 = .06***	R^2 = .04, ΔR^2 = .04***	R^2 = .08, ΔR^2 = .07***
	Age	−.05	−.05	.02
	Gender[a]	.04	.03	.15***
	Education level	−.10*	−.05	−.05
	Willingness to take risks	.25***	.19***	.18***
	Self-esteem	.00	.01	.15**
3		R^2 = .14, ΔR^2 = .07***	R^2 = .11, ΔR^2 = .07***	R^2 = .29, ΔR^2 = .21***
	Age	−.03	−.03	.03
	Gender[a]	.02	.00	.12**
	Education level	−.13**	−.08	−.08*
	Willingness to take risks	.20***	.14**	.09*
	Self-esteem	.09	.09	.19***
	AOT	−.21***	−.23***	−.46***
	PFI	.20***	.17***	.12**
4		R^2 = .15, ΔR^2 = .02**	R^2 = .12 ΔR^2 = .01*	R^2 = .30, ΔR^2 =.01**
	Age	−.04	−.04	.02
	Gender[a]	.01	−.01	.11**
	Education level	−.12**	−.07	−.07*
	Willingness to take risks	.19***	.13**	.08
	Self-esteem	.07	.07	.17***
	AOT	−.18***	−.20***	−.44***
	PFI	.19***	.16***	.12**
	DTD	−.13**	−.11*	−.12**

Note. N = 532. [a]male = 1, female = 2. * $p < .050$; **: $p < .010$; ***: $p < .001$

Beads Task: (Over)confidence

The same procedure was repeated using (over)confidence in the beads task as the dependent variable to assess its association with demographics, willingness to take risks and self-esteem, cognitive styles, and DTD on (over)confidence after the decision. None of the demographic variables had any significant association, ps ≥. 109. However, both self-esteem, p = .003, and willingness to take risks, p = .022, were significant predictors. There was no significant relationship with PFI, p = .269, while AOT did, p = .009, suggesting those higher in AOT expressed lower confidence. Finally, DTD was a highly significant predictor of (over)confidence

in having selected the correct jar, $p < .001$. For a full summary of the models, see Table 6.

Table 6

Regression coefficients (βs) for the hierarchical regression models predicting (over)confidence in the beads task in Study 1

Step	Predictor	(Over)confidence
1		$R^2 = .01$
	Age	−.08
	Gender	−.06
	Education level	.53
2		$R^2 = .04$, $\Delta R^2 = .03$***
	Age	−.09
	Gender	−.02
	Education level	.03
	Willingness to take risks	.11*
	Self-esteem	.11*
3		$R^2 = .05$, $\Delta R^2 = .01$
	Age	−.08
	Gender	−.02
	Education level	.02
	Willingness to take risks	.09
	Self-esteem	.13*
	AOT	−.07
	PFI	.04
4		$R^2 = .84$, $\Delta R^2 = .04$***
	Age	−.07
	Gender	.00
	Education level	.00
	Willingness to take risks	.11*
	Self-esteem	.16**
	AOT	−.12**
	PFI	.06
	DTD	.20***

Note. $N = 532$. [a]male = 1, female = 2. * $p < .050$; **: $p < .010$; ***: $p < .001$

Discussion

The results showed several connections between the cognitive styles, measures of general and COVID-19-related conspiracy mentality and beads task performance. The significant negative correlations between AOT and all measures of conspiracy beliefs and the positive correlation between AOT and DTD in the beads task indicates that participants who categorized themselves as open-minded thinkers were less likely to endorse conspiracy theories, both generally and concerning COVID-19 and were less likely to jump to conclusions (i.e., sought more information before reaching a decision in the beads task). The results also suggest that those with higher PFI had a higher general conspiracy mentality. However, contrary to our expectations, there was no statistically meaningful

relationship between PFI and COVID-19-related conspiracy beliefs. The negative relationship between DTD and all measures of conspiracy mentality indicates that those who endorsed conspiracy beliefs sought less information on which to base their decision in the beads task.

Regarding the assessed background variables, we found education level and willingness to take risks to be opposing predictors of conspiracy beliefs. While there was a positive influence of willingness to take risks on conspiracy beliefs, educational level was a negative one. Interestingly, gender emerged as a significant predictor for COVID-19-related conspiracy beliefs when controlling for other variables but not for general conspiracy beliefs, suggesting that women were more prone to holding COVID-19-related but not general conspiracy beliefs.

In the beads task, confidence in one's decision was positively related to self-esteem, willingness to take risks, and draws-to-decision and negatively to AOT. This means that even when controlling for an objective basis of confidence (i.e., DTD, as more draws should make one more confident in one's decision), participants with higher AOT scores were less certain about their decision, indicating their increased threshold for sufficient data gathering. Most crucially, observed behavior in the beads task was able to explain variance in conspiracy mentality beyond self-reports of cognitive styles, attesting to its importance and hinting at its role in the adoption and maintenance of conspiracy beliefs.

Study 2

Study 2 replicates and extends Study 1. We added a short version of the need for cognitive closure scale (Schlink & Walther, 2007) as an additional reasoning style. NFCC, much like the other reasoning styles included in these studies, has been found to affect people's information search strategies (Choi et al., 2008), information processing, generation of alternative hypotheses, the rejection of other opinions, and many other processes (Kruglanski, 1996) and has previously been studied in conjunction with JTC (Webster & Kruglanski, 1994). Therefore, we wanted to explore it as an additional potential predictor of conspiracy mentality. We also added the CRT (Frederick, 2005) as an indicator of the willingness and aptitude to reflect on a task's solution and recognize an intuitive, impulsive answer as incorrect, as this ability is expected to be positively related to the number of beads sampled in the beads task (Ross et al., 2016).

The results from Study 1 enabled us to pre-register our hypotheses and analysis plan regarding the relationships between cognitive styles, DTD, and general and COVID-19-related conspiracy mentality on AsPredicted.org (#103004), which can be found online at https://researchbox.org/910&PEER_REVIEW_passcode=EUGPHY. Based on the theoretical background and the results from the previous study, we pre-registered four hypotheses. First, we hypothesized that there would be negative correlations between AOT and the measures of conspiracy mentality. Second, we hypothesized a positive correlation between actively open-minded thinking and draws to decision in the beads task. This means that we expect those with a stronger tendency towards AOT to exhibit less JTC and indicate a lower belief in conspiracy theories. Third, we hypothesized that there would be positive correlations between personal fear of invalidity and the measures of conspiracy mentality, supporting the idea that delays in decision-making caused by PFI do not shield one from the adoption of conspiracy beliefs. However, it is to note that Study 1 found no significant correlation between PFI with COVID-19-related conspiracy mentality, but only with general conspiracy mentality. Lastly, we hypothesized that behavior in the beads task (i.e., DTD) would be a significant predictor of conspiracy mentality beyond the variance already explained by the cognitive styles. As DTD was found to significantly increase the variance explained by the models in Study 1, we expect this to be the case once more in Study 2.

Exploratively, we additionally aimed to assess whether the content and context of the beads task could change its effect on or correlation with COVID-19-related conspiracy mentality by using a COVID-19-themed version of the beads task. As this was exploratory, we did not preregister a hypothesis regarding the effects of the beads task's content. However, we expected participants with marked COVID-19-related conspiracy beliefs to express higher rates of JTC in the COVID-19-themed beads task than in the conventional, neutral beads task.[6]

[6] We also added a strategic numeracy task (Mata et al., 2015) in Study 2. This task can be found in the materials but because it is not the focus of the present research, will not be discussed in the methods or analyses.

Method

Participants, Design, and Sample Size Considerations

Seven hundred and fifty participants were initially recruited via CloudResearch (Litman et al., 2017) to participate in Study 2. Participants received $2.00 for their participation.[7] As previously, only participants who indicated that they had completed the study carefully (all but 1) and answered both questions in the comprehension check for the beads tasks correctly (all but 198) were included in the data analysis. Hence 551 participants (306 men, 3 non-binary, 6 'prefer not to answer', M = 39.7 years old, SD = 11.1) remained in the final sample. Participants were randomly assigned to one of two beads task versions (conventional vs. COVID-19-themed). This sample size should be sufficient for the meaningful interpretation of correlation coefficients (Schönbrodt & Perugini, 2013).

Procedure

Study 2 followed the same procedure as Study 1 except for minor changes. Participants once again began by giving their informed consent. Then, half of the participants were presented with the conventional version of the beads task, while the other half received a COVID-19-themed version of the beads task. They then worked on the cognitive reflection task, followed by the final questionnaire.

Materials

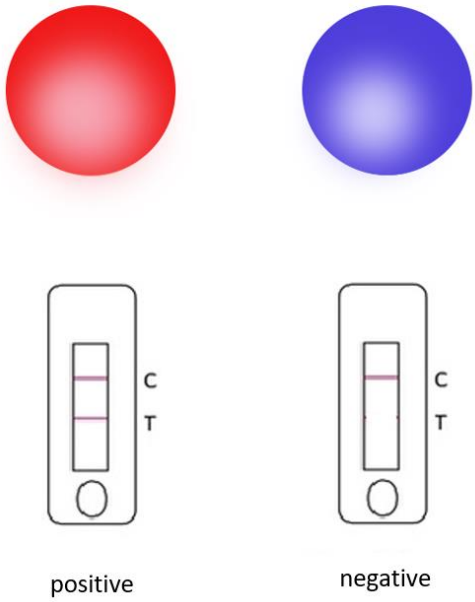
Beads Task

Participants were randomly assigned to one of two experimental conditions. In the first, they completed the conventional version of the beads task described in Study I. In the second, they completed a COVID-19-themed version of the beads task. Participants were presented with two different COVID-19 testing facilities (Facility A or B) instead of jars, from which they drew positive or negative rapid test results instead of beads in different colors. The ratios were kept consistent with the conventional beads task (60 positive vs. 40 negative test results in Facility A and 60 negative vs. 40 positive test results in Facility B). The order of test results (Ross et al., 2016) and comprehension check were the same as in Study 1.

[7] As there were no differences between the bonus and no-bonus conditions in Study 1, the beads task was no longer incentivized in Study 2. Instead, all participants received the same payment.

Figure 4

Beads and test results drawn by participants in the conventional beads task (top) and the COVID-19-themed beads task (bottom)



Conspiracy Mentality

The instruments used to measure general conspiracy beliefs and COVID-19-related conspiracy mentality were the same as in Study 1.

Cognitive Styles

Need for Cognitive Closure (NFCC). We assessed NFCC using a 16-item short scale (Schlink & Walther, 2007), which was constructed based on the original 47-item scale (Kruglanski et al., 1993). The scale assesses tolerance for ambiguity and uncertainty. As the short version of the scale is validated for use in German, it was translated into English and then back into German by two independent translators. The statements were answered on a 6-point scale ranging from *strongly disagree* to *strongly agree*.

Cognitive Reflection Task (CRT). The CRT (Frederick, 2005) consists of three items and assesses cognitive reflection ability. Each item provides an intuitive but incorrect answer (e.g., *A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?* Intuitive answer $0.10, correct answer $0.05). Participants, therefore, need to carefully reflect to find the correct rather than the intuitive solution.

Demographics

As in the previous study, we assessed the participants' gender, age, level of education, willingness to take risks (Dohmen et al., 2011), and self-esteem (Robins et al., 2001). Furthermore, we assessed their political ideology (*extremely conservative – extremely liberal*), as well as their party identification (Democratic Party, Republican Party, or neither).

Final Questionnaire

The final questionnaire included the same questions on mental health and drug (ab)use as in the previous study. Once again, participants were asked to indicate whether they had completed the survey carefully, as this served as an inclusion criterion.

Results

As previously, we assessed whether randomization between the beads task conditions (regular beads task vs. COVID-19-themed beads task) was successful by testing for any significant differences between background variables (i.e., the final questionnaire, demographic variables). Overall, randomization can be considered successful, as there were no significant differences between the two conditions, Fs ≤ 3.07, ps $\geq .080$. Political party identification was not a function of the bonus condition, χ^2 (2, $N = 551$) = 4.48, $p \geq .107$. Furthermore, there were no significant differences between all but one of the background variables based on participants' mental health history, Fs ≤ 3.31, ps $\geq .070$; there was, however, a highly significant difference in self-esteem, F (1, 549) = 11.21, $p < .001$, $\eta^2 = .02$. Political party identification was not a function of participants' mental health history, χ^2 (2, $N = 551$) = 0.82, $p \geq .665$. We again control for self-esteem in the subsequent analyses.

Beads Task

Overall, only 104 (19%) of the participants chose the correct jar in the beads task. Furthermore, 337 (61%) participants did not exhibit JTC in the beads task, while 214 (39%) did. DTD were (by design) significantly lower for participants who exhibited JTC ($M = 1.08$, $SD = 0.28$) than for participants who did not, $M = 9.31$, $SD = 3.57$, $p < .001$. JTC was not a function of the experimental condition, χ^2 (1, $N = 551$) = 0.23, $p = .629$. Neither were DTD, $t(546) = 0.20$, $p = .840$. However, accuracy was, χ^2 (1, $N = 551$) = 8.72, $p = .003$, $\varphi = 0.13$, meaning significantly more participants in the COVID-themed condition chose

the correct jar. There was also no significant difference in DTD between participants with a history or diagnosis of mental illness compared to participants without any diagnoses, $t(546) = -0.72$, $p = .471$, so participants with a diagnosis remained in the sample for analysis.

Correlations

As previously, we calculated correlations between the cognitive styles, behavior in the beads task (i.e., DTD), and general and COVID-19-related conspiracy mentalities/beliefs. Further, we added correlations with CRT scores. Means, standard deviations, and correlation coefficients can be found in Table 7. Like in Study 1, we found a significant positive correlation between AOT and DTD, $p < .001$. We also found a positive correlation between DTD and PFI, $p = .015$, which was not observed in Study 2. There was no significant correlation between DTD and NFCC, $p = .526$. Furthermore, there were significant negative correlations between AOT and all measures of conspiracy beliefs, ps $< .001$, which was in line with the findings in Study I. Interestingly, there was no significant correlation between PFI and general measures of conspiracy beliefs, ps $\geq .787$, but a significant negative correlation between PFI and COVID-19-related conspiracy theories, $p = .024$; the opposite was the case in Study 1. NFCC was positively correlated with both general and Covid-19-related conspiracy mentality, ps $\leq .020$. We also found significant negative correlations between all measures of conspiracy mentality and DTD in the beads task, ps $< .001$, the same as in Study 1. Furthermore, there was a positive correlation of CRT scores with AOT, $p < .001$, and DTD, $p < .001$. CRT score was also negatively correlated with all measures of conspiracy mentality, ps $<. 001$.

Table 7

Means, standard deviations, and correlations in Study 2

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1. Actively Open-Minded Thinking (AOT)	4.70	.57	α = .69							
2. Personal Fear of Invalidity (PFI)	3.62	.94	.17***	α = .91						
3. Need for Cognitive Closure (NFCC)	3.59	.67	−.11**	.24***	α = .82					
4. Conspiracy Mentality Questionnaire (CMQ)	53.31	25.41	−.19***	.01	.15***	α =.90				
5. Single-Item Conspiracy Scale	4.75	2.60	−.22***	.01	.11**	.74***				
6. COVID-19 Conspiracy	2.23	1.28	−.43***	−.10*	.10*	.51***	.54***	α = .92		
7. Draws to Decision (DTD)	6.10	4.89	.18***	.10*	−.03	− .10*	−.08	−.25***		
8. Cognitive Reflection (CRT)	2.13	1.12	.22***	−.02	−.04	−.20***	−.19***	−.25***	.33***	α = .78

Note. * Indicates $p < .05$, ** indicates $p < .01$, *** indicates $p < .001$

Regression Models

CMQ. Next, we ran a hierarchical regression predicting CMQ scores to see whether each additional block of predictors would improve model fit. The first block of predictors included demographic variables (age, gender, political ideology, and education level), and the second block included willingness to take risks and self-esteem. The third block included the thinking styles (AOT, PFI, NFCC, and CRT), and the last block contained DTD. The results showed three highly significant models, *p*s < .001. The significant predictors among the demographic variables were age, $p = .025$, education level, $p = .015$, and political ideology, $p < .001$. Furthermore, general willingness to take risks once again emerged as a significant predictor, $p < .001$. Neither AOT nor PFI were significant predictors, *p*s ≥.369. However, NFCC was, $p < .001$. Finally, DTD was not a significant predictor, *p*s ≥ .988. The improvement in fit with each additional block can be seen in Table 8.

Single-Item Conspiracy Beliefs Scale. The pattern of results was identical to the CMQ results, with the exception of AOT and age. Age had no significant relationship with this measure, $p = .170$. In contrast to the previous model, AOT did emerge as a significant predictor in this case, $p = .032$, suggesting those with higher AOT held less pronounced conspiracy beliefs. A full summary of all models and the improvement in model fit from each model to the next can be found in Table 8.

COVID-19 Conspiracy Beliefs. The procedure was repeated for a third time using COVID-19 conspiracy beliefs as a dependent variable. In this case, political ideology emerged as a significant predictor, $p < .001$, while age, gender and level of education did not, *p*s ≥ .126. Furthermore, willingness to take risks was a significant predictor, $p < .001$. Once more, AOT, $p < .001$, and NFCC, $p = .002$, were significant predictors, as was PFI, $p = .047$. Finally, the draws to decision were a significant predictor, $p < .001$. As previously, each block significantly improved model fit (see Table 8).

Table 8

Regression coefficients (βs) for the hierarchical regression models predicting general and COVID-19-related conspiracy beliefs in Study 2

		Dependent Variable		
Step	Predictor	CMQ	Single-Item	COVID-19-related
1		R^2 = .10***	R^2 = .11***	R^2 = .30***
	Age	−.15***	−.12**	−.09*
	Gender	.05	.04	.06
	Political ideology	−.28***	−.30***	−.55***
	Education level	−.10*	−.08*	−.05
2		R^2 = .13, ΔR^2 = .02***	R^2 = .13, ΔR^2 = .03***	R^2 = .34, ΔR^2 = .04***
	Age	−.13**	−.08*	−.09*
	Gender	.08	.07	.11**
	Political ideology	−.27***	−.29***	−.52***
	Education level	−.11**	−.10*	−.07
	Willingness to take risks	.17***	.18***	.19***
	Self-esteem	−.06	−.04	.04
3		R^2 = .18, ΔR^2 = .05***	R^2 = .18, ΔR^2 = .05***	R^2 = .43, ΔR^2 = .10***
	Age	−.09*	−.06	−.04
	Gender	.04	.03	.05
	Political ideology	−.24***	−.25***	−.44***
	Education level	−.10*	−.09*	−.05
	Willingness to take risks	.22***	.21***	.18***
	Self-esteem	−.02	.02	.08
	CRT-Score	−.12**	−.10*	−.11**
	AOT	−.04	−.09*	−.25***
	PFI	.04	.09	.08
	NFCC	.19***	.15***	.12***
4		R^2 = .18, ΔR^2 = .00	R^2 = .18, ΔR^2 = .00	R^2 = .44, ΔR^2 = .01***
	Age	−.10*	−.06	−.05
	Gender	.04	.04	.04
	Political ideology	−.24***	−.25***	−.44***
	Education level	−.10*	−.09*	−.05
	Willingness to take risks	.22***	.21***	.17***
	Self-esteem	−.02	.02	.07
	CRT-Score	−.12**	−.10*	−.07*
	AOT	−.04	−.09*	−.24***
	PFI	.04	.09	.08*
	NFCC	.19***	.15***	.11**
	DTD	.00	.02	−.12***

Note. N = 551. [a]male = 1, female = 2. * $p < .050$; **: $p < .010$; ***: $p < .001$

Beads Task: (Over)confidence

The same procedure was repeated using (over)confidence as the dependent variable to assess its association with demographics, willingness to take risks, self-esteem, CRT score, cognitive styles, DTD, and experimental condition on (over)confidence. Among the demographic variables, gender was a highly

significant predictor for overconfidence, p <.001. Additionally, ideology was a significant predictor, p = .041. Neither self-esteem, willingness to take risks, nor CRT score were significant predictors, ps ≥ .218. None of the cognitive styles had any significant relationship with (over)confidence, ps ≥ .10. Finally, DTD was a highly significant predictor of (over)confidence, p < .001, while the experimental condition had no effect, p = .215. For a full summary of the models, see Table 9.

Table 9

Regression coefficients (βs) for the hierarchical regression models predicting (over)confidence in the beads task in Study 2

Step	Predictor	(Over)confidence
1		R^2 = .04
	Age	.02
	Gender	−.17***
	Education level	−.01
	Ideology	−.09*
2		R^2 = .05, ΔR^2 = .01
	Age	.02
	Gender	−.15***
	Education level	−.02
	Ideology	−.07
	Willingness to take risks	.06
	Self-esteem	.06
3		R^2 = .06, ΔR^2 = .01
	Age	.02
	Gender	−.16***
	Education level	−.01
	Ideology	−.06
	Willingness to take risks	.08
	Self-esteem	.06
	CRT	−.02
	AOT	−.03
	PFI	.00
	NFCC	.08
4		R^2 = .11, ΔR^2 = .05***
	Age	.04
	Gender	−.15***
	Education level	−.01
	Ideology	−.06
	Willingness to take risks	.10*
	Self-esteem	.08
	CRT	−.09
	AOT	−.05
	PFI	−.01
	NFCC	.09
	DTD	.25***

Note. N = 551. [a]male = 1, female = 2*. p < .050; **: p < .010; ***: p < .001

Discussion

Many of the results of Study 2 replicate the results of Study 1. Consistent with Study 1, we again found a negative relationship between AOT and JCT. A negative correlation with JTC was expected, given the fact that those who score higher in AOT tend to seek more evidence on which to base their decision before making it (Bronstein et al., 2019; Stanovich & West, 1997). The data, therefore, confirm our hypothesis predicting a negative association between AOT and JTC. As previously, those higher in AOT showed lower scores across all measures of conspiracy beliefs. In the regression analyses controlling for other influences, AOT was found to be a negative predictor for both COVID-19-related conspiracy beliefs and the single-item general conspiracy beliefs but not conspiracy mentality as measured by the CMQ. While this is generally in line with both the theory and the results of Study 1 and supports our hypothesis that there will be negative correlations between AOT and the measures of conspiracy mentality, it is important to note that AOT was no significant predictor for CMQ when controlling for other variables. A possible explanation is that the CMQ may be very broad and may therefore be influenced by things such as actual political scandals, thereby potentially capturing things beyond conspiracy mentality. Another could relate to the addition of political ideology in Study 2. Political ideology was a negative predictor of conspiracy mentality and correlated to AOT, $r(549) = .29$, $p < .001$. It is thus possible that the influence of AOT was somewhat weakened by the addition of political ideology.

The data also showed a negative relationship between PFI and JCT. In the case of PFI, more draws to decision could be viewed as a way of putting off a decision, which those with high PFI have been found to do (Freund et al., 1985; Kruglanski & Freund, 1983; Neuberg et al., 1997; Rietzschel et al., 2007; Webster & Kruglanski, 1994). However, this finding is not in line with the previous data, as no significant correlation between PFI and draws to decision was found in Study 1.

There was no significant correlation between JTC and NFCC, which is an interesting finding; a positive relationship between the two concepts driven by participants with a high NFCC wanting closure on which jar/facility had been selected by the computer might have been expected. However, the elapsed wait time for participants to fulfill their need for closure may have been too short,

irrespective of how many beads/test results they chose to sample before making their decision.

PFI only appeared to be related to COVID-19-related conspiracy beliefs, but not to general conspiracy mentality as shown by both correlations and the regression models, so the second hypothesis is only partially supported ("There will be positive correlations between personal fear of invalidity and the measures of conspiracy mentality"). This is striking, as the pattern was different in Study 1, in which we found that higher PFI scores predicted higher endorsement of all types of conspiracy mentality, while there were positive correlations between PFI and general measures of conspiracy mentality, but not COVID-19 conspiracies.

NFCC positively predicted both general and COVID-19-related conspiracy beliefs, meaning those with higher NFCC were more likely to hold conspiracy beliefs. This is in line with the idea that conspiracy beliefs may provide simpler explanations for complex issues (van Prooijen, 2017), thereby more easily satisfying people's need for closure than the complex truth. Though no hypothesis concerning NFCC was preregistered, as this cognitive style was only added in Study 2, these results can be seen as a starting point for further future investigation.

Cognitive reflection ability (CRT) showed a pattern similar to AOT, as it correlated negatively with JTC and all measures of conspiracy mentality and was likewise a negative predictor of all measures of conspiracy beliefs. This suggests that those with higher cognitive reflection ability are less susceptible to conspiracy beliefs.

This time, we did not find behavior in the beads task to affect general conspiracy mentality. However, for COVID-19-related conspiracy beliefs, the addition of DTD was able to explain additional variance beyond that already explained by thinking styles and demographic variables. This provides partial support for our fourth and final hypothesis ("Jumping to Conclusions/Draws to Decision will be a significant predictor of conspiracy mentality beyond the variance already explained by the cognitive styles"), suggesting that JTC has explanatory value on its own rather than being a mere redescription of cognitive styles.

Additionally, we found that participants who were younger and participants with a more liberal political ideology, as well as those with a higher level of

education, were less likely two endorse conspiracy theories; however, the level of education did not seem to affect COVID-19-related conspiracy theories, but only general conspiracy mentality. This suggests that education may be a protective factor when it comes to general conspiracy mentality but does not extend to beliefs specific to COVID-19.

In contrast to Study 1, gender did not emerge as a predictor for COVID-19 conspiracy beliefs or the single-item measure. However, younger participants endorsed general conspiracy mentality in the CMQ more than older participants did. Once again, this may be related to the broad nature of the CMQ, which may also be affected by true political scandals or trust in government and politicians, which has been found to be lower in younger people.

Regarding the (over)confidence variable, we found that men were significantly more confident about their decision in the beads task compared to women, as were participants more willing to take risks when controlling for all other variables. Unsurprisingly, those with higher draws to decision were significantly more confident compared to those with fewer, as their decision was based on more information. Furthermore, AOT, which was a significant predictor in Study 1, was no longer a significant predictor of confidence in Study 2.

General Discussion

The results of both studies presented in this research revealed a relationship between JTC and cognitive styles. The case for a negative link between AOT and JTC appears to be the strongest, as we found strong evidence of it in both studies. The findings from both studies suggest that those more inclined to AOT are less likely to make their decisions based on little and inconclusive information, which is consistent with previous research on the construct, showing that it is associated with targeted information search and a strategic weighing of information to come to an informed conclusion (Bronstein et al., 2019; Stasielowicz, 2022). These findings also support the third of our preregistered hypotheses (*There will be a positive correlation between actively open-minded thinking and more draws to decision in the beads task (i.e., less jumping to conclusions)*.

The connection between JTC and PFI was less clear-cut, showing no correlation between the two constructs in the first study but a small negative correlation in the second study. While this negative correlation in Study 2 could be interpreted as postponing a decision, which is in line with some of the findings

regarding PFI (Freund et al., 1985; Kruglanski & Freund, 1983; Neuberg et al., 1997; Rietzschel et al., 2007; Webster & Kruglanski, 1994), the relationship does not appear to be stable enough to allow for drawing this conclusion, and additional research is still required.

Further, there was no significant correlation between JTC and NFCC, which was only assessed in Study 2, suggesting that out of the cognitive styles, NFCC was the only one with no significant association with JTC. As mentioned, a positive relationship between the two concepts driven by participants with a high NFCC wanting closure on the correct solution may have been expected; however, the wait time between the beginning of the task and its resolution after completing it may have been too short to produce have any influence, meaning a longer time frame might have been required to expect people's high NFCC to cause them to jump to conclusions in order to get to the end of the task and receive closure on the correct answer.

Both studies provided evidence that AOT is negatively linked to all measures of conspiracy beliefs, supporting the first hypothesis in Study 2 (*There will be negative correlations between AOT and the measures of conspiracy mentality*). In the case of PFI, the regression analyses of both studies revealed positive associations with COVID-19-related conspiracy mentality, while this was only the case with the general conspiracy beliefs Study. Nevertheless, this lends support to the third hypothesis (*There will be positive correlations between personal fear of invalidity and the measures of conspiracy mentality*).

Study 2 provided evidence of a positive relationship between NFCC and all measures of conspiracy belief. Though we had no previous data to serve as a basis for a preregistered hypothesis, these data may serve as such for future research regarding the relationship between NFCC and conspiracy mentality.

Study 2 also showed negative correlations of cognitive reflection ability in the CRT with JTC and all measures of conspiracy mentality. Furthermore, the CRT negatively predicted all measures of conspiracy beliefs, suggesting that those with higher cognitive reflection ability are less susceptible to conspiracy beliefs. This is consistent with previous research and the findings on the findings regarding AOT, with which it correlated positively.

The fourth and final hypothesis (*Jumping to Conclusions/Draws to Decision will be a significant predictor of conspiracy mentality beyond the variance*

already explained by the cognitive styles) was supported fully in Study 1, but only in the case of COVID-19-related conspiracy beliefs in Study 2. While this pattern of results strongly suggests that JTC can explain variance beyond that already explained by cognitive styles, further research is necessary to confirm this finding. Possible underlying mechanisms need to be explored to find out when this is the case and when it is not.

Implications

Overall, these large-sample studies add to the literature on JTC, reasoning styles, and conspiracy mentality in various ways. Firstly, they provide additional evidence regarding the links between JTC and different reasoning styles. They provide new evidence, especially in the cases of AOT and PFI, which have been theoretically linked to JTC but have not frequently been empirically tested. Furthermore, they provide additional evidence regarding the links between NFCC and CRT with jumping to conclusions, which is in line with prior research.

Moreover, these studies find that JTC is indeed a significant predictor on its own, indicating that it is not merely a redescription of underlying cognitive styles. Crucially, Study 2 also provides new insights regarding JTC and the beads task, showing that the content and context of the task do not affect the extent to which participants display JTC. Both studies further our understanding of factors that contribute to fostering different types of conspiracy beliefs. These insights may support future interventions.

Limitations and Future Directions

Naturally, there are some limitations to the studies at hand. While these studies use large samples, all participants were recruited from the United States. While conspiracy beliefs regarding COVID-19 have been studied in other countries (Kuhn et al., 2021; Sallam et al., 2021), it is unclear whether these findings are generalizable. However, previous research found no differences in conspiracy beliefs between various countries (Coninck et al., 2021), so the rates of conspiracy beliefs and, therefore, their underlying mechanisms may be similar. Nevertheless, other populations should be studied in the future to assess whether these findings can be replicated in different social and cultural contexts.

Among the reasoning styles, PFI produced the most inconsistent results, strongly predicting all conspiracy beliefs in Study 1 but only predicting COVID-

19-related conspiracy theories in Study 2. This suggests that future research and a more detailed understanding of PFI and its mechanisms are necessary.

Moreover, despite a rather high correlation between the two measures, there were inconsistencies between the CMQ and single-item measure for conspiracy beliefs. This raises the question of how accurately these measures capture general conspiracy mentality. While the single-item measure was used as it lists various specific conspiracy theories, the CMQ is much broader and does not list any specific conspiracy theories. It may, therefore, be susceptible to reactions to actual political scandals or lack of trust in politicians or media. Such factors should be controlled for in future research. Additionally, the inclusion of further measures of general conspiracy beliefs, such as the Generic Conspiracist Beliefs Scale (Brotherton et al., 2013), could be useful in replication studies to assess whether results are consistent between all measures.

Beyond the inconsistencies between the measures of general conspiracy beliefs, we also found some differences in how general and COVID-19-specific beliefs related to the other concepts. For example, DTD significantly predicted COVID-19-related conspiracy beliefs but not general conspiracy beliefs in Study 2. This raises questions regarding the differences between specific and general conspiracy beliefs. To further investigate these potential differences, future research may add other specific conspiracy beliefs, such as conspiracy beliefs about historical events or technology, to its designs. This could clear up whether these patterns are unique to COVID-19 conspiracies or whether differences lie within the general versus the specific nature of a conspiracy theory.

The present studies focused on four reasoning styles with ties to JTC. Of course, this leaves many other reasoning styles open for future investigation regarding their relationship with JTC and conspiracy beliefs. This could help to further unravel the mechanisms behind JTC and the formation and maintenance of conspiracy beliefs.

Finally, our data revealed that AOT and CRT negatively predict all types of conspiracy beliefs, while NFCC positively predicts them. A crucial part of future research would be to assess whether these reasoning styles can be regulated, meaning whether AOT can be improved and increased, and NFCC can be decreased with the aim of reducing susceptibility to conspiracy theories. This could be achieved through training (i.e., learning how to consciously apply and

improve a thinking style like AOT) or using self-regulation strategies, such as implementation intentions (P. M. Gollwitzer, 2014), to increase or suppress the use of certain reasoning styles.

Conclusion

These two studies examined the links between cognitive styles, JTC, and conspiracy mentalities. The results provide compelling evidence that links between cognitive styles and JTC to conspiracy mentality do exist, especially in the case of AOT, CRT, and NFCC. They also provide new partial evidence that JTC predicts conspiracy beliefs beyond the association with cognitive styles, especially when it comes to COVID-19-related conspiracy mentality. Study 2 showed that JTC remains stable and unaffected by the content or context of the beads task. Future research should focus on shedding light on the relationship between conspiracy beliefs and PFI, which showed inconsistent results, and NFCC, which provided consistent results that are yet to be replicated. Additionally, many more cognitive styles remain open for future study. An important area of study for further research is to investigate whether and how the use of certain cognitive styles could be encouraged or induced (e.g., through training or self-regulation) to reduce conspiracy beliefs that may lead to harmful health behaviors.

Research Paper III

Gendered Leadership Perception and the COVID-19 Pandemic: Are Women Perceived as Better Leaders in a Health Crisis?

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Abstract

The COVID-19 pandemic sparked media attention surrounding the supposedly superior leadership of women in public health crises. This notion may have resulted from associating women with risk-aversion and men with risk-seeking. Men's leadership is often viewed as superior, but the pandemic's unique challenges might have led to stereotypically risk-averse women being viewed as superior. We conducted three experiments on evaluating pandemic strategies, investigating the effect of the politician's gender and the participants' political ideology. A risk-averse strategy was generally viewed more favorably. Moreover, ideology is a stronger predictor than the politician's gender. Conservative participants favored a risk-seeking strategy, while liberal participants favored a risk-averse strategy. Participants adhered to gender stereotypes of risk-seeking/aversion but did not project them onto political leaders.

Introduction

The COVID-19 pandemic poses one of the most significant challenges in modern history, having caused more than 6.6 million recorded deaths as of the end of 2022 (Dong et al., 2020) and an estimated global GDP loss of at least 77 billion US Dollars (Statista, 2021). Numerous media outlets and studies conducted in its early phases reported that women-led countries (e.g., New Zealand, Taiwan, Germany, Finland, Iceland) outperformed men-led countries in their public health responses (Aldrich & Lotito, 2020; Dudman, 2020; Garikipati & Kambhampati, 2021; Kwan et al., 2020; cf. Selck et al., 2020; Sergent & Stajkovic, 2020; Windsor et al., 2020; Wittenberg-Cox, 2020). These women-led countries were seen to gain control of the spread of COVID-19 more successfully, reporting fewer infections and deaths per capita (Garikipati & Kambhampati, 2021; World Health Organization, 2020b). However, government responses have varied and have been the subject of much discussion and criticism from all sides of the political spectrum (Altman, 2020; Menon & Jose, 2021). The most prominent controversy pertained to the tradeoff between an effective public health response, including social contact restrictions, and its economic repercussions (Gourinchas, 2020).

While there is some evidence that women-led countries fared better in the early months of the ongoing pandemic (Coscieme et al., 2020; Garikipati & Kambhampati, 2021), it is difficult to pinpoint the contributing factors exactly or determine who should be credited for these developments (e.g., leaders, the ministry for health, legislators). Nonetheless, the idea that countries under female leadership outperform others has been based on the idea that women-led countries have followed a risk-averse and empathetic public health response (Kwan et al., 2020; Luoto & Varella, 2021). This response involves measures such as lockdowns, physical distancing, and mask mandates, which turned out to be successful strategies in reducing new infections and the number of deaths before the advent of vaccines (Kasahara et al., 2020; Oraby et al., 2021).

Empathy, caring, and risk-aversion are features often more strongly linked to women than men and therefore hypothesized to be the driving factors behind female leaders' public health responses. In contrast, there is a stronger perceived association between features like being obstinate and risk-seeking with men than women (Christov-Moore et al., 2014; Corrêa Varella et al., 2016; Greenberg et al.,

2018)[8]. Many leadership stereotypes are masculine and male leadership is often perceived as more successful than female leadership (Koenig et al., 2011). However, facing the COVID-19 pandemic, a risk-averse approach may be the more appropriate leadership strategy (Habersaat et al., 2020; Priesemann et al., 2021). But such reports may not align with people's expectations. Therefore, the question arises whether and to what degree such claims influence people's views of male versus female political leaders and their relevant skills in the context of the COVID-19 pandemic.

Leadership and Risk-Taking Stereotypes

People associate certain leadership skills or characteristics (e.g., power, agency) with men, while they associate other skills deemed less relevant for leadership (e.g., empathy) with women (Glick & Fiske, 1999). Furthermore, they believe that women display a more people-oriented leadership style than men (Alan et al., 2019). However, there is no evidence supporting the assumption that men are inherently better leaders than women or that traits primarily associated with men rather than women facilitate successful leadership. On the contrary, research surrounding the so-called female leadership advantage suggests that women may outperform men in terms of their leadership style despite the disadvantages they face when acquiring a leadership position (Eagly & Carli, 2003). Yet, the ideas that high agency and power are necessary for good leadership and that men possess these qualities more than women are widespread. These beliefs also affect how men and women are seen in leadership positions (Rudman & Glick, 2001). People report a preference for male authority figures compared to female authority figures despite the idea of a female leadership advantage (Rudman & Kilianski, 2000).

Further, there are extensive reports of gender differences in risk-taking behavior. These reports suggest that women tend to be more risk-averse (Charness & Gneezy, 2012). In the context of the pandemic, women were more likely to experience negative emotions about COVID-19 (e.g., fear, worry) than men (Galasso et al., 2020). Furthermore, they complied more with public health rules to reduce its spread and were less likely to infect others, which is in line with

[8] Because this conversation surrounding leadership operates within in the gender binary, and no leaders outside the binary are known to be involved, this article also adheres to the binary regarding the leaders.

displaying more health-related risk-aversion (Galasso et al., 2020). There is, however, criticism of the idea that women are generally more risk-averse than men (Nelson, 2016). Researchers have uncovered alternative factors that may explain differences, such as age (Byrnes et al., 1999) or financial literacy in the case of investment decisions (Bannier & Neubert, 2016; Hardies et al., 2013). Other evidence suggests gender neutrality in most managerial contexts (Maxfield et al., 2010) despite previously claimed gender differences.

Nevertheless, the stereotype that women are risk-averse and different expectations for women and men in leadership positions remain. However, in the global pandemic threat context, we expect people's evaluations of male and female leaders and their pandemic responses to differ substantially. The current case of the COVID-19 pandemic allows for rethinking one's evaluation of female leadership, leading to a more positive assessment of female leaders, as it is in line with female leadership stereotypes (Rudman & Glick, 2001) as highlighted by various media reports (Wittenberg-Cox, 2020).

The Role of Political Ideology

Gender and risk-taking are not the only factors influencing the evaluation of politicians and their policies. Political ideology is a spectrum along which people's risk-taking can greatly differ (Choma et al., 2013); this is also true for the ongoing COVID-19 pandemic (A. Gollwitzer et al., 2020). The current evidence suggests that there are domain-specific differences between conservatives and liberals: Liberal individuals tend to be more risk-averse regarding collective threats (e.g., climate change, gun violence), while conservative individuals are more risk-averse concerning personal hazards (Choma et al., 2013). These differences in risk assessment are highly relevant in the context of the COVID-19 pandemic, as there have been strong disagreements regarding an appropriate leadership response to it. Liberal politicians have, overall, advocated for a risk-averse public health response, while conservative politicians argued for unrestricted personal freedom and the avoidance of negative economic impacts (Nowlan & Zane, 2022).

Research has shown potential links between a conservative political ideology and lower compliance with COVID-19 measures like reducing mobility, physical distancing (A. Gollwitzer et al., 2020; Grossman et al., 2020) and the use of masks (Gonzalez et al., 2021); conservatives were also less concerned about the dangers of the virus itself (Pennycook et al., 2022). This suggests that conservative

participants, compared to liberals, may evaluate political leaders who favor risk-averse measures negatively.

The Present Research

Many media reports of gender differences in how politicians managed the COVID-19 pandemic favored women leaders (Dudman, 2020; Wittenberg-Cox, 2020), thus contradicting pre-existing leadership stereotypes. These reports align with the growing research on a potential female leadership advantage (Eagly & Carli, 2003; Offermann & Foley, 2020). Combining this with the evidence of differential treatment and perception of men and women in leadership positions (Rudman & Kilianski, 2000), we ran three experiments to test whether a politician's gender and their COVID-19 response (risk-seeking vs. risk-averse) influence evaluations of the politicians and their crisis management. We aimed to assess whether stereotypical patterns would be maintained (i.e., male leaders would be evaluated more positively than female leaders). Alternatively, considering the recent narrative shift surrounding COVID-19, stereotypical patterns might not be upheld (Rudman & Glick, 2001).

Additionally, given the political polarization surrounding COVID-19 (A. Gollwitzer et al., 2020), a further aim was to establish whether political orientation would moderate these evaluations. To answer these questions, we first assessed the effects of a political leader's gender and whether their response was risk-averse or risk-seeking (Experiment 1). Further, we added participants' political orientation (Experiment 2). Finally, we added an alternative, stronger manipulation of the politician's gender (Experiment 3) to test the robustness of our findings. In three experiments, we recruited female and male participants to test a potential moderating effect of participants' gender. It is important to note that these experiments focus on the perception of male and female leaders rather than on their objective qualification or effectiveness as leaders.

We used mayors as the political leaders in question, which diverges from the example of heads of government. However, heads-of-governments−especially the few women among them−tend to be very well known. This means there are likely associations with their person, politics, or country, which may affect both the politician's ratings and the scenario's believability. Therefore, mayors–being lesser-known political figures−were chosen instead.

We report how we determined our sample size, all data exclusions (if any), all

manipulations, and all measures in the experiments. Materials and data from all three experiments can be found alongside the preregistration for Experiments 2 and 3 at https://researchbox.org/457&PEER_REVIEW_passcode=AJJNAG.

Experiment 1

Experiment 1 aimed to assess how political leaders are evaluated based on gender and the degree of risk taken in their pandemic response. We expected male and female leaders to be evaluated differently. On the one hand, stereotypical evaluations might remain (Rudman & Glick, 2001), leading to male leaders being evaluated more positively than female leaders. On the other hand, the association of women with risk-averse leadership (Rudman & Kilianski, 2000) might lead to a positive evaluation of female leadership during a public health crisis.

Methodology

Participants and Design

We recruited 400 US residents from Amazon's MTurk via CloudResearch (Litman et al., 2017) in April 2021. Ten participants were excluded because they withdrew their consent (6) or stated that they had not completed the survey carefully (4). Therefore, the analyses were conducted on the remaining 390 complete datasets (demographics for all three experiments can be found in Table 10). Participants were randomly assigned to one of four conditions of the 2 (mayor's gender: male vs. female) × 2 (mayor's pandemic response: high vs. low public health risk) between-subjects experimental design. A sensitivity analysis revealed that effects of $\Delta R^2 = .02$ can be reliably detected (at 80% power) with this sample size in the regression analysis used to test our main hypothesis (Faul et al., 2009). All participants received $1.00 compensation for their 10-minutes participation.

Table 10

Demographic information

Characteristics	Experiment 1	Experiment 2	Experiment 3
	n (%)	*n (%)*	*n (%)*
Age			
18-24	14 (4%)	39 (5%)	39 (5%)
25-34	140 (36%)	248 (31%)	232 (29%)
35-44	124 (32%)	222 (28%)	241 (30%)
45-54	56 (14%)	139 (17%)	128 (16%)
55+	51 (13%)	156 (19%)	156 (20%)
Gender			
Male	220 (56%)	400 (50%)	365 (46%)
Female	167 (43%)	398 (49%)	426 (53%)
Other/Prefer not to say	3 (1%)	6 (1%)	5 (1%)

Procedure

After giving their informed consent, participants read an interview with a fictional mayor. They then evaluated the mayor and the mayor's response to the COVID-19 crisis. Subsequently, participants completed a final questionnaire, after which they were fully debriefed and compensated.

Materials

Independent Variables: Fictional Interview

Both independent variables were manipulated with a transcript of an interview with a fictional US mayor about their response to the COVID-19 pandemic. Participants were unaware that the interview was fictional; instead, they were told that names had been changed to avoid any recognition of people or places.

In the interview, the interviewer and the mayor discussed the COVID-19 pandemic and the measures the mayor planned to take in response. In the *risk-averse pandemic response* version of the interview, the mayor stated that they would keep implementing physical distancing policies, mask mandates in place, and non-essential businesses closed. They emphasize the importance of protecting the citizens' lives and health by focusing on the severity of COVID-19 and its potential for damage. In the *risk-seeking pandemic response* version of the interview, the mayor stated that they would lift mask mandates, end physical distancing policies, and open all businesses to avoid further economic repercussions. Additionally, they downplay COVID-19's severity by comparing it to the flu. We varied the *mayor's gender* in the interview by changing their name (John Smith vs. Anna Smith).

Dependent Variables

Participants' evaluations of the mayor and their response to the pandemic served as the dependent variables. Participants indicated whether they would vote for the mayor, support their campaign, and donate to the campaign, each on a scale from 0 (*not likely at all*) to 100 (*very likely*). Next, they were asked to rate how competent, warm, and caring they found the mayor to be on a scale from 0 (*not at all*) to 100 (*extremely*). These dimensions were selected as they tend to show gender stereotypes when rating professionals (Fiske et al., 2002). Lastly, participants were asked how effective, necessary, typical, and alarmist they found the mayor's pandemic response to be on a scale from 0 (*not at all*) to 100 (*extremely*). The items *typical* and *alarmist* served as positive controls and were not used as dependent variables. Participants should rate a risk-averse response as more alarmist than a risk-seeking response, as lifting COVID-19-related measures implies one is not alarmed about the virus. Furthermore, regarding stereotypical patterns, participants were expected to rate a risk-averse female mayor and a risk-seeking male mayor as more typical than a risk-seeking female and a risk-averse male mayor.

Originally, we had planned to create an index for each variable set (i.e., *warmth*, *competence*, and *caring* into person perception; *vote, support,* and *donate* into political support; *necessary* and *effective* into COVID-19 response). However, all items were highly interrelated, Cronbach's $\alpha = .97$. Therefore, we combined them into a single general evaluation measure serving as the dependent variable.

Final Questionnaire

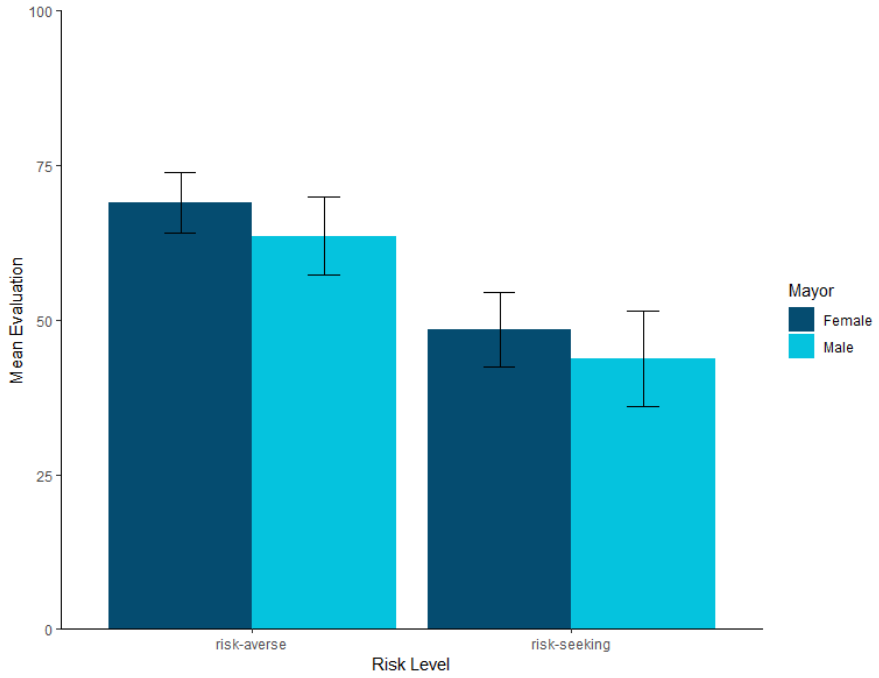
We assessed participants' gender, year of birth, and subjective socioeconomic status (Adler et al., 2000). For half of the participants, we also assessed political ideology in the final questionnaire. As the subsequent experiments (Experiments 2 and 3) focus on political ideology, we refrain from further discussing political ideology in Experiment 1. We also assessed whether participants had answered the questions carefully.

Results

We ran an OLS regression predicting the politician's evaluation based on the level of public health risk level, the mayor's gender, and the participant's gender. The model with main effects was significant, $R^2 = .11$. The risk level was a significant predictor (see Table 11), while the mayor's or the participant's gender were not. Next, we added interaction terms between the risk level and the mayor's and the participant's gender, neither of which were significant, $ps \geq .235$. In a final step, we added the three-way interaction between the risk level, the mayor's gender, and the participant's gender to the model. The three-way interaction was not significant, $p = .134$.

Figure 5

Grouped Means of the Evaluation by Mayor's Gender and Risk Level



Note. Error bars represent 95% confidence intervals.

Table 11

Experiment 1: Regression Coefficients on Evaluation

	Model 1		Model 2		Model 3	
Variable	*b* (*SE*)	β	*b* (*SE*)	β	*b* (*SE*)	β
Constant	62.65*** (3.21)		63.13***(4.32)		60.58***(4.64)	
Strategy[a]	−20.02***(3.11)	−.31	−16.07** (5.62)	−.25	−10.97^{+} (6.56)	−.17
Politician's gender[b]	5.64^{+} (3.15)	.09	2.48 (5.19)	.04	6.54 (5.85)	.10
Participant's gender[b]	1.75 (3.14)	.03	0.15 (5.76)	.00	5.67 (6.82)	.09
Strategy × pol. gender			−1.52 (6.30)	−.02	−9.94 (8.42)	−.14
Strategy × part. gender			−7.05 (6.28)	−0.09	−17.88^{+} (9.55)	−.23
Pol. gender × part. gender			8.78 (6.34)	.12	−0.53 (8.86)	−.01
Strategy × pol. gender × part. gender					−19.03 (12.66)	.18
R^2	.11***		.12***		.12***	
ΔR^2			.01		.01	

Note. $N = 387$.

[a]Risk-averse = 0, risk-seeking = 1. [b]male = 0, female = 1

$^{+}p < .100$. $*p < .050$. $**p < .010$. $***p < .001$.

Positive Controls. As expected, the risk-averse approach (M = 36.3, SD = 35.4) was rated significantly more alarmist than the risk-seeking approach, M = 18.2, SD = 25.8, $t(388) = 5.74$, $p < .001$, $d = 0.58$. We found no significant differences between the stereotypical combinations (female/risk-averse, male/risk-seeking; M = 59.8, SD = 25.9) and the non-stereotypical combinations (female/risk-seeking, male/risk-averse) in the *typical* variable, M = 56.9, SD = 25.5, $t(388) = 1.08$, $p = .281$. This suggests that risk-averse women and risk-seeking men were not considered more typical.

Discussion

Experiment 1 assessed whether the public health risk level of a politician's response to the COVID-19 pandemic and their gender would affect how participants rated them and their response. We found that the risk level of the politician's pandemic response significantly predicted the evaluation measure. This suggests that participants view a pandemic response that focuses on lowering the public health risk as more appropriate and more likely to support than a response that prioritizes economic outcomes over public health. This result indicates that as risk-averse public health strategies are effective (Habersaat et al., 2020; Priesemann et al., 2021), the public views them as the more appropriate course of action in the absence of other public health interventions (e.g., vaccines).

Interestingly, the items regarding competence, warmth, and caring were highly correlated, contrary to previous research suggesting that competence and warmth are orthogonal dimensions regarding stereotypes (Fiske et al., 2002). Our finding suggests, however, that the risk manipulation worked, as the pandemic strategy has reflected on all evaluation measures similarly, whether it was seen positively or negatively. As all items were highly correlated in the present experiment, this finding may indicate that participants rated politicians favorably across all domains when they agreed with their pandemic strategy rather than differentiating between different dimensions. It is difficult to tell whether the gender manipulation was successful or whether participants registered the mayor's gender. This may explain why the mayor's gender did not affect the evaluation measure or the positive control regarding typicality.

Experiment 1 offered a first insight into how politicians and their pandemic strategies are evaluated and how their gender and strategy affect such evaluations.

It showed that, as hypothesized, a risk-averse pandemic response is viewed significantly more positively than a risk-seeking response, yet no significant gender effects emerged.

Experiment 2

While gender may have a role in the evaluations of leaders, political ideology may overshadow gendered perceptions of leadership in evaluating risk-taking behavior. Political ideology could be especially relevant in the COVID-19 pandemic, given the disagreements between conservatives and liberals regarding an appropriate pandemic response. Therefore, we included participants' political ideology in Experiment 2 to assess whether it may impact how favorably politicians of different genders, who have taken risk-averse or risk-seeking measures, are evaluated. We recruited a balanced sample of conservatives, moderates, and liberals to avoid biased results and added a manipulation check to analyze whether participants registered the mayor's gender.

In line with Experiment 1, we expected a risk-averse public health strategy to be seen as the more favorable strategy. Furthermore, when controlling for participants' political ideology, we expected that there would be room for several interaction effects. First, we expect that male and female mayors should be evaluated depending on their pandemic response risk level. Because there are stereotypical associations of women with risk-aversion and men with risk-seeking, we expect a risk-seeking male mayor to be evaluated more positively, while we expect a risk-averse female mayor to be favored. Second, we expect female participants to evaluate a risk-averse response more positively than men, who should prefer a risk-seeking strategy. Both interactions were not present in Experiment 1 but could have been overshadowed by differences in political ideology or due to ignoring the gender manipulation. Third, we expect liberals to evaluate a risk-averse pandemic response more positively than a risk-seeking response, while we expect conservatives to evaluate a risk-seeking response more positively than a risk-averse response. We pre-registered our hypotheses, design, and analysis plan on AsPredicted.org (#67693).

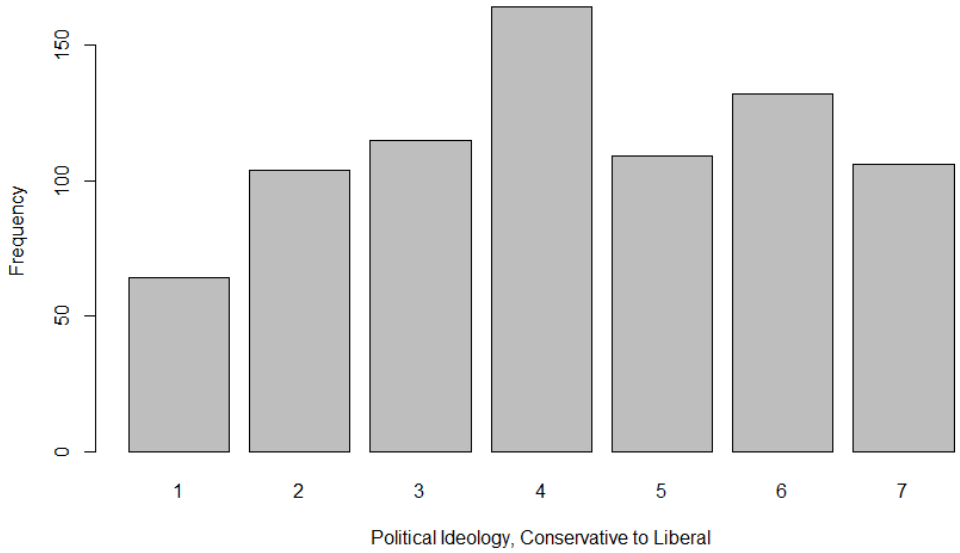
Methodology

Participants and Design

We recruited 804 participants via CloudResearch (Litman et al., 2017) in June 2021. We recruited a balanced sample in terms of political ideology by using the CloudResearch screening for political ideology until there was parity (see Figure 6). Design and compensation were the same as in Experiment 1. A sensitivity analysis showed that we could detect effects of $\Delta R^2 = .01$ reliably (at 80% power) with this sample size in the regression analysis used to test our main hypothesis (Faul et al., 2009).

Figure 6

Distribution of political ideology among participants of Experiment 2



Procedure

Experiment 2 followed the same procedure as Experiment 1 except for a gauge of political ideology and a manipulation check.

Materials

Dependent Variable

The dependent variable was the same as in Experiment 1. Once again, internal consistency was exceptional, Cronbach's $\alpha = .97$.

Final Questionnaire

We assessed participants' political orientation on a 7-point scale ranging from *very conservative* to *very liberal* (Azevedo & Jost, 2021) with no additional labels. We added a manipulation check, in which participants were asked what the

mayor's name was (*Anna Smith*, *John Smith*, or *I do not remember*) to confirm whether they had noted the mayor's gender.

Results

We first tested whether participants correctly remembered the mayor's name, which was the case for 94% of participants. We then fitted an OLS regression predicting the evaluations based on the response's risk level, the mayor's gender, and the participants' gender and political ideology. The model with main effects was significant, $R^2 = .04$, see Table 12. As expected, the response's risk level was again a significant predictor, as was the participant's gender, while the mayor's gender and political ideology were not. Female participants rated the politician more positively than male participants. As preregistered, we added the two-way interactions between risk level and the mayor's gender, the participant's gender, and the participant's ideology. The model was significant, $\Delta R^2 = .28$, primarily due to the powerful impact of ideology and its interaction with risk level (see Figure 7). No other effects in this model were significant, as was adding the three-way interaction between risk level, mayor's gender, and participant's gender, $\Delta R^2 = .00$.

Table 12

Experiment 2: Regression Coefficients on Evaluation

Variable	Model 1		Model 2		Model 3	
	b (*SE*)	β	*b* (*SE*)	β	*b* (*SE*)	β
Constant	53.68*** (2.06)		54.71***(2.30)		54.73***(2.45)	
Strategy[a]	−7.42*** (2.11)	−.12	−5.42^{+} (2.98)	−.09	−5.45 (3.38)	−.09
Politician's gender[b]	0.80 (2.13)	.01	−5.45^{+} (3.11)	−.09	−5.48 (3.60)	−.09
Participant's gender[b]	−7.51*** (2.11)	.13	5.83^{+} (2.97)	.10	5.80^{+} (3.37)	.10
Participant's ideology[c]	0.85 (0.58)	.05	9.24***(0.68)	.56	9.24***(0.68)	.56
Strategy × pol. gender			6.42^{+} (3.59)	.09	6.49 (5.10)	.09
Strategy × part. gender			−2.62 (3.57)	−.04	−2.56 (4.86)	−.04
Pol. gender × part. gender			4.59 (3.58)	.07	4.66 (4.97)	.07
Strategy × part. ideology			−17.45***(0.98)	−.74	−17.45***(0.98)	−.74
Strategy × pol. gender × part. gender					−0.13 (7.16)	−.00
R^2	.04***		.32***		.32***	
ΔR^2			.28***		.00	

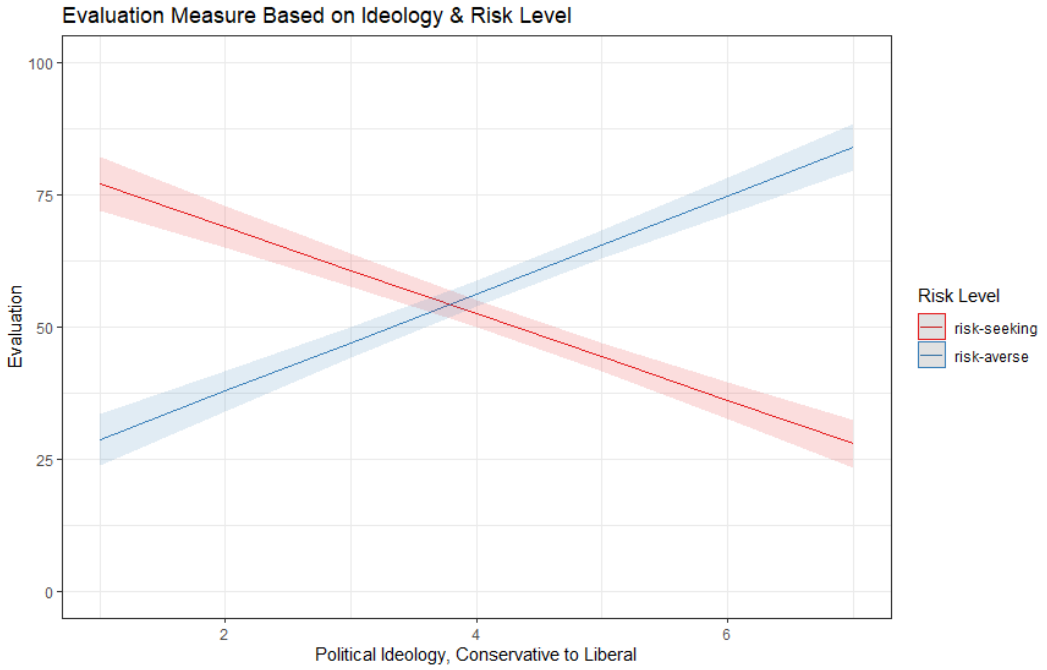
Note. $N = 788$.

[a]Risk-averse = 0, risk-seeking = 1. [b]male = 0, female = 1. [c]continuous, very conservative (-3) to very liberal (3).

$^{+}p < .100$. *$p < .050$. **$p < .010$. ***$p < .001$

Figure 7

Experiment 2: Interaction effect of the pandemic response's risk level and participants' political ideology on the evaluation measure



Note. Error bars represent 95% confidence intervals.

Positive Controls. Again, the risk-averse approach ($M = 43.9$, $SD = 36.1$) was rated as significantly more alarmist than the risk-seeking approach, $M = 19.7$, $SD = 24.2$, $t(802) = 11.07$, $p < .001$, $d = 0.78$. We again found no significant differences between the stereotypical combinations ($M = 58.9$, $SD = 25.3$) and the non-stereotypical combinations, $M = 58.2$, $SD = 25.3$, $t(802) = 0.38$, $p = .705$.

Discussion

Experiment 2 supports our hypothesis that a risk-averse pandemic response is evaluated more positively than a risk-seeking response, along with the politician implementing it. Moreover, there was a significant main effect of the participants' gender, which had not been present in the previous sample. It showed that women overall gave more favorable evaluations than men regardless of the risk level. No notable effects were found for the mayor's gender.

In Experiment 1, political ideology may have overshadowed our experimental manipulations. Previous research has identified a slightly higher percentage of male conservatives (Pew Research Center, 2014) which might have led to a confounding between gender and political ideology that was not detected because political ideology was not assessed. However, in Experiment 2, men and women

were almost equally represented among conservatives (51% of conservatives were men). Notably, Experiment 2's sample was balanced in terms of political ideology. If anything, it lacked very conservative participants compared to the prevalence of participants self-identifying as very liberal. The data showed that political orientation was a strong predictor: liberals and conservatives held strongly opposing views regarding a risk-averse pandemic strategy. While liberals support a risk-averse pandemic response, conservative participants favor a leader implementing a risk-seeking pandemic response.

Overall, political ideology seems to be much more influential than gender. Interestingly, the participants' gender seems more relevant than the mayor's gender. An alternative explanation for the absence of any effect of the mayor's gender in Experiment 1 was that participants may have paid no attention to the mayor's name. However, only a low percentage (about 6%) stated that they could not remember the mayor's gender or gave a wrong answer. However, numerous comments from participants who answered the manipulation check correctly stated that they were unsure and had selected a name randomly or with much uncertainty. This suggests that the gender manipulation in the experiment may have been too subtle.

Experiment 3

To make a conclusive statement regarding the relative weight of political ideology versus the political leader's gender, we increased the gender manipulation's strength to determine whether its subtlety has barred any gender effects from emerging so far.

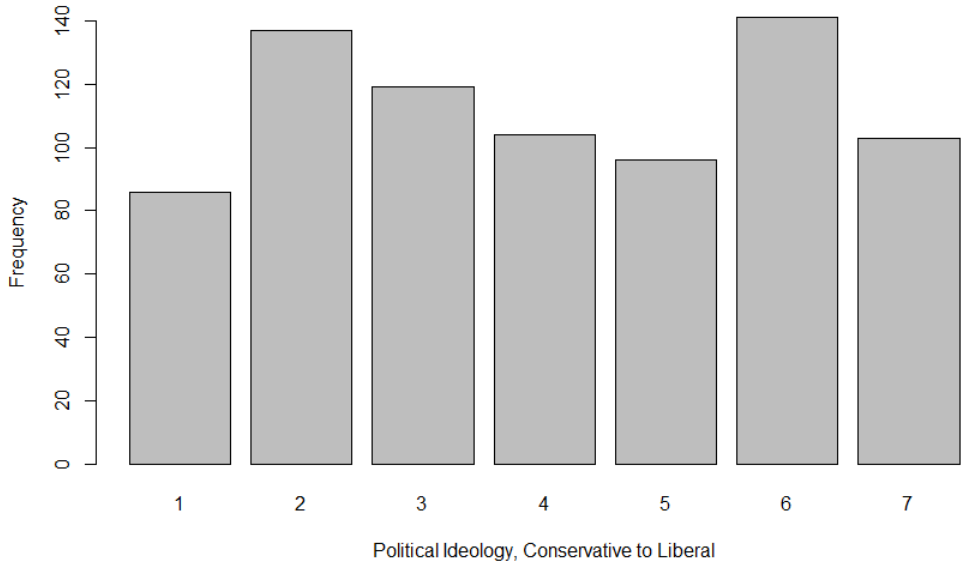
Methodology

Participants and Design

We recruited 801 participants via CloudResearch (Litman et al., 2017) in July 2021, again using the CloudResearch prescreen until there was a balance between liberals and conservatives (Figure 8). Five participants were excluded because they withdrew their consent; 796 were included in our analyses. The design and compensation were identical to Experiments 1 and 2; sample size considerations were identical to Experiment 2.

Figure 8

Distribution of political ideology among participants in Experiment 3



Procedure

Experiment 3 followed the same procedure as Experiment 2 except for adding images of female or male politicians.

Materials

Images

To achieve a more salient gender manipulation, we added images to the interview. We used election campaign images showing German politicians from a database that contained information regarding the politicians' ages and attractiveness ratings (Herrmann & Shikano, 2021). We selected six images (three men, three women) of middle-aged, white politicians of medium attractiveness (*M* = 4.5 on a 10-point scale). We did not vary race to avoid adding confounding variables and randomized the images across participants to account for other potential effects. As participants were from the US, using real but unknown politicians should prevent preconceived associations with the person or their political ideology.

Dependent Variable

The dependent variable was the same as in the previous experiments with the same exceptional internal consistency, Cronbach's $\alpha = .97$.

Results

Most participants (98%) remembered the mayor's name correctly. As previously, we fitted an OLS regression predicting the evaluation based on the pandemic response's risk level, the mayor's gender, and the participant's gender and ideology. The model was significant, R^2 = .04, see Table 13. As expected, risk level was significant, but all other predictors were not. We then added the interactions between risk level and the mayor's gender, the participant's gender, and the participant's ideology. The model was significant, ΔR^2 = .31, which was again primarily due to the strong effect of the ideology variable and its interaction with risk level, suggesting conservatives rated a risk-seeking strategy more positively than liberals, while liberals rated a risk-averse strategy more positively (see Figure 9). The interaction of risk level and the participants' gender was also significant, meaning female participants rated a risk-seeking response significantly less positively than male participants. No other effect in this model was significant, as was adding the three-way interaction between risk level, mayor's gender, and participant's gender, ΔR^2 = .00.

Table 13

Experiment 3: Regression Coefficients on Evaluation

Variable	Model 1		Model 2		Model 3	
	b (*SE*)	β	*b* (*SE*)	β	*b* (*SE*)	β
Constant	60.52***(2.08)		58.28***(2.19)		58.64***(2.32)	
Strategy[a]	−11.78***(2.11)	−.20	−5.95^{+} (3.09)	−.09	−6.45^{+} (3.59)	−.11
Politician's gender[b]	−1.75 (2.11)	−.03	−2.64 (3.14)	−.04	−3.55 (3.69)	−.06
Participant's gender[b]	1.03 (2.11)	.02	4.54 (2.88)	.08	3.83 (3.25)	.06
Participant's ideology[c]	−0.02 (0.54)	−.00	8.17***(0.62)	.54	8.18***(0.62)	.54
Strategy × pol. gender			−1.31 (3.50)	−.02	0.48 (5.18)	.01
Strategy × part. gender			−8.86* (3.51)	−.13	−7.25 (4.92)	−.11
Pol. gender × part. gender			3.39 (3.51)	−.05	5.01 (4.94)	.07
Strategy × part. ideology			−16.83***(0.88)	−.77	−16.85***(0.89)	−.77
Strategy × pol. gender × part. gender					−3.29 (7.02)	−.04
R^2	.04***		.35***		.35***	
ΔR^2			.31***		.00	

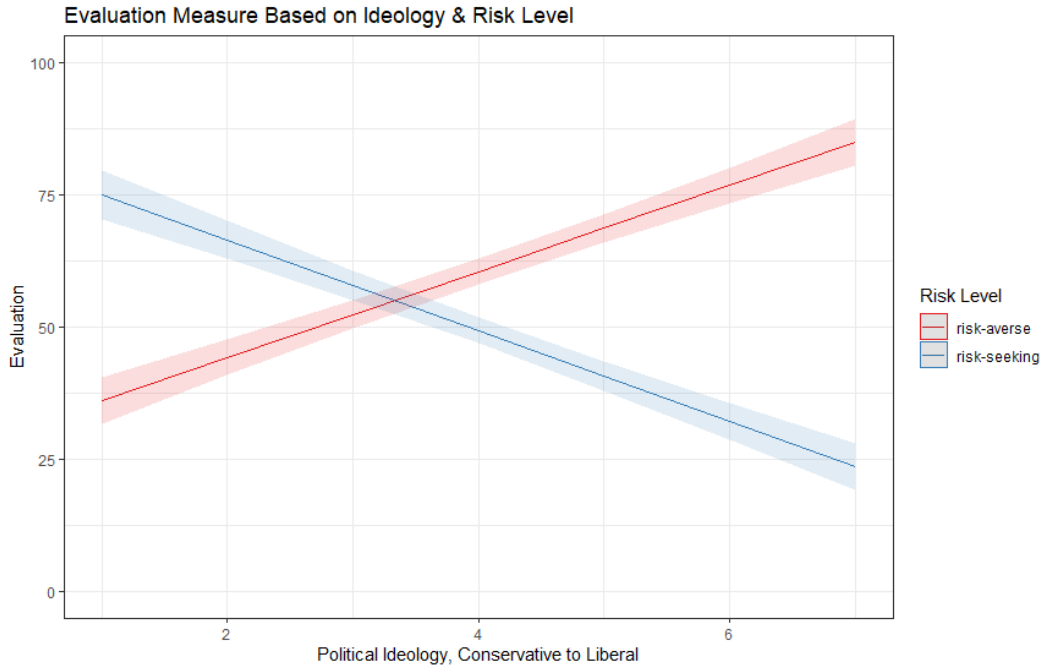
Note. $N = 782$.

[a]Risk-averse = 0, risk-seeking = 1. [b]male = 0, female = 1. [c]continuous, very conservative (-3) to very liberal (3).

$^{+}p < .100$. $*p < .050$. $**p < .010$. $***p < .001$

Figure 9

Experiment 3: Interaction Effect of the Pandemic Response's Risk Level and Participants' Political Ideology on the Evaluation Measure



Note. Error bars represent 95% confidence intervals.

Positive Controls. The risk-averse approach was again rated as significantly more alarmist, $M = 41.00$, $SD = 34.3$, compared to the risk-seeking approach, $M = 17.4$, $SD = 22.8$, $t(794) = 11.35$, $p < .001$, $d = 0.81$. As before, we found no significant difference between the stereotypical combinations, $M = 57.6$, $SD = 24.7$, and the non-stereotypical combinations, $M = 55.2$, $SD = 24.7$, $t(794) = 1.39$, $p = .167$, which again suggests that stereotypical gender perceptions do not seem to be highly relevant in this scenario.

Discussion

We replicated our previous findings, showing that a risk-averse strategy is viewed as the more successful and effective one. The data confirmed the effect of political ideology, indicating that conservatives support a risk-seeking strategy. In contrast, liberals support a risk-averse strategy. This is in line with research showing that Democrats were more likely to engage in pandemic safety measures compared to Republicans and that various interventions were unsuccessful in modifying this difference in behavior (Gelfand et al., 2022), suggesting that this partisan polarization is quite intense. The political leader's gender did not affect

evaluations even with a stronger manipulation with images instead of mere text. Participants' political ideology is much more influential than their own or the politician's gender. There does, however, appear to be an effect of the participant's gender. While, in contrast to Experiment 2, there was no main effect of the participants' gender in Experiment 3, the interaction of gender and risk level suggests that women favor a risk-averse response more strongly than men.

General Discussion and Implications

The three experiments presented in this paper provide robust evidence that a pandemic response that minimizes public health risk is widely preferred and that implementing it reflects positively on the politician who does so, especially among liberals and moderates. All three experiments showed a significant main effect of the pandemic response's risk level, allowing us to verify the hypothesis that a risk-averse public health strategy will be accepted as the more successful strategy during the pandemic across all three samples. As mentioned, other evidence shows that a risk-averse response is successful in keeping the pandemic in check (Kasahara et al., 2020; Oraby et al., 2021; Shay, 2020); our data suggest that the public is aware of this and views a strategy that minimizes public health risks and its implementing leader positively.

Though our data indicated that there was no effect of the politician's gender, it may be overshadowed by the strong political polarization toward the issue at hand in the US (Kerr et al., 2021), which may cause a stronger focus on policy and attenuate influences of peripheral factors like a politician's gender compared to a less divisive issue. Overall, we found no interaction between a political leader's chosen strategy and the political leader's gender. Female leaders were neither favored for implementing a risk-averse strategy nor penalized for it. This is an interesting finding given the fact that there is evidence claiming female leadership advantages (Eagly & Carli, 2003), as well as penalties, especially when women excel at stereotypically male tasks (Heilman et al., 2004) such as agentic leadership (Phelan et al., 2008). The strong political polarization surrounding COVID-19 may leave no room for gender advantages or penalties. One must note, however, that data collection for Experiments 2 and 3 occurred about three months after data collection for Experiment 1. This may account for some differences between the experiments, as vaccination rates and the overall pandemic situation had significantly progressed.

Regarding the participants' gender, the experiments provide mixed evidence. Experiment 3 supports the hypothesis that there would be an interaction between a political leader's strategy and the participants' gender. It suggests that women favor a risk-averse response and reject a risk-seeking strategy more strongly than men. This corresponds to the idea that women show greater risk-aversion than men (Charness & Gneezy, 2012). Furthermore, this pattern suggests that rather than stereotypes being projected onto political leaders, participants were more stereotypical in their evaluations.

The results of Experiments 2 and 3 made the political polarization of the pandemic itself very clear, showing that conservatives were strongly opposed to a risk-averse strategy involving physical distancing, mask mandates, and the closing of schools and businesses, while liberals were firmly in favor. The fact that a risk-averse pandemic response is still generally preferred—despite the strong opposition from self-identified conservatives—can be accounted for by the fact that moderates also favored the risk-averse strategy.

One may consider whether the manipulation indeed manipulated risk-aversion rather than other dimensions such as rule-following, for example, about complying with CDC guidelines. However, the findings align with the domain-specific differences in risk perception and behavior between conservatives and liberals, as liberals show more risk aversion when it comes to collective threats (Brody et al., 2008; Choma et al., 2013; Leiserowitz, 2006). Furthermore, if the manipulation manipulated rule following instead of risk-aversion, conservatives, who tend to emphasize obedience and authority more strongly than liberals (Graham et al., 2009), should be more likely to comply with official guidelines. Moreover, the results are consistent with evidence suggesting that conservatives are less concerned about the virus (Pennycook et al., 2022). In sum, our experiments' results strongly support the hypothesis that there should be an interaction between a politician's strategy and the participants' political ideology.

One may wonder why we did not vary the mayor's political ideology in addition to the response's risk level and the mayor's gender. We were concerned that participants would infer political ideology based on the pandemic response's risk level, thereby confounding both variables. To test this idea, we presented the interviews to 100 new participants and asked them what they believed the mayor's political orientation to be. Our results showed that the risk-averse mayor was rated

as liberal-leaning (M = 5.5, SD = 1.1), while the risk-seeking mayor was rated as conservative-leaning, M = 2.7, SD = 1.5; 93% of participants assumed the risk-seeking mayor to be a member of the Republican Party. Therefore, we refrained from additionally varying the politician's political ideology, as participants would likely have found information about a risk-seeking liberal mayor norm-defying and improbable.

Outlook

While our experiments provided new information regarding the (absence of) effects of public health risk level, gender, and ideology on evaluating a COVID-19 response and its implementing leader, several questions remain open for future research. A question that arises is whether the absence of an effect of the politician's gender in our data may be attributable to the strong political polarization surrounding the subject of the pandemic and its implications (Kerr et al., 2021), which may cause participants to focus more strongly on policy than they otherwise would, or whether it ultimately does not exist. Future research should, therefore, investigate this by using a similar experimental design and having participants evaluate leaders based on a less emotionally and politically charged issue.

Finally, it is essential to mention that in the context of the COVID-19 pandemic, economic impacts and public health risks are often portrayed as orthogonal constructs. However, whether they are mutually exclusive or more closely related should be addressed by future research, along with how economic risk during the pandemic may relate to the constructs assessed in our experiments.

Conclusion

We put forward the results of three experiments testing the impact of the risk level of a pandemic strategy, the gender of the leader implementing it, and the participants' gender and political ideology on the evaluations of a political leader in the context of the COVID-19 pandemic. We showed that a risk-averse pandemic strategy was widely accepted as effective and necessary and that leaders following such a strategy were generally evaluated more positively. We found this to be true even in samples that were balanced in terms of ideology. There was some evidence indicating a main effect of the participants' gender in Experiment 2. However, this effect could not be replicated in Experiment 3, which instead showed an interaction effect of risk level and the participants' gender; the pattern

of this effect revealed that female participants favored a risk-averse strategy more strongly than male participants. Moreover, Experiments 2 and 3 showed that people who placed themselves on the conservative end of the political spectrum were inclined to support a more risk-seeking pandemic strategy. In contrast, the opposite was the case for those who placed themselves on the liberal end of the political spectrum, over and beyond any effects of gender.

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Record of Achievement

All research papers presented in this thesis were the products of collaboration with other psychological researchers from the University of Konstanz. I am very grateful for my co-authors' efforts and contributions to our shared research projects. Generally, the order of authors indicates an author's contribution to a research paper. I now want to list my own contributions to each research paper presented in this thesis.

Research Paper I

I contributed to the following tasks in this research paper: design of the experiment, the programming of the task paradigm, creating experimental material, data collection, interpretation of the data, theoretical refinement, and writing the manuscript.

Research Paper II

I contributed to the following tasks in this research paper: design of both experiments, programming the task paradigm, creating experimental material, data collection, analysis, and interpretation, theoretical refinement, and writing the manuscript.

Research Paper III

I contributed to the following tasks in this research paper: design of all three experiments, programming the task paradigm, creating the experimental materials, data collection, analysis, and interpretation, theoretical refinement, and writing the manuscript.