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Bachelor Thesis

What Psychological Factors Determine to What Extent Young Adults Believe in Covid-19 Conspiracy Theories?

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Abstract

During the covid-19 pandemic, conspiracy theories concerning the virus gained popularity within the public. Since covid-19 conspiracy theory believers less frequently engage in preventive measures and health-promoting behaviors, reducing the prevalence of these beliefs may assist in decreasing the transmission of the virus. This research aims to assess what psychological factors determine to what extent young adults believe in covid-19 conspiracy theory beliefs. Based on the Extended Parallel Processing Model (EPPM) Adjusted to Covid-19, it is hypothesized that uncertainty, risk perception, fear, and efficacy play a role in determining covid-19 conspiracy theory believing. It is measured whether ‘uncertainty about covid-19’ and ‘risk perception of covid-19’ directly and positively relate to ‘covid-19 conspiracy theory beliefs’, or whether these relationships are mediated by ‘fear of covid-19’. Moreover, it is tested whether efficacy moderates the relationship between ‘uncertainty about covid-19’/‘risk perception of covid-19’ and ‘fear of covid-19’.

A correlational survey design was implemented with 172 valid responses. Correlation analyses indicate a direct positive relationship between ‘uncertainty about covid-19’ and ‘covid-19 conspiracy theory beliefs’ as well as a direct negative relationship between ‘risk perception of covid-19’ and ‘covid-19 conspiracy theory beliefs’. Mediation analyses found no evidence for ‘fear of covid-19’ to mediate these relationships. ‘Self-efficacy towards covid-19’ and ‘response efficacy towards covid-19’ did not moderate the relationships between ‘uncertainty about covid-19’/‘covid-19 conspiracy theory beliefs’ and ‘fear of covid-19’.

Respondents who felt more uncertain about the virus were more likely to adopt covid-19 conspiracy theory beliefs. Contrary, respondents who perceived covid-19 to be a high risk were less likely to adopt these beliefs. It must be considered that these correlations do not prove causality. It is therefore probable that covid-19 conspiracy theories may act as a coping mechanism that reduce perceived risk of the virus. Contradicting the EPPM Applied to Covid-19, fear was not found to mediate these relationships. Efficacy did not moderate the relationship between uncertainty about covid-19/risk perception of covid-19 and fear of covid-19. This study advises interventions to aim for reducing individuals’ perceived uncertainty and increasing perceived efficacy towards covid-19, as these may be key aspects in preventing covid-19 conspiracy theory believing.

Keywords: covid-19, conspiracy theory beliefs, Extended Parallel Processing Model

What Psychological Factors Determine to What Extent Young Adults Believe in Covid-19 Conspiracy Theories?

Since the outbreak of a priorly unknown coronavirus in 2019, the SARS-CoV-2 virus, societies all over the globe are facing tremendous healthcare, political, and social challenges. When the World Health Organization named the novel disease “covid-19” in February 2020 (World Health Organization, 2020), the virus had spread in a high number of countries. The uncontrollable exponential increase in covid-19 incidences and accompanying increasing mortality rates obligated worldwide decision-makers to release countermeasures. These measures included shutting down economies and restricting citizens from leaving their homes in order to slow down the transmission rate of the virus (Jutzi et al., 2020). Whilst the rapid spread of the disease caused health care systems and science to be overwhelmed by the unexpected consequences of the pandemic (Imhoff & Lamberty, 2020), citizens felt increasingly threatened by the virus (Cypryńska & Nezlek, 2020). As a response to the perceived threat of the disease, individuals displayed a variety of reactions, such as believing in covid-19 conspiracy theories (Šrol et al., 2021). Common conspiracy theories claim that the virus gets activated by 5G networks, that the pandemic is a hoax, and that Bill Gates uses vaccinations to build a global surveillance regime (Shasavari et al., 2020), only to name a few.

The prevalence and impact of covid-19 conspiracy theories should not be underestimated as they gained popularity within the general public (Kim & Kim, 2021) and are no longer exclusively held by extremists or smaller groups of people with alternative worldviews (Miller et al., 2016). This collective engagement in covid-19 conspiracy theories can have far-reaching consequences if a high number of individuals believes them and adjust their behavior accordingly (Erceg et al., 2020). Such beliefs are assumed to influence the health and safety of individuals who hold them and the general public (van Prooijen & Douglas, 2018). Individuals who for example believe that the virus does not exist were found to be less likely to adhere to covid-19 measures (Allington et al., 2020; Bierwiazzonek et al., 2020; Erceg et al., 2020; Imhoff & Lamberty, 2020; Romer & Jamieson, 2020) and are hence more likely to spread the disease (Bierwiazzonek et al., 2020; Romer & Jamieson, 2020). Believing covid-19 conspiracy theories may further decrease one’s trust in science and expert recommendations (Imhoff & Lamberty, 2020). Imhoff and Lamberty (2020) therefore suggest that covid-19 conspiracy theory believing is correlated with a reduction of engagement in preventive behaviors, like social distancing and frequent hand washing. Research findings further propose that such beliefs negatively affect health-promoting behaviors, like reducing doctor attendances

(Oliver & Wood, 2014) and decreasing one's willingness to get vaccinated against the virus (Bertin et al., 2020; Romer & Jamieson, 2020).

If scientists and governments come to understand what drives individuals to believe in covid-19 conspiracy theories, through the identification of psychological factors that induce such beliefs, they may be able to implement tailored interventions. These interventions could nullify the credibility of conspiracy theories and in turn decrease their propagation by preventing people from engaging with them in the first place. Reducing covid-19 conspiracy theory beliefs may thereby not only assist in slowing down the transmission rate of the virus, but may ultimately help to end the current pandemic.

Although young age was found to positively relate to conspiracy theory believing (Allington et al., 2020; Swami et al., 2016), few studies have addressed the role of young adults. Since young adults may be more likely to believe in covid-19 conspiracy theories compared to people of advanced age, assessing this age group may be highly relevant. To the best of the researcher's knowledge, no research with the focus on psychological determinants of covid-19 conspiracy theory beliefs within young adults has been published yet. In order to fill the aforementioned literature gap, this study targets young adults between 18 to 30 years of age since young adulthood is commonly defined as the life span between teenage years and middle adulthood.

Theoretical Framework

Covid-19 Conspiracy Theories

Douglas et al. (2019) and Swami et al. (2016) suggest that conspiracy theories refer to explanations of social or political events that an individual believes to be caused by powerful actors or groups who engage in plots to suit their own interests. In other words, conspiracy theories serve as a justification for complex events and attribute blame to certain actors. Alternatively, an explanation is considered a conspiracy theory when it has no scientific foundation and individuals perceive alternate reasons as more plausible (Aaranovitch, 2009, as cited in Brother at al., 2013). Van Prooijen and Douglas (2017) indicate that the frequent appearance of conspiracy theories during events of crisis is characterized by heightened levels of fear and uncertainty among the public. These feelings of fear and uncertainty, caused by events of threat, are believed to promote sense-making processes, such as believing in conspiracy theories (van Prooijen & Douglas, 2017). Accordingly, conspiracy theories can help people to cope with threatening situations (Douglas et al., 2017), as they offer explanations to complex events that could be difficult to understand otherwise (Clarke, 2002; Franks et al., 2013).

The aforementioned determinants for believing in general conspiracy theories may also account for believing in covid-19 conspiracy theories. Covid-19 is a socio-political event that is frequently believed to be caused by powerful actors, for example politicians who are thought to use the pandemic and its implications to make citizens dependent on the government. The unpredictability of the pandemic leads people to develop feelings of fear as covid-19 constitutes an uncontrollable and life-threatening health risk (Jutzi et al., 2020). Whilst the virus may cause some individuals to feel scared about their health or financial autonomy, others potentially fear to lose their personal freedom due to governmental countermeasures. Likewise, individuals may feel uncertain about various contexts, such as the origins of the virus or their personal future after the pandemic. It is further assumed that perceiving the risk of the virus to be high increases one's likelihood to believe in covid-19 conspiracy theories (Šrol et al., 2021). If one feels threatened by covid-19 but perceives the efficacy towards the virus as low, they are also suggested to be more likely to believe in conspiracy theories concerning the virus (Jahangiry et al., 2020). In order to cope with these feelings and cognitions, people may adopt covid-19 conspiracy theories. For instance, individuals may believe that the virus was created in a Chinese laboratory because it allows them to make sense of the situation and to find a comprehensible explanation for the threatening events.

Extended Parallel Processing Model (EPPM)

The Extended Parallel Processing Model (EPPM) by Witte (1992) may serve as an explanation for the underlying reasons of covid-19 conspiracy theory beliefs. The model hypothesizes two responses towards a threat: danger control and fear control. Since only fear control is assumed to play a role in conspiracy theory adoption, the EPPM will be adjusted to this research and reduced to the context-relevant elements of fear control.

According to the EPPM, perceptions of threat, efficacy, and emotions of fear determine individuals' compliance with certain messages. When an individual encounters a message, they evaluate and process its components. They thereby appraise the perceived threat of the message. If the threat is perceived as low, the message may not be processed further since the threat is perceived as irrelevant. If the threat is perceived as moderate to high, the individual may develop feelings of fear. The efficacy appraisal then determines whether this fear increases further. First, response efficacy will be evaluated, which refers to one's perception over the effectiveness of a response to prevent the threat (Witte, 1992). In the context of covid-19, an individual may appraise whether wearing face masks can reduce the likeliness of contracting the virus (Adiwena et al., 2020). Next, self-efficacy will be appraised, which refers to one's perception over their ability to implement the recommended prevention response (Witte, 1992).

For example, one may evaluate whether they can financially afford to wear masks regularly (Adiweni et al., 2020). Witte (1992) proposes that an individual will base their responses on the dynamics of perceived threat and efficacy. An individual who perceives the threat of a message as high, but the efficacy as low, is suggested to engage in fear control. The fear, which was originally caused by the high threat perception, increases further since the individual feels unable to resolve the threat. Consequently, they may avoid or deny the threat to cope with their fear by engaging in maladaptive responses, such as believing in conspiracy theories (Witte, 1992). In short, when an individual encounters a message that they perceive as threatening but perceive the efficacy towards the threat to be low, conspiracy theory beliefs may act as a fear control strategy.

Psychological Factors of Covid-19 Conspiracy Theory Beliefs

In line with the Extended Parallel Processing Model (EPPM), current research increasingly recognizes the relationship between perceived efficacy (Jahangiry et al., 2020; Mækelæ et al., 2020; Witte, 1992), feelings of fear (Bruder & Kunert, 2020; Witte, 1992), and conspiracy theory beliefs. Research findings further point towards a relationship between perceived uncertainty (Miller, 2020; van Prooijen & Douglas, 2017; van Prooijen & Jostmann, 2013), perceived risk (Kim & Kim, 2021; Šrol et al., 2021), and conspiracy theory believing. As uncertainty and perceived risk are believed to arise in threatening situations (Jutzi et al., 2020), the threat component of the EPPM will be conceptualized in terms of perceived uncertainty and perceived risk. Indeed, covid-19 may pose a threat as it brings high levels of subjective uncertainty and perceived risk whilst leaving individuals little control over the pandemic and its impacts.

Uncertainty refers to one's limited understanding of the present, future, or past (Walker et al., 2013). Miller (2020) argues that feelings of uncertainty, which may arise due to the pandemic, are positively related to believing in covid-19 conspiracy theories. Van Prooijen & Douglas (2017) add that people increasingly believe in conspiracy theories during times of crisis since high levels of uncertainty provoke a desire to make sense of one's environment, which people aim to fulfill with such theories. Van Prooijen and Jostman (2013) support the finding of a positive relationship between uncertainty and conspiracy theory beliefs. Their experiment provides evidence for causality, meaning they found that high levels of uncertainty led to increased conspiracy believing and not vice versa (van Prooijen & Jostmann, 2013). Although research findings agree on a direct positive relationship between uncertainty and conspiracy theories, the role of fear in this relationship has not been tested yet. To test whether the EPPM may be applicable in the context of covid-19, this study aims to assess whether fear

mediates the relationship between the aforementioned variables.

The second psychological factor, *risk perception*, relates to one's perception of potential harm or loss (Darker & Phillips, 2016). Thus, risk perception is a subjective assessment about the features and severity of a certain risk (Darker & Phillips, 2016). Kim and Kim (2021) argue that perceived risk is an impactful predictor of conspiracy theory engagement since it positively relates to covid-19 conspiracy theory beliefs. Šrol et al. (2021) support this finding as they also found a direct positive relationship between covid-19 risk perception and covid-19 conspiracy theory beliefs. The researchers additionally found risk perception of covid-19 to be associated with feelings of anxiety (Šrol et al., 2021). Since feelings of anxiety and fear are interrelated concepts (Gray, 1991), this finding raises the question of whether risk perception of covid-19 may also be associated with fear of covid-19. To test whether fear mediates the relation between risk perception of the virus and covid-19 conspiracy theory beliefs, additional research is needed.

Another psychological factor that is frequently mentioned in covid-19 conspiracy theory research is perceived *efficacy*. Perceived efficacy refers to one's perception of feasibility and effectiveness of an advised reaction to a threat (Witte, 1994, as cited in Lin & Chen, 2021). Mækelæ et al. (2020) found low perceptions of efficacy concerning governmental reactions towards covid-19 to be directly associated with increased paranoia. Indeed, the study suggests that this association could account for the rise of covid-19 conspiracy theory beliefs (Mækelæ et al., 2020). Building upon the EPPM, Jahangiry et al. (2020) point out that individuals who perceive the threat of covid-19 to be higher than their perceived efficacy are more likely to engage in fear control processes, such as believing in covid-19 conspiracy theory beliefs. This implies that the interplay of threat perception and efficacy perception determine covid-19 conspiracy theory beliefs, thus contradicting the findings of Mækelæ et al. (2020). In particular, the EPPM highlights the role of perceived response efficacy and perceived self-efficacy, which are suggested to determine one's general efficacy perception. Assessing the role of efficacy towards covid-19 will offer insight into the psychological factors that determine covid-19 conspiracy theory beliefs and may provide evidence over the fit of the EPPM in the context of covid-19.

Lastly, relevant research points out that *fear* plays a role in conspiracy theory adoption. Van Prooijen and Douglas (2017) reviewed psychological research and concluded that feelings of fear increase the likelihood of believing in general conspiracy theories. In the context of the current pandemic, fear frequently concerns perceived risks for loved individuals and health anxiety (Mertens et al., 2020). Bruder and Kunert (2020) assessed correlates of generic beliefs

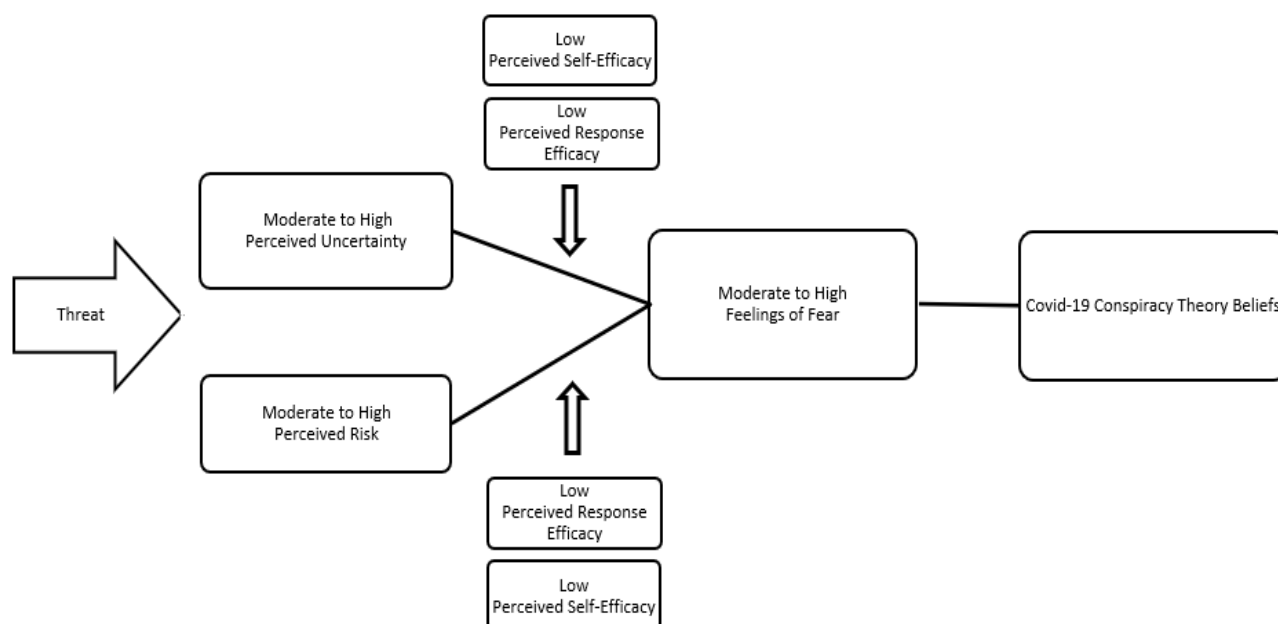
in conspiracy theories during the covid-19 pandemic and found personal and economic fear to be directly correlated with conspiracy theory beliefs. Nevertheless, fear of losing a loved individual did not predict conspiracy theory beliefs (Bruder & Kunert, 2020). Although fear has been suggested to determine conspiracy theory beliefs in a variety of psychological models, such as EPPM, few studies tested the role of fear in the context of covid-19. This study therefore expands on the EPPM, which assumes that high threat perceptions result in emotions of fear, which interplay with low perceived efficacy and stimulate conspiracy theory believing (Witte, 1992).

Extended Parallel Processing Model (EPPM) Applied to Covid-19

The Extended Parallel Processing Model Applied to Covid-19 (Figure 1) hypothesizes that perceiving the virus as a moderate to high risk and feeling moderately to highly uncertain about the virus stimulates feelings of fear. Moderate to high levels of fear in turn promote covid-19 conspiracy theory believing. The Extended Parallel Processing Model Applied to Covid-19 also adapts the efficacy component of the original model, by hypothesizing that low response efficacy and low self-efficacy may influence the relationship between threat perception and fear.

Figure 1

Extended Parallel Processing Model Applied to Covid-19



Current Research: Research Question and Hypotheses

Based upon relevant research findings and the Extended Parallel Processing Model Applied to Covid-19, this research intends to answer the following research question: What psychological factors determine to what extent young adults believe in covid-19 conspiracy theories?

Due to the rapidly changing nature of covid-19 and its far-reaching impacts on societies, the context of this study should be taken into consideration. This study was conducted in the Netherlands between February and July 2021. As of 12.02.2021, covid-19 accounted for 1.017.302 confirmed cases and 14.662 confirmed deaths within the Netherlands (World Health Organization, 2021). At the time this study was finalized, the Netherlands counted 1.683.828 confirmed cases and 17.741 confirmed deaths on the 30.06.2021 (World Health Organization, 2021). From January until April 2021, a curfew and a lockdown applied due to high covid-19 incidences. As these measures stimulate feelings of uncertainty and lack of control, individuals feel increasingly threatened by the virus (Jutzi et al., 2020). The impact of these countermeasures may be relevant since research findings point towards a positive relation between threat perception and covid-19 conspiracy (Jutzi et al., 2020; Šrol et al., 2021).

This study examines the relationship between uncertainty about covid-19/risk perception of covid-19 and covid-19 conspiracy theory beliefs (Figure 1). It will be assessed whether fear of covid-19 mediates these hypothesized relationships (Figure 1). Furthermore, this research tests if efficacy affects the direction and strength of the prospective relationships between uncertainty about covid-19/risk perception of covid-19 and fear of covid-19 (Figure 1). With the purpose of answering the research question, this study hypothesizes that:

H1a: A direct, positive relationship exists between uncertainty about covid-19 and young adults' beliefs in covid-19 conspiracy theories

H1b: An indirect, positive relationship exists between uncertainty about covid-19 and young adults' beliefs in covid-19 conspiracy theories, mediated by fear

H2a: A direct, positive relationship exists between perceived risk of covid-19 and young adults' beliefs in covid-19 conspiracy theories

H2b: An indirect, positive relationship exists between perceived risk of covid-19 and young adults' beliefs in covid-19 conspiracy theories, mediated by fear

H3: The relationship between perceived uncertainty about covid-19 and fear of covid-19 is moderated by response efficacy towards covid-19

H4: The relationship between perceived uncertainty about covid-19 and fear of covid-19 is moderated by self-efficacy towards covid-19

H5: The relationship between risk perception of covid-19 and fear of covid-19 is moderated by response efficacy towards covid-19

H6: The relationship between risk perception of covid-19 and fear of covid-19 is moderated by self-efficacy towards covid-19

Methods

Participants

Two methods were used to recruit the respondents of this study. First, a convenience sample was applied since respondents were recruited based on their accessibility. A high number of respondents therefore belonged to the researcher's social environment as the link of the survey was sent to friends, acquaintances, and students from the researcher's university. Second, respondents forwarded the questionnaire to their friends and acquaintances and thus, a snowball sample was used. Participation was voluntarily and required written informed consent. This research received ethical approval by the BMS committee of the University of Twente before the beginning of the data collection.

In total, 217 individuals filled out the questionnaire. 45 responses had to be excluded from the data analysis to prevent distortion of the results: 3 individuals did not give their consent, 36 individuals did not complete the survey, and 6 respondents did not meet the age criteria of being a young adult between 18 to 30 years. From the 172 responses that validated for the data analysis, respondents' age therefore ranged between 18 and 30 ($M = 21.7$, $SD = 2.8$) years of age. 106 respondents identified as female (61.6%), 65 individuals identified as male (37.8%), and 1 respondent identified as diverse (.6%). 93 respondents resided in the Netherlands (54.1%), 39 in Germany (22.7%) and 40 respondents resided in another country (23.3%). Whilst 150 respondents were university students (87.2%), 19 worked (11.0%), and 3 individuals described their occupation as unemployed (1.8%).

Materials

The questionnaire was constructed in 2021 by using Qualtrics, which is an online software for the design and conduction of surveys. The survey measured six constructs (Appendix A, Table A1) which were adapted from relevant research. The constructs of the questionnaire measured the following concepts: 'uncertainty about covid-19' (9 items), 'risk perception of covid-19' (6 items), 'fear of covid-19' (5 items), 'response efficacy towards covid-19' (5 items), 'self-efficacy towards covid-19' (5 items) and 'covid-19 conspiracy theory

beliefs' (8 items plus 6 distractor items). In total, 52 questions were asked in the survey, including six questions concerning respondents' demographics and two questions concerning respondents' consent.

Uncertainty About Covid-19

The items measuring the construct 'uncertainty about covid-19' (e.g. *'I am unsure when social normal order will return'*; *'the transmission route of Covid-19 is unclear'*) were adapted from the uncertainty about COVID-19 scale by Wu et al. (2021). All items were measured on a 5-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. The Cronbach's alpha score of the construct 'uncertainty about covid-19' showed, according to Nunnally (1967), acceptable reliability ($\alpha = .68$). Results of the KMO and Bartlett's test indicated that the construct 'uncertainty about covid-19' was suitable for factor analysis [KMO = .69, $\chi^2(28) = 270.13$, $p > .01$]. The items loaded on two factors. Factor 1 possessed an Eigenvalue of 2.63 and explained 32.88% of the variance. Moreover, factor 2 had an Eigenvalue of 1.46 and an explained variance of 18.39%. Whilst the items that load on factor 1 seem related to personal uncertainty, the items that load on factor two seem to relate to uncertainty concerning covid-19 as a disease (Appendix A, Table A1).

Risk Perception of Covid-19

The construct 'risk perception of covid-19' was measured based on the covid-19 risk appraisal scale by Jaspal et al. (2020). Items (e.g. *'I feel vulnerable to covid-19 infection'*; *'I feel I am unlikely to get infected with covid-19'*) were measured on three different scales: 1=extremely unlikely to 5=extremely likely, 1=strongly disagree to 5=strongly agree, and 1=very low to 5=very high. According to Nunnally (1967), the reliability of the construct was classified as good ($\alpha = .81$). As the construct also showed a satisfying KMO and Bartlett's score [KMO = .83, $\chi^2(15) = 385.53$, $p > .01$], factor analysis was conducted. All items loaded on one factor (Appendix A, Table A1), which was found to have an Eigenvalue of 3.22 and explained 53.67% of the variance.

Fear of Covid-19

Next, 'fear of covid-19' was measured with an adjusted version of the fear of covid-19 scale by Ahorsu et al. (2020). All items (e.g. *'it makes me uncomfortable to think about covid-19'*; *'I cannot sleep because I am worried about getting covid-19'*) were measured on a 5-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. The reliability of the construct ($\alpha = .67$) was acceptable (Nunnally, 1967). The construct further showed an acceptable KMO and Bartlett's score [KMO = .66, $\chi^2(10) = 176.11$, $p > .01$]. The items loaded on two factors. Factor 1 possessed an Eigenvalue of 2.26 whilst factor 2 showed an Eigenvalue

of 1.06. The former factor explained 45.23% and the latter factor 21.25% of the variance. The items that loaded on the first factor relate to fear of personal contamination with the virus. On the other hand, items that loaded on the second factor concern fear of covid-19 in general (Appendix A, Table A1). It is therefore probable that the items measured two different constructs.

Response Efficacy Towards Covid-19

The construct ‘response efficacy towards covid-19’ was measured based the EPPM scale by Shirahmadi et al. (2020). Items (e.g. ‘*regular hand washing prevents covid-19*’; ‘*I believe that by disinfecting the surfaces, I am less likely to get covid-19*’) were measured on a 5-point Likert scale ranging from 1=completely disagree to 5=completely agree. In the context of this study, reliability ($\alpha = .78$) of the construct was good (Nunnally, 1967) and the KMO and Bartlett’s test further indicated ‘response efficacy towards covid-19’ to be suitable for factor analysis [KMO = .73, $\chi^2(10) = 226.72$, $p > .01$]. All items of the construct loaded on one factor (Appendix A, Table A1) with an Eigenvalue of 2.59 and an explained variance of 51.73%.

Self-Efficacy Towards Covid-19

The construct ‘self-efficacy towards covid-19’ was also adapted from the EPPM scale by Shirahmadi et al. (2020). All items of this scale were measured on a 5-point Likert scale ranging from 1=completely disagree to 5=completely agree. The reliability of the scale ($\alpha = .78$) was good (Nunnally, 1967) and displayed a satisfactory KMO and Bartlett’s score [KMO = .76, $\chi^2(6) = 216.05$, $p > .01$]. All items loaded on one factor (Appendix A, Table A1) with an Eigenvalue of 2.48. The factor explained 61.65% of the variance.

Covid-19 Conspiracy Theory Beliefs

Lastly, the ‘covid-19 conspiracy theory beliefs’ construct of this study was adjusted from Constantinou et al. (2021). To prevent distortion of the results by respondents’ personal dispositions, distractor items were added to the scale. These items were official statements that were publicly and scientifically believed to be true at the time of this research. These items were not included in the data analysis and merely served the purpose of preventing response bias. All items (e.g. ‘*covid-19 does not exist for real*’; ‘*the ultimate goal of covid-19 is to chip us with the vaccine*’) were measured on a 10-point Likert scale ranging from 1=strongly disagree to 10=strongly agree. The Cronbach’s alpha analysis showed, according to Nunnally (1967), good reliability ($\alpha = .80$). Lastly, the KMO and Bartlett’s score indicated ‘covid-19 conspiracy theory beliefs’ to be suitable for factor analysis [KMO = .84, $\chi^2(28) = 405.53$, $p > .01$]. The items loaded on two factors. Whilst factor 1 possessed an Eigenvalue of 3.51, factor 2 was found to have an Eigenvalue of 1.02. Furthermore, factor 1 explained 43.93% of the

variance whilst factor 2 explained 12.75% of the variance. The covid-19 conspiracy theory items that involve plots of powerful actors loaded on factor one, whilst the items that include denial loaded on factor two (Appendix A, Table A1).

In brief, all six constructs showed acceptable to high reliability scores in the context of this study. Although three constructs were not unidimensional, the total scales of ‘uncertainty about covid-19’ and ‘fear of covid-19’ were not split into subconstructs. Measuring these subscales goes beyond the scope of this study but may be an interesting starting point for future research. However, for exploratory purposes, the ‘covid-19 conspiracy theory beliefs’ scale was split into subscales, which will be explained further in the ‘additional analyses’ section.

Procedure

After the questionnaire was published, its link was sent to friends and acquaintances through the social media platforms WhatsApp, Instagram, Facebook, and Snapchat. The survey was further uploaded on PollPool, which is an online platform where researcher upload their surveys and exchange them with other researchers. Filling out the online questionnaire thus required respondents to have access to an internet device, such as a laptop, computer, smartphone, or tablet, and a social media account to open the surveys’ link. When respondents started the questionnaire, they first read an informed consent form (Appendix A, Table A2). This form informed the respondent about the aim of the study, the procedure, and about their rights as a participant. Furthermore, the researchers contact details were shown and it was explained that respondents must be at least 18 years old, and that possession of sufficient English proficiency was required to assure full understanding of the content. Before respondents were forwarded to the main body of the questionnaire, they had to tick a box to confirm that they meet these requirements. If the respondent disagreed with the latter consents, their participation immediately ended. If the respondent agreed, they were forwarded to the main body of the questionnaire. To begin with, they were asked for demographic parameters concerning their gender identity, age, country of residence and current occupation. The questions measuring the six constructs were asked afterwards. Subsequently, a second consent form (Appendix A, Table A3) explained that the real aim of this study was not to measure respondents’ general covid-19 beliefs, but instead measured respondents’ beliefs in covid-19 conspiracy theories and their psychological determinants. To prevent that the respondent felt distrusted, it was explained that the real aim of the study was not revealed from the beginning to avoid personal dispositions towards the topic. Based on this, respondents were asked again for their consent to submit their data. If respondents did not give their consent, their data were deleted and excluded from the analysis. At the end of the survey, respondents were thanked for

their participation. Completing the questionnaire took approximately 10 minutes.

Data Analyses

Design

A correlational survey design was employed. The study had six continuous variables. The variables ‘uncertainty about covid-19’ and ‘risk perception of covid-19’ served as independent variables, whilst the variable ‘covid-19 conspiracy theory beliefs’ was the dependent variable. ‘Fear of covid-19’ was the mediating variable and ‘response efficacy towards covid-19’ and ‘self-efficacy towards covid-19’ were moderating variables in this study.

Assumption of Normality

The collected data from the questionnaire were analyzed by using the statistical program IBM SPSS Statistics 24, which license key was provided by University of Twente. The assumption of normality of the data was measured by using skewness and kurtosis tests. Histograms of the mean scores of the constructs were created to get a clearer understanding of the skewness and kurtosis results. The skewness scores of the constructs ‘uncertainty about covid-19’, ‘risk perception of covid-19’ and ‘fear of covid-19’ laid in-between -1 and 1. This points towards the assumption of normal distributions of the constructs. In contrast, the skewness scores of the constructs ‘response efficacy towards covid-19’, ‘self-efficacy towards covid-19’ and ‘covid-19 conspiracy theory beliefs’ laid outside this range. Accordingly, a deviation from normal distribution was indicated as the data was highly skewed. Similar to the skewness test, the kurtosis test of the constructs ‘uncertainty about covid-19’, ‘risk perception of covid-19’ and ‘fear of covid-19’ suggested a normal distribution, as these constructs scored in-between -2 and 2. The kurtosis of ‘response efficacy towards covid-19’, ‘self-efficacy towards covid-19’ and ‘covid-19 conspiracy theory beliefs’ scored outside this range, meaning that the data may be heavily tailed compared to normal distributions. These findings are in line with the bell-shapes of the constructs in the histograms. Despite these findings, the data analysis was proceeded as planned for several reasons. Skewness of the data was expected as a high number of individuals hold strong opinions towards covid-19. For example, it is plausible that the conspiracy theory scale was skewed since only a minority of individuals holds such beliefs. Moreover, violations of normality do not threaten data with a large sample size. According to Piovesana and Senior (2016), sample sizes greater than 85 generate stable means and standard deviations despite skewness. Since the sample size in this research was larger than 85, it was assumed that the data would be robust against these violations.

General Analyses

A Kaiser-Meyer-Olkin measure of sampling adequacy was conducted for each construct

to assure that the instrument was suitable for a factor analysis. If that condition was met, a Bartlett's sphericity test (BST) was conducted. The confirmatory factor analysis tested on what factors the items loaded. Results were satisfying when the items which belonged to the same construct loaded on the same factor. The reliability of the data was tested by conducting a Cronbach's alpha test to measure the internal consistency of the constructs. To get a first glimpse of the correlations between the data, Pearson analyses were conducted. Then next general analysis concerned respondents' demographic data. In order to illustrate the characteristics of the sample, a frequency table containing the respondents' demographics was created. This way, the mean and standard deviation of the samples demographics were analyzed.

Mediation Analyses

Next, analyses were conducted that aided to answer the hypotheses of this study. Hypotheses 1a, 1b, 2a, and 2b were tested by conducting mediation analyses. A mediation effect refers to an indirect effect in which one variable affects a second variable, which in turn affects a third variable. This intervening second variable is referred to as mediating variable because it mediates the relationship between the independent and dependent variable. The mediation analyses included multiple regression analyses in SPSS and Sobel tests.

Moderation Analyses

Moderation analyses were conducted to answer hypothesis 3, 4, 5, and 6. These analyses are used to test whether a third variable, also considered as moderating variable, affects the strengths or direction of the relationship between an independent and dependent variable. The moderation analysis was conducted with multiple regression analyses in SPSS statistics.

Results

Means, Standard Deviations and Correlations of the Constructs

In order to get a first glimpse of the data, the correlations of the constructs were analyzed by conducting several Pearson correlations (Table 1). These analyses further displayed the mean scores and standard deviations for each construct.

Based on 5-point Likert scales, results showed that respondents felt moderately to highly uncertain about covid-19 ($M = 3.6$, $SD = 0.5$). Besides this, they perceived covid-19 to be a medium risk ($M = 3.0$, $SD = 0.8$) and felt moderately fearful of the virus ($M = 2.3$, $SD = 0.7$). However, respondents perceived their response efficacy towards covid-19 to be moderate-high ($M = 3.9$, $SD = 0.7$) and their self-efficacy to be high ($M = 4.3$, $SD = 0.7$). Based on a 10-point Likert scale, respondents believed covid-19 conspiracy theories to a low extent ($M = 2.5$, $SD = 1.5$).

‘Uncertainty about covid-19’ was found to be significantly positively correlated with ‘covid-19 conspiracy theory beliefs’ ($r = .16, n = 172, p = .03$). ‘Risk perception of covid-19’ significantly negatively correlated with ‘covid-19 conspiracy theory beliefs’ ($r = -.19, n = 172, p = .01$). These findings point towards direct relationships between the variables and hence, against the prospected mediation effects of ‘fear of covid-19’. Moreover, ‘uncertainty about covid-19’ significantly positively related to ‘fear of covid-19’ ($r = .20, n = 172, p < .01$). ‘Risk perception of covid-19’ was also found to correlate positively with ‘fear of covid-19’ ($r = .18, N = 172, p = .02$). ‘Self-efficacy towards covid-19’ and ‘response efficacy towards covid-19’ were also positively related ($r = .39, n = 172, p < .01$). Lastly, significant negative relationships were found between ‘response efficacy towards covid-19’ and ‘covid-19 conspiracy theory beliefs’ ($r = -.40, n = 172, p < .01$) and ‘self-efficacy towards covid-19’ and ‘covid-19 conspiracy theory beliefs’ ($r = -.28, n = 172, p < .01$). In the following paragraphs, mediation and moderation analyses were conducted to explore these relationships further and to answer the hypotheses of this study.

Table 1

Means, Standard Deviations, and Pearson Correlations Between Determinants and Covid-19 Conspiracy Theory Beliefs (n = 172)

Constructs		Mean	SD	Correlations					
				1.	2.	3.	4.	5.	6.
1.	Uncertainty	3.61	0.53	1.00					
2.	Risk perception	3.01	0.77	-.00	1.00				
3.	Fear	2.30	0.71	.20**	.18*	1.00			
4.	Response efficacy	3.93	0.70	-.13	.11	.05	1.00		
5.	Self-efficacy	4.28	0.70	-.02	.04	.08	.39**	1.00	
6.	Covid-19 beliefs	2.52	1.46	.16*	-.19**	-.12	-.40**	-.28**	1.00

**Correlation is significant at the $p \leq .01$ level (two-tailed); *correlation is significant at the $p \leq .05$ level (two-tailed)

Mediation Analyses

To answer hypotheses 1a, 1b, 2a and 2b, mediation analyses were conducted according to the three-step approach of mediation by Baron and Kenny (1986). Then, the results of the

regression analyses were run in a Sobel test, which tested whether the mediator variable significantly carries the influence of the independent variable on the dependent variable.

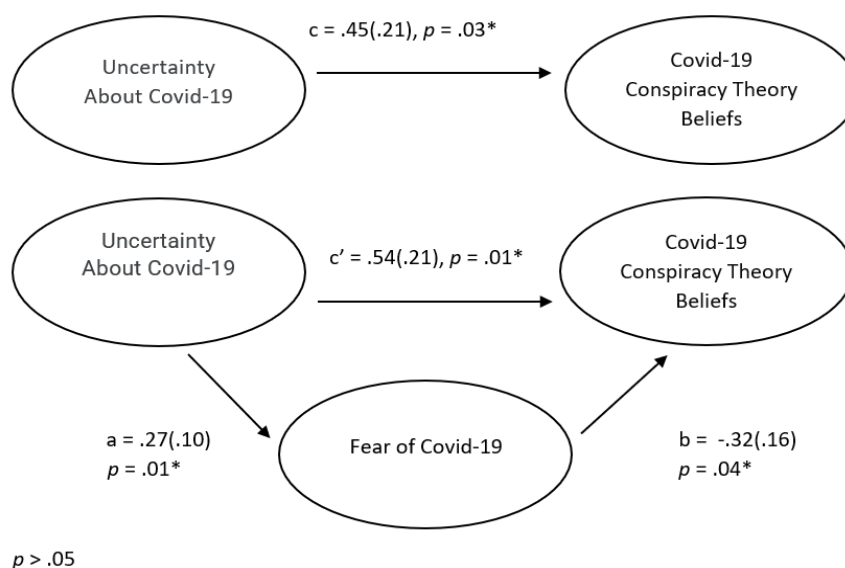
Mediation Effect of ‘Fear of Covid-19’ on the Relationship Between ‘Uncertainty About Covid-19’ and ‘Covid-19 Conspiracy Theory Beliefs’

Firstly, it was investigated whether the independent variable ‘uncertainty about covid-19’ significantly correlated with the dependent variable ‘covid-19 conspiracy theory beliefs’. The results indeed indicated a significant relation between the variables ($c = .45$, $s_c = .76$, $p = .03$). Based on this significant finding, the first criterion of mediation was met, and the second analysis was conducted. It was thereby assessed whether the independent variable ‘uncertainty about covid-19’ significantly correlated with the mediating variable ‘fear of covid-19’. Since this was found to be the case ($a = .27$, $s_a = .10$, $p < .01$), a third multi-regression analysis was conducted. Within this analysis, ‘covid-19 conspiracy theory beliefs’ was treated as the dependent variable whilst ‘uncertainty about covid-19’ and ‘fear of covid-19’ acted as independent variables. This step tested whether ‘uncertainty about covid-19’ significantly influenced ‘covid-19 conspiracy theory beliefs’ whilst controlling for ‘fear of covid-19’. First, the mediating variable ‘fear of covid-19’ also significantly influenced the dependent variable ‘covid-19 conspiracy theory beliefs’ ($b = -.32$, $s_b = .16$, $p = .04$). Since the influence of ‘uncertainty about covid-19’ on ‘covid-19 conspiracy theory beliefs’ remained significant after the mediating variable was included in the regression ($c' = .54$, $s_{c'} = .21$, $p = .01$), partial mediation was indicated. In case of complete mediation, this relation would have to become zero or nonsignificant. Finally, a Sobel test was run to assess whether the mediating variable indeed carries the influence of the independent variables to the dependent variable. The results suggested that the mediation effect was nonsignificant (Sobel $z = -1.62$, $p = .10$). Consequently, ‘fear of covid-19’ was not found to significantly mediate the relationship between ‘uncertainty about covid-19’ and ‘covid-19 conspiracy theory beliefs’. Hypothesis 1b was therefore rejected (Figure 4).

Based on the first regression analysis of the mediation analysis ($c = .45$, $s_c = .76$, $p = .03$) and the Pearson correlation ($r = .16$, $n = 172$, $p = .03$), hypothesis 1a was accepted as a positive and direct relationship between ‘uncertainty about covid-19’ and ‘covid-19 conspiracy theory beliefs’ was found (Figure 4).

Figure 2

Mediation Model with ‘Fear of Covid-19’ Mediating the Relationship Between ‘Uncertainty About Covid-19’ and ‘Covid-19 Conspiracy Theory Beliefs’



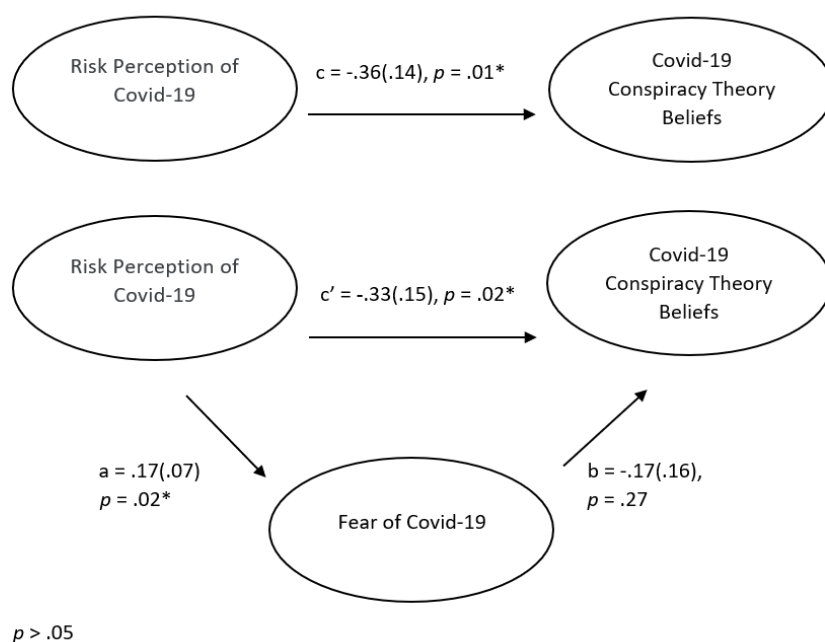
Mediation Effect of ‘Fear of Covid-19’ on the Relationship Between ‘Risk Perception of Covid-19’ and ‘Covid-19 Conspiracy Theory Beliefs’

The first regression analysis showed a significant effect of the independent variable ‘risk perception of covid-19’ on the dependent variable ‘covid-19 conspiracy theory beliefs’ ($c = -.36, s_c = .14, p = .01$). Based on this significant finding, it was tested whether the independent variable ‘risk perception of covid-19’ significantly correlated with the prospective mediator ‘fear of covid-19’. Indeed, the second regression analyses confirmed this significant correlation ($a = .17, s_a = .07, p = .02$). During the next step, it was tested whether the potential mediator ‘fear of covid-19’ had a significant effect on the dependent variable ‘covid-19 conspiracy theory beliefs’. As this effect was found to be nonsignificant ($b = -.17, s_b = .16, p = .27$), the third criterion for mediation was not met. Hence, this mediation analysis did not find ‘fear of covid-19’ to mediate the relationship between ‘risk perception of covid-19’ and ‘covid-19 conspiracy theory beliefs’ and hypothesis 2b was thus rejected (Figure 4).

The results of the first regression of the mediation analysis ($c = -.36, s_c = .14, p = .01$) point towards a significant relationship between the variables. The findings of the Pearson correlation ($r = -.19, n = 172, p = .01$) supported this finding and found a negative relationship between the variables. Since a direct, negative relationship between ‘risk perception of covid-19’ and ‘covid-19 conspiracy theory beliefs’ was found, hypothesis 2a was rejected (Figure 4).

Figure 3

Mediation Model With ‘Fear of Covid-19’ Mediating the Relationship Between ‘Risk Perception of Covid-19’ and ‘Covid-19 Conspiracy Theory Beliefs’



Moderation Analyses

Effect of 'Response Efficacy Towards Covid-19' on the Relationship Between 'Uncertainty About Covid-19' and 'Fear of Covid-19'

Four moderation analyses were conducted in order to test hypothesis 3, 4, 5, and 6. The moderation effects were measured using multiple regression analyses. The results (Table 2) showed a significant fit of the regression model [$F(3,168) = 2.79, p = .04$] with a low adjusted R-squared of .03. Whilst 'uncertainty about covid-19' was found to be a significant predictor in the model ($\beta = 0.15, p = <.01$), 'response efficacy towards covid-19' was not found to be a significant predictor ($\beta = 0.06, p = .29$) of 'fear of covid-19'. Since the interaction effect was also found to be insignificant ($\beta = -0.00, p = .93$), 'response efficacy towards covid-19' did not moderate the relationship between 'uncertainty about covid-19' and 'fear of covid-19' and hypothesis 3 was rejected (Figure 4).

Table 2

Moderation Effect of Response Efficacy on the Relationship Between Uncertainty and Fear

Model		Standardized			
		Unstandardized Coefficients		Coefficients	
		B	Std. Error	Beta	t
1	(Constant)	2.301	0.054		42.642
	Uncertainty (centered)	0.152	0.054	0.214	2.811

Response Efficacy (centered)	0.058	0.055	0.081	1.060	.291
Interaction: Uncertainty*Response Efficacy (both centered)	-0.004	0.047	-0.007	-0.091	.927

a. Dependent Variable: Fear

Effect of ‘Self-Efficacy Towards Covid-19’ on the Relationship Between ‘Uncertainty About Covid-19’ and ‘Fear of Covid-19’

Results (Table 3) indicate a significant regression model [$F(3,168) = 3.26, p = .02$] with a low adjusted R-squared of .04. ‘Uncertainty about covid-19’ ($\beta = 0.15, p < .01$) was found to be a significant predictor in the model. Contrary to that, ‘self-efficacy towards covid-19’ ($\beta = 0.05, p = .34$) and the interaction effect ($\beta = -0.06, p = .28$) were not found to be significant predictors. Based on this, hypothesis 4 was rejected as the relationship between ‘uncertainty about covid-19’ and ‘fear of covid-19’ was not moderated by ‘self-efficacy towards covid-19’.

Table 3

Moderation Effect of Self-Efficacy on the Relationship Between Uncertainty and Fear

Model		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	t	
1	(Constant)	2.300	0.053		43.072	.000
	Uncertainty (centered)	0.154	0.054	0.215	2.844	.005
	Self-Efficacy (centered)	0.052	0.054	0.073	0.964	.336
	Interaction: Uncertainty*Self-Efficacy (both centered)	-0.061	0.057	-0.082	-1.074	.284

a. Dependent Variable: Fear

Effect of ‘Response Efficacy Towards Covid-19’ on the Relationship Between ‘Risk Perception of Covid-19’ and ‘Fear of Covid-19’

According to the results (Table 4), the fit of the regression model was found to be nonsignificant [$F(3,168) = 2.46, p = .06$] with a low adjusted R-squared of .02. Whilst ‘risk perception of covid-19’ was found to be a significant predictor of ‘fear of covid-19’ in the

model ($\beta = 0.13, p = .02$), ‘response efficacy towards covid-19’ was not found to be a significant predictor ($\beta = 0.03, p = .61$). Hypothesis 5 was rejected since the interaction effect was also found to be insignificant ($\beta = 0.06, p = .26$) and the relationship between ‘risk perception of covid-19’ and ‘fear of covid-19’ was not moderated by ‘response efficacy towards covid-19’ (Figure 4).

Table 4

Moderation Effect of Response Efficacy on the Relationship Between Risk Perception and Fear

Model		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	t	
1	(Constant)	2.295	0.054		42.489	.000
	Risk Perception (centered)	0.129	0.054	0.180	2.371	.019
	Response Efficacy (centered)	0.028	0.054	0.039	0.518	.605
	Interaction: Risk Perception*Response Efficacy (both centered)	0.057	0.051	0.086	1.133	.259

a. Dependent Variable: Fear

Effect of ‘Self-Efficacy Towards Covid-19’ on the Relationship Between ‘Risk Perception of Covid-19’ and ‘Fear of Covid-19’

The results (Table 5) of the last analysis indicate a nonsignificant fit of the regression model [$F(3,168) = 2.38, p = .07$] with a low adjusted R-squared of .03. Although ‘risk perception of covid-19’ was found to be a significant predictor in the model ($\beta = 0.13, p = .02$), ‘self- efficacy towards covid-19’ was not found to be a significant predictor ($\beta = 0.05, p = .32$). Based on this and the fact that the interaction between the variables was found insignificant ($\beta = 0.03, p = .62$), hypothesis 6 was rejected. The relationship between ‘risk perception of covid-19’ and ‘fear of covid-19’ was therefore not moderated by ‘self-efficacy towards covid-19’ (Figure 4).

Table 5

Moderation Effect of Self-Efficacy on the Relationship Between Risk Perception and Fear

Model		Unstandardized Coefficients		Standardized Coefficients	
		B	Std. Error	Beta	t
1	(Constant)	2.302	0.054		45.752
	Risk Perception (centered)	0.133	0.055	0.186	2.433
	Self-Efficacy (centered)	0.054	0.054	0.076	0.998
	Interaction: Risk-0.030 Perception*Self-Efficacy (both centered)	0.060	0.060	-0.038	-.501
					.617

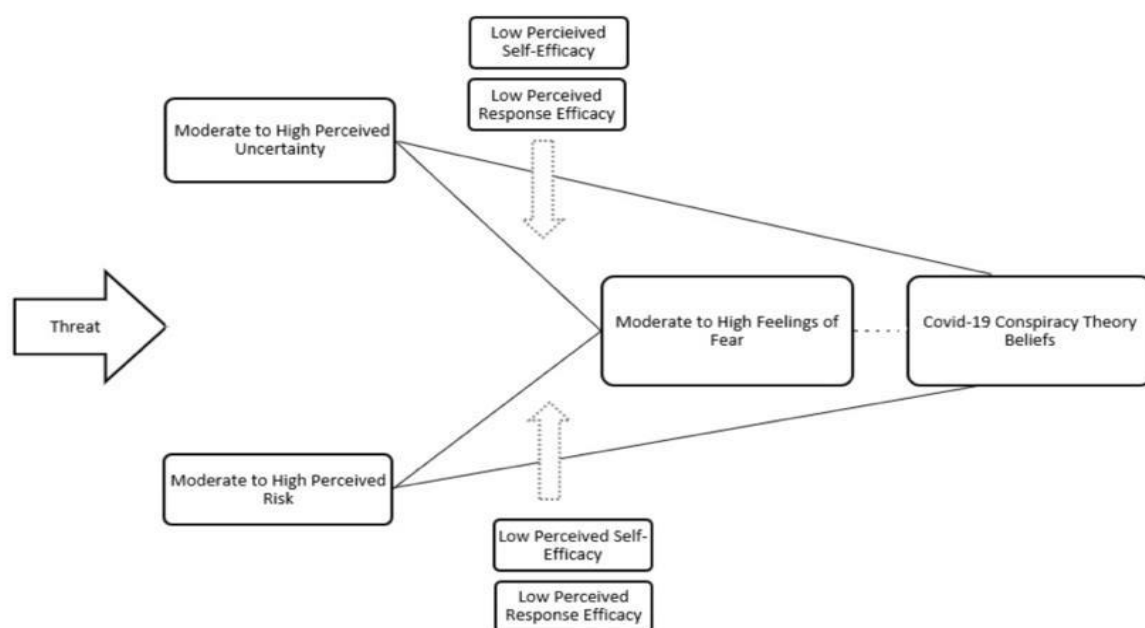
a. Dependent Variable: Fear

Testing the Extended Parallel Processing Model Applied to Covid-19

For the sake of clarity and ease of comprehension, figure 4 illustrates the results of the hypotheses in the tested Extended Parallel Processing Model Applied to Covid-19. More details on these results will be given in the ‘discussion’ section of this research.

Figure 4

Results of Testing the Extended Parallel Processing Model Applied to Covid-19



Solid Arrow: Significant Path; Dashed Arrow: Insignificant Path.

Additional Analysis

Since the factor analysis indicated that the construct ‘covid-19 conspiracy theory beliefs’ measured two factors, the items were split into two new constructs according to their factor loadings. One construct included items that related to covid-19 denial and the other construct included items that related to covid-19 conspiracy theories that involve plots of powerful actors. An additional Pearson correlation analyses was conducted to test whether the constructs relate to ‘fear of covid-19’. Neither covid-19 denial was found to be significantly correlated with ‘fear of covid-19’ ($r = -.10$, $n = 172$, $p = .21$), nor covid-19 conspiracy theories that concerned plots of powerful actors ($r = -.12$, $n = 172$, $p = .12$).

Socio-Demographic Statistics

To test for significant differences between respondents with different genders, an independent t-test was conducted. The results (Appendix B, Table B1) indicate that males and females scored similarly high in ‘response efficacy towards covid-19’ and similarly low in ‘covid-19 conspiracy theory beliefs’. Both genders also scored in the upper middle of the scale in terms of ‘uncertainty about covid-19’. Females ($M = 3.1$, $SD = 0.7$) scored significantly higher in ‘risk perception of covid-19’ than males ($M = 2.8$, $SD = 0.9$), $t(115.52) = -2.06$, $p = .04$. Females ($M = 2.5$, $SD = 0.7$) further reported significantly higher scores in ‘fear of covid-19’ compared to males ($M = 1.99$, $SD = 0.6$), $t(169) = -4.79$, $p < .01$. In fact, females’ scores laid in the middle of the scale whilst males’ ‘fear of covid-19’ scores laid slightly below medium. In ‘self-efficacy towards covid-19’ scores, females ($M = 4.4$, $SD = 0.6$) also scored significantly higher compared to males ($M = 4.1$, $SD = 0.9$), $t(95.52) = -2.21$, $p = .03$.

The results of the Pearson correlations (Appendix B, Table B2) indicate no significant relationships between age and ‘risk perception of covid-19’, ‘fear of covid-19’, ‘self-efficacy towards covid-19’ and ‘covid-19 conspiracy theory beliefs’. Besides this, a significant negative correlation between age and ‘uncertainty about covid-19’ was found ($r = -.21$, $p < .01$). ‘Response efficacy towards covid-19’ and respondents’ ages were also significantly negatively related ($r = -.17$, $n = 172$, $p = .03$). The results of the descriptive analyses suggest that the data of this sample is not entirely independent from the respondents’ socio-demographics, which will be reviewed in the discussion.

Discussion

General Discussion

The adoption of covid-19 conspiracy theory beliefs became a highly prevalent phenomenon during the current pandemic. Since individuals who hold such beliefs may be more

likely to spread the virus (Bierwiazzonek et al., 2020; Romer & Jamieson, 2020), reducing these beliefs may assist in slowing down the transmission of the virus. Scientists and governments consequently became interested in finding answers for the underlying reasons of covid-19 conspiracy theory beliefs. Therefore, the aim of this study was to answer the following research question: What psychological factors determine to what extent young adults believe in covid-19 conspiracy theories?

Mediating Effect of Fear of Covid-19

To test whether the Extended Parallel Processing model may be applicable to the context of covid-19, the first goal of this research was to measure whether perceived uncertainty and perceived risk of the virus would stimulate feelings of fear, which then in turn stimulate covid-19 conspiracy theory believing. Contradicting the Extended Parallel Processing Model Applied to Covid-19, the results of this study showed no support for the mediating role of fear in the context of covid-19.

Whilst these results could indicate that the model may generally be unsuitable in the covid-19 context, Šrol et al. (2021) offer an alternative explanation. The researchers found not all covid-19 conspiracy theories to be associated with increased fear. In particular, they found fear to be more prevalent among individuals who believe in conspiracy theories concerning powerful actors who engage in plots. This means that individuals who for example believe that the virus was made up by the government are more fearful than individuals who believe that covid-19 does not exist. Thereby, conspiracy theories that involve denial, such as claiming that the virus is not dangerous or does not exist, may act as a coping strategy to reduce fear (Šrol et al., 2021). It is noteworthy that approximately half of the items that measured covid-19 conspiracy theory believing in this study concerned denial. The factor analysis of the covid-19 conspiracy theory beliefs scale offered support for potential differences between these two types of conspiracy theory beliefs. More specifically, all items related to powerful actors loaded on one factor, whilst all items related to denial loaded on a second factor. If the findings by Šrol et al. (2021) hold true, the items may have been in conflict whilst measuring fear. Whilst the items that involved actors may have had higher fear scores, the other items may have decreased these fear scores. As a consequence, the results of the mediation analyses may have been different with a set of items that exclusively focuses on conspiracy theory beliefs involving powerful actors.

To get a first glimpse on this issue, a Pearson correlation was conducted to see how the denial and actor items related to fear. This analysis failed to support the findings of Šrol et al. (2021) as neither denial nor actor conspiracy items significantly correlated with fear of covid-19. These results are nevertheless insufficient to reject the possibility of potential differences

between these two types of conspiracy theory beliefs and their impact on fear. Future research should come up with separate denial and actor conspiracy theory scales and assure good psychometrical fit in order to draw conclusions on the issue. This is necessary to test whether the Extended Parallel Processing Model (EPPM) may work in the context of covid-19 conspiracy theories that exclusively concern plots by powerful actors.

The scale that was used to measure fear of covid-19 in this study may offer an alternate explanation for the results. The factor analysis indicated that the fear of covid-19 construct loaded on two different constructs, namely fear of personal contamination with the virus and fear of covid-19 in general. Upon reflection of the items that load on the fear of personal contamination construct, it seems likely that these items are more similar to the risk perception of covid-19 items than to the general fear of covid-19 items. If this is the case, it is possible that only the items that relate to general fear of covid-19 account for fear of covid-19. Since only two items loaded on the general fear of covid-19 construct and the Cronbach's alpha of the total fear of covid-19 scale was only found to be acceptable, low reliability of the fear of covid-19 scale is indicated. Having only two items that account for the fear of covid-19 construct may further limit the generalizability of the results. Taking this into account, it is possible that the psychometric fit of the scale itself may have been insufficient and therefore failed to find a mediation effect of fear. Drawing conclusions on whether fear mediates the relationship between uncertainty about covid-19/risk perception of covid-19 and covid-19 conspiracy theory beliefs should thus be treated with caution. Future research should measure fear of covid-19 with a scale that focuses exclusively on items that relate to general fear of covid-19 in order to shed light into the role of fear on covid-19 conspiracy theory believing.

Direct Relationships

Direct relations were found between uncertainty about covid-19/risk perception of covid-19 and covid-19 conspiracy believing. To begin with, respondents who scored high in uncertainty about the virus were more likely to adopt covid-19 conspiracy theories. This finding provides further evidence for Miller (2020), who also found a direct positive relationship between uncertainty and covid-19 conspiracy believing. It may also extend on the idea of van Prooijen and Douglas (2017), who found conspiracy theory beliefs to act as coping strategies in uncertain situations. The finding may thus demonstrate that this could be applicable in the context of covid-19. This would mean that individuals may adopt covid-19 conspiracy theory beliefs in order to cope with their uncertainty and to make sense of their environment. This claim may be supported by the finding that respondents who felt uncertain about covid-19 and perceived it to be a high risk tended to be more fearful of the virus.

Secondly, results of this study showed that risk perception negatively related to covid-19 conspiracy theory beliefs. This means that respondents who perceive the virus to be a moderate to high risk may be less likely to adopt covid-19 conspiracy theory beliefs and vice versa. This finding of a negative relationship is in contradiction with recent studies (Kim & Kim, 2021; Šrol et al., 2021), despite concurring on a direct relationship between the variables. There are several reasons which may explain this contradicting finding. Compared to the result of Kim and Kim (2021) and Šrol et al. (2021), the methods used in this this research differed. In fact, these studies measured risk perception with two to three items only, which may have led to questionable reliability of their constructs and limited generalizability of their results. The items by Šrol et al. (2021) also measured covid-19 as a general risk and not as a perceived personal risk. The psychological differences between different types of covid-19 conspiracy theories, which were pointed out by Šrol et al. (2021), may also play a role here. As half of the items of the covid-19 conspiracy theory scale concerned denial of the virus, a negative relationship between perceived risk of covid-19 and covid-19 denial conspiracy theory beliefs is reasonable. Believing in denial conspiracy theories may act as a coping strategy, thus reducing one's risk perception of the virus. It is therefore crucial to consider that the results of this correlational study do not prove causality. In other words, it cannot be established whether risk perception of covid-19 causes covid-19 conspiracy believing or whether covid-19 conspiracy believing causes risk perception of covid-19. This way, the possibilities that high covid-19 risk perception may alternatively reduce risk perception and vice versa cannot be excluded. Nevertheless, no clear conclusions can be drawn as the other items of the covid-19 conspiracy believing scale concerned plots by powerful actors. Similar to the mediation analyses, the mixed covid-19 conspiracy scale that was used in this research, consisting of both conspiracy theory types, may have been conflicting.

The correlation analyses found a direct, negative relationship between efficacy and covid-19 conspiracy believing. Consequently, individuals who believe their self-efficacy or response efficacy towards the virus to be high may be less likely to adopt covid-19 conspiracy theory beliefs. This is in line with a similar research finding by Mækelæ et al. (2020), who found low levels of efficacy towards governmental covid-19 measures to be associated with increased paranoia scores. Respondents who believed response efficacy towards the virus to be higher were also more likely to perceive their self-efficacy towards covid-19 to be higher and vice versa, which indicates that both constructs account for general efficacy.

Moderating Effect of Efficacy

The results of the moderation analyses found no evidence for efficacy to moderate the

relationship between uncertainty about covid-19/risk perception and fear of covid-19. Neither response efficacy nor self-efficacy did therefore affect the strength of the relationship between uncertainty about covid-19/risk perception and fear of covid-19. These results are interesting since this study is, to the best of the researcher's knowledge, the first to measure these precise relationships in the context of covid-19.

General Findings and Socio-Demographics

The tendency to believe in covid-19 conspiracy theories was generally low among young adults. Although the respondents felt moderately uncertain about covid-19 and perceived the virus to be a medium risk, they perceived the efficacy towards the virus as high. This suggests that young adults feel able to prevent themselves and others from getting infected but nonetheless perceive the virus as moderately threatening. Based on the EPPM, individuals who perceive a threat as moderate to high but also perceive the efficacy as high, are less likely to adopt conspiracy theory beliefs (Witte, 1992). These findings may therefore explain why the overall tendency to believe in covid-19 conspiracy theory beliefs was low.

Females in particular were found to be more fearful of covid-19 and perceived the virus to be a higher risk, which is in line with recent research findings (Al-Rahimi et al., 2021; Broche-Perez et al., 2020; Nino et al., 2021). They also perceived their self-efficacy towards the virus as higher, which is also in agreement with prior research findings (Jahangiry et al., 2020). These findings point towards the usefulness of gender-tailored interventions that may prevent the adoption of covid-19 conspiracy theories. With regards to age, younger respondents reported higher levels of uncertainty about covid-19 and higher levels of response efficacy. Nevertheless, it should be considered that the age differences between the respondents were rather small and interpreting these differences should hence be treated with caution.

Limitations and Recommendations for Further Research

It is plausible that a number of limitations might have influenced the obtained results. The data of this research was collected in 2021, thus over a year after covid-19's first appearance in 2019. During this time, various strategies were found to effectively prevent contamination with the virus, such as frequent hand washing, using disinfectants or wearing face masks. It is therefore likely that individuals perceived the efficacy towards the virus as higher compared to covid-19's initial phase, since they knew how to prevent themselves from getting infected. For instance, people may know that face masks proved as effective prevention strategy in the past and may therefore feel more confident in being able to prevent themselves from getting contaminated. The place of this study should also be considered. This research was conducted in the Netherlands, a country which offered wide access to prevention tools,

such as face masks. An individual who resides in the Netherlands may therefore perceive their ability to access prevention tools as easy, which may increase their efficacy perception. These limitations underline the difficulty of collecting and comparing data in the complex, dynamic context of covid-19. Comparing findings from different countries should be treated with caution, as a variety of factors differ, such as number of cases, governmental actions and societal influences.

Another limitation concerns the sampling method that was used in this study. Since respondents were recruited based on convenience and snowball sampling, the majority of young adults were university students and therefore had a high level of academic background. Previous research proposes that individuals with a high educational level have a higher efficacy towards the virus (Jahangiry et al., 2020), are less fearful of covid-19 (Sahu et al., 2021) and are less likely to adopt general conspiracy theory beliefs (van Prooijen, 2017). If the aforementioned research findings hold true, it is probable that the results of this research may differ in a more diverse sample. The efficacy perceptions were generally high in the highly educated sample of this study. A more diverse educational background may lead to lower efficacy perceptions. This may influence the fit of the model since Witte (1992) proposed that efficacy is crucial in determining individuals' responses to a threat. More specifically, it was found that findings become inconsistent when too little emphasis is put on the efficacy construct (Witte, 1992). In this case, it could be argued that the non-diverse sample may have hindered a good fit of the model because the efficacy scores were generally high. It is therefore possible that the moderation effects of efficacy may be confirmed in a more diverse sample. Taking the findings of Sahu et al. (2021) into account, who suggest that less educated individuals are more fearful of covid-19, it is likely that a more diverse sample may have higher levels of fear. Fear of covid-19 may thereby significantly mediate the relationship between uncertainty about covid-19/risk perception and covid-19 conspiracy theory beliefs. Although respondents in this study were moderately fearful of the virus, the levels of fear may have been too low to support its hypothesized mediating role. These considerations highlight that comparability between education and its impact on efficacy, fear and covid-19 conspiracy believing is limited. Future research should include a sample with a diverse educational background to assess whether the EPPM may be applicable in that context.

Further significant differences between age and gender were found. This is another indication that the results of this study may not be generalizable to the whole population of young adults. Additional research is needed to get clearer insight into the socio-demographic differences and its implications on covid-19 conspiracy believing among young adults.

As reported above, the correlational analyses could not provide evidence for the causality of the relationships between uncertainty about covid-19/risk perception of covid-19 and covid-19 conspiracy believing. In order to establish causality, future research should examine these relationships with the use of experimental manipulations.

Conclusion and Implications

The results of this study found a direct negative relationship between efficacy towards covid-19 and covid-19 conspiracy theory beliefs. This suggests that young adults were less likely to adopt covid-19 conspiracy theory beliefs if they perceived their self-efficacy and the response efficacy to be high. Direct relationships between uncertainty about covid-19/risk perception of covid-19 and covid-19 conspiracy theory beliefs were also found. Respondents who felt more uncertain about the virus were more likely to adopt conspiracy theory beliefs. Contrary, respondents who perceived covid-19 to be a high risk were less likely to adopt these beliefs. However, it must be considered that these correlations do not prove causality. According to recent research findings (Šrol et al., 2021; van Prooijen & Douglas, 2017), it is probable that covid-19 conspiracy theory beliefs may act as a coping mechanism and may thus reduce perceived risk of the virus. Contradicting the EPPM, fear was not found to mediate the relationships between uncertainty about covid-19 nor risk perception of covid-19, and covid-19 conspiracy theory beliefs. Moreover, efficacy did not moderate the relationship between uncertainty about covid-19/risk perception of covid-19 and fear of covid-19.

The findings of this study are valuable in multiple ways, as reducing the spread of covid-19 conspiracy theory beliefs may play a key role in fighting the pandemic due to these beliefs being related to higher transmission rates of the virus (Bierwiazek et al., 2020; Romer & Jamieson, 2020). Hence, it is of utmost importance to fully understand the psychological determinants of covid-19 conspiracy theories in order to prevent individuals from adopting these beliefs. This research advises interventions with the aim of decreasing young adults' perceived uncertainty and increasing perceived efficacy towards covid-19, as these may be key aspects in preventing covid-19 conspiracy theory believing. Since results about the role of risk perception of covid-19 and fear of covid-19 were less clear, additional research is needed to draw conclusions on how these psychological factors determine covid-19 conspiracy theory beliefs. This study recommends future research to assess whether tailoring prevention methods to different factors, such as gender and educational background, may enhance the effectiveness of such interventions. If these interventions prove successful, we may be one step closer to ending the covid-19 pandemic.

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Appendix A

Table A1

Items of the Questionnaire, Items Reliability, KMO, Factor Validity and Their Research Origin (n=172)

Construct	and	Items	Factor		Research origin
Cronbach's alpha			1	2	
Uncertainty about Covid-19		1. I am unsure how to deal with a fever, cough or other symptoms**	.34		Adapted and adjusted from Wu et al. (2021)
$\alpha = .68$					
KMO = .69		2. The effectiveness of the treatments or medications covid-19 patients are receiving is undetermined (not yet known)		.70	
Two-dimensional scale		3. The transmission route of Covid-19 is unclear		.77	
		4. There are so many different opinions about the prognosis of Covid-19		.76	
		5. Because of the unpredictability of the Covid-19 outbreak, I cannot plan for the future	.59		
		6. Because of the Covid-19 outbreak, what I can do and cannot do is in flux	.35	.47	

	7. I am unsure when the outbreak of Covid-19 will end	.88	
	8. I am unsure when social normal order will return	.85	
	<i>(1=strongly disagree, 5=strongly agree)</i>		
Risk perception of Covid-19	1. What is your gut feeling about how likely you are to get infected with Covid-19? <i>(1=extremely unlikely; 5=extremely likely)</i>	.87	Adapted and adjusted from Jaspal et al. (2020)
$\alpha = .81$	2. I am sure I will NOT get infected with COVID-19* <i>(1=strongly disagree; 5=strongly agree)</i>	.73	
KMO = .83	3. I feel I am unlikely to get infected with COVID-19* <i>(1=strongly disagree; 5=strongly agree)</i>	.80	
Unidimensional scale	4. I feel vulnerable to COVID-19 infection <i>(1=strongly</i>	.47	

	<i>disagree; 5=strongly agree)</i>		
	5. Picturing myself getting COVID-19 is something I find: (1=very hard to do; 5=extremely easy to do)	.57	
	6. I think my chances of getting infected with COVID-19 are: (1=very low; 5=very large)	.87	
Fear of Covid-19	1. It makes me uncomfortable to think about Covid-19	.90	Adapted and adjusted from Ahorsu et al. (2020)
$\alpha = .61$	2. I am not afraid of losing my life because of Covid-19*	.70	
KMO = .66	3. When watching news and stories about Covid-19 on social media, I become nervous and anxious	.71	
Two-dimensional scale	4. I cannot sleep because I am worried about getting Covid-19	.74	
	5. My heart races or palpates when I think	.80	

about getting Covid-19

(1=strongly disagree, 5=strongly agree)

Response efficacy towards Covid-19 $\alpha = .78$ KMO = .73 Unidimensional scale	1. Regular hand washing prevents Covid-19	.62
	2. I believe that by disinfecting the surfaces, I am less likely to get Covid-19	.72
	3. Doing health recommendations (e.g. keeping 1.5-meter distance, working from home if possible) is effective in killing Covid-19	.74
	4. If everyone in the community follows the principles of home quarantine and stays at home, the Covid-19 cycle will be broken	.69
	5. I think doing necessary health recommendations	.82

Adapted and adjusted from Shirahmadi et al. (2021)

works in preventing
Covid-19

(1=completely
disagree,
5=completely agree)

Self-efficacy towards Covid-19 $\alpha = .67$ KMO = .76 Unidimensional scale	1. It is easy for me to use disinfectants	.85	Adapted and adjusted from Shirahmadi et al. (2021)
	2. I think it is easy for me to wash my hands regularly	.83	
	3. It is difficult for me to access masks and disinfectants**		
	4. I believe that disinfecting the surfaces and goods is easy for me	.81	
	5. It is easy for me to consider health recommendations outside the home	.62	

(1=completely
disagree,
5=completely agree)

Covid-19 conspiracy theory beliefs $\alpha = .80$ KMO = .84	1. Covid-19 does not exist for real	.39	.44	Adapted and adjusted from Constantinou et al. (2021)
	2. Covid-19 was created in a laboratory by scientists	.85		

Two-dimensional scale	3. Deaths in countries like Italy, US, and Spain are lower than reported in the media	.44
	4. Nobody has died from Covid-19	.47
	5. Individuals who died where those who would soon die anyway	.94
	6. Covid-19 and other viruses such as Ebola were created for population control	.92
	7. The ultimately goal of Covid-19 is to chip us with the vaccine	.73
	8. Most countries' presidents are in a conspiracy to keep us locked at home so they can pass unwanted policies	.71

*(1=strongly disagree,
10=strongly agree)*

Covid-19 beliefs (Distractor items, excluded from data analysis)	1. Covid-19 does exist for real
	2. The virus is most likely to have started

at a wet market in
China

3. The virus is most
likely to have
originated from bats

4. Social distancing
reduces the
likelihood of
spreading the virus
from person to person

5. The virus is
naturally occurring

6. Most countries'
presidents use
politics to safeguard
citizens' health

(1=strongly
disagree,
10=strongly agree)

*= Reverse coded items

**= Excluded items due to reliability and validity issues

Table A2

Informed Consent Before the Start of the Questionnaire

Consent form for participation in a survey about young adults' beliefs concerning Covid-19

Description of the research

You are being invited to participate in a research study conducted by Louisa Peters. The aim of this research is to assess and better understand to what extent psychological factors determine young adults' beliefs about Covid-19. It will take you approximately 10 to 15 minutes to complete. Your participation will involve answering several survey questions. I would further

like to get some demographics of you, such as information about your age or your country of residence. Please try to answer each question honestly.

Risks and discomforts

We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a breach is always possible. If the thought of answering questions concerning covid-19 makes you feel uncomfortable, you are welcome to end the survey now. If you feel any type of discomfort during your participation, you may discontinue the survey at any given time without having to state your reasoning. Moreover, you are free to omit any question. Your participation in this research study is entirely voluntary. You may also contact the researcher (l.peters-2@student.utwente.nl) or the Secretary of the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences of the University of Twente (ethicscommittee-bms@utwente.nl) about your concerns.

Protection of confidentiality

To the best of our ability your answers in this study will remain confidential. We will minimize any risks by assuring that your participation in this study is anonymous, as no information will be collected that would allow personal identification.

Contact information

If you have any questions or concerns about this study, if any problems arise or if you have any questions or concerns about your rights as a research participant, please contact l.peters-2@student.utwente.nl

Contact information for questions about your rights as a research participant

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher, please contact the Secretary of the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences at the University of Twente through the following email address: ethicscommittee-bms@utwente.nl

Participation requirements

To assure that you will be able to fully understand the content of this questionnaire, you need to possess a sufficient level of proficiency in the English language. Moreover, you need to be at least 18 years old in order to participate.

Consent

I confirm that I have read the consent information and decide to participate.

I further confirm that I possess a sufficient level of English proficiency and that I am at least 18 years old.

- ☐ I agree
- ☐ I disagree

Table A3

Informed consent at the end of the questionnaire

Important note

At the beginning of the survey, you were told that the aim of this research was to assess psychological factors that determine young adults' beliefs about Covid-19. In fact, the aim of this research is to assess psychological factors that determine young adults' beliefs in Covid-19 conspiracy theories. The real aim of this research was not revealed before completion to prevent your responses from being influenced by personal dispositions.

You will be asked again for your consent. If you changed your mind and if you want to withdraw from this study, feel free to do so. In that case, your data will be excluded and deleted.

Consent

After knowing the real aim of this study, I confirm that I consent with the processing of my responses.

- ☐ I agree
- ☐ I disagree

Appendix B

Table B1

Mean Score, Standard Deviation and Independent t-tests of Respondents Concerning Gender

<i>Gender</i>	<i>Males</i>	<i>Females</i>	<i>Independent t-test</i>
	<i>N=65</i>	<i>N=106</i>	

<i>'Uncertainty about covid-19'</i>	<i>M=3.55</i> <i>SD=0.50</i>	<i>M=3.65</i> <i>SD=0.54</i>	<i>F=1.20, Sig.=.27</i> <i>t(169)=-1.16</i> <i>Sig.(2-tailed)=.249</i>
<i>'Risk perception of covid-19'</i>	<i>M=2.84</i> <i>SD=0.86</i>	<i>M=3.10</i> <i>SD=0.70</i>	<i>F=5.58, Sig.=.02</i> <i>t(115.520)=-2.06</i> <i>Sig.(2-tailed)=.04</i>
<i>'Fear of covid-19'</i>	<i>M=1.99</i> <i>SD=0.56</i>	<i>M=2.50</i> <i>SD=0.73</i>	<i>F=3.70, Sig.=.06</i> <i>t(169)=-4.79</i> <i>Sig.(2-tailed)=.00</i>
<i>'Response efficacy towards covid-19'</i>	<i>M=3.87</i> <i>SD=0.78</i>	<i>M=3.96</i> <i>SD=0.64</i>	<i>F=1.64, Sig.=.20</i> <i>t(169)=-.844</i> <i>Sig.(2-tailed)=.40</i>
<i>'Self-efficacy towards covid-19'</i>	<i>M=4.11</i> <i>SD=0.87</i>	<i>M=4.38</i> <i>SD=0.55</i>	<i>F=5.59, Sig.=.02</i> <i>t(95.523)=-2.21</i> <i>Sig. (2-tailed)=.03</i>
<i>'Covid-19 conspiracy theory beliefs'</i>	<i>M=2.77</i> <i>SD=1.79</i>	<i>M=2.37</i> <i>SD=1.21</i>	<i>F=4.97, Sig.=.03</i> <i>t(100.183)=1.57</i> <i>Sig.(2-tailed)=.12</i>

Missing value: 1

Table B2

Pearson Correlation of Respondents Concerning Age

<i>Age</i>	<i>Pearson correlation</i>
<i>N=172</i>	
<i>'Uncertainty about covid-19'</i>	<i>-.209</i> <i>Sig.:.006</i>
<i>'Risk perception of covid-19'</i>	<i>-.069</i> <i>Sig.:.369</i>
<i>'Fear of covid-19'</i>	<i>.077</i> <i>Sig.:.314</i>
<i>'Response efficacy towards covid-19'</i>	<i>-.165</i> <i>.Sig.:.031</i>

<i>'Self-efficacy towards covid-19'</i>	<i>-.017</i> <i>Sig.:.826</i>
<i>'Covid-19 conspiracy theory beliefs'</i>	<i>.134</i> <i>Sig: .079</i>
