The Dutch case of public compliance to government measures during the COVID-19 pandemic

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Preface

Before you lies the master thesis "The Dutch case of public compliance to government measures during the COVID-19 pandemic", the basis of which is a survey on demographic factors, trust in government institutions, personality traits and compliance behaviour. It has been written to fulfil the graduation requirements of the master program Crisis and Security management of the faculty of Global and Public Affairs at the University of Leiden. I was engaged in researching and writing this dissertation from April to July 2020.

For me, it was a logical choice to use the unique COVID-19 situation as my research subject. Because of the influenza pandemic, I did not want to be dependable on third parties for my data collection. Therefore, I choose to switch from qualitative to quantitative. I was less familiar with quantitative research, and because of that, I can argue that I enjoyed learning the concepts and methods.

I want to thank my supervisor's Assistant professor Tommy van Steen and Assistant professor James Shires, for their excellent guidance and support during this process. I also thank all respondents, who found the time to fill in the survey that formed the basis of this research project. I also benefitted from debating issues with my two housemates, Daan Konings and Michiel Timmers, thanks for the support.

To my father I would like to say, thank you for all the support you gave me. Also, thanks for your wise counsel and kind words which have, as always, and still, serve me well. Sonia Massot Balletbó deserves a particular note of thanks: if I ever lost interest, you kept me motivated. Lastly, I would like to thank Hubert Kirch for providing general feedback on the draft version.

I hope you enjoy your reading.

Nick Albericus Antonius Hoogedoorn

The Hague, July 8, 2020

Abstract

By no other known crisis is the effectiveness of mitigation measures so dependable on the public's compliance as in an influenza pandemic. Research has shown that attitudes as perceived threat and self-efficacy influence compliance behaviour. Risk assessment represents a synthesis of judgment and science controlled by psychological, social, political and cultural factors. This study aims to fill a gap in knowledge on the subject predictors of citizens compliance behaviour with mitigation measures during an influenza pandemic. Building on existing work on compliance behaviour with health promoting measures, it asks: Do the concepts trust in government institutions, personality traits, and demographic variables predict public compliance behaviour with COVID-19 mitigation measures during the pandemic in the Netherlands? In this context, compliance is defined as the extent to which people, due to the pandemic, show health promoting behaviour and adopt the mitigation measures regulated by the government. The mitigation measures are categorised into two subgroups social distancing and personal protective measures.

Based on a review of the literature on influenza pandemic studies, models of health promoting behaviour, an online survey was distributed to the Dutch population. Their data is analysed using a logistical regression method. Analysis of the response demonstrated that people who score high on extraversion are less likely compliant with social distancing measures. Moreover, the demographic factors age and gender both are positively correlated with compliance behaviour. Lastly, individuals living without children comply less likely with personal protective measures compared to people who live with children in their household situation. The results indicate that during an influenza pandemic extravert people tend to engage in risky health behaviour. Furthermore, women and older people feel more vulnerable during an influenza pandemic. On this basis, it is recommended that governments understand the predicting effects of compliance behaviour in order to maximise the effectiveness of their crisis management strategy, now and in future influenza pandemics. The results of this study are especially relevant for Dutch society and their reflection on the Dutch strategy during the last two-week period of quarantine. Further research is needed to thoroughly understand the underlying effect between the independent variables and compliance.

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Introduction

In the beginning of January 2020, a respiratory virus was identified in China. On the 30th of January, the World Health Organization declares a global emergency (2020). After that moment, the virus spread around the world, and more countries worldwide got affected. The emerging of the influenza disease COVID-19, identified as a Zoonotic coronavirus, has a similar clinical profile to seasonal flu (Liu, Gayle, Wilder-Smith, & Rocklöv, 2020). Respiratory infection diseases (RID's) are a significant public health issue. The best way to deal with them is by prevention or vaccination (Liao et al., 2010). On the 3rd of March, the Dutch government convenes a ministerial crisis management committee (Ministerie van Volksgezondheid, Welzijn en Sport, 2020). The following days the Dutch Ministers decide to introduce non-pharmaceutical mitigation measures to prevent COVID-19 from spreading.

Previous epidemiological studies have identified several active behaviour related measures to stop RID from transmission (Ferguson, Cummings, Fraser, Cajka, Cooley, & Burke, 2006; Blendon, Koonin, Benson, Cetron, Pollard, Mitchell, & Herrmann, 2008). These studies are mainly related to the earlier H1N1 outbreak and the outbreak of SARS (Prati, Pietrantoni, & Zani, 2011). The effectiveness of these preventive measures is beyond a country's organisational capabilities. In no other known crisis is the effectiveness of mitigation measures so dependable on citizens compliance behaviour as with a pandemic.

Scholars researched the H1N1 outbreak in 2005 and 2009 (Gilles, Bangerter, Clémence, Green, Krings, Staerklé, & Wagner-Egger, 2011; Podlesek, Roskar, & Komidar, 2011), the SARS outbreak in 2009 (Lippi & Plebani, 2020) and the HIV and AIDS infection disease crisis (Napper, Reynolds, & Fisher, 2010). Risk perception is subjective, attitudes, trust in authorities, and even personalities predict compliance with health promoting behaviour (Slovic, 1999; Gilles et al., 2011; Prati, Pietrantoni, & Zani, 2011; Jerram & Coleman,1999).

Taking into account there is no vaccine against COVID-19, RID transmission strongly influences governmental non-pharmaceutical preventive measures (Liao et al., 2010; Ferguson et al., 2006). Therefore, public compliance is a critical factor within an authority's crisis management strategy. Compliance in this context defines health promoting behaviour. Champion and Skinner's (2008) model of Health Promoting Behaviour offers an understanding of how individuals show compliance by looking at their attitudes. Scholars studied the relation of demographic variables, trust and also personality towards health promoting behaviour. However, COVID-19 offers a contextual condition that is so unique that research on this topic is necessary to create new insights on predictors of health promoting behaviour.

Research objective

This research aims to fill a gap in knowledge on the subject of citizens compliance behaviour with mitigation measures during an influenza pandemic. The research focusses on a better understanding of how demographic factors, trust in government institutions, and personality traits predict compliance behaviour with mitigation measures.

Research question

The main research question derived from the literature study is the following:

Do the concepts trust in government institutions, personality traits, and demographic variables predict public compliance behaviour with COVID-19 mitigation measures during the pandemic in the Netherlands?

Relevance of study

This study will be relevant from an academic and societal perspective. Pandemics are challenging to simulate. Therefore, COVID-19 offers the opportunity to do research in a unique context. The insights of this cross-sectional survey will build upon existing research done during previous pandemics. This research will support efforts to develop models for incorporating affective, cognitive, and social-contextual predictors of compliance with recommended behaviours. The results of this particular study are relevant for Dutch society as such. There is no research known that touches upon citizens behaviour during a pandemic within Dutch society. Furthermore, from an academic perspective, this study mainly contributes to a better understanding of how trust in government institutions, personality traits and demographic factors affect public compliance. The concept of personality is researched quite well. However, little is known about the relationship of personality with health promoting behaviour during an influenza pandemic.

A better understanding of public compliance is especially necessary for society as a whole. Gilles et al. (2011) found that public trust and compliance during pandemics are a critical determinant of vaccination behaviour. Vaccinating people is the best remedy against an influenza pandemic, and therefore a better understanding of compliance is essential. The two-wave longitudinal survey study of Gilles et al. (2011) is one in its kind. More research is needed, and therefore, this study will touch upon a better understanding of how trust in government institutions predict compliance behaviour during a pandemic. Pandemics are known for its high mortality rate and spreading's effect. Societies over the world will benefit from a better understanding of how to approach the relationship between government institutions and citizens. Their main objective is preventing the disease from spreading, and public compliance is a crucial factor in this process.

Theoretical framework

The emerging of COVID-19

In December 2019, the SARS-CoV-2 (COVID-19) was detected. The virus origin is linked to the Huanan Wholesale Seafood Market in Wuhan, a city in China (World Health Organization, 2020). The discovered virus is a new strain related to a large family of viruses known as Coronaviruses (CoVs). Other known viruses related to this family are the Severe Acute Respiratory Syndrome virus (SARS) and the Middle East Respiratory Syndrome virus (MERS) (Lippi & Plebani, 2020). Both viruses have a high mortality rate and were discovered in 2003 and 2012 (World Health Organization, 2020). At this moment, little was known about the specific characteristics of the COVID-19 virus. However, beginning research showed a similar high mortality rate as with SARS and MERS (Lippi & Plebani, 2020; Rezaeetalab, Mozdourian, Amini, Javidarabshahi, & Akbari, 2020; World Health Organization, 2020). Furthermore, research estimated that the transmission rate varied between two and seven (MacIntvre, 2020). This transmission rate means that an infectious person will infect between two and seven other persons. The virus spreads through droplets inhalation and potential more modes of transmission (Rezaeetalab, Mozdourian, Amini, Javidarabshahi, & Akbari, 2020). According to the Johns Hopkins University, who keeps track of the virus its development, already more than 10.000.000 people are infected worldwide in 213 different countries. Over 502.000 people lost their lives in the battle against COVID-19. In the Netherlands, the number of confirmed infected cases is more than 50.223, and 6.107 deaths are reported (RIVM, 2020).

Crisis management during a pandemic

In the months after the detection of COVID-19 in December 2019, the World Health Organization characterised COVID-19 as a pandemic on March 11 (World Health Organization, n.d.). An influenza pandemic is a widespread, sudden outbreak of disease that affects a large population (Gilbert, 2009). Pandemics are not uncommon and often differ in severity and magnitude. In the past, there were many moments the world had to deal with influenza pandemics. In 1918 the Spanish Flu, in 2005 the Bird Flu, and 2009 the Swine Flu (Bootsma & Ferguson, 2007; Paek et al., 2008; Gilbert, 2009; SteelFisher

et al., 2012; Rubin et al. 2009). Given the enormous negative economic and social consequences pandemics causes, scholars studied how authorities should approach such a crisis.

Scholars did research on crisis management approaches and formulated theories explaining the different stages crisis management actors go through (Boin, 2009; Hart, Rosenthal, & Kouzmin, 1993; Pearson & Clair, 1998). A crisis means that the functioning of multiple life-sustaining systems is threatened (Pearson & Clair, 1998). Crisis management should offer a systematic approach to the urgent threat that brings a high level of socio- and economic uncertainty (Boin, 2009). In order to carry out a decisive and fast crisis response, government structures change to a more centralised structure of command and control (Hart, Rosenthal, & Kouzmin, 1993). The governmental structure will be more like a "constitutional dictatorship" than a democratic system. Governments need to prevent society from shortages of crucial resources that will increase public pressure further. With limited information about the estimated severity of the virus, governments need to decide how to mitigate the pandemic (Lipsitch et al., 2009).

According to previous studies, it is challenging to maintain a 'life as usual' approach of normality as the virus is a 'hidden' enemy (Gilbert, 2009). Influenza pandemics are known to bring high levels of uncertainties (Ferguson et al., 2006). In the case of COVID-19, no vaccine is available to offer pharmaceutical-related measures. Therefore, authorities are during their crisis management strategy limited to non-pharmaceutical measures such as household quarantine, school and workplace closure, and travel restrictions (Ferguson et al., 2006). During the Spanish Flu pandemic in 1918, research has shown that implementing measures in the early stages reduces the overall mortality rate (Bootsma & Ferguson, 2007). In 2005 during the Bird Flu, researches learned that mitigation measures that limit freedoms of individuals are not fitting society's political, economic, and social values (Paek et al., 2008). The effect of many governmental mitigation measures will be successful depending on public participation (SteelFisher et al., 2012; Rubin et al. 2009). The virus transmitting rate will vary depending on how

well citizens respond to behaviour change, such as washing hands or comply with social distancing measures.

The Crisis management approach of the Dutch government is a systematic attempt to mitigate the spread of the COVID-19 virus to protect Dutch citizens. In the case of the Netherlands, the COVID-19 virus caused the implementation of mitigation measures on a nationwide scale (Ministerie van Algemene Zaken, 2020). Appendix 1 presents an overview of all active measures introduced by the Dutch government during the lockdown.

Behaviour intention and compliance

Everybody is at risk of catching the virus during pandemics. Some will say that the risk for somebody working in the healthcare sector will be more significant than somebody who works from home in isolation. Risk as a concept is complicated as it is inherently subjective (Slovic, 1999). Risk assessment represents a synthesis of judgment and science controlled by psychological, social, political, and cultural factors. Personal attitudes play an important role when people decide to comply with measures of behaviour change (Slovic, 1999). According to the three prominent models, Protection Motivation Theory, Extended Parallel Process Model, and the Health Belief Model, the perceived threat appraisal can predict people's intention to comply with health promoting behaviour (Paek et al., 2008; Champion & Skinner, 2008; Glanz, Rimer, & Viswanath, 2008).

The Health Belief Model gives an understanding of people's health promoting behaviour regarding the prevention and detection of diseases (Champion & Skinner, 2008). The model based on the Cognitive theory of value expectancy can be explained as an individual subjective expectation, 'that the frequency of a behaviour is determined by its consequences' (Champion & Skinner, 2008, p. 46). The model assumes that individuals will value the avoidance of the virus and will comply with measures when that person expects a measure will help in avoidance.

The model has proven that demographic factors influence compliance with health promoting behaviour (Champion & Skinner, 2008). The intervener variables are the attitude factors; Perceived Benefits and Perceived Barriers, Risk factors; Perceived severity and Perceived susceptibility, and the ability factor Self-Efficacy (Champion & Skinner, 2008).

The attitude factors Perceived Benefits and Barriers refer to the belief in the efficacy of the advised behaviour to reduce the risk of impact. The Perceived Barriers refer to the belief about individual psychological and tangible costs of the advised behaviour (Champion & Skinner, 2008). The Perceived Benefits minus the Perceived Barriers provide an individual preferred path of action. The ability factor Self-Efficacy refers to the conviction that one can successfully follow up on the advised behaviour. The risk factor Perceived Threat is the result of the combined outcomes of individuals Perceived Susceptibility and Severity (Champion & Skinner, 2008). Perceived Susceptibility refers to one individual's belief about the likelihood of getting the disease. The Perceived Severity relates to one's belief about how dangerous the disease is. If an individual will be infected, what will then be the medical and social consequences for that individual? Together these two factors are labelled as Perceived Threat and provide an individual with the energy to act (Champion & Skinner, 2008).

The concepts of individual beliefs are intervener variables and directly influence somebody's health promoting behaviour. Other modifying factors such as demographic, sociopsychological, and structural variables directly influence the belief concepts and thus indirectly health promoting behaviour (Champion & Skinner, 2008; Prati, Pietrantoni, & Zani, 2011). Demographic variables such as age, gender, educational level, and household situation are common factors measured by scholars regarding compliance behaviour (Davis et al., 2015; Rubin et al., 2009; Paek et al., 2008; Prati, Pietrantoni, & Zani, 2011). Furthermore, from previous studies, it becomes clear that also employment status, religion, place of residence, ethnical background and general health are variables that influence somebody's behaviour intentions (Blendon et al., 2008; Prati, Pietrantoni, & Zani, 2011; Rubin et al., 2009; Paek et al., 2008). These

factors are also present in the Pandemic Influenza survey developed by the Harvard School of Public Health (Blake, Blendon & Viswanath, 2010).

Not only demographic variables seem to indirectly or directly influence people's health promoting behaviour. Also, trust in government predicts compliance behaviour of the public during an influenza pandemic (Siegrist & Zingg, 2014; Paek et al., 2008; Bangerter, 2014, Gillis et al., 2011). From the literature, it becomes clear that trust influences compliance with health promoting behaviour partly indirectly through self-efficacy, which we know from the HBM (Gilles et al., 2009). However, no causal relationship could be established, mainly because research in times of pandemics are scarce. To continue on this note, scholars did also find that personality could have a predicting effect on public compliance to health promoting behaviour (Coleman, 1997; Sirois & Hirsch, 2015; Jerram & Coleman, 1999; Vollrath, Knoch, & Cassano, 1999). However, little is known about the relationship between personality and compliance under the condition of a pandemic. To understand the predicting effects of demographic variables, trust in government institutions and personality towards public compliance with health promoting behaviour, the following section will offer an overview of how different scholars present these predicting effects. Furthermore, Table 1 presents an overview of the key papers this study uses. The overview gives an understanding of the main conclusions in these articles and how the independent variable affects compliance.

Table 1: Key papers literature

Author	Year	Independent variable/effect	Research methodology	Prediction outcomes
Paek et al.	2008	- Age/indirect - Gender/indirect - Employment/indirect - Trust in government/indirect	Cross-sectional telephone survey	- Older people feel more vulnerable - Women comply more likely with health promoting measures - People with a lower income will show more compliance - Trust is positively associated with compliance through urban areas.
Gilles et al.	2011	- Demographic variables/indirect - Trust in government/indirect - Employment/indirect	Two-wave longitudinal survey	- People feeling vulnerable are positively associated with personal protective behaviours. - A high level of trust is positively associated with personal protective behaviour - People with a lower income will show more compliance
Rubin et al.	2009	- Gender/indirect - Employment/indirect - Household situation/indirect - Ethnical background/indirect - Trust in government/indirect	Cross-sectional telephone survey	- Women comply more likely with health promoting measures - People with a lower income will show more compliance - People living with children will more likely comply - People belonging to a minority will more likely comply - A high level of trust predicts more compliance
Blendon et al.	2008	- Employment/indirect	Cross-sectional survey	- People with a lower income show more compliance

Table 1 continues

Baum, Jacobsen & Goold	2009	- Religion/indirect	Interviews focus groups	-	Religious people will less likely comply with social distancing measures
		- Trust in government		-	Lack of trust in government is associated with less compliance with social distancing measures
Sirois & Hirsch	2015	- Neuroticism	Two-wave	-	Neuroticism is negatively associated with Health promoting behaviour
		- Conscientiousness	longitudinal	-	Conscientiousness is positively associated with HPB
		- Agreeableness	survey	-	Agreeableness is positively associated with HPB
Jerram & Coleman	1999	- Neuroticism	Qualitative	-	Neuroticism is negatively associated with Health promoting behaviour
		- Extraversion	interviews	-	Extraversion is positively associated with HPB
		- Openness		-	Openness is positively associated with HPB
		- Agreeableness		-	Agreeableness is positively associated with HPB
Vollrath, Knoch, & Cassano	1999	- Neuroticism	Cross-sectional	-	Neuroticism is negatively associated with Health promoting behaviour
		- Openness	survey	-	Openness is not associated with any direct or indirect effect with HPB
		- Conscientiousness		-	Conscientiousness is positively associated with HPB
		- Agreeableness		-	Agreeableness is positively associated with HPB
Vollrath & Torgersen	2002	- Extraversion	Cross-sectional survey	-	Extraversion is associated with risky health behaviour

The influence of demographic variables on public compliance behaviour

Different demographic variables shape compliance behaviour with health promoting measures. However, results from previous studies present ambiguity regarding the relationship between the two. Paek et al. (2008), Davis (2015), argue that age affects the perceived threat, specifically perceived susceptibility. Older people feel more vulnerable to an influenza pandemic. Gilles et al. (2011) argue that people who feel more vulnerable are rating personal protective behaviours, like washing hands, as more effective than people who do not feel vulnerable. Gilles et al. (2011) argues that sneezing in the elbow is believed to be more effective among older people than younger people. These scholars conclude that therefore older people are more likely to comply with compliance measures for health promoting behaviour during an influenza pandemic. However, Rubin et al. (2009) also agree on the effect between age and somebodies perceived threat. Only their findings conclude that younger people between the age of 18 and 24 are more likely to comply with compliance measures. However, it is not clear what the cause of this phenomenon is.

Another variable that shapes compliance behaviour is gender. Davis (2015), Rubin et al. (2009) and Paek et al. (2008) all agree that also gender affects somebody's perceived threat. Paek et al. (2008) and Rubin et al. (2009) argue that women are more likely to comply with health promoting behaviour compared with men. However, it becomes from their studies not clear why only women have a different perceived susceptibility. The only scholar that gives a possible explanation is Davis (2015), who argues that the response to the H1N1 pandemic in the year 2009 was associated with gender roles. The management of respiratory illness domestic was mostly feminised. Women were managing respiratory infections of family members while men did not. Associated with this role women were more likely to identify symptoms, where men are more likely to 'soldier on' and face accusations of 'man flu' (Davis, 2015, p. 6).

The third demographic variable is educational level. Rubin et al. (2009) and Paek et al. (2008) both argue that low educated people feel more vulnerable towards an influenza pandemic. Both scholars argue that this is a result of a more perceived susceptible feeling towards a pandemic. Gilles et al. (2011) are ambiguous about this effect. Their study

argues that people who feel vulnerable rate mitigation measures related explicitly to handwashing as more effective. Furthermore, they state that people with a higher education level rate sneezing in the elbow as more effective compared with people with lower educational background. From the literature, it does not become clear how education is predicting compliance behaviour during a pandemic.

Two other critical demographic variables are income and employment. Blendon et al. (2008) argue that compliance is compromised when income or job is at jeopardy. People with a low income are less flexible to comply with social distancing measures if there is a danger of losing income. They prefer to still show up at work because they cannot lose income. Less income means that it will be harder to pay medical bills (Baum, Jacobsen & Goold, 2009; Blendon et al., 2008). On the contrary, Paek et al. (2008), Rubin et al. (2009) and Gillis et al. (2011) argue that people with a lower income feel more vulnerable during an influenza pandemic. Therefore, this vulnerability affects somebody's perceived threat, and therefore people with a lower income would more likely comply with health promoting behaviour.

Other Demographic variables measured by scholars related to public compliance are household situation, ethnical background and religion (Rubin et al., 2009; Blendon et al., 2008; Paek et al., 2008). Rubin et al. (2009) argue that households with children are more likely to comply with compliance measures. Baum, Jacobsen and Goold (2009) argue that due to religious concerns, people who actively participate in religious environments are less likely to follow compliance measures presented by the government. This phenomenon is mainly caused by the fact that during pandemics, religious institutions will not experience mandatory closure. Religious gatherings are essential places for information sharing during times of fear (Baum, Jacobsen & Goold, 2009). There is some ambiguity between scholars regarding the predicting effect of somebody's ethnical background on compliance behaviour. Blendon et al. (2008) argue that racial and ethnical minorities are associated with less compliance due to a lower level of social cohesion. However, Rubin et al. (2009) argue that people belonging to a minority, are more likely to carry out compliance behaviour as they see themselves as more vulnerable.

From the literature it becomes clear that demographic factors can have predicting effects on health promoting compliance behaviour with non-pharmaceutical mitigation measures. Demographic factors influence attitudes such as threat perception, perceived barriers and benefits and self-efficacy, which have a direct effect on health promoting behaviour. Table 1 presents an overview of the influence of demographic factors on compliance behaviour.

The influence of citizens trust in government institutions on public compliance behaviour

According to Gilles et al. (2011), public compliance with government protection measures is not only influenced by demographic variables. Trust in government and medical institutions is, in the case of an influenza pandemic, an indirect predictor of public compliance (Gilles et al., 2011; Paek et al., 2008; Prati, Pietrantoni, & Zani, 2011). The study of Gilles et al. (2011) found that trust increases perceived efficacy of personal protective behaviours like washing hands. They even suggest that public trust is a crucial determinant of vaccination behaviour. Trust seems to affect risk perception and self-efficacy that according to the Health Belief Model, affects health promoting behaviour (Champion & Skinner, 2008). Risk perception is subjective and therefore influenced by attitudes, emotion, and perception (Slovic, 1999). Research has shown that trust is essential for decision making in the presence of a lack of knowledge (Siegrist & Zingg, 2014). The public relies on the information of trustworthy institutions for their decision-making.

Paek et al. (2008) suggest that authorities should reinforce trust-building and personalisation of risk more than focusing on education or publicity. The study also found that people are more pessimistic during a pandemic due to the high level of uncertainty. Furthermore, individuals living in urban areas were more supportive of government measures than compared with individuals living in rural areas (Paek et al., 2008). Rural residents felt more vulnerable and sceptical about getting attention or resources from the government in times of an influenza pandemic.

Siegrist and Zingg (2014) explain in their study how trust influences the way people process information, which eventually will lead to compliance with recommended behaviour. When the source of information can be trusted, people are more likely to adapt their risk perspective. When people distrust the information source, they are more likely to reject the recommendations. People will tend to do the opposite of what this information source is promoting (Siegrist and Zingg, 2014).

Classic studies about risk perception and health behaviour theories poorly define the relationship with trust (Bangerter, 2014). Many research papers about approaching disease outbreaks, do not focus mainly on trust. Paek et al. and Siegrist and Zingg, only explain trust as an effect through classic health behaviour models. However, some scholars argue that trust influences public compliance directly as a predictor. Rubin et al. (2009) found that participants with a higher level of trust in government institutions were more likely to follow recommendation during severe respiratory outreach.

Furthermore, as earlier said, Gilles et al. (2011) found that trust in government institutions is a direct predictor of vaccination behaviour within the context of an influenza pandemic. Siegrist and Zingg present in their article several studies showing a relationship between trust and behaviour. However, the problem here is that studies during a pandemic often suffer from a methodological weakness such as cross-sectional designs.

The study of Baum, Jacobsen and Goold (2009), is especially interesting as they used focus groups to understand how the public react with social distancing measures. Their findings related to trust were that if people experience a lack of trust in government, they less likely comply with social distancing measures. In their article, they highlight the importance for the government to incorporate a mechanism for financial support in their response strategy (Baum, Jacobsen & Goold, 2009). The poorer sectors of society require such mechanisms for implementing social distancing measures.

According to the literature is trust positively associated with compliance behaviour. Table 1 presents an overview of the key papers about trust and how compliance as an outcome variable is affected by it.

The influence of the Big-five personality traits on public compliance behaviour

The interaction between health and personality has a long history of analysis. Different personalities approach health behaviour differently (Coleman, 1997; Sirois & Hirsch, 2015; Jerram & Coleman, 1999; Vollrath, Knoch, & Cassano, 1999; McCrae & Costa, 1991; Booth-Kewley & Vickers, 1994). Scholars agreed that personality traits have an influence on health promoting behaviour. For example, Vollrath, Knoch and Cassano (1999) argue that if people perceive themselves as susceptible to health risks, they are more likely to have intentions to take preventive measures to avoid risk. Jerram and Coleman (1999) researched the predicting effect of personality on health behaviour, and the effect of different traits can be direct or indirect on health behaviour. However, little is known about this predicting effect under the condition of an influenza pandemic. The classic Health Behaviour Model explains this effect, wherein this case personality affects health behaviour through attitudes (Champion & Skinner, 2008).

The Big-Five personality inventory is according to scholars the best instrument to identify five primary personality traits. Within psychology, scholars agree on the fact that personality changes over time and between cultures. John and Srivastava (1999) developed an instrument to measure the five primary traits which are invariant across age groups and cultures. The five traits identified are Neuroticism, Extraversion, Openness, Conscientiousness and Agreeableness (John & Srivastava, 1999). Neuroticism is related to somebody's emotional stability, a neurotic individual, is emotionally unstable, worries a lot, and can get nervous or moody quickly (John & Srivastava, 1999). The personality extraversion is related to assertiveness, energetic and talkative. Openness is related to being imaginative and independent-minded (John & Srivastava, 1999). The conscientiousness personality trait is related to being orderly, dependable and responsible. The fifth trait, agreeableness is related to being good-natured, trustful and cooperative. According to the literature, the five personality traits are predicting variables for health promoting behaviour.

Outside a pandemic context, is neuroticism is associated with the presence of harmful health practices and absence of health promoting behaviour (Booth-Kewley & Vickers, 1994; Coleman, 1997). The higher risk perception influences a person's perceived wellbeing (McCrae & Costa, 1991). Despite their tendency to worry, neurotic people show less sensibility to health behaviour (Jerram & Coleman, 1999). From the literature can be concluded that neuroticism has an indirect negative effect on health behaviour. Somebody with a neurotic personality will less likely comply with health promoting behaviour (Sirois & Hirsch, 2015; Jerram & Coleman, 1999; Vollrath, Knoch, & Cassano, 1999).

Outside a pandemic context extraversion is associated with positive health behaviour (Coleman, 1997; Jerram & Coleman, 1999; McCrae & Costa, 1991). According to Booth-Kewley and Vickers (1994) extraversion is associated with preventive health behaviour. Extravert people tend to be less reluctant in being transparent about symptoms (Coleman, 1997). However, extravert people are more likely than other personality groups associated with risky health behaviour (Raynor & Levine, 2009; Vollrath & Torgersen, 2002). Extraversion is related to impulsive behaviour which manifests in smoking or having unsafe sex. Therefore, Extraversion is also associated with harmful health behaviour. From the literature it can be concluded that extraversion is associated with both negative and positive health behaviour (Jerram & Coleman, 1999; Vollrath & Torgersen, 2002).

Individuals with a high score on the personality openness tend to experience good and bad feelings more intense (McCrae & Costa, 1991; Vollrath, Knoch, & Cassano, 1999). According to Booth-Kewley and Vickers (1994), this results in a negative link to health behaviour. Jerram and Coleman (1999) found in their study a positive association between openness and health promoting behaviour. However, most of the literature studies demonstrate no predicting effect between openness and health promoting behaviour (Sirois & Hirsch, 2015; Vollrath, Knoch, & Cassano, 1999).

Outside a pandemic context conscientiousness is the personality trait most associated with positive health behaviour (Coleman, 1997; Sirois & Hirsch, 2015; Vollrath, Knoch, & Cassano, 1999; Booth-Kewley & Vickers, 1994; Jerram & Coleman, 1999; McCrae & Costa, 1991). Conscientiousness has a negative direct effect on perceived susceptibility and therefore according to the Health Belief Model a positive effect on health promoting behaviour (Champion & Skinner, 2008; Sirois & Hirsch, 2015; Vollrath, Knoch, & Cassano, 1999). Conscientious people show in general good long-term health habits and less risky health behaviour (Booth-Kewley & Vickers, 1994; Jerram & Coleman, 1999). From the literature it can be concluded that somebody with a conscientious personality will most likely comply with health promoting behaviour, compared to other personalities (Sirois & Hirsch, 2015; Vollrath, Knoch, & Cassano, 1999).

Individuals with a high score on Agreeableness are, outside the context of a pandemic associated with positive health behaviour (Sirois & Hirsch, 2015; Vollrath, Knoch, & Cassano, 1999; Booth-Kewley & Vickers, 1994; Jerram & Coleman, 1999; McCrae & Costa, 1991). Agreeableness also has a direct negative effect on an individual perceived susceptibility, and thus positive with health promoting behaviour according to the Health Belief Model (Champion & Skinner, 2008; Vollrath, Knoch, & Cassano, 1999). Together with conscientiousness, agreeableness is positively significantly correlated with good health behaviour and negatively significantly correlated with bad health behaviour (Sirois & Hirsch, 2015). According to the literature agreeableness is positively associated with health promoting behaviour (Sirois & Hirsch, 2015; Jerram & Coleman, 1999; Vollrath, Knoch, & Cassano, 1999).

Previous research shows that personalities are differently associated with health behaviour. This can also be seen in Table 1.

Conceptual model and Hypothesis

Conceptual model

This research focusses on the effect that demographic variables, trust in government institutions and personality together have on compliance behaviour with governmental mitigation measures in a pandemic context. The Spanish Flu from 1918 was one of the first pandemics studied (Bootsma & Ferguson, 2007). Because pandemics are unique there are only a few studies which did research during a pandemic to the relationships between the above named concepts.

The crisis management literature about the understanding of public behaviour during a crisis lacks in establishing specific direct effects on citizens compliance. According to scholars, it is well known that demographic variables influence public compliance with governmental mitigation measures. However, there are different views about how these variables directly or indirectly influence public compliance. Furthermore, trust in government institutions is, according to many scholars, an essential determinant for public compliance. Especially in the context of a pandemic as uncertainty is high. However, trust is within many studies, not been the primary research objective. The literature does not offer an unambiguous answer about the predicting effects of trust and personality on public compliance.

The conceptual model of this study is derived from the literature. The independent variables are trust in government, personality traits and demographic factors. Furthermore, this study focusses on understanding how these variables influence the outcome variable compliance behaviour. In the following section are the hypotheses explained which are derived from the literature study.

Hypotheses

In the following section are the hypotheses presented. For each independent variable there are different hypotheses formulated. The hypotheses are derived from the key papers presented in Table 1. For each hypothesis this study test or the null hypothesis, no predicting effect, can be rejected. The hypotheses are:

- **H1:** The demographic variables age, gender, household situation, ethnicity and religion have predicting effects on public compliance behaviour with mitigation measures during the COVID-19 pandemic in the Netherlands.
  - o **H1a**: Age will predict compliance positively, the older people get, the more likely they will comply with government mitigation measures.
  - o **H1b**: Gender will predict compliance, women will compare to men, more likely show compliance with mitigation measures during a pandemic.
  - o **H1c**: Household situation predict compliance, living in a household with children will positively predict compliance behaviour.
  - o **H1d**: Ethnicity predicts compliance, Dutch individuals will more likely comply with measures from the Dutch government than individuals who have a non-Dutch ethnicity background.
  - o **H1e**: Religion will predict compliance, religious individuals will less likely comply with social distancing measures of the Dutch government than non-religious individuals.
- **H2**: Trust in government institutions has a positive predicting effect on public compliance behaviour with mitigation measures during the COVID-19 pandemic in the Netherlands.
- **H3:** The personality traits Neuroticism, Agreeableness, Extraversion and Conscientiousness have predicting effects on public compliance behaviour with mitigation measures during the COVID-19 pandemic in the Netherlands.
  - o **H3a**: When people score high on Neuroticism, they will less likely comply with all mitigation measures during an influenza pandemic.
  - o **H3b**: When people score high on Agreeableness, they will more likely comply with all mitigation measures during an influenza pandemic.
  - o **H3c**: Extraversion has a positive or negative predicting effect on compliance with mitigation measures during an influenza pandemic.
  - o **H3d**: When people score high on Conscientiousness, they will more likely comply with all mitigation measures during an influenza pandemic.

Method

Research design

The research conducts a cross-sectional survey study. The study establishes if citizens' trust in a government institution, personality, and demographic factors predict their compliance behaviour. The choice of this design relates to the probability of understanding compliance behaviour for a large group of individuals. The cross-sectional survey questions are based on previous research done by Blendon et al. (2008), Denissen et al. (2008), Paek et al. (2008) and SteelFisher et al. (2012). These scholars already validated the items in their research. The survey existed out of close-ended questions (Appendix 3, 4, 5 & 6). The survey aims to test the hypotheses derived from the literature. The research methodology is quantitative and aims to establish predicting effects between the independent and dependent variables. This is done using a logistic regression analysis.

The choice for a cross-sectional research design jeopardises the internal validity. No causality can be established from the results as there is no possibility to exclude other non-tested variables. Other unknown variables can affect the dependent variable (Bryman, 2016). Therefore, the cross-sectional survey study can only touch upon a possible predicting effect.

Concerning the ecological validity, we can state that this aspect is relatively high as the research is done during a pandemic. Ecological validity refers to the ability to generalise the results of the study in a real-life setting. The study of Blendon et al. (2008) is not conducted during a pandemic. The study of SteelFisher et al. (2012) and Paek et al. (2008) is conducted under the condition of a less severe pandemic. Compared to all three studies the ecological validity of this study will be higher. The choice for a cross-sectional design also influences the ecological validity in a negative way as answering the survey can feel unnatural (Bryman, 2016). However, the self-selection bias is minimised in this study as the study is in everybody's direct interest.

Through the choice of the sampling method, external validity is influenced (Bryman, 2016). The focus of this study is to generalise the results within the unique research

context. To maximise the external validity, a random sample size of 385 is necessary to touch upon an effect (Bryman, 2016). This sample size is established by multiplying the total population of the Netherlands to the standard error allowance of the mean of five per cent multiplied by a z-score of ninety-five per cent reliability (Bryman, 2016; Centraal Bureau voor de Statistiek, 2019a). The sample size can be described as heterogeneous because it considers the population of a country.

Respondents

In total, 522 individuals have respondent on the survey. From the 522 people, 25 people did not give consent to use their data. From the 497 remaining individuals, 56 respondents did not fully complete the survey. It was necessary to delete their data because a coherent data set is needed to conduct the logistical regression analysis. The analysis is conducted with the remaining 441 individuals.

The web-based self-completion survey was distributed, through social media. The choice for a web-based design distribution is related to the focus of minimising time and cost and maximizing responses. As previously mentioned, a sample size of 385 is necessary to conduct the analysis (Bryman, 2016). The survey is designed for all Dutch citizens and written in the Dutch language. Due to the focus on a whole country, it is necessary to collect a sample size with a high level of heterogeneity (Bryman, 2016).

Online surveys are proven to be effective in health research (Merolli, Sanchez & Gray, 2014). The internet is the main source for the Dutch population to find and communicate health-related information (Van de Belt, Engelen, Berben, Teerenstra, Samsom & Schoonhoven, 2013). Moreover, survey research is by definition "a social interaction between a researcher and a respondent" (Dusek, Yurova & Ruppel, 2015, p. 282; Murphy, Hill & Dean, 2014). This conversation between researcher and respondent should take place using a medium that the target group is currently using. Social media is a perfect fit as it is a web-based system that allows for mass communication, conversation and sharing among members of the same network (Murphy, Hill & Dean, 2014).

The survey was distributed through the social media platforms LinkedIn and Facebook. Respondents were approached by the use of snowball sampling to share the survey through their network (Bryman, 2016). Respondents were able to fill in the survey by using their phone or computer. A significant advantage of mobile phone availability is proven to be effective in reaching hard-to-recruit survey respondents (Lutig & Toepoel, 2016; Dusek, Yurova & Ruppel, 2015). Another positive aspect of a web-based survey is the fact that respondents are more likely to share sensitive information (Merolli, Sanchez & Gray, 2014). Because inadequate compliance can be seen as socially unacceptable, this is an advantage.

During the data collection, it was necessary to minimise time and cost and still be efficient in reaching a minimum of 385 sufficient samples (Bryman, 2016). Due to the focus on a whole country, it is necessary to collect a sample size with a high level of heterogeneity (Bryman, 2016).

Measurement concepts

Demographic variables

The demographic factors are the first independent variables. The questions regarding the demographic variables are the same as the ones in the Pandemic Influenza survey of the Harvard School of Public Health (Blendon et al., 2008). The demographic items provide contextual information about the respondents. The items measure gender, age, education, employment situation, location of residents, ethnicity, household situation, children and religion.

To provide a better understanding of the respondents and prevent the sample from being disproportionately distributed. It was useful to ask additional questions about employment situations regarding health care professionals. Healthcare professionals who work with COVID-19 patients are in general outliers when answering questions about social distancing and personal protective behaviours. Furthermore, education is also mapped to test the sample distribution. For a complete overview of all questions asked regarding demographic factors, see Appendix 6.

Respondents were asked in which Province their residence is situated. For model optimisation a dummy variable for provinces is made. To analyse this variable, the provinces are divided into three groups, the northern provinces (Groningen, Friesland, Drenthe and Overijssel), the central provinces (Noord-Holland, Gelderland, Utrecht and Flevoland) and the southern provinces (Zuid-Holland, Zeeland, Noord-Brabant and Limburg).

The Big Five personality traits

The second independent variable measured is personality. The instruments of the Big-Five Inventory (BFI) were used to assess a respondent's personality. The original BFI consists of 44 questions (BFI-44) and can identify the five primary traits which are invariant across age groups and cultures (John & Srivastava, 1999; Jerram & Coleman, 1999). The five primary traits measured are Extraversion, Conscientiousness, Agreeableness, Neuroticism and Openness (John & Srivastava, 1999). However, Rammstedt and John (2007) reduced this number of questions to 10 items-scale. According to their study, the BFI-10 retained significant levels of validity and reliability. Furthermore, the article of Denissen et al. (2008) is used to translate the English Big-Five inventory items to Dutch. Each item is measured by using a question with a positive and negative factor loading (Denissen et al., 2008). Respondents were able to answer the questions using a 5-point Likert scale with the options, (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly Agree.

To inform respondents about the following questions the subject of trust in government was introduced by the following sentence: 'The following questions are related to your personality. The questions are formulated as I … this is done, so you can repeat the question and choose the answer which is most applicable to you as a person'. Appendix 3 presents the BFI-10 questions used related to their personality trait and the positive and negative direction.

Lastly, it is essential to understand how personality scores are calculated. Due to the calculation method used, a personality trait score can be lower than zero. Every personality trait is measured by two questions with a Likert-scale of 1 (strongly disagree)

to 5 (strongly agree). From the two questions one is positive, and one asked in a negative direction. For the final personality score calculation, the negative is score subtracted from the value of the positive question score. The use method has no negative implication for the research itself. Furthermore, the reliability of the translation of the survey questions regarding personality is proven by the article of Denissen et al. (2008).

Trust in government

The trust dimension is assessed using five trust items adopted from Paek et al. (2008, p. 68). Trust is after demographic factors and personality, the third independent variable this study measures. These items already prove their validity and reliability in the article where they studied, 'Public support for government actions during a flu pandemic' (Paek et al., 2008, p. 60). Each question measures a trust dimension. The five trust dimensions measured are Trust in general, Confidence, Openness, Benevolence and Competence. Together the items have a strong reliability alpha of 0.83 (Paek et al., 2008). The reliability Alpha of the trust items in this study is 0.77. The average trust of all respondents was 3.35 on a scale of 1 to 4 trust score. The respondents were able to answer the five questions using a 4-point Likert scale, with the options: (1) Not at all; (2) Little; (3) Some; (4) Very much. Together the total score of these five items create a trust index. Appendix 4 presents an overview of the trust items used in this study.

Public compliance

From the articles 'Public response to the 2009 influenza A H1N1 pandemic' from SteelFisher et al. (2012) and 'Public response to community mitigation measures for pandemic influenza' from Blendon et al. (2008) are the compliance questions derived. The questionnaire of SteelFisher et al. already prove its wording and psychometric properties. The questionnaire from Blendon et al. is based on the pandemic survey constructed by the Harvard School of Public Health. By evaluating both questionnaires with the preventive measures taken by the Dutch government, an adequate questionnaire is created to fit best the contextual situation in the Netherlands (Ministerie van Algemene Zaken, 2020; Appendix 1). The questions are slightly adapted to meet the Covid-19 pandemic context.

Compliance is the outcome variable in this study. A selection of twelve questions offers an indication of how well respondents comply with the preventive COVID-19 measures (Appendix 5). The compliance questions are divided into two outcome subgroups, 'personal protective behaviours' and 'social distancing behaviours' (SteelFisher et al., 2012). For each outcome variable a regression model is calculated. The three dependent variables are the overall compliance variable and the two subgroup variables. Respondents were able to answer all questions through a 7-point Likert scale with the options (1) never untill (7) always. The reason for choosing this Likert scale instead of a 'yes' or 'no question is because a respondent would have failed to comply with one of the measures just one time, he or she would have to answer no compliance. Therefore, the Likert scale indication allows estimating the compliance level for each respondent personally. At the beginning of the compliance section, a section introduction is saying: 'The next section is related to the mapping of behavioural changes and in what sense these changes are in line with preventive measures. Here you see an overview of the active measures (picture of Appendix 1) which aim to prevent the COVID-19 virus from spreading. The government actively monitors, or the public is complying with these measures. According to the Dutch government the Dutch people are compliant with the measures, however sometimes this is not the case'. The aim of this introduction is to minimise socially desirable answers as respondents get an impression that not everybody is being compliant with the rules. Within this statement the Dutch government is used as an authoritative figure to enhance this message. Furthermore, within the survey flow the compliance questions are asked in two parts of each six questions. At the start of each single part is stated 'Indicate how adequately you did comply with the following measures in the last seven days'.

Lastly, to be able to analyse this outcome variable through the use of logistical regression, it is necessary to have a dichotomic variable. The median was used to make a distinction made between 'Low compliance' and 'High compliance'. The compliance median is 5.58 on a scale of 1 to 7. Everything under the median is labelled as 'Low compliance' Everything equal to the median and higher are labelled 'High compliance'. The median of the outcome variable personal protective behaviour is 5.5, and social

distancing behaviour 5.625. The Cronbach Alpha of the compliance items in this study is 0.70.

Analysis

The effects of the independent variables on the dependent variables are calculated with logistical regression. The reasoning behind the use of a logistical regression model for analysis is the two-answer opportunity for compliance behaviour (Daniel & Cross, 2018). There are three outcome variables compliance behaviour, personal protective behaviour and social distancing behaviour. For each outcome variable a logistical regression analysis is completed. The build-up of the three regression models are the same. First the independent variables are unconnected analysed for each outcome variable. The fourth analysis presents the logistical regression analysis, including all independent variables.

A part of the logistical regression is mapping the Log Likelihood and the Akaike information criterion. The Log Likelihood gives an understanding of how likely a model is, compared to all other models. When adding more variables to the model, the Log Likelihood becomes higher. The Akaike information criterion (AIC) is an estimator for prediction errors. The AIC estimates the quality of the statistical model compared to all other models for the used dataset.

Furthermore, in the regression table is also the McFadden's R^2 defined (McFadden, 1973). McFadden's R^2 and the Log Likelihood both give information about how high the predictive ability of each model is. When calculating the McFadden R^2 the Log Likelihood is used to establish the explained variance.

$$R^2_{\text{McFadden}} = 1 - \frac{log(L_c)}{log(L_{\text{null}})}$$

The explained variance always lies between 0 and 1. The higher McFadden's R^2 the better the predictive ability of the model. The McFadden's R^2 provides an estimation of how big the chance is that the null hypothesis has been wrongly rejected. However, when

a lot of variation between the variables are present in the model, it becomes almost impossible to reach 1. Louviere, Hensher and Swait argue in their article that due to the high variance a McFadden R^2 higher than 0,2 already indicates an extremely good model fit (Louviere, Hensher & Swait, 2000, p. 54). With the interpretation of the Log Likelihood, the AIC and McFadden's R^2, the preferred model can be chosen.

Results

Sample distribution

In the next section, the demographical factors are compared with those from the Dutch institute of Statistics (CBS). A normal sample distribution minimises possible prediction errors due to the sample distribution. According to the CBS, 50.3% of the total population is female (Centraal Bureau voor de Statistiek, 2019a). The Gender distribution in this study was normal, 55% of the respondents were female, and 45% male. Furthermore, the average age was 35, and the youngest respondent reported to be 17 years old, the oldest was 84. According to data of the Dutch institute of statistics, the average age in the Netherlands is 42 years old (Centraal Bureau voor de Statistiek, 2019a). When comparing these figures, the age distribution is younger compared to the national data but not divergent.

Regarding employment status, 57% of the respondents reported having a full-time- or part-time job. Furthermore, 33% reported to be a student, and 10% reported to be, not working. Of all working respondents, 85 worked in a vital job and 177 respondents in a non-vital job. 144 respondents of the 177 respondents working in non-vital jobs were able to work from home, 35 were not. From the 85 respondents working in vital jobs, 35 respondents were working in the healthcare sector, and 23 of them had daily contact with corona patients. The not working group consists of 43%, students and others. For the generalisation, it is essential to have an equal share of healthcare workers in the sample compared to the national figures. When looking at all respondents, 7.9% is working in the healthcare sector. The Dutch institute of statistics shows a 7.5% of the total population working in the healthcare sector (Centraal Bureau voor de Statistiek, 2019a;

Centraal Bureau voor de Statistiek, 2020b). From this comparison it can be concluded that there is a normal distribution of healthcare workers in this sample.

When mapping the educational background of all respondents, 44% finished a university degree (WO), 36% Dutch higher education (HBO) and 20% Lower education (MBO, high school, primary school). From an educational perspective, the sample is not equally distributed. According to the CBS are the respondents in this sample in general high educated (Centraal Bureau voor de Statistiek, 2019c). Regarding the place of residence, 6% of the respondents live in the north of the Netherlands, 64% in the centre, and 30% in the Southern area. This distribution is not entirely normal as the CBS reports 17% in the Northern, 39% in the central provinces and 44% in de southern (Centraal Bureau voor de Statistiek, 2020a).

Regarding the reported data about ethnicity, 430 respondents are Dutch, one respondent says to be Indonesian, and ten others have the Belgian nationality. This distribution is, compared to the Dutch multicultural society, a not workable sample distribution (Centraal Bureau voor de Statistiek, 2019c). Ethnicity can better be defined as a variable for nationality. Moreover, the average household consisted out of 3 people. According to the CBS, the average household consists out of +-2.1 people (Centraal Bureau voor de Statistiek, 2019d). This difference is negligible.

Furthermore, from all respondents, 65 were living with children who were 18 years and younger. Lastly, 39 respondents were religious, which equals 9% of the total. This low religious figure is probably due to the high educational level of the respondents in the sample. According to the CBS are highly educated people less religious (Centraal Bureau voor de Statistiek, 2018).

From the sample analysis, it can be concluded that the sample is normally distributed and is except for educational, ethnicity and religious background well-fitting the demographic factors of the Dutch population

Compliance behaviour

The first logistic regression analysis uses compliance behaviour as the dependent variable. The model shows the effects of demographic variables, personality traits and trust. Table 3 shows four logistical regression models. The models 1, 2 and 3 present the effect of every single independent variable related to the outcome variable compliance behaviour. The fourth model includes all independent variables. When comparing the Log Likelihood, AIC and McFadden's R^2, the fourth model is defined as preferred. The explained variance is 0.1421, which indicated no strong predictive ability. This model shows the best predictive ability, and the effects are, therefore, more accurate. In the next section all significant associations between the independent variables and the dependent variables compliance are presented.

Demographic variables and compliance behaviour

In the first and fourth model in Table 3 show the logistical regression analysis, an apparent significant predicting effect between gender and compliance behaviour. The significance is positive, which means that female have a higher predictability of showing compliance behaviour compared to male respondents. The analysis shows a more substantial effect between the first and the fourth model. This increase indicates higher predictability for women showing compliance behaviour as the fourth model has a better predictive ability than the first. The second variable age also presents a significant positive effect on both models. According to the model, there is a higher probability that older people show more likely compliance behaviour. The effect becomes weaker between the first and the preferred model. The effect in the preferred model is influenced by adding the other two independent variables.

The demographic variables employment, place of residence, ethnicity and religion do not predict compliance behaviour according to this model. The first and the fourth model do not show any significant effect. This study cannot prove a predicting effect between these variables and the outcome variable. What this study can prove is a predicting effect between the variable, living with children and compliance behaviour. The logistical regression analysis shows a predicting effect between having no children and less compliance behaviour. In the fourth model, this significance becomes clear. The model

shows that people living with children are more likely compliant when compared to people living without children.

Personality traits and compliance behaviour

The second and fourth model in Table 3 show the effects of personality related to the outcome variable compliance. From the analysis in model two it becomes clear that Extraversion is negatively significant, Agreeableness is positively significant, and Conscientiousness is positive significant. However, the predicting effects of Agreeableness and Conscientiousness disappeared in the fourth model. The preferred model is leading in establishing an effect between a personality trait and the outcome variable. Extraversion is thus the only personality trait that predicts compliance behaviour. The more somebody is an extravert, the less likely will that respondent show compliance behaviour. This study found no other predicting effects between personalities and compliance behaviour.

Trust in government institutions and compliance behaviour

The third and fourth model in Table 3 show how the independent variable trust influences the dependent variable compliance behaviour. Form the analysis becomes clear that this study cannot prove a predicting effect between trust in government institutions and compliance behaviour.

Table 3: Compliance behaviour

	Dependent variable:			
	Compliance behaviour			
	(1)	(2)	(3)	(4)
Constant	-1.338	-0.173	-1.104[*]	-2.042[*]
	(0.867)	(0.174)	(0.659)	(1.115)
Gender (Ref: Female)	0.873[***]			0.903[***]
	(0.213)			(0.232)
Age	0.050[***]			0.044[***]
	(0.008)			(0.008)
Employment (Ref: Working)	-0.134			-0.139
	(0.226)			(0.231)
Residence (Ref: North)	0.376			0.313
	(0.421)			(0.423)
Residence (Ref: South)	0.350			0.296
	(0.239)			(0.243)
Ethnicity (Ref: Dutch)	0.038			-0.040
	(0.698)			(0.706)
Children (Ref: No)	-0.491			-0.601[*]
	(0.302)			(0.312)
Religion (Ref: No)	-0.470			-0.437
	(0.415)			(0.422)
Extraversion		-0.193[***]		-0.182[**]
		(0.071)		(0.079)
Agreeableness		0.130[*]		0.060
		(0.077)		(0.083)
Conscientiousness		0.222[***]		0.100
		(0.065)		(0.073)
Neuroticism		-0.032		-0.062
		(0.058)		(0.068)
Openness		0.086		0.098
		(0.060)		(0.066)
Trust			0.072[*]	0.058
			(0.039)	(0.043)
Observations	441	441	441	441
Log Likelihood	-267.314	-293.048	-303.459	-261.805
Akaike Inf. Crit.	552.627	598.095	610.919	553.611
McFadden's R^2	0.1241	0.0397	0.0056	0.1421

Note: *p**p***p<0.01

Personal protective behaviour

The second regression analysis focusses on the subgroup personal protective behaviour. Personal protective behaviours are preventive measures that individuals can perform on their own. Washing hands and sneezing in the elbow are two examples of these behaviours. The analysis presented in Table 4 includes three models of the effect of every single independent variable on the outcome variable. In the fourth model all independent variables are included and the predicting effect on personal protective behaviour presented. As in the previous regression analysis, the Log Likelihood, AIC and McFadden's R^2 are presented in the table. From the analysis it becomes clear that the fourth model is preferred. The explained variance presented by the McFadden's R^2 is 0.1191. The explained variance indicates that the model does not possess a strong predictive ability. In the next section all significant effects of the independent variables are presented.

Demographic variables and personal protective behaviour

The regression analysis in the first and the fourth model both show a strong positive significant effect of gender and age on personal protective behaviours. Gender and age predict both compliance behaviour with personal protective measures. The positive effect shows that females, compared to males, show more likely compliance behaviour with personal protective measures. Furthermore, the analysis shows a higher probability that older people show more likely compliance behaviour with personal protective measures when compared with younger individuals.

The analysis in Table 4 also shows a significant effect between ethnicity and personal protective behaviour. However, as discussed in the sample distribution section nationality is a better definition for this variable. According to the analysis nationality has a predicting effect on compliance behaviour with personal protective measures. The analysis shows that Dutch people are less likely complying with personal protective measures compared to non-Dutch nationals. Moreover, the first and fourth model in Table 4 shows a predicting effect between the independent variable living without children and compliance behaviour with personal protective measures. The effect is strongly significant in a negative direction. From this analysis it can be said that people

who live without children tend to be less likely compliant with personal protective behaviours, compared to people who live with children. Lastly, according to this model, no other demographic factors have any predictive ability for compliance with personal protective behaviour.

Personality traits, trust in government institutions and personal protective behaviour
The second model of Table 4 shows two significant effects of personality on compliance with protective behaviour. However, the model presents a weak predictive ability due to the low McFadden's R^2. Therefore, the preferred model 4 is dominant and shows no significant predicting effects between personality traits, trust in government institutions and compliance behaviour with personal protective measures.

Table 4: Personal protective behaviour

	Dependent variable:			
	Personal protective behaviour			
	(1)	(2)	(3)	(4)
Constant	0.999	-0.272	-0.826	0.117
	(1.205)	(0.174)	(0.656)	(1.389)
Gender (Ref: Female)	1.171***			1.066***
	(0.210)			(0.225)
Age	0.032***			0.030***
	(0.007)			(0.008)
Employment (Ref: Working)	-0.076			-0.088
	(0.220)			(0.224)
Residence (Ref: North)	0.293			0.247
	(0.425)			(0.433)
Residence (Ref: South)	0.305			0.292
	(0.236)			(0.239)
Ethnicity (Ref: Dutch)	-2.177**			-2.218**
	(1.094)			(1.104)
Children (Ref: No)	-0.755**			-0.746**
	(0.309)			(0.316)
Religion (Ref: No)	0.198			0.079
	(0.391)			(0.399)
Extraversion		0.084		0.089
		(0.070)		(0.076)
Agreeableness		0.115		0.051
		(0.077)		(0.081)
Conscientiousness		0.209***		0.105
		(0.065)		(0.072)
Neuroticism		0.109*		0.035
		(0.058)		(0.067)
Openness		0.060		0.059
		(0.060)		(0.065)
Trust			0.061	0.050
			(0.039)	(0.043)
Observations	441	441	441	441
Log Likelihood	-270.977	-294.321	-302.329	-267.409
Akaike Inf. Crit.	559.955	600.643	608.658	564.817
McFadden's R^2	0.1074	0.0305	0.0041	0.1191

Note: *p**p***p<0.01

Social distancing behaviour

The last regression analysis shows the effects between the independent variables and the subgroup of compliance with social distancing behaviour. Social distancing behaviours are preventive measures that individuals can perform during the company of others. Reducing social contacts or maintaining the 1.5 meters distance in public areas are examples of these behaviours. The analysis is presented in Table 5, there are three models based on the effect of the single independent variables on the outcome variable social distancing behaviour. The fourth model includes all independent variables and based on the Log Likelihood, AIC and McFadden's R^2, this model can be defined as preferred. The explained variance, measured by the McFadden R^2, shows a value of 0.1627. The explained variance indicates that the model has no strong predictive ability, however, it is neither a terrible one. Compared to other regression models, this model has the highest predictive ability in this study. In the next section all significant effects of the independent variables are presented.

Demographic variables and social distancing behaviour

As with the previous analysis, the variables age and gender are significant in the first and fourth model of Table 5. The variable gender has a positive predicting effect on compliance behaviour with social distancing measures. The effect shows that females are more likely complying with social distancing measures than men do. Furthermore, age is also a predictor of compliance behaviour with social distancing measures. The effect is positively significant. According to this study it can be concluded that the older somebody gets, the more likely he or she will comply with social distancing measures.

The preferred model also shows a weak significant positive effect between the place of residence north and compliance behaviour with social distancing measures. The significant positive effect indicates that people living in Friesland, Groningen, Drenthe and Overijssel are more likely to comply with social distancing measures than people who live in Utrecht, Gelderland, Flevoland and Noord-Holland. Place of residence (North) is, according to this model, a predictor of compliance with social distancing measures. This study does not prove any other predicting effect between demographic variables and compliance behaviour with social distancing measures.

Personality traits and social distancing behaviour

The second and the fourth model in Table 5 show both significant predicting effects for the independent variable's extraversion and conscientiousness. Extraversion is negatively significant, which means that the more extravert someone is, the less likely he or she will show compliance behaviour with social distancing measures. Furthermore, conscientiousness is significant as well and shows a positive effect on social distancing behaviour. The more someone is conscientious, the more likely this someone will comply with social distancing measures. What stands out is the fact that the effect becomes significantly weaker between the second and the fourth model. The change in significance indicates that part of the effect is explained by adding the other two independent variables to the fourth model. Moreover, none of the other personality traits, neuroticism, agreeableness and openness shows predicting effects according to the preferred model.

Trust in government institutions and social distancing behaviour

The last independent variable to discuss is trust. According to the third and the fourth model, trust in government institution is a predictor of compliance behaviour with social distancing measures. The preferred model shows a significant positive effect of trust on compliance behaviour. From the model it can be concluded that the more trust someone has in government institutions, the more likely that someone will comply with social distancing behaviour.

Table 5: Social distancing behaviour

	Dependent variable:			
	Social distancing behaviour			
	(1)	(2)	(3)	(4)
Constant	-1.832**	-0.045	-1.536**	-2.999***
	(0.852)	(0.178)	(0.668)	(1.135)
Gender (Ref: Female)	0.450**			0.494**
	(0.211)			(0.234)
Age	0.057***			0.050***
	(0.008)			(0.009)
Employment (Ref: Working)	-0.118			-0.121
	(0.227)			(0.236)
Residence (Ref: North)	0.952**			0.827*
	(0.433)			(0.437)
Residence (Ref: South)	0.475**			0.400
	(0.240)			(0.247)
Ethnicity (Ref: Dutch)	-0.001			-0.126
	(0.681)			(0.706)
Children (Ref: No)	-0.316			-0.360
	(0.299)			(0.314)
Religion (Ref: No)	-0.102			-0.040
	(0.402)			(0.415)
Extraversion		-0.311***		-0.295***
		(0.075)		(0.083)
Agreeableness		0.082		0.001
		(0.077)		(0.084)
Conscientiousness		0.292***		0.181**
		(0.068)		(0.075)
Neuroticism		-0.062		-0.045
		(0.060)		(0.069)
Openness		0.037		0.044
		(0.061)		(0.066)
Trust			0.099**	0.093**
			(0.039)	(0.044)
Observations	441	441	441	441
Log Likelihood	-266.676	-285.444	-301.760	-255.366
Akaike Inf. Crit.	551.352	582.887	607.521	540.731
McFadden's R^2	0.1256	0.0640	0.0105	0.1627

Note: *p**p***p<0.01

Discussion

This study extends current knowledge regarding the predicting effects on compliance behaviour in the Netherlands during the COVID-19 pandemic context. The main research question touches upon a broader understanding of how compliance behaviour is affected in a pandemic influenza context. The outcome of this study builds upon this understanding and can be helpful for government institutions for crisis management implications. The lessons learned from this study can help evaluate the COVID-19 crisis management approach. The research question answered is:

> *Do the concepts trust in government institutions, individual personalities and demographic variables predict public compliance behaviour with COVID-19 mitigation measures during the pandemic in the Netherlands?*

The results of this study indicate that the demographic factors age and gender positively predict compliance behaviour with social distancing and personal protective measures. Furthermore, individuals who live without children in their household tend to comply less likely with protective behaviour measures and compliance in general. The independent variable trust only predicts compliance behaviour with social distancing measures in a positive direction. Moreover, the personality trait extraversion predicts compliance behaviour and the subgroup social distancing negatively. Lastly, conscientiousness predicts compliance behaviour with social distancing measures positively. All three main hypotheses are partly accepted.

In the next section all hypothesises are evaluated. Table 6 presents an overview of this evaluation. For every hypothesis a null hypothesis is formulated. This hypothesis is not presented in Table 6. However, the null hypothesis for every hypothesis is the opposite of the predicting effect and direction where the hypothesis is based on. The null hypothesis for every hypothesis is no predicting effect. When a hypothesis is labelled as accepted in Table 6, the null hypothesis is rejected. On the other hand, if a hypothesis is rejected in Table 6 the null hypothesis is accepted as this study shows no predicting effect for these hypotheses.

Demographic variables

The study demonstrates a correlation between age and compliance behaviour (Table 3, 4 & 5). Age is also positively correlated with both compliance subgroups, social distancing behaviour and personal protective measures (Table 3, 4 & 5). Moreover, gender is also positively correlated with both the compliance subgroups (Table 3, 4 & 5). The analysis confirms the theories of Paek et al. (2008), Rubin et al. (2009) and Gillis et al. (2011) about age and gender. The probability that older people comply is higher compared to a younger age. The null hypothesis, no predicting effect is rejected, what means that, age will predict compliance positively, the older people get, the more likely they will comply with government mitigation measures during a pandemic (Table 6). This result is in line with the formulated hypothesis 1a. The probability that women comply is more than that compared to men. The null hypothesis is because of this effect rejected and the result is therefore in line with hypothesis 1b. Gender predict compliance, women will, compared to men, more likely comply with mitigation measures during a pandemic (Table 6). These results build on existing evidence that age and gender predict compliance during a pandemic context. This study cannot demonstrate the underlying reason of the predicting effect. However, based on findings of similar studies of Gillis et al. (2011), a plausible explanation is that the significance of age is probably because older people feel more vulnerable to the COVID-19 virus. Furthermore, Paek et al. (2008) and Rubin et al. (2009) are ambiguous about why females have a higher probability of compliance than men. Only Davis gives an explanation that is related to traditional gender roles. This study touched upon the effect and cleared the way for future research to dive deeper into this subject. Other studies should focus on finding the underlying cause of the predicting effects of age and gender.

Living with children in the same household predicts compliance behaviour with personal protective measures and compliance in general. No predicting effect is found between living with children and compliance with social distancing measures. The null hypothesis for compliance and the subgroup personal protective behaviour is rejected. The study demonstrates a negative correlation between living without children and compliance behaviour (Table 3). Furthermore, the logistical regression also demonstrates a correlation with the compliance subgroup personal protective behaviour

(Table 4). The two significant effects are in line with hypothesis 1d (Table 6). This result confirms the theory of Rubin et al. (2009) about people living with children having a higher chance of showing compliance behaviour. Based on the findings of similar studies, a plausible explanation is that people who are living with children assess the risk of the virus different. Slovic (1999) explains in his study that risk assessments represent a synthesis of judgements controlled by psychological, social, political and cultural factors. This outcome builds on existing evidence of the influence of children within households regarding compliance, with a particular focus on personal protective behaviours. Furthermore, further research is needed to understand the demonstrated effect thoroughly. It would be interesting to take into account a richer household variable, that includes people living with elderly, disabled or sick people.

The null hypothesis of ethnicity could not be accepted nor rejected. The variable ethnicity was in the sample poorly defined, which resulted in a not workable variable. The sample existed out of mainly people with a Dutch background, 10 Belgians and one Indonesian. These results indicate that nationality could be a better definition. Therefore, this study does not demonstrate the ethnicity variable. This study is not able to test hypothesis 1d. Suggestion for future scholars is to ensure a more diverse background in the respondent sample.

Furthermore, according to this study religion does not demonstrate a predicting effect on compliance of any of the subgroups (Table 3, 4 & 5). The analysis contradicts the theory of Baum, Jacobsen and Goold (2009) about that religious people being less likely to show compliance behaviour with social distancing measures. Therefore, this study cannot reject the null hypothesis of hypothesis 1e. The possibility that the results do not fit the theory can be because only 9% of the total respondents answered to be religious. The low figure of religious individuals is probably due to the fact that respondents in the sample are highly educated. According to the Dutch institute of Statistics high educated people are less religious (Centraal Bureau voor de Statistiek, 2018). There is thus a possibility that this sample is too small to test the theory adequately. Future research should focus on ensuring a higher sample of religious people.

Table 6: overview hypothesis

Hypothesis	Dependent variable	Rejecting/Accepting the hypothesis
H1: The demographic variables age, gender, household situation, ethnicity and religion have predicting effects on public compliance behaviour with mitigation measures during the COVID-19 pandemic in the Netherlands.	Compliance - Personal protective - Social distancing	Accepted Accepted Partly accepted
- **H1a**: Age will predict compliance positively, the older people get, the more likely they will comply with government mitigation measures.	Compliance - Personal protective - Social distancing	Accepted Accepted Accepted
- **H1b**: Gender will predict compliance, women will compare to men, more likely show compliance with mitigation measures during a pandemic.	Compliance - Personal protective - Social distancing	Accepted Accepted Accepted
- **H1c**: Household situation predict compliance, living in a household with children will positively predict compliance behaviour.	Compliance - Personal protective - Social distancing	Accepted Accepted Rejected
- **H1d**: Ethnicity predict compliance, Dutch individuals will more likely comply with measures from the Dutch government than individuals who have a non-Dutch ethnicity background.	Compliance - Personal protective - Social distancing	Inapplicable Inapplicable Inapplicable
- **H1e**: Religion will predict compliance, religious individuals will less likely comply with social distancing measures of the Dutch government than non-religious individuals.	- Social distancing	Rejected
H2: Trust in government institutions has a positive predicting effect on public compliance behaviour with mitigation measures during the COVID-19 pandemic in the Netherlands.	Compliance - Personal protective - Social distancing	Rejected Rejected Accepted

Table 6 continuous

H3: The personality traits Neuroticism, Agreeableness, Extraversion and Conscientiousness have predicting effects on public compliance behaviour with mitigation measures during the COVID-19 pandemic in the Netherlands.	Compliance - Personal protective - Social distancing	Partly accepted Partly accepted Partly accepted
o **H3a**: When people score high on Neuroticism, they will less likely comply with all mitigation measures during an influenza pandemic.	Compliance - Personal protective - Social distancing	Rejected Rejected Rejected
o **H3b**: When people score high on Agreeableness, they will likely comply with all mitigation measures during an influenza pandemic.	Compliance - Personal protective - Social distancing	Rejected Rejected Rejected
o **H3c**: Extraversion has a positive or negative predicting effect on compliance with mitigation measures during an influenza pandemic.	Compliance - Personal protective - Social distancing	Accepted Rejected Accepted
o **H3d**: When people score high on Conscientiousness, they will more likely comply with all mitigation measures during an influenza pandemic.	Compliance - Personal protective - Social distancing	Rejected Rejected Accepted

Trust

The study demonstrates a correlation between trust and the compliance subgroup social distancing behaviour (Table 5). The analysis confirms partly the theory of Rubin et al. (2009), who argued that a high level of trust predicts more compliance. The analysis of this study confirms that trust is a predictor of compliance behaviour with social distancing measures (Table 5). This study can, therefore, partly reject the null hypothesis of hypothesis 2 (Table 6). However, the result for social distancing behaviour contradicts the theory of Baum, Jacobsen and Goold (2009), that lack of trust in government is associated with less compliance with social distancing measures. Furthermore, the result contradicts the study of Gilles et al. (2011), who argued a predicting effect between personal compliance behaviour and trust in government institutions. Previous scholars did state that trust is predicting compliance through other variables such as place of residence (Paek et al., 2008). However, this study is not able to establish this effect, and therefore, it can be that the effect partly is demonstrated through other demographic variables. Future scholars should focus on a more in-depth understanding of how trust predicts compliance, taken into account the health behaviour model of Champion and Skinner (2008). Lastly, future scholars should also include distrust in government as a variable in their analysis. This study did not measure distrust due to ethnical reasons. In times of a severe pandemic, there are high levels of uncertainty present, and this study did not intend to question government trust by bringing up questions associated with distrust in government.

Personality traits

The analysis does not demonstrate a correlation between neuroticism and compliance behaviour (Table 3). Furthermore, there is no correlation found between any of the compliance subgroups (Table 4 & 5). This result indicates that, according to this study, neuroticism does not predict compliance under the condition of a pandemic. Moreover, agreeableness also shows no correlation with compliance behaviour or any of the two subgroups (Table 3, 4 & 5). Therefore, this study accepts the null hypothesis of hypothesis 3 a and b (Table 6). These results do not fit the theories from Sirois and Hirsch (2015), Jerram and Coleman (1999), and Vollrath, Knoch and Cassano (1999)

regarding these two personality traits. According to these scholars, a neurotic individual shows less compliance, which in turn would indicate a negative predicting effect on compliance behaviour. Furthermore, agreeableness would predict compliance positively, according to these scholars. The results of this study indicate that neither of these personality traits play a predicting role for compliance behaviour with mitigation measures in the context of a pandemic influenza.

Conscientiousness is according to Sirois and Hirsch (2015), Jerram and Coleman (1999), and Vollrath, Knoch and Cassano (1999), the personality trait most associated with health promoting behaviour. The analysis confirms that conscientiousness shows a positive significance with social distancing behaviour (Table 5). No correlation is found between compliance and the subgroup personal protective behaviour (Table 3 & 4). Moreover, the analysis partly confirms the theory of Sirois and Hirsch (2015) and Vollrath, Knoch and Cassano (1999). These scholars argued that conscientiousness is associated with positive health behaviour. The results of this study indicate that the null hypothesis of hypothesis 3d is only rejected for social distancing behaviour (Table 6). However, due to this study, we now know that conscientiousness predicts compliance of social distancing measures. Research about the effects of personality on compliance behaviour during a pandemic is scarce. Therefore, future research should focus on defining the relationship between social distancing behaviour conscientiousness.

Extraversion can, according to the literature, be negatively and positively associated with health behaviour (Vollrath & Torgersen, 2002; Jerram & Coleman, 1999). The analysis of this study confirms the theory of Vollrath and Torgersen, as extraversion negatively correlates with compliance and the subgroup social distancing behaviour (Table 3 & 5). Extraversion is a predictor of compliance behaviour, the more extrovert, the less compliant. Furthermore, extraversion shows no correlation with personal protective behaviour (Table 4). The study demonstrates that extravert people are less compliant with especially social distancing behaviour. Extraversion is according to the literature associated with assertiveness, energetic and talkative. Since social connections are limited in times of quarantine, it seems that extrovert people have difficulties complying with social distancing behaviour and are more open to risky behaviour during a

pandemic. According to Table 3 and 5, the null hypothesis of hypothesis 3c is rejected (Table 6). Advice for future research is to focus on understanding how extraversion directly or indirectly predicts negative compliance behaviour through attitudes. This study exposed extravert people as the weakest link in being compliant with mitigation measures and especially with social distancing behaviour.

Limitations and recommendations

Despite the contribution of this research to establish predicting effects of compliance during a pandemic, the research comes with limitations. The choice for a cross-sectional survey design limits the generalisability of the results. Due to this design, the study is not able to prove a causal relationship between variables. The cross-sectional survey design is, however, a logical choice because pandemics are hard to foresee. The internal validity is due to this choice jeopardised (Bryman, 2016). Therefore, this study can only touch upon predicting effects between variables.

Respondents were found using the snowball method (Bryman, 2016). A minimum of 385 respondents was needed to generalise the results for the whole Dutch population. This study accomplished this minimum but experienced more difficulties in establishing a heterogeneous sample size that fits in the equal demographic description distribution of a country. Furthermore, the period in which the survey is distributed is an essential characteristic when interpreting the results. The survey was distributed during the last two weeks of the 'intelligent lockdown'. The results of this study reflect on the compliance of the Dutch people during the end of the lockdown. For some this can be a limitation if the reader of this article reflects on creating an image of people's compliance behaviour at the beginning of a quarantine period. However, as explained in the introduction and the theoretical framework crisis management during a pandemic is as strong as the public compliance with mitigation measures. Controlling a worldwide pandemic becomes more difficult for governmental institutions when the public does not see an urgency in actively preventing the virus from spreading. The period when this survey is distributed can therefore also be beneficial.

Further research is needed to establish an indirect or direct effect between the independent variables and the dependent variables. Due to time constraints, this study was not able to expand research by testing the attitudes from the health behaviour model of Champion and Skinner (2008). Moreover, regarding the age variable, Ruben et al. (2009) argued that younger people between the age of 18 and 24 are more likely to comply with mitigation measures. The models in this study do not account for a probability estimation that younger people aged 18-24 are more compliant then older people. This can be solved by including the explanatory variable age^2 or age^3 to account for possible changes in behaviour in the shape of curves, i.e. U-shaped

Conclusion

The COVID-19 virus caused global socio and economic uncertainty. With no vaccine on the market, governments hold on to non-pharmaceutical preventive measures such as social distancing and personal protective behaviours. A governments crisis management strategy is as strong as the compliance of the public with its mitigation measures. There is no known crisis where the effectiveness of the crisis strategy is so dependable on the public's reaction. Attitudes as perceived threat and feelings of self-efficacy influence public compliance behaviour. Demographic factors, trust in government institutions, and also personalities play a role in this process. During this study, the focus was to find predicting effects between these three concepts and public compliance behaviour.

The Dutch called their strategy an intelligent lockdown. During the last two-week period of quarantine, the web-based survey was distributed using a snowball method. With the cross-sectional survey design, this study touched upon new insights into how compliance is predicted. From the logistic regression analysis, it becomes clear that the demographic variables age and gender are both positively related to compliance behaviour of social distancing and personal protective measures. Furthermore, individuals living without children tend to be less compliance with mitigation measures, in particular with personal protective measures.

Trust in government institutions has only a small predicting effect on compliance with social distancing measures. Trust seems especially crucial in the next phase when

pharmaceutical solutions are presented. This study could, however, not prove any strong predicting effect between trust and compliance behaviour.

The most exciting result from this study is the one regarding the personality trait extraversion. From this study it becomes apparent that a high score ratio on extraversion is negatively associated with compliance behaviour and the subgroup social distancing measures. Extraversion is in general associated with health promoting behaviour but can also engage in risky health behaviour. This study has proven that during an influenza pandemic extravert people tend to engage in risky health behaviour actively. Lastly, the personality trait conscientiousness is, as expected, associated with positive social distancing behaviour.

The results and conclusion from this research build upon existing knowledge regarding compliance behaviour during a worldwide influenza pandemic crisis. The results of this study can be used for optimising models for incorporating affective, cognitive and social contextual predictors of public compliance. The results of this study are especially relevant for Dutch society and reflection on the Dutch strategy during the COVID-19 crisis. The study provides an essential perspective on compliance during the last two weeks of the Dutch quarantine period.

Scholars and the public should not underestimate the predicting effects of demographic variables, trust in government and personality on compliance behaviour. Policy and communication between government and the public do not often have an individual focus. A complete understanding of public compliance and its predictors can enable governments to maximise the effectiveness of their crisis management strategy, now and in other future influenza pandemics.

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Appendix

Appendix 1: Overview of active government mitigation measures regarding the COVID-19 pandemic (Ministerie van Algemene Zaken, 2020)

21 april 2020

Rijksoverheid

Maatregelen tegen het coronavirus

Blijf zoveel mogelijk thuis.

Houd 1,5 meter afstand.

Was vaker je handen.

Hoest en nies in je elleboog.

Gebruik papieren zakdoekjes.

Schud geen handen.

Beperk sociaal contact:

Ga alleen naar buiten voor boodschappen, een frisse neus of om iets voor een ander te doen.

Werk thuis wanneer dit mogelijk is.

Groepsvorming van meer dan twee personen is alleen toegestaan als er 1,5 meter afstand wordt gehouden.

Uitzondering voor gezinnen / huishoudens en kinderen t/m 12 jaar.

Heb je verkoudheids-klachten? Blijf dan thuis en ziek uit. Ben je ook benauwd en/of heb je koorts? Dan moet iedereen in het huis thuisblijven.

Maatregelen in het openbare leven:

Vanaf 29 april	Vanaf 11 mei	T/m 19 mei:	Tot 1 september:
✔ Kinderen t/m 12 jaar kunnen georganiseerd en onder begeleiding samen buiten sporten. Wedstrijden niet toegestaan.	✔ Opening kinderopvang en (speciaal) basisonderwijs.	🔒 Het overige onderwijs blijft gesloten.	✖ Alle evenementen met een vergunnings- en meldplicht zijn verboden.
✔ Jongeren van 13 t/m 18 jaar kunnen georganiseerd en onder begeleiding samen buiten sporten op 1,5 meter afstand. Wedstrijden niet toegestaan.	✔ Basisscholen halveren groepsgrootte in de klas. Kinderen gaan de helft van de tijd naar school. De andere helft volgen ze onderwijs op afstand.	🔒 Alle eet- en drinkgelegenheden zijn gesloten. Bezorgen en afhalen blijft mogelijk.	
✔ Topsporters kunnen binnen- en buitentrainingen hervatten, op 1,5 meter afstand. Wedstrijden niet toegestaan.		🔒 Sportverenigingen (18+), fitnessclubs, sauna's, casino's, speelhallen en seksinrichtingen zijn gesloten.	
✔ Zelfstandig wonende ouderen (70+) kunnen door één of twee vaste personen worden bezocht.		🔒 Publieke locaties zoals musea, concertzalen, theaters, sportclubs zijn gesloten.	
		✖ Het uitoefenen van alle contactberoepen is verboden.	
		✖ Samenkomsten zijn verboden.	

alleen samen krijgen we corona onder controle

Meer informatie: **rijksoverheid.nl/coronavirus** *of bel 0800-1351*

Appendix 2: Survey consent form

Welcome to this study conducted by Nick Hoogedoorn at Leiden University. Please read the information below before you continue.

Aim of the study: The study aims to understand citizens compliance to government mitigation measures during the COVID-19 pandemic.

Duration: The survey takes around 5 minutes.

Potential risks: There are no expected risks of participation.

Anonymity: Your information remains confidential. We do not ask for your name or any other identifying information. Your answers cannot be traced back to you.

Data and publication: The collected data is stored safely. In publications, all data will be presented in aggregate.

Right of revocation: Your participation in this study is completely voluntary. You can withdraw from the study at any moment.

CONSENT

I am at least 18 years of age and participate voluntarily in the study. I was informed about the nature of the study and any possible side effects.

Appendix 3: Personality questions in survey related to the big-five derived from Rammstedt & John (2007) & Denissen et al. (2008).

I see myself as someone who … (ENG)	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Ik zie mijzelf als iemand die … (NL)	Helemaal niet mee eens	Niet mee eens	Niet mee eens niet mee oneens	Mee eens	Helemaal mee eens
… is reserved/Terughoudend is	*Extraversion (-)*				
… is generally trusting/Mensen over het algemeen vertrouwt	*Agreeableness (+)*				
… tends to be lazy/Geneigd is lui te zijn	Conscientiousness (-)				
… is relaxed, handles stress well/ontspannen is, goed met stress kan omgaan	*Neuroticism (-)*				
… has few artistic interests/Weinig intresse voor kunst heeft	*Openness (-)*				
… is outgoing, sociable/Hartelijk, een gezelschapsmens is	*Extraversion (+)*				
… tends to find fault with others/Geneigd is kritiek te hebben op anderen	*Agreeableness (-)*				
… does a thorough job/grondig te werk gaat	Conscientiousness (+)				
… gets nervous easily/Gemakkelijk zenuwachtig wordt	*Neuroticism (+)*				
… has an active imagination/een levendige fantasie heeft	*Openness (+)*				

Appendix 4: Trust in government survey questions derived from Paek et al. (2008).

Trust in general: How much do you believe the government will protect you from the COVID-19 Flu pandemic? / In hoeverre denkt u dat de overheid u zal beschermen gedurende de COVID-19 pandemie?	Not at all/Helemaal niet Little/Weinig Some/Een beetje Very much/Heel erg
Confidence: How confident are you in the government's ability to handle the COVID-19 flu pandemic? / Hoe zeker bent u over het vermogen van de regering om de COVID-19 pandemie aan te pakken?	Not at all/Helemaal niet Little/Weinig Some/Een beetje Very much/Heel erg
Openness: How open do you think the government will be with information regarding the COVID-19 Flu pandemic? / In hoeverre denkt u dat de regering open is in haar informatie verspreiding over de COVID-19 pandemie?	Not at all/Helemaal niet Little/Weinig Some/Een beetje Very much/Heel erg
Benevolence: How much do you believe that the government's actions concerning the COVID-19 Flu pandemic will be in your personal best interest? / In hoeverre denkt u dat de acties van de overheid ter bestreiding van de COVID-19 pandemie in uw persoonlijk belang is?	Not at all/Helemaal niet Little/Weinig Some/Een beetje Very much/Heel erg
Competence: How competent do you believe the government is to handle the COVID-19 Flu pandemic? / In hoeverre acht u de Nederlandse regering bekwaamd in haar aanpak van de COVID-19 pandemie.	Not at all/Helemaal niet Little/Weinig Some /Een beetje Very much/Heel erg

Appendix 5: Compliance survey questions derived from SteelFisher et al. (2012) &
Blendon et al. (2008).

ENG/NL	Never/Nooit 1	2	3	4	5	6	Always/Altijd 7
You kept at least 1.5 meters distance towards people who did not belong to your household/U heeft minstens 1,5-meter afstand gehouden van mensen die niet behoorde tot uw huishouden	*Social distancing behaviour*						
More frequently washed hands or used hand sanitizer/Vaker handen gewassen en/of ontsmettingsmiddel gebruikt?	*Personal protective behaviour*						
More frequently coughed or sneezed into elbow or shoulder/Het hoesten en/of niezen, vaker in de elleboog gedaan?	*Personal protective behaviour*						
More frequently covered mout hand nose with tissue when coughing or sneezing/Bij het hoesten of niezen vaker gebruik gemaakt van papieren zakdoekjes?	*Personal protective behaviour*						
You did shake hands with people who did not belong to your household/U heeft handen geschud met mensen die niet behoorde tot uw huishouden?	*Social distancing behaviour*						
More frequently washed hands after arriving back home/Vaker handen gewassen na thuiskomt?	*Personal protective behaviour*						

Reduced contact with people ouside your own household/U heeft uw sociale contacten gereduceerd tot enkel mensen die behoren tot uw huishouden?	*Social distancing behaviour*
You have recently traveled by public transport when this was actially not necessary for you/U heeft afgelopen tijd met het openbaar vervoer gereisd terwijl dit voor u eigenlijk niet noodzakelijk was?	*Social distancing behaviour*
Avoided places where many people gather/U heeft er bewust voor gekozen om drukke plekken te vermijden?	*Social distancing behaviour*
You visited smaller group gatherings, such as family and/or friend gatherings/U heeft familie en/of vrienden bezocht?	*Social distancing behaviour*
Avoided going to public places, such as parks and/or beaches/Publieke plekken zoals parken en/of stranden, heeft u gemeden?	*Social distancing behaviour*
You worked from home as much as possible/U heeft zoveel mogelijk vanuit huis gewerkt voor uw baan of studie?	*Social distancing behaviour*

Appendix 6: Demographic variables survey questions

Questions	Answer possibilities				
What is your gender/Wat is uw geslacht?	Male/Man			Female/Vrouw	
How old are you/Hoe oud bent u?					
What is the highest educational degree you have accomplished/Wat is uw hoogst behaalde opleidingsniveau?	Basisschool	Middelbare school	MBO	HBO	WO
Which of the following describes your situation best/Welke van het volgende beschrijft uw huidige werksituatie het beste?	Student Part-time werkzaam Fulltime werkzaam Gepensioneerd Gehandicapt, niet mogelijk om te werken Werkloos Huisvader/Huismoeder				
Do you work within a by the government assigned, vital sector/Bent u werkzaam in de door de overheid aangewezen gebieden als vitaal?	Yes/Ja			No/Nee	
Are you able to work from home/Kunt u werken vanuit huis?	Yes/Ja			No/Nee	
Do you work in the healthcare sector/Bent u	Yes/Ja			No/Nee	

werkzaam in de zorgsector?			
Do you have contact with patient during your work/Komt u tijdens uw werk in contact met patiënten?	Yes/Ja		No/Nee
In which province do you live/In welke provincie woont u?	**Noord** Friesland Drenthe Overijssel Groningen	**Midden** Flevoland Gelderland Utrecht Noord-Holland	**Zuid** Noord-Brabant Zeeland Zuid-Holland
What is your ethnicity/Wat is jouw afkomst?	Nederlandse Surinaams Turks Marokkaans Indonesisch Chinees Anders (aangeven)		
How many people are living with you in your household/Met hoeveel mensen vormt u op dit moment een huishouden?	Range from 1 till 20		
Are there children under the age of 18 years old living in your houshold/Bevat uw	Yes/Ja		No/Nee

huisouden kinderen jonger dan 18 jaar?		
Are you religious/Bent u religieus?	Yes/Ja	No/Nee