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Who Follows the Rules During a Crisis?—Personality Traits and Trust as Predictors of Compliance With Containment Recommendations During the COVID-19 Pandemic

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When the COVID-19 pandemic hit in 2020, many governments tried to contain the spread of the virus by legally restricting social life and imposing national lockdowns. The Swedish government did not enforce a national lockdown, but instead appealed to the individual's self-responsibility to follow specific containment recommendations developed by the Swedish Public Health Agency. Sweden is thus an especially interesting case to study because of the potential influence of psychological and attitudinal individual-level factors that might contribute to compliance with containment recommendations. Drawing on previous literature on how individuals respond during health crises, we define and evaluate a mediation model that considers the role of personality traits and trust authorities to explain compliance. More specifically, we argue that we need to consider the role of trust in authorities to better understand the relationship between personality traits and compliance. In analyses based on a large-scale representative survey (N = 1,034), we find Conscientiousness to be directly linked to compliance, whereas Agreeableness, Neuroticism and Openness were indirectly related to compliance when trust in the Public Health Agency was taken into account.

Keywords: personality, Big Five, trust, compliance, COVID-19

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INTRODUCTION

In the early phase of the COVID-19 pandemic in March 2020, many European governments enforced social distancing measures to contain the spread of the virus. How stringent and to what extent these measures were implemented varied between countries (Hale, Petherick, Phillips, and Webster, 2020). Sweden's response to the outbreak constituted an exception amongst most of its European neighbors and received much international attention for its strategy that was regarded as more lenient (Yoo, 2020). Instead of implementing a strict national lockdown, the Swedish government appealed to the responsibility of each citizen to follow containment recommendations which were developed and published by the Governmental authority the Swedish Public Health Agency (Paterlini, 2020). The term recommendation is heavily culturally dependent and its meaning varies with sender within Sweden. When a behavioral recommendation is issued by the Public Health Agency, the public is expected to comply. Yet, there are no legal consequences for the individual in case of non-compliance. Compared to countries that decided on

more stringent strategies, the success of the Swedish containment strategy was more dependent on individual voluntary decisions and actions. Sweden is therefore an interesting case when it comes to exploring the influence of psychological and attitudinal individual-level factors on compliance with the Public Health Agency's recommendations as the more lenient approach leaves more space for such influence.

During previous epi- or pandemics, studies on what influences compliance often focused on the role of personality traits (e.g., Bogg and Roberts, 2004; John, Naumann, and Soto, 2008), or on the role of trust in institutions and governments (e.g., Condon and Sinha, 2010; Gilles et al., 2011; Prati, Pietrantoni, and Zani, 2011; Vinck, Pham, Bindu, Bedford, and Nilles, 2019). Such explanatory features have also been in the focus of several studies during the COVID-19 pandemic (e.g., Bargain and Aminjonov, 2020; Bogg and Milad, 2020; Carvalho, Pianowski, and Gonçalves, 2020; Devine, Gaskell, Jennings, and Stoker, 2020; Götz, Gvirtz, Galinsky, and Jachimowicz, 2020). However, no previous research has taken into consideration how personality may influence institutional trust, and how trust in turn may influence compliance.

By combining these two approaches we aim to contribute to a better understanding of how personality traits relate to public compliance with behavioral recommendations issued by a government authority. Based on previous research about public trust which suggests that the Big Five personality traits might influence the extent to which a person trusts state institutions (Freitag and Ackermann, 2016; Mondak and Halperin, 2008), we define a mediation model to test whether the Big Five personality traits are predictive of compliance, mediated by trust in the Swedish Public Health Agency. Due to the special importance of the Swedish Public Health Agency in developing and communicating the containment recommendations, we focus on how trust in this agency influences compliance with containment guidelines.

THEORY

Personality has become an increasingly important aspect in political psychological and political science research during the last decades. One of the most common theories of personality that have had major influence in political psychology is the Big Five, or the Five-Factor theory (McCrae and John, 1992). The Big Five has been related to ideology and political attitudes (see Gerber, Huber, Doherty & Dowling, 2011), to partisanship (Mondak, 2010; Mondak and Halperin, 2008), and to political participation (Andersson, 2009; Mondak et al., 2010).

An important contribution of the Big Five is that the traits specified in the model are not directly associated with political attitudes and behavior (Gerber et al., 2011), but instead the model claims that there are five basic personality traits that influence individual life choices. The traits include Conscientiousness, Neuroticism, Agreeableness, Openness to Experience, and Extraversion. These traits are to be understood as five dimensions, where every person is located at a certain position on each dimension. Conscientiousness entails the striving for achievement and purpose. Persons high on this trait could be described as reliable, responsible, and thorough. Neuroticism describes the tendency to experience negative emotions. Highly neurotic persons could for example be described as anxious, tense, and worrying. Agreeableness describes the tendency to circumvent interpersonal conflict and comply with other's ideas. Highly agreeable persons are for example described as trusting, sympathetic, and forgiving. Openness to Experience describes the need to seek out new or varying experiences. People scoring high on this trait are described as curious, insightful, and original. Extraversion describes the tendency or the need to be social. Persons scoring high on extraversion are for example described as active, outgoing, and talkative (McCrae and John, 1992; McCrae and Costa Jr, 2008).

Personality and Health-Promoting Behaviors During COVID-19

Out of the Big Five traits, Conscientiousness is the only trait that is clearly connected to compliance, since this trait is characterized by impulse control that generally aids compliance to norms and rules (John and Srivastava, 1999). Even though some studies emphasize that personality traits alone are not reliable predictors for medical compliance (Kaplan and Simon, 1990), in a meta-analysis, Bogg and Roberts (2004) concluded that higher Conscientiousness often comes with more preventative or beneficial health behaviors, while risky health behaviors are less common in people high on Conscientiousness. In the context of COVID-19, higher levels of Conscientiousness were associated with higher levels of compliance to restrictions, in-home sheltering, and social distancing (Aschwanden et al., 2020; Bogg and Milad, 2020; Brouard, Vasilopoulos, and Becher, 2020; Carvalho et al., 2020; Götz et al., 2020).

Higher manifestations of Neuroticism have on the other hand been connected to non-beneficial health outcomes (Lahey, 2009), and to risk behavior such as smoking and drinking (Mroczek, Spiro, and Turiano, 2009). This relationship between Neuroticism and risky health behaviors suggests that individuals high on Neuroticism would behave in a more risk-oriented manner, and consequently less in line with containment guidelines during a public health crisis. However, studies investigating the relationship between Neuroticism and containment behavior during the COVID-19 pandemic have yielded mixed results. While Neuroticism was found to be positively related to in-home sheltering (Götz et al., 2020), and lower use of public transport (Asselmann, Borghans, Montizaan, and Seegers, 2020), which would speak for a positive relationship between Neuroticism and precautious measures, other studies found evidence for a negative relationship. Both Aschwanden et al. (2020) and Brouard et al. (2020) found high levels of Neuroticism to be related to less compliance and precautious behavior.

Regarding Extraversion, some studies show that Extraversion is related to non-beneficial or risky health behaviors (Raynor & Levine, 2009). Concerning the recommendations to prevent the spread of COVID-19, it is the inherent social aspect of Extraversion that might make it difficult for highly extraverted

individuals to comply with the containment recommendations. Following the social distancing recommendations would drastically restrict social life, consequently, individuals high on Extraversion might be less prone to comply to the recommendations. Some of the studies focusing on the Big Five and precautious behavior during the COVID-19 pandemic found support for this postulated negative relationship between Extraversion and precautious behavior (Carvalho et al., 2020; Götz et al., 2020).

For individuals scoring high on Openness, social distancing might not per se be difficult, however, individuals high on this trait can be expected to have a strong interest for new ideas, and a comparably high tendency for non-conforming thoughts and behaviors (McCrae and Costa, 1997; Mondak and Halperin, 2008). Highly open individuals might therefore also be critical towards the recommendations published by the Public Health Agency and may consequently not necessarily follow these recommendations. However, Götz et al. (2020) found a positive relationship between Openness and sheltering in place during the COVID-19 pandemic.

Individuals high on Agreeableness tend to experience a strong wish to maintain positive relations with others. Part of this is to avoid interpersonal conflicts. In order to not upset others, highly agreeable individuals tend to show higher levels of conformity and compliance with societal norms and rules (Roccas, Sagiv, Schwartz, and Knafo, 2002). Thus, the norm about following recommendations established in a community could play a crucial role for whether individuals scoring high on Agreeableness decide to comply with the recommendations or not. Studies investigating the relationships between the Big Five and containment behavior during the COVID-19 crisis indicated a positive relationship between Agreeableness and compliance with containment guidelines and precautious measures (Asselmann et al., 2020; Götz et al., 2020; Zajenkowski, Jonason, Leniarska, and Kozakiewicz, 2020).

To sum up, even though the findings on associations between the Big Five traits and containment behavior often point to the same direction for each of the traits, the findings do not consistently reveal the same traits as relevant. Conscientiousness protrudes as a predictive factor for compliance since it has been shown to be positively linked to precautious behavior consistently across several studies. Neuroticism has been found to be influential for precautious behavior in several of the conducted studies as well, even though results regarding the direction of the relationship are mixed. Extraversion, Openness, and Agreeableness have only been sporadically found to play a role for containment behavior. Overall, personality traits seem to play a role for preventive behavior, but it is difficult to explain the mixed results found in previous research.

One reason for these differing results could be distinctions between the samples, particularly regarding the country of residence. As policies on containment behaviors and legal consequences of not following the behavioral recommendations have varied between countries, it is possible that the importance of specific personality traits for the shown behavior varies as well. If the number of social contacts is legally enforced, it is likely that Extraversion might not influence the extent of social distancing as much as it would in countries where citizens can decide more freely to what extent they reduce their social contacts. Furthermore, whether and what kind of social norms have developed around containment behaviors could for example play a relevant role for whether Agreeableness influences containment behaviors or not.

A second explanation for why the relevant relationships differed between studies could be that personality traits may not be directly linked to compliance with containment recommendations. Instead, a third variable might influence and mediate the relationship between personality traits and compliance. We here suggest that political trust, especially trust in authorities could be such a variable.

Trust in Authorities as Mediator

Political trust describes the feeling a person has towards their government and relevant state authorities that these institutions will act in a competent and righteous way in accordance with the best interests of society and its members (Citrin and Stoker, 2018; Pytlik Zillig and Kimbrough, 2016). Putting trust into state authorities comes with the acceptance of this risk and with the acceptance of being vulnerable to the authorities. This risk acceptance and the feeling of trust towards state institutions or the government influences how legitimate inhabitants regard their government, and consequently how willing they are to follow regulations and demands from the government (Levi, 1996; Prati et al., 2011).

Especially in complex and uncertain situations that exceed the individual's knowledge and ability to perform an accurate risk assessment of the situation by themselves, the level of trust might determine whether individuals turn to their governments and follow its guidance or not (Siegrist and Cvetkovich, 2000). Letting oneself be guided through an intricate situation comes with the acceptance of the risk that the guide could also be wrong in the evaluation of and the reaction to the situation. When trust in the government or authorities is low, it thus seems unlikely that an individual would turn to these authorities and follow their lead in a crisis. During previous public health crises, it has been observed that individuals with lower institutional trust engage less in recommended preventive behaviors to stop the spread of the disease (Prati et al., 2011; Vinck et al., 2019). During the H1N1 pandemic (the Swine flu), lower trust in the government or in institutions was for example accompanied by a decrease in the use of recommended face masks (Condon and Sinha, 2010), and by a lower willingness to get the recommended vaccination against the H1N1 virus (Gilles et al., 2011). Trust in governments or state institutions have therefore also been of interest when it comes to investigations of who engages in social distancing behaviors and follows containment recommendations during the COVID-19 pandemic (Devine et al., 2020).

In countries where institutional trust was high before the outbreak of COVID-19, mortality due to the virus was found to be generally lower by the end of April 2020 (Oksanen et al., 2020). As Oksanen et al. (2020) point out, several factors, like sociability in different cultures, or the capacity of health care systems need to be considered when trying to explain the findings

of why there seems to be a relationship between the extent of trust and spread of a virus. These findings could also point to that governments in countries with higher trust introduced more efficient measures or they could point to that precautions are more likely met when the public trusts their government as suggested by Bargain and Aminjonov (2020) who looked at regional-level mobility data in Europe. They found that with the implementation of containment measures in March 2020, non-essential travelling decreased more in countries where political trust was higher before the crisis, especially when the stringency of containment measures was high. One reason for this might be that individuals with higher trust in their government are less averse to being controlled by this government (Schmelz, 2021).

However, not all studies show a strong positive effect of trust on compliance. Clark, Davila, Regis, and Kraus (2020) emphasized that other factors, like the belief in the effectiveness of the measures, were better predictors of compliance, even though they also found a positive relationship between governmental trust and the extent of compliance with containment recommendations and health precautions during the COVID-19 crisis. Furthermore, Guglielmi et al. (2020) found that in some regions in Italy, confidence in institutions was positively related to support of the introduced containment measures, while in other regions, the confidence in the government was unrelated to precautious behavior. There is even evidence for a negative effect of political trust on social distancing (Woelfert and Kunst, 2020). One potential explanation for a negative relationship between trust and social distancing is that some individuals have too much trust in the containment strategy, which may lead them to experience a false sense of safety, and to lower engagement in protective behavior (Devine et al., 2020).

Since some recent research suggests that individual personality traits could influence the level of trust (for a review see Citrin and Stoker, 2018), we suggest that it is important to consider how both features influence compliance and whether an effect of personality traits is mediated by trust. To specify our hypotheses, we therefore draw on such research.

For example, Mondak and Halperin (2008) find Openness and Agreeableness to be relevant predictors in a sample of American citizens. While Openness was predictive for lower political trust, higher levels of Agreeableness were related to higher levels of political trust. In a Swiss sample, Freitag and Ackermann (2016) found Neuroticism and Extraversion to be negatively related to political trust. That the personality traits serving as best predictors vary between countries indicates that the traits relevant for political trust might not be stable and universal. Instead, the importance of single personality traits for political trust might vary as a function of relevant contextual variables, like political institutions, which is in line with the definition of trust as relational, situational, and domain specific (Pytlik Zillig and Kimbrough, 2016).

Hypotheses

Considering that the feeling of trust is not universal but depends on the specific situation, and the involved trustors and trustees, we regard trust in the Swedish Public Health Agency to be the relevant variable of trust to include in the proposed mediation model. The Public Health Agency of Sweden developed and communicated the behavioral recommendations to limit the spread of the virus, while the government encouraged citizens to follow these recommendations but otherwise largely kept in the background. Therefore, we expect trust in the Swedish Public Health Agency to serve as a mediating variable for the relationship between the Big Five personality traits and compliance with the containment recommendations.

As Conscientiousness has consistently been found to be positively related to containment behavior during the COVID-19 pandemic (Aschwanden et al., 2020; Bogg and Milad, 2020; Brouard et al., 2020; Carvalho et al., 2020; Götz et al., 2020), we expect a positive direct effect of Conscientiousness. Thus, we expect that *the higher individuals score on Conscientiousness, the more likely they are to comply with the containment recommendations (H1).*

Second, we hypothesize a direct, positive relationship between trust in the Public Health Agency and compliance with the containment recommendations published by the Public Health Agency. Thus, *the more individuals trust Public Health Agency, the more likely they are to comply with the containment recommendations (H2).* This is based on previous research that found a positive impact of trust in authorities on preventive behavior during a pandemic (e.g., Prati et al., 2011; Vinck et al., 2019), as well as during the COVID-19 pandemic (Bargain and Aminjonov, 2020; Clark et al., 2020; Guglielmi et al., 2020).

One of our main contributions is that we expect that some personality features influence compliance through their impact on trust in the Public Health Agency, suggesting that trust functions as a mediator between Big Five traits and compliance. Even though we do not focus on explaining trust in authorities here, we therefore also have some expectations about how personality may influence trust. Building on Mondak and Halperin (2008), we expect a positive relationship between Agreeableness and trust in the Public Health Agency, while a negative relationship is expected between Openness and trust. Furthermore, we expect negative relationships between Neuroticism and Extraversion and trust in the Public Health Agency, as these traits have been identified as negative predictors of political trust (Freitag and Ackermann, 2016). More importantly, focusing on the indirect relationships between traits and compliance, we expect that the indirect relationship between Agreeableness and compliance will be positive, while the indirect relationship to compliance will be negative for Openness, Neuroticism, and Extraversion. Or differently put, the *higher individuals score on Agreeableness, the higher their trust in the Public Health Agency, and the more likely they are to comply with the containment recommendations (H3a)*, and *the higher individuals score on Openness, Neuroticism, and Extraversion, the weaker their trust in the Public Health Agency, and the less likely they are to comply with the containment recommendations (H3b).*

RESEARCH DESIGN AND METHODS

Design and Participants

Our analyses are based on a large-scale, representative survey conducted in April 2020 in Sweden, that is, during the initial phase of the COVID-19 crisis. In total, 1,077 participants took part in this survey. Participants who did not fill in the questionnaire until the end or were exceptionally fast at

finishing the survey were excluded from the analysis. After removing these, a sample of 1,034 participants remained for further analysis. Of the resulting sample, 567 participants were women, 455 were men. The gender of further 12 participants remained undisclosed. The age of participants ranged between 18 and 89 years (M = 50.55 years, SD = 17.60 years). The representative sample was recruited through an online polling company, *Enkätfabriken*. Recruitment and implementation of the study took place in two rounds between the 2nd and the 26th of April 2020. Participants received a monetary reimbursement after their participation through the polling company. The project was evaluated by the Swedish Ethical Review Authority (number: 2020–01590). Data collection was anonymous and confidential. Written informed consent was obtained.

Material and Procedure

Data was collected online as part of a larger study on COVID-19. The survey used for data collection was created on the platform Qualtrics. Participants were informed about the aim of the survey and what it entailed, and that the collection and storage of data was completely confidential and anonymous. After participants consented to participate, the variables were assessed in the following order.

To assess our main dependent variable, *compliance with recommendations to limit the spread of the virus,* participants were asked what they themselves did to limit the spread. They were shown a list of behaviors and answered for each behavior on a 7-point Likert scale to what extent they engaged in the specific behavior (*1 = Not at all; 7 = As much as possible*). The listed behaviors were: avoiding to travel, avoiding to meet other people, keeping a distance of at least 1 m to others, washing or disinfecting hands. The internal consistency of the scale assessing behavioral measures indicated by Cronbach's alpha was 0.69, and the items were collapsed into a mean index.

To assess our main independent variables, the *Big Five personality traits*, a Swedish version of the Ten-Item Personality Inventory (TIPI; Gosling, Rentfrow, and Swann Jr, 2003) was used. Each of the five personality dimensions was measured with two items, each consisting of two adjectives where one of the items was reverse-scored. Participants were instructed to rate on a 7-point Likert scale from *1= Do not agree at all* to *7 = Completely agree* how much they saw themselves reflected in the adjectives. Openness was assessed with the adjective pairs "open to new experiences, complex" and the reverse scored "conventional, uncreative." Conscientiousness was assessed by "dependable, self-disciplined" and the reverse scored "disorganized, careless." The items assessing Extraversion were "extraverted, enthusiastic" and the reverse scored "reserved, quiet." Agreeableness was assessed with "sympathetic, warm" and the reverse scored "critical, quarrelsome." Neuroticism was assessed with the item "anxious, easily upset" and the reverse scored "calm, emotionally stable." The items were presented in randomized order. The reliability of this short instrument with a retest interval of 6 weeks was found to be between 0.62 and 0.76 for the five scales. Internal consistencies were measured with Cronbach's alpha between 0.40 and 0.73 (Gosling et al., 2003). In the current study, internal consistency determined by Cronbach's alpha was similar; Extraversion: $\alpha = 0.69$, Neuroticism: $\alpha = 0.60$, Conscientiousness: $\alpha = 0.53$, Openness: $\alpha = 0.39$, and Agreeableness: $\alpha = 0.34$. Spearman correlation coefficients between the two items in each trait was: Neuroticism: $r_s = 0.43$, $p < 0.001$, Extraversion: $r_s = 0.53$, $p < 0.001$, Agreeableness: $r_s = 0.21$, $p < 0.001$, Conscientiousness: $r_s = 0.41$, $p < 0.001$, and Openness: $r_s = 0.27$, $p < 0.001$.

TABLE 1 | Correlation coefficients of the items to assess compliance.

Item	M (SD)	1	2	3
1 Avoid travelling	6.47 (1.09)			
2 Avoid meeting others	5.75 (1.50)	0.50***		
3 Keeping distance	6.31 (1.21)	0.39***	0.54***	
4 Hand hygiene	6.27 (1.27)	0.32***	0.30***	0.37***

*Coefficients were calculated through Spearman correlation (*N = *1,028). *p < 0.05. **p < 0.01. ***p < 0.001.*

To assess *Trust in Institutions,* participants were asked to indicate how much confidence they have in 18 different institutions, for example the press, political parties, the government, scientists, and the Public Health Agency. The order of the institutions was randomized for each participant. For the current study, only trust in the government (used as a control variable) and trust in the Public Health Agency were considered. Answers ranged from *1 = None at all* to *7 = A great deal.*

To assess *Political Orientation,* participants were asked the question "Sometimes political perspectives are described on a scale from left to right. What would you say, where are you located on such a scale?". Answers ranged from *1 = Clearly to the left* to *10 = Clearly to the right*. This variable was included as a control variable in our analyses.

We also included several control variables measuring various demographics. Participants indicated their gender and age, which both could be answered with a free text entry, highest level of education ("not completed primary school," "primary school," "high school," "polytechnical school or similar," "higher education, for example from a university" to "Doctoral degree or similar"). Furthermore, participants were asked whether they belonged to a group with a higher risk to fall seriously ill from COVID-19. If so, they could choose from the options that their heightened risk stems from their age or from a preexistent health condition.

EMPIRICAL RESULTS

Descriptive Results

Our main dependent variable was compliance with the Public Health Agency's recommendations, which was measured by four items. Means, and standard deviations of these items, as well as correlations between the items are shown in **Table 1**. The items were collapsed into a mean index of Compliance. Compliance with the Public Health Agency's recommendations was high (M = 6.20, SD = 0.92).

Means and standard deviations for the personality dimensions are shown in **Table 2**. It is noteworthy that while Extraversion, Openness, Agreeableness and Conscientiousness were similarly represented in this sample, Neuroticism was less pronounced than the other Big Five traits.

Trust in the Swedish Public Health Agency was relatively high with an average of 5.46 (SD = 1.46). With an average of 4.50 (SD =

TABLE 2 | Correlation coefficients of the independent variables, mediator, and control variables.

Measure	M (SD)	Cons	Agree	Neuro	Open	Extrav	Trust G	Pol. Ori	Risk	Gender	Age	Edu	Trust PHA
Conscientiousness	5.36 (1.13)												
Agreeableness	5.38 (1.00)	0.31***											
Neuroticism	2.82 (1.21)	–0.36***	–0.31***										
Openness	5.10 (1.06)	0.18***	0.27***	–0.20***									
Extraversion	4.60 (1.37)	0.14***	0.27***	–0.15***	0.38***								
Trust Government	4.50 (1.70)	0.06*	0.10**	–0.09**	0.05	0.06							
Pol. Orientation	5.28 (2.32)	0.14***	–0.05	0.13***	–0.05	0.01	–0.32***						
Risk group		0.04	0.03	–0.02	–0.00	–0.00	0.01	0.01					
Gender		–0.08**	–0.16***	–0.10**	–0.10**	–0.15***	–0.03	0.17***	–0.02				
Age	50.55 (17.60)	0.19***	–0.10**	–0.17***	0.04	0.15***	0.08*	0.07*	–0.31***	0.09**			
Education		0.01	0.04	–0.05	0.14***	0.09**	0.09**	–0.01	–0.01	–0.06*	0.07*		
Trust PHA	5.46 (1.46)	0.08**	0.15***	–0.14**	0.04	0.10**	0.59***	–0.21***	–0.04	–0.08**	0.07*	0.09**	
Compliance	6.20 (0.92)	0.21***	0.13***	–0.10**	0.10**	0.13***	0.03	0.03	0.13***	–0.20***	0.23***	0.02	0.10**

*Coefficients were calculated through Spearman correlation (*N *= 1,011). PHA, public health agency. [c]marks variables that served as control variable. [d]marks the dependent variable in our study design. [m]marks the mediating variable.* *p < *0.05.* **p < *0.01.* ***p < *0.001.*

1.70), trust in the government, which was used as a control variable, was lower than trust in the Public Health Agency. The average of the reported political orientation was 5.28 (*SD* = 2.32) and balanced over politically left and politically right orientations. Furthermore, most participants (61.5%) reported not to be a part of a risk group regarding COVID-19. A last control variable was education. Percentages of participants' education levels are reported in the following from lowest to highest degree: 0.4% of participants reported that they have no school degree, 5.8% reported to have a degree from a primary school, whereas 31.4% reported that their highest education was a high school degree. 10.1% of the participants reported to have completed a degree from a poly-technical school. Many participants reported their highest degree to be from a university (50.8%), while 1.5% reported a doctoral degree to be their highest education. For the main analysis, the variable assessing education was broken down into six single dummy variables. Categorical control variables were dummy coded for the analysis. Not being a part of a risk group was coded with 0 while being a part of a risk group was coded with 1. For the analysis, it was not differentiated between the reasons why participants belonged to a risk group. The gender variable was coded with 0 for women and 1 for men. For the calculation of correlations, Education was not dummy coded, but entered as ordinal variable ranging from the lowest level of education (1 = "not completed primary school") to the highest level of education (6 = "doctoral degree or similar"). Correlations between all variables included in the analysis are found in **Table 2**.

Importantly, there were significant correlations between all personality traits and compliance, such that conscientiousness, agreeableness, openness and extraversion all were related to more compliance, while neuroticism was related to less compliance.

Multivariate Regression Results and Mediation Model

First, to investigate the relationship between the Big Five personality traits and compliance, with the aim to test the hypothesis concerning the relationship between Conscientiousness and compliance (H1), a linear regression model was calculated. This model included the five personality traits as predictors. Further, gender, age, education level, risk group, political orientation, and trust in the government were included as control variables. To check for possible collinearity issues, we investigated Variance Inflation Factors, which ranged between 1.02 and 1.30 and hence indicated no problems with collinearity issues between the predictors (Sheather, 2009).

TABLE 3 | Regression coefficients of the model predicting compliance from the Big Five.

Predictor	*B*	*SE*	*p*
Conscientiousness	0.10	0.03	<0.001
Agreeableness	0.05	0.03	0.099
Neuroticism	–0.00	0.03	0.956
Openness	0.02	0.03	0.506
Extraversion	0.01	0.02	0.649
Trust in government	0.01	0.02	0.745
Political orientation	0.00	0.01	0.981
Risk group	0.10	0.06	0.087
Gender	–0.31	0.06	<0.001
Age	0.01	0.00	<0.001
Education–no degree	0.29	0.62	0.643
Education–primary school	0.09	0.13	0.499
Education–high school	–0.06	0.06	0.351
Education–polytechnical school	0.10	0.10	0.318
Education–PhD	0.18	0.23	0.428

Overall model significance $F(15, 976) = 9.53$, $p < 0.001$.

The model turned out to be significant, $F(15, 976) = 9.53$, $p < 0.001$, with an adjusted R^2 of 0.11. In line with H1, Conscientiousness was a positive predictor of compliance, such that higher levels of Conscientiousness were associated to more compliance with the recommendations. Further, we observed a trend of Agreeableness to be positively associated with compliance. Neuroticism, Extraversion, and Openness did not significantly predict compliance. See **Table 3** for a complete overview of the model coefficients. Hence, H1 was supported.

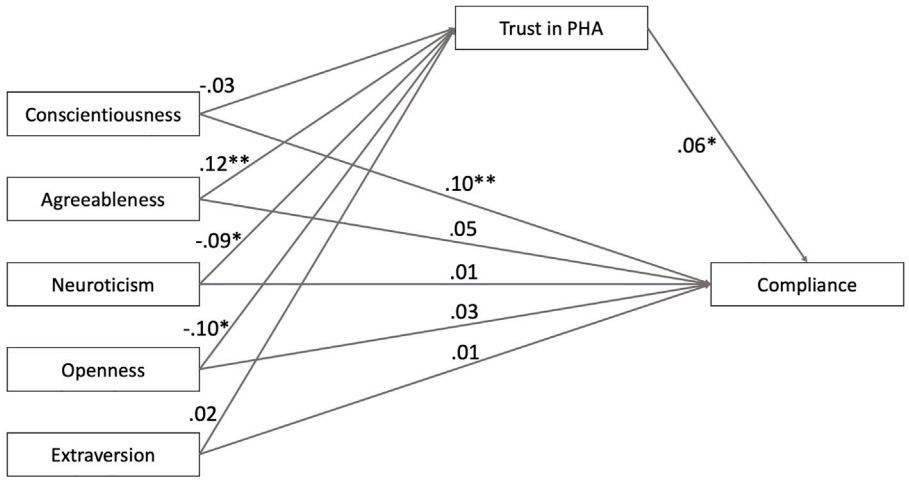

FIGURE 1 | Path diagram of the calculated mediation model with the according, mean centered regression coefficients. Coefficients stem from a mediation model predicting compliance to the recommendations published by the Public Health Agency (PHA) mediated by trust in the PHA. For simplification purposes, the control variables gender, age, education level, belonging to a risk group, political orientation, and trust in the government are not included in this graph. *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

To assess our hypotheses further, a mediation model was calculated. The model was calculated with the PROCESS macro for SPSS by Hayes (2017), model 4. It included the Big Five personality factors as predictors. Gender, age, education level, whether participants belonged to a risk group, political orientation[1], and trust in the government were included as control factors[2]. Trust in the Swedish Public Health Agency was included as a mediator. The compliance index was used as outcome variable[3]. Continuous variables in the model were mean centered. Missing values were excluded pair-wise. Heteroskedasticity consistent estimators after Hubert-White were applied. See **Figure 1** for a graphical depiction of the paths included in the model and the regression coefficients. This mediation model accounted for 13.34% (R^2) of the variance in reported compliance. See **Table 4** for the resulting coefficients of the model.

Second, we predicted, and found that trust in the Public Health Agency was positively related to compliance (H2), meaning that higher levels of trust in the Public Health Agency, was related to higher tendencies to follow the Public Health Agency's recommendations; $B = 0.06$, t (975) = 2.29, $p = 0.022$. Regarding trust in the Public Health Agency, the predictors included in the model accounted for 40.89% (R^2) of the variance.

Regarding the relationships between personality traits and trust, we found that higher levels of Openness and Neuroticism were associated with lower trust, while higher levels of Agreeableness were related to higher trust in the Public Health Agency [Openness, $B = -0.10$, t (976) = −2.64, $p = 0.009$, Agreeableness, $B = 0.12$, t (976) = 2.70, $p = 0.007$, and Neuroticism, $B = -0.09$, t (976) = −2.49, $p = 0.013$]. No evidence was found for the expected negative relationship between Extraversion and trust in the Public Health Agency, $B = 0.02$, t (975) = 0.69, $p = 0.491$.

Finally, to investigate the third prediction, that trust in the Public Health Agency serves as a mediating variable between the Big Five and compliance (H3), possible indirect effects in the mediation model were considered. For these effects, 95% confidence intervals were calculated based on 5,000 bootstrap samples each. **Table 5** contains an overview of all effects within the calculated model and the according bootstrapped confidence intervals.

Specifically, we expected that Agreeableness would be associated to increased trust in the Public Health Agency, and

[1]We ran the analysis using political blocs instead of left-right position. We used a left-wing bloc, a right-wing bloc and the populist party the Sweden Democrats as a separate party. The results did not differ from the analysis using left-right as predictor. This is in line with previous research that showed that political orientation had marginal effects on satisfaction with the handling of the Covid-19 situation and that the attitudes surrounding the situation do not follow traditional party lines (Gadarian et al., 2020; Renström & Bäck, 2021a; 2021b).

[2]Since Trust in government has been shown in earlier research to be connected to the Big Five traits, we also tested to run the model without Trust in government as a control variable. The results did not differ substantially. Effects of traits on trust in PHA remained the same, while the effect of trust in PHA on compliance became slightly weaker. Explained variance remained the same.

[3]We ran the model with the compliance items separately to explore if specific behaviors may be differently related to the personality traits and trust. Overall, the results mirrored that of the main model, with the exception that for the outcome "avoid to meet other people," trust in PHA did not predict this outcome. The effect was also weaker for "avoid to travel". Agreeableness was directly related to "avoid to travel," such that increased agreeableness was related to less travelling. There was also a positive direct effect of Extraversion on increased hand hygiene. These results indicate that personality traits and trust in the PHA may be different for different compliance behaviors. Still, since the effects were relatively weak in the original model, this could also be an effect of splitting up the index, which should provide more reliable results.

TABLE 4 | Regression coefficients of the mediation model predicting compliance from the Big Five and control variables, mediated by trust in the PHA.

		Consequent						
		M (trust in PHA)				Y (compliance)		
Antecedent		**Coeff**	***SE***	***P***		**Coeff**	***SE***	***p***
X (Conscientiousness)	a_1	–0.03	0.04	0.489	c_1	0.10	0.03	0.002
X (Agreeableness)	a_2	0.12	0.04	0.007	c_2	0.05	0.04	0.209
X (Neuroticism)	a_3	–0.09	0.04	0.013	c_3	0.01	0.03	0.862
X (Openness)	a_4	–0.10	0.04	0.009	c_4	0.03	0.03	0.411
X (Extraversion)	a_5	0.02	0.03	0.491	c_5	0.01	0.02	0.700
C (Trust Gov)		–0.19	0.08	<0.001		–0.03	0.02	0.243
C (Pol Orien)		–0.16	0.07	0.613		0.00	0.01	0.920
C (Riskgroup)		–0.00	0.00	0.013		0.12	0.06	0.037
C (Gender)		–0.52	0.46	0.031		–0.29	0.06	<0.001
C (Age)		–0.22	0.16	0.205		0.01	0.00	<0.001
C (Edu–no degree)		–0.08	0.08	0.258		0.32	0.31	0.294
C (Edu–primary)		–0.12	0.20	0.181		0.10	0.11	0.386
C (Edu–high school)		–0.03	0.13	0.318		–0.06	0.07	0.380
C (Edu–polytechnic)		–0.19	0.08	0.564		0.19	0.17	0.258
C (Edu–PhD)		–0.16	0.07	0.806		0.10	0.09	0.291
M (Trust PHA)					b	0.06	0.03	0.022
Constant		3.45	0.39	<0.001		4.58	0.33	<0.001
		R^2 = 40.89		R^2 = 13.34				
		F (15, 975) = 30.84, p <0 .001		F (16, 974) = 8.08, p < 0.001				

Coefficients of continuous variables are mean centered. Gender was dummy coded, women were coded as 0, men as 1; education level of the majority (university degree) was chosen as reference category for the education variable.

hence increased compliance (H3a), while Neuroticism, Openness and Extraversion would be associated to less trust in the Public Health Agency, leading to less compliance (H3b).

Several indirect effects turned out to be significant, indicating that for particular personality traits, trust in the Public Health Agency mediated the relationship with compliance.

First, trust in the Public Health Agency served as a mediating variable in the relationship between Agreeableness and Compliance. The higher individuals scored on Agreeableness, the more they trusted the Public Health Agency which in turn was associated with more compliance with recommendations; 95% CI [0.001, 0.017]. However, Agreeableness was not directly linked to compliance, 95% CI [−0.026, 0.117]. These results support H3a.

Second, Trust in the Public Health Agency significantly mediated the effect of Neuroticism on compliance, indicating that the higher individuals score on Neuroticism, the lower their levels of trust in the Public Health Agency, which in turn is associated with less compliance, 95% CI [−0.013, −0.000], even though Neuroticism was not directly associated with compliance, 95% CI [−0.052, 0.057].

Openness was not directly related to compliance, 95% CI [−0.034, 0.084], but when trust in the Public Health Agency was considered as a mediating variable, there was a negative indirect relationship between Openness and compliance. The higher individuals scored on Openness, the lower was their reported level of trust in the Public Health Agency and thus the lower were the levels of compliant behavior they reported, 95% CI [−0.015, −0.001].

For Extraversion 95% CI [−0.003, 0.006], trust in the Public Health Agency did not serve as a mediating variable on compliance. Hence, H3b was partially supported. We found the expected effects for Neuroticism and Openness, but not for Extraversion.

TABLE 5 | Total, direct, and indirect effects of the Big Five personality traits on compliance and according 95% confidence intervals. Trust in PHA was included as mediator.

Personality trait	Effect type	Effect	SE	LCI	UCI
Conscientiousness	Total	0.100	0.032	0.037	0.163
	Direct	0.102	0.032	0.039	0.164
	Indirect	–0.002	0.003	–0.008	0.003
Agreeableness	Total	0.053	0.036	–0.019	0.124
	Direct	0.046	0.036	–0.026	0.117
	Indirect	0.007	0.004	0.001	0.017
Neuroticism	Total	–0.000	0.029	–0.057	0.057
	Direct	0.005	0.029	–0.052	0.063
	Indirect	–0.005	0.003	–0.013	–0.000
Openness	Total	0.018	0.030	–0.040	0.076
	Direct	0.025	0.030	–0.034	0.084
	Indirect	–0.006	0.004	–0.015	–0.000
Extraversion	Total	0.010	0.023	–0.035	0.055
	Direct	0.009	0.023	–0.036	0.054
	Indirect	0.001	0.002	–0.002	0.006

95% Confidence Intervals are based on 5,000 bootstrap samples.

Finally, for Conscientiousness, 95% CI [−0.008, 0.003], we found no mediating effect of trust in the Public Health Agency, which was not expected either.

DISCUSSION

In this study, we aimed at investigating the interplay between the Big Five personality traits and trust in the authority the Swedish Public Health Agency to predict compliance with containment recommendations during the first wave of the COVID-19 pandemic in Sweden. Since the non-compliance with the

containment recommendations was not legally enforced in Sweden, individual and contextual factors might have had more influence on the extent to which individuals complied with containment behaviors compared to countries where these behaviors were legally enforced. Thus, personality factors and trust might have played an especially important role for compliance with the containment recommendations in Sweden. With data from a large-scale, representative survey conducted in April 2020 in Sweden, we investigated the proposed mediation model including the Big Five as predictors of compliance and trust in the Public Health Agency as mediator.

Participants reported to largely adhere to the containment regulations during the first wave of the COVID-19 pandemic in Sweden. This is in line with other studies investigating compliance with containment guidelines, voluntary distancing and self-isolation in Sweden (Helsingen et al., 2020; Kamerlin and Kasson, 2020). Furthermore, participants reported high trust in the Public Health Agency, which is in line with Helsingen et al. (2020), who also described high levels of trust in health authorities in Sweden. Moreover, it suits the general finding that institutional and political trust is high in Sweden, and might even have risen during the pandemic in the general population (Esaiasson, Sohlberg, Ghersetti, and Johansson, 2021).

Of the Big Five personality traits, only Conscientiousness was directly linked to compliance, such that the higher individuals scored on Conscientiousness, the greater the extent to which they reported to comply with the recommendations published by the Public Health Agency. This is in line with previous studies, which repeatedly found higher levels of Conscientiousness to be associated with more precautious behavior during the COVID-19 pandemic (Aschwanden et al., 2020; Bogg and Milad, 2020; Brouard et al., 2020; Carvalho et al., 2020; Götz et al., 2020). This points to that Conscientiousness might take on a special role among the Big Five traits in the context of compliance to containment behavior. Regarding the definitions of the Big Five, Conscientiousness is the trait most closely connected to rule following and compliant behavior (McCrae and John, 1992; McCrae and Costa Jr, 2008).

Trust in the Public Health Agency itself was positively related to compliance. This positive relationship between trust and compliance is in line with observations during previous public health crises, where trust in authorities often was found to have a promoting influence on the willingness to engage in preventive behaviors to stop the spread of a disease (Condon and Sinha, 2010; Gilles et al., 2011; Vinck et al., 2019). Several studies conducted on the relationship between political or institutional trust and precautious behaviors or compliance with containment guidelines during the COVID-19 pandemic provided evidence for a positive effect of trust on precautious behavior and compliance (Bargain and Aminjonov, 2020; Clark et al., 2020). Other studies suggested however a negative effect of trust on containment behavior (Woelfert and Kunst, 2020), which was discussed to be a possible consequence of a sense of false safety resulting from high trust in the authorities leading through the crisis (Devine et al., 2020). Thus, the fact that both trust in the Public Health Agency, but also compliance was reported to be high, could be interpreted as a sign that the Swedish population trusted the authorities enough to follow their guidance. Even though trust in the Public Health Agency was reported to be high, it seemingly did not result in a false sense of safety which could lower the extent of precautious behaviors taken by the public.

By including trust in the Public Health Agency as a mediating variable in our analyses, Agreeableness, Neuroticism, as well as Openness turned out to be indirectly linked to compliance, even though none of these traits was directly linked to compliance. The indirect link discovered between Agreeableness, Neuroticism, Openness, and compliance mediated through trust in the Public Health Agency implies that the pronouncement of these personality traits is related to trust in the Public Health Agency. It is important to note here that a direct link between the traits and compliance is not required for a mediation process (Hayes, 2018; Rucker et al., 2011). A possible reason for direct null effects is that some of the found effects were oppositional in direction, which is discussed as "oppositional mediation." When an independent variable, such as neuroticism, has a negative effect on the mediator, in this case trust in the Public Health Agency, which in turn have a positive effect on the outcome variable, here, containment behaviors, the oppositional effects between the predictor and mediator and between the mediator and the outcome result in a direct null effect when the mediator is not considered in the model (Lambert, et al., 2019; Kenny, 2017; Renström et al., 2021). This is one reason why there may be a lack of results, or mixed results, in previous research that has investigated the relationship between personality and compliance.

Our findings indicated that the higher individuals score on Neuroticism or Openness, the lower their trust in the Public Health Agency, which is accompanied by less compliance with the containment recommendations. On the other hand, the higher individuals scored on Agreeableness, the higher their trust, which is associated with more compliance. These findings emphasize the importance of considering the mediating factor of trust when trying to investigate the relationship between the Big Five personality traits and compliance. Thus, our findings indicate not only that personality traits are associated with the extent to which individuals comply to containment recommendations, but they also shed light on how personality traits and compliance relate to each other.

Previous studies found direct connections between Neuroticism and less beneficial or risky health behaviors (Lahey, 2009; Mroczek et al., 2009). Investigations of relationship between Neuroticism and health precautions during the COVID-19 pandemic yielded mixed results. While some studies suggested a negative relationship between Neuroticism and health precautions (Aschwanden et al., 2020; Brouard et al., 2020), other studies pointed towards a positive relationship (Asselmann et al., 2020; Götz et al., 2020). These mixed findings could point to that this relationship might be more complex and that other variables might be needed in the models to account for potential underlying mechanisms. Our findings support this interpretation as we found no direct, but an indirect effect of Neuroticism on compliance. Individuals higher

on Neuroticism tended to trust the Public Health Agency less, which in turn was associated with lower compliance.

The negative relationship between Neuroticism and trust is partly in line with previous research. Individuals high on Neuroticism are often described as having a stronger tendency than individuals low on Neuroticism to worry and to feel anxious (McCrae and John, 1992). In line with findings by Freitag and Ackermann (2016) who found Neuroticism linked to less political trust, our study results suggest that highly neurotic individuals tend to be more careful about who to trust to which extent. Considering the circumstances of our study, it seems reasonable that individuals high on Neuroticism worry more than others about the pandemic, which might affect the trust they have in the Authorities responsible for the crisis strategy. Lower trust in return was connected to less compliance with the containment recommendations. That no direct effect between Neuroticism and compliance was found could be interpreted as an indication that the relationship between Neuroticism and compliance with containment measures during the COVID-19 pandemic is generally more complex and that other factors need to be taken into consideration to explain the relationship between these two variables.

Whether highly agreeable individuals will follow containment guidelines or not, could be dependent on to what extent these behaviors have turned into a norm in society. The results of our study indicated that the majority in our representative sample of the Swedish population reported to try to follow the containment recommendations to a great extent. Following the containment recommendations could therefore be regarded as a norm, which should make it more likely that individuals high on Agreeableness also follow the recommendations. However, unlike previous studies conducted during the COVID-19 pandemic (Asselmann et al., 2020; Götz et al., 2020; Zajenkowski et al., 2020), we did not find a direct positive relationship between Agreeableness and precautious behavior. No direct effect of Agreeableness on compliance was found. However, we found higher values on Agreeableness to be associated with higher trust in the Public Health Agency, which in turn was associated with higher compliance. The direction of the indirect effects of Agreeableness are overall in line with studies that have been conducted on the relationship between the Big Five personality traits and compliance with containment recommendations during the COVID-19 pandemic. The positive relationship between Agreeableness and trust is furthermore in line with early work on the Big Five of McCrae and John (1992), where highly agreeable persons were described as generally more trusting. Furthermore, Mondak and Halperin (2008) described agreeable individuals to be higher in political trust. This in line with our findings for Agreeableness.

We found no direct effect of Openness on compliance, however, we found a negative indirect effect of Openness on compliance, when trust in the Public Health Agency was included as a mediator. While Götz et al. (2020) found a positive relationship between Openness and sheltering in place, only few of the studies conducted on the relationship between the Big Five and compliance during the COVID-19 pandemic found Openness to be a relevant trait for compliance. That it was necessary to include trust as a mediator to be able to establish a link between Openness and compliance might explain why previous findings that have not considered the mediating influence of trust, did not find Openness to be of relevance for compliance. The relationship between Openness and compliance might be complex, so that it is necessary to take other variables into account. The negative link between Openness and trust in the Public Health Authority is in line with previous research. Individuals scoring high on Openness were described to be critical citizens who think or behave in unconventional and non-conforming ways which might as a consequence also come with lower trust into state authorities (McCrae and Costa, 1997; Mondak and Halperin, 2008).

Regarding the role of political trust during the COVID-19 pandemic, studies often focus on institutional trust in general or specifically on trust in the government (e.g., Böhm, Lilleholt, and Zettler, 2020; Clark et al., 2020; Oksanen et al., 2020). Clark et al. (2020) found governmental trust to be weakly related to compliance with containment behavior regarding COVID-19 in an international sample. In the current study, governmental trust was included as a control variable. Similar as in the findings of Clark et al. (2020), governmental trust was not a strong predictor of compliance, whereas trust in the Public Health Agency was. This indicates that when investigating the effect of trust on behavior during the COVID-19 pandemic, it is crucial to look at trust in the particular state authority or institution that is most relevant in this context.

Limitations and Future Directions

The current study relies on self-report measures, which comes with the risk that participants' answers are biased by social desirability. This might especially be the case for the dependent variable, the compliance with containment recommendations. Other studies conducted on compliance with containment recommendations in Sweden during the first wave of COVID-19 with similar measures around the same time in Sweden came however to similar results (Helsingen et al., 2020). Further, studies analyzing behavioral data, like movement data from phones, which are not susceptible to biases due to social desirability, also indicate that the public followed the recommendations on travelling and staying at home in Sweden during the first wave of the pandemic when we were conducting this study (Dahlberg et al., 2020; Wetter, Rosengren, and Törn, 2020). This could be carefully interpreted as an indication that our results did not only occur due to answers biased by social desirability. Yet, it should be noted that personality and social desirability may be related, and so caution in the interpretation of the present results is warranted.

The Ten-Item Personality Inventory (Gosling et al., 2003) often show low-to-moderate internal reliability (Cronbach's alphas around 0.40–0.68), which was also the case in this study. This could affect the capacity of the instrument to capture the underlying constructs. Nonetheless, it has showed high temporal stability, and strong correlations with longer personality inventories, and patterns of correlations with other psychological variables are similar to those obtained with longer measures (Nunes, et al., 2018), and similar factor loadings as

longer measures (Erhart et al., 2009). Nonetheless, the TIPI's efficiency comes at a cost of losing more nuanced aspects of the Big Five. Single facets of the Big Five factors might be better predictors of specific behaviors than the five complete factors (Paunonen and Ashton, 2001). More nuanced measures of the Big Five might therefore better predict compliance with containment regulations and could contribute to a better understanding of how the Big Five, trust, and compliance relate to each other. Moreover, future studies could benefit from including more elaborate trust measures, as discussed by Devine et al. (2020).

The possibility to generalize the results of this study to other countries is somewhat limited, as the measures taken by other countries and the actors involved in the development of the measures differed between countries. While in many countries, governments were the most prominent state institutions in handling the pandemic, in Sweden, it was the Public Health Agency that designed and communicated the containment recommendations, and the government kept largely in the background. As the extent of trust changes with variations in situation, relation or domain, trust in a government in a country other than Sweden might relate to compliance differently than trust in the Public Health Agency in Sweden. However, we believe that the general findings of our analyses, meaning that trust and the Big Five personality traits act together to influence compliant behavior during the COVID-19 pandemic could also be valuable findings for other countries and contexts.

The current study is based on a one-time measurement and thus only captures participants' trust and compliance during one specific point in time early during the pandemic. Future studies could contribute to the understanding of the interplay of personality, trust, and compliance by measuring these factors longitudinally. Especially since trust in authorities or the government can be expected to change depending on how the public evaluates their performance during the pandemic. Moreover, because trust may vary with different segments of the population, future research should analyze how well the model presented here performs in different demographic groups.

Conclusion and Implications

In this study, we aimed at better understanding how personality traits relate to compliance. We presented evidence for the influence of personality traits on compliance with containment recommendations during the COVID-19 crisis in Sweden and showed that this relationship is more complex than often assumed as trust in the Public Health Agency was found to be an important mediator in this relationship. While individuals scoring high on Conscientiousness seem to follow the containment recommendations regardless, individuals scoring high on Openness, Agreeableness, or Neuroticism, need to feel that they can trust the Public Health Agency in order to follow the recommendations. Keeping the level of public trust in the Public Health Agency high is thus crucial for whether citizens comply with the containment recommendations or not, and hence determines the success of the containment strategy.

Another consequence of this research is that it becomes challenging to formulate policy advice. Given that personality features influence level of trust, policy makers should be aware that the policies and strategies to increase compliance with the containment strategy, may not successfully appeal to all citizens. Hence, several different types of strategies may have to be used to increase compliance in the population.

While at the beginning of the COVID-19 pandemic, Sweden was one of the few countries in Europe that responded to the crisis in a lenient way, with some time into the pandemic and decreasing infection rates, many countries started to loosen their restrictions and started to open up again. The transformation from lockdowns to more lenient strategies also hand over more responsibility to the individual to behave in a way that limits the risk for a spread of the virus. Thus, personality traits and trust in relevant authorities could also play a crucial role for the success of the new, more lenient containment strategies of many countries.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found below: https://osf.io/r7f8d/.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

ER and HB contributed to conception and design of study. YS contributed with the analyses and draft of the manuscript. All authors contributed with writing sections of the manuscript, reading and revising the manuscript.

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