Personality traits predict perception of pandemic risk and compliance with infection control measures (Stage 1 registered report)

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## Abstract

Personality traits influence our outlook and choices in life, and may also influence how we evaluate and respond to an extreme event such as the early stages of the COVID-19 pandemic in 2020. Here we combined big-5 personality measures from a large nationally representative sample before the onset of the pandemic with measures of perceived risk and compliance four months into the pandemic. We predicted that low extraversion, low openness, and high neuroticism would predict higher perceived risk. We further predicted that high conscientiousness, low extraversion, high agreeableness, high openness, and high neuroticism would predict higher compliance. To provide transparency and to control for flexibility in the analysis and reporting of the many possible associations, hypotheses and analysis plans were reviewed and approved in advance of aligning the two datasets (a registered report format). Our results supported [none of these hypotheses / all of the hypotheses / the hypotheses about the effect of conscientiousness / extraversion / agreeableness / openness / neuroticism / on perceived risk / on compliance].

Keywords: Personality, Big-Five, COVID-19, Perceived risk, Compliance, Registered report

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### Personality and pandemic outcomes

The extent to which an individual sees a pandemic to constitute a risk for them, and the extent to which they comply with the health authorities’ infection control measures, is crucial for the individual’s mental and physical health, and for society’s management of the pandemic. Several possible relationships between personality traits, risk, and compliance have been suggested in the literature (Aschwanden et al., 2020).

Our dataset allows us to compare personality measures from half a year before the onset of the pandemic with measures of perceived risk and compliance during the pandemic. By stating a number of hypotheses derived from the literature in advance, we can test which relationships are and are not supported in the dataset. This can inform which personality traits are associated with seeing the risk of a given pandemic situation to be particularly high or particularly low. It can also inform us about which personality traits are associated with higher or lower compliance with infection control measures. Knowledge about how personality traits and other individual differences determine risk perception and compliance may be relevant for designing public health interventions. In particular, information campaigns may be adjusted in attempts to influence individuals that may otherwise be resistant to seeing the risk or complying with infection control measures.

### Pandemic outcomes

#### Perceived risk.

In the context of an ongoing pandemic, “perceived risk” would constitute the subjective likelihood of being infected (or of being affected by other direct or indirect effects of the pandemic), and the subjective evaluation of how negative this event would be. How people see risks during a pandemic may be shaped by various psychological mechanisms. Individuals may rely on their past experiences with infectious diseases, information from various news sources, and their prior beliefs to evaluate risk. Personality traits, level of trust in authorities, and cultural beliefs may influence how people perceive and respond to risk. For example, someone with a higher tolerance for risk might perceive the threat of the virus differently than someone who is more risk averse. Similarly, individuals who trust government advice may be more likely to trust infection rates and take precautions compared to those who are sceptical of government information (Ebrahimi et al., 2021; van der Weerd et al., 2011). It has previously been argued that perceived risk could have a major contribution to the extent to which individuals comply with infection control measures (Bish & Michie, 2010; van der Pligt, 1998; van der Weerd et al., 2011; Witte & Allen, 2000). However, a previous analysis of other data from the current panel (measured in March 2020) did not show substantial association between perceived risk and compliance (Sætrevik & Bjørkheim, 2022). Hansen and colleagues (2023) also found mixed evidence for the association between perceived risk and compliance with infection control measures in an American sample. These conflicting findings could be due to individual factors (such as personality traits) causing the factors to correlate in some settings, but not others.

#### Compliance with infection control measures.

Around March 2020 most countries implemented various public health measures to gain control over the COVID-19 infection. In Norway these measures mostly took the form of recommendations for regulating various behaviours that at the time were assumed to increase infections. In the late summer of 2020, the measures in Norway constituted close testing and tracing, quarantine and isolation measures for infected persons, crowd limitation on recreational activities such as going to bars and restaurants, restrictions on international travel, and restrictions on cultural events such as sports, art, and theatre events (Norwegian Government, 2022). Additionally, the health authorities recommended people to work from home, limit the use of public transportation, keep physical distance to strangers, and avoid crowds. “Compliance” can be thought of as the extent to which individuals’ actual behaviour is in accordance with the measures. Compliance is typically measured as the self-reported intention to comply, past or typical compliance behaviour. Our analyses of compliance from previous time-points of the current panel dataset have shown that compliance was very high among Norwegians in March 2020 (Sætrevik, 2021), decreased somewhat over the summer as infection rates fell, but rose again in the early fall when the rates increased (Bjørkheim et al., 2024; Sætrevik & Bjørkheim, 2020).

### Impact of personality on pandemic behaviour

#### The big-5 personality model.

The “big-5” model (or five-factor model; Costa & McCrae, 1992) is the dominant model for describing individual differences in personality. The model was developed primarily based on lexical and statistical approaches, and has later been replicated in a range of cultures and supported by empirical correlates corresponding with the conceptualisations of the traits (Costa & McCrae, 1992). The fundamental assumptions in the model are that traits represent important differences between individuals and that such traits are relatively stable across time and situations (Larsen et al., 2021). We should mention that alternative models have also been suggested, such as the HEXACO model (Lee & Ashton, 2008) and the dark triad model (Paulhus & Williams, 2002).

#### How personality may impact pandemic behaviour.

Individuals’ personality traits may influence how they gather and evaluate information about risk, and make decisions about protective behaviour during a pandemic. Personality traits have been shown to influence both which information individuals notice and how they respond to the information (Costa & McCrae, 1992). For instance, neuroticism has been linked to a stronger tendency to notice negative social stimuli (e.g., signs of social exclusion) and to experience more negative affect in response to such stimuli (Abdellaoui et al., 2019; Montag & Panksepp, 2017). It has been suggested that differences in risk perceptions have evolutionary underpinnings in which different levels of risk sensitivity have been advantageous in different settings (Buss & Penke, 2015). Further, personality traits have been suggested to influence safety-relevant behaviour (Beus et al., 2015).

Two types of mechanisms have been suggested to explain relationships between personality and compliance: First, personality traits may have a direct effect on pandemic compliance by affecting the individual's willingness and capacity for complying. This proposed mechanism is supported by theory and research on health behaviour, in which pandemic compliance could be considered as a form of health protective behaviour (Weinstein, 2000). Personality traits influence health behaviour by influencing the individual’s motivation and capacity for both avoiding negative health behaviours and committing to positive health behaviours (Strickhouser et al., 2017; Willroth et al., 2021). A second possible mechanism through which personality traits can influence compliance is through norm adherence. Adhering to norms may affect an individual’s likelihood of being aware of, agreeing with, and being motivated to comply with what is seen as the socially expected behaviour (Bogg & Roberts, 2004; Tate et al., 2022). It has been suggested that the mechanisms that leads to personality being associated with compliance with other types of norm adherence would also be applicable to compliance with pandemic norms (Bogg & Milad, 2020). Thus, once social norms for compliance with infection control measures are established in the person’s environment, compliance would be subject to the personality mechanisms that influences norm-following in general.

There have been a number of studies and a few reviews on how personality traits may impact assessment and decision-making during pandemic situations. These are mostly based on data collections done during the COVID-19 pandemic, and some studies during the 2009 H1N1 (“swine flu”) pandemic. All the big-5 personality traits have been indicated to be involved, but the indications are clearer for some traits than for others, and some of the associations have little or contradictory support. There are more studies about the association personality traits have to compliance than about the association they have to pandemic risk perceptions. Below we will review the theoretical reasoning for and empirical indication that each of the personality traits should influence risk and compliance. We will discuss the traits in decreasing order based on how central they appear to be for the current research questions. Other relationships between personality and pandemic outcomes than those discussed here may have been suggested, but we will limit our discussion to relationships we see as having a certain amount of theoretical or empirical support.

#### Effects of conscientiousness on compliance.

The big-5 trait of “Conscientiousness” refers to a tendency to hold and comply with high standards for orderliness and self-discipline (Roberts et al., 2014)

Across the literature, conscientiousness appears to be the most reliable and robust personality trait that predicts general health behaviour and adhering to medical advice (Hampson & Friedman, 2008; Hill & Roberts, 2011). Conscientiousness tends to be positively related to health-beneficial behaviours and inversely related to risky health-related behaviours and (Bogg & Roberts, 2004). This may work through a mechanism in which conscientious individuals are rule-abiding and prioritize long-term over short-term gains (Roberts et al., 2014). Conscientiousness could also work through increasing compliance with what is seen as the dominant or desirable social norms as conscientious individuals are known to be norm abiding (Roberts et al., 2014).

This association is likely to also generalize to health-behaviour during a pandemic, as argued by (Zajenkowski et al., 2020). Accordingly, research during the COVID-19 pandemic has indicated that conscientiousness is associated with taking health precautions against infection (Aschwanden et al., 2020), give health recommendations to others (Clark et al., 2020), physical distancing and handwashing (Carvalho et al., 2020; Ebrahimi et al., 2021; Ludeke et al., 2021; Zettler et al., 2022), physical distancing among older adults (Airaksinen et al., 2021), more shelter-in-place (Götz et al., 2021), less often going to bars/restaurants or touching their face (Bogg & Milad, 2020), getting vaccinated (Adamus et al., 2022), and in general more compliance and more changed behaviour (Brouard et al., 2020; Horwood et al., 2023; Schmeisser et al., 2021; Willroth et al., 2021; Zettler et al., 2022).

To our knowledge, there is no empirical or theoretical reason to expect an association between conscientiousness and risk perception.

#### Effects of agreeableness on compliance.

willingness to help others (Costa & McCrae, 1992)In a pandemic, agreeableness may lead to pro-social motivation to comply with infection control measures in order to protect other members of the community.

At the time of measurement there was a strong social norm for compliance with infection control measures in Norway (Sætrevik et al., 2021). Since agreeableness reflects social compliance, it is likely that higher agreeableness is positively associated with the socially dominant pattern of complying.with infection control measures was important to protect at-risk populations. Thus, another mechanism for the association between agreeableness and compliance may be through compassion and concern for others’ well-being (Lauriola & Weller, 2018).

In line with these assumptions, it has been shown that agreeableness is associated with taking pandemic health-precautions during, and to give health recommendations to others (Clark et al., 2020). More specifically, agreeableness has been shown to be associated with more shelter-in-place (Götz et al., 2021), more physical distancing (Ludeke et al., 2021; Nofal et al., 2020), more handwashing (Asselmann et al., 2020; Nofal et al., 2020), avoiding public transport, crowds, and social situations (Asselmann et al., 2020), with being less mobile (Chan et al., 2021), and less risky behaviour (sample 1 in Panish et al., 2023). One study (Willroth et al., 2021) found agreeableness to have a larger contribution to compliance than any other traits. On the other hand, a study of older adults found an inverse relationship between agreeableness and limiting in-person contact (Airaksinen et al., 2021)

#### Effects of extraversion on risk perception.

“Extraversion” is associated with engagement with the external world across a wide range of activities (Costa & McCrae, 1992)

Extraversion may influence how people assess risk during a pandemic. Extraversion has been associated with some types of risk-taking (Lauriola & Weller, 2018). This tendency is often attributed to increased levels of “sensation seeking” (Nettle, 2005), which has been suggested to be a specific facet of extraversion (Zuckerman & Kuhlman, 2000). Extraversion is also associated with optimism and perceiving risks to be lower (Sharpe et al., 2011). It is also associated with being more attentive to positive information and less attentive to negative information (Noguchi et al., 2006)

#### Effects of extraversion on compliance

* + . In addition to the effects on how risk information is processed, extraversion may also have an effect on compliance with infection control measures. Extraverts have stronger social drive and get more enjoyment from social activities, and extraversion has been found to predict increased loneliness during the pandemic (Entringer & Gosling, 2022). This may make it more difficult for extraverts to comply with infection control measures that call for limiting social activities, such as keeping physical distance, avoiding private social events, or limiting shopping, restaurant visits, and nightlife. Stronger motivation to socialize may lead to less compliance with the infection control measures, independently of how the pandemic risk is perceived (see Zajenkowski et al., 2020, for a similar argument). Conversely, individuals with lower levels of extraversion might be better equipped to cope with the pandemic, as they may find solace in quieter, more introspective activities. It has been showed that extraverted individuals showed less physical distancing during the COVID-19 pandemic (Carvalho et al., 2020; Ebrahimi et al., 2021; Ludeke et al., 2021), less shelter-in-place (Götz et al., 2021), less mask-wearing (Barceló & Sheen, 2020), more hesitation about vaccines (Panish et al., 2023), and telemetry data showed them to be more mobile during lockdown (Chan et al., 2021). In more general terms, it was indicated that extraverts changed their behaviour less in response to the infection control measures (Brouard et al., 2020). However, note that some studies have also indicated a positive or absent association between extraversion and compliance (Airaksinen et al., 2021; Willroth et al., 2021; Zettler et al., 2022).

Effects

#### of openness on risk perception.

The personality trait “Openness to experience” reflects orientations towards aesthetics and novelty, and it may be related to need for cognition and flexibility (Costa & McCrae, 1992)

Openness to experience is associated with unconventional thinking. This could lead to individuals higher on openness to be less willing to accept the official message that the pandemic is a threat, and could thus lead to perceiving the risk as lower. Openness to experience is also associated with “sensation seeking” (Zuckerman & Kuhlman, 2000), along with extraversion, as discussed above. The higher risk tolerance that this entails might also transfer to a pandemic setting. On the other hand, openness to experience is associated with the ability to imagine dramatic changes in their everyday life (Eldesouky, 2012). This could lead open individuals to more easily acknowledge that the pandemic is a radically changed situation that implies a higher risk. Although effects in either direction are theoretically conceivable, we find an inverse association to be more likely given the established connection between openness and sensation seeking. We are not aware of any previous research that has shown associations between openness to experience and perceived infection risk.

#### Effects of openness on compliance.

Individuals higher in openness may be more accepting towards engaging in new activities and may more easily change their routines. As most of the infection control measures requested people to make radical changes to their lives, it is possible that individuals higher on openness were more willing to comply with them (see similar argument e.g., in Webster et al., 2023). Accordingly, previous research has shown that openness was positively associated with handwashing and physical distancing (Airaksinen et al., 2021; Nofal et al., 2020), shelter-in-place (Götz et al., 2021), vaccination (Panish et al., 2023; Webster et al., 2023), and less risky behaviour (Panish et al., 2023). Others have found indications of positive associations between openness and compliance to infection control measures (Willroth et al., 2021; Zettler et al., 2022), and indirect association through trust in government (Schmeisser et al., 2021).

#### Effects of neuroticism on risk perception.

“Neuroticism” is associated with behavioural tendencies for emotional instability, anxiety, and a predisposition to experience negative emotions. Individuals with higher levels of neuroticism may be perceived as emotional labile, self-conscious, and vulnerable. Neuroticism has been shown to predict the extent to which individuals perceive themselves to be vulnerable to infectious diseases (Duncan et al., 2009). In a pandemic, neuroticism could generalize to fear of being infected, and taking action to avoid infection.

Since neuroticism is associated with increased attention to negative information and a tendency to worry (Abdellaoui et al., 2019; Montag & Panksepp, 2017), we may assume that individuals higher in neuroticism may perceive the risk of the pandemic to be higher. This expectation is also in line with the findings from a previous study (Zettler et al., 2022). Neuroticism has been found to be associated with seeing COVID-19 to constitute a higher risk and being more pessimistic about the outcomes of the COVID-19 pandemic (Horwood et al., 2023).

#### Effects of neuroticism on compliance.

In addition to the effect on perceived risk, neuroticism could have an independent effect on compliance with pandemic measures. Neuroticism has been shown to be associated with fear of disease and with germ avoidance behaviour (Duncan et al., 2009), and more specifically anxiety about pandemics have predicted compliance with infection control measures (Bults et al., 2011). Neuroticism has been shown to have a positive association with shelter-in-place behaviour (Götz et al., 2021), with physical distancing (Ludeke et al., 2021), limiting in-person contact among older adults (Airaksinen et al., 2021), and reducing use of public transport (Asselmann et al., 2020). It has been indicated that the effects of neuroticism may work through emotions (Brouard et al., 2020) and trust in government (Schmeisser et al., 2021). It should be noted that some studies have indicated an inverse association between neuroticism and taking precautions (Aschwanden et al., 2020) or getting vaccinated (Adamus et al., 2022).

### Knowledge gap

As reviewedSome associations, such as the effect of personality on COVID-19 vaccination have shown only weak or mixed results (Halstead et al., 2022; Lin & Wang, 2020; Murphy et al., 2021).

Most of the relevant research on this matter is cross-sectional, where personality was measured during a health crisis and while also measuring protective behaviour. This context may have provided normative influences on how individuals respond to questions about both personality and compliance (social-desirability bias, Edwards, 1953). Such influences may lead individuals to report higher values for extraversion, conscientiousness, agreeableness, openness, and emotional stability, and also to report seeing the pandemic risk to be substantial and that one intends to comply with the infection control measures.

The respondent’s current mood or emotional state may influence both reports of personality (Kokkonen & Pulkkinen, 2001; Lewis et al., 1995) and health status (Croyle & Uretsky, 1987). For example, a person in a positive mood may report to be agreeable and to be optimistic about pandemic outcomes, while a person in a negative mood has the opposite pattern in their responses. A related challenge is that responses to one type of question may influence how subsequent questions in the same survey are answered (Braverman & Slater, 1996; Krosnick et al., 1996; Moore, 2002). After stating that one is a conscientious person, it may be more consistent to also report higher levels of compliance, or vice versa.

Relatively few of the reviewed studies on how personality may influence pandemic behaviour have separate procedures to distinguish hypothesis statement from hypothesis testing. Although this may be understandable for research initiated during an ongoing health crisis, it may make it difficult to say how robust the findings are and what predictive value they have (Simmons et al., 2021). When measuring a number of personality traits along with a number of pandemic outcomes (attitudes, beliefs, or behaviours, which may be indexed in different ways) there is a high number of potential relationships that can be discovered. An approach where the planned hypotheses are registered in advance of the analysis can make stronger claims about whether a priori predictions are supported (as opposed to false positives findings that may emerge from multiple comparisons and undisclosed analytic flexibility, Munafò et al., 2017; Nelson et al., 2018).

Most of the reviewed studies report effects of some of the big-5 traits against a specific outcome, but not for other traits. Some data-exploration approaches to big datasets find that most of the personality traits may play a role (e.g., Han, 2021). Given that a high number of possible associations between personality traits and pandemic outcomes have been suggested in the literature, it could have value to test all the relevant associations in a single study, and state which of the associations from the literature are and are not supported. As the majority of the relevant literature has focused on the association between personality and compliance, we think it could be valuable to also include the association between personality and perceived risk.

### Hypotheses and approach

The current study uses personality trait measures from the year before the onset of the COVID-19 pandemic. These are compared to questions about perceived risk and compliance that were collected half a year into the pandemic. We registered the following hypotheses (summarized in Table 1) based on previous empirical studies and theoretical statements about the association that personality may have to pandemic behaviour (or to general health behaviour). Based on a number of previous studies, we expect (H1) Conscientiousness to have a positive association with Compliance. There is also considerable support for an expectation that (H2) Agreeableness will have a positive association with Compliance. We expect (H3a) Extraversion to have an inverse association with Perceived risk, although there is limited support for this in previous literature. There is more literature to support the expectation that (H3b) Extraversion will have an inverse association with Compliance (although previous literature may only support this for measures related to social interaction). Although previous literature on this is conflicted, we lean towards expecting (H4a) Openness to have a positive association with Perceived risk. Previous pandemic literature provides some reason to expect that (H4b) Openness will have a positive association with Compliance. Based on general descriptions of the trait, we may expect (H5a) Neuroticism to have a positive association with Perceived risk. Finally, based on a few recent studies we expect (H5b) Neuroticism to have a positive association with Compliance.

The registered reports approach (Chambers & Tzavella, 2022) entails that we first (Stage 1) preregistered our assumptions and analytic approach, and had this reviewed by experts in the field. We had some prior knowledge of the dataset before Stage 1 submission, in terms of having examined the response distributions of the pandemic variables (Perceived risk and Compliance). However, we had no knowledge about the personality variables, and the data from the two data-collection time-points had not been combined before Stage 1 submission. After “in-principle acceptance” of the Stage 1 manuscript, we combined the datasets and performed the planned analyses (Stage 2).

Table 1: Hypotheses for current study

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Personality factor | Direction | Outcome | Support in literature |
| H1 | Conscientiousness | Positive | Compliance | Strong |
| H2 | Agreeableness | Positive | Compliance | Strong |
| H3a | Extraversion | Inverse | Perceived risk | Limited |
| H3b | Extraversion | Inverse | Compliance | Moderate |
| H4a | Openness | Inverse | Perceived risk | Limited |
| H4b | Openness | Positive | Compliance | Moderate |
| H5a | Neuroticism | Positive | Perceived risk | Limited |
| H5b | Neuroticism | Positive | Compliance | Moderate |

## Methods

### Data collection

All data in the current analysis are from the Norwegian Citizen Panel. Recruitment is done through random selection among all Norwegian citizens above the age of 18. Initial recruitment to the panel was done in 2013, with yearly supplemental recruitment. Researchers at the University of Bergen are responsible for planning and measurement design for the panel, while the company Ideas2Evidence manages the recruitment, data collection, and survey methodology reports. The dataset with personality measures and the dataset with pandemic measures were not merged before Stage 2, in order to prevent preliminary analyses from affecting the hypothesis formation.

#### Personality data collection.

The survey that measured big-5 personality traits was collected between May 21st and June 7th, 2019. Initial invitations were sent out to the email accounts of the then 18,090 panel members, with subsequent reminders sent out on the 29th of May, 3rd of June and 7th of June. The data collection yielded a response rate of 74.4%. In total 8,105 panel members answered the big-5 questions.

#### Pandemic data collection.

The survey that measured perceived risk from the pandemic and compliance with infection control measures was collected between August 26th and September 2nd, 2020. Invitations were sent out by email to a subset of the panel which consisted of 6,776 panel members, with subsequent reminders sent out on the 28th and 31st of August. The data collection had a response rate of 81.8%, which yielded an *n* of 5,531 (see methodology report: <https://osf.io/5h2sb/>). Of these, [number to be added at Stage 2] panel members could be matched between the personality and the pandemic data collection [exact number not known at Stage 1 as the datasets have not yet been combined. Given typical attrition rates in this panel, we expect the combined dataset will be *n* > 2,000, which should be sufficient for the planned analyses (see Table 2 for sensitivity analysis)].

At the time the pandemic data was collected, the infection rates in Norway were increasing following a summer of low and stable infection rates. There were a number of infection control measures in place, including restrictions on public gatherings, quarantine requirements for travellers, and widespread testing and tracing. Additionally, Norwegians were advised by the health authorities to adopt a number of personal hygiene measures such as handwashing, avoiding touching public surfaces, and keeping physical distance from strangers (no encouragement to wear masks at that time).The more intrusive measure from the outbreak in March and April of the same year had been lifted, including re-opening international borders and schools. The pandemic was very much a part of the public debate, although there were fewer cases in Norway than a number of other Western countries at the time. A number of vaccine candidates were being examined at the time, but no conclusive successes had been reported, and it was projected that distribution of vaccines would not happen for at least another six months.

### Respondents

Members of the Norwegian Citizen Panel have participated in online surveys about diverse social matters three to four times a year since 2013. The panel aim to be representative for the adult Norwegian population (aged 18 or older). There are slight deviations from perfect representativity in terms of age, education level, and place of residence. The dataset is provided with weighting variables for adjust for the deviations in representativity (see methodology report, [https://osf.io/g57sf](https://osf.io/g57sf/)).

### Materials and variables

All item text (in original Norwegian and English translation), with variable classification and response options are shown in an online supplemental file (<https://osf.io/ksvh3>). Measurement of the Personality, Perceived risk and Compliance are described in more detail below.

#### Personality measure.

We measured personality traits by adopting the Big Five Inventory‐10 (BFI-10) scale from Rammstedt and John (2007). The BFI-10 offers a viable option for quick and efficient assessment of the big-5 personality dimensions, making it particularly useful in research settings with time or space limitations. While it incurs some loss in psychometric properties when compared to the 44 item version that it is adapted from, its reliability and validity remain robust, demonstrating its utility as a brief and effective personality measurement tool (Rammstedt & John, 2007). The BFI-10 was created by selecting two items for each of the big-5 personality dimensions, ensuring representation of both poles (high and low) of each factor. The selection process aimed to retain core aspects of each dimension while minimizing redundancy. The scale comprises a series of statements that are intended to assess a respondent’s self-perception of various personality traits. Respondents were prompted to evaluate the extent to which each statement aligns with their self-concept. Each statement begins with an introductory phrase such as “I see myself as someone who” and is then followed by the key trait such as “… is reserved”. Responses are made on a five-point Likert scale, where respondents indicate their level of agreement with the characterizations on a scale ranging from “disagree strongly” (1) to “agree strongly” (5). For each personality trait, we will calculate an arithmetic average of the two items.

#### Perceived risk measure.

Four items were used to assess perceived risk related to the coronavirus, all using a five-point Likert-type scale ranging from “very low” (1) to “very high” (5). These items were designed to measure the extent to which respondents saw various aspects of the ongoing pandemic as a threat to their health, to their established lives, or indirectly by threatening their society. The first item, “Perceived risk of for being infected,” asked how high or low respondents perceived the risk for themselves to be infected by the coronavirus. The second item, “Perceived risk for the average adult to be infected,” asked how respondents perceived the risk of an average adult in Norway to be infected by the coronavirus. The third item, “Perceived risk of serious illness,” asked how likely the respondents perceived it io be that they themselves would become seriously ill due to the coronavirus. The fourth item, “Perceived risk of impact on everyday life,” asked how the respondents perceived the risk for their everyday life to be significantly changed as a result of the pandemic. We will calculate an arithmetic average of the four items to represent the variable Perceived risk.

#### Compliance measure.

Compliance was measured with four items that indicated how engaged the respondents were in preventive actions and how much they adhered to the recommended health precautions. All responses were recorded on Likert-type scales that asked the respondents to indicate their intention to adhere to pandemic measures. The first item, “General compliance,” involved a five-point scale ranging from “strongly disagree” (1) to “strongly agree” (5). It asked about the extent the respondent agreed to doing their best to follow advice from health authorities, and gave the following examples of practices in parentheses: frequent handwashing, limiting travel, maintaining physical distance to others, and avoid touching surfaces. The subsequent three items asked how frequently the respondent had adhered to three prominent behavioural recommendations in the last two weeks and used a seven-point Likert-type scale from “never” (1) to “always” (7). “Handwashing” asked how much of the time they washed their hands carefully when outside. “Physical distancing compliance” asked how much of the time they maintained at least a 1-meter distance from strangers. Lastly, “Avoidance of social situations” asked how much of the time they avoided social interactions with strangers during this period. To represent the variable Compliance, we will calculate an arithmetic average of the four items.

### Analyses

We will use one multiple linear regression to test potential relationships between the five personality traits and Perceived risk. We will use a second multiple linear regression to test potential relationships between the five personality traits and Compliance. As can be seen in Table 1 and Table 2, there are hypotheses associated with eight of the ten possible combinations in these analyses. Any effects on the two non-hypothesized associations will be reported as novel discoveries.

We will report effect sizes of the relationships between the traits and the outcomes as Cohen’s ƒ2, where effects of 0.02, 0.15, and 0.35 are conventionally interpreted to small, moderate, and large effect sizes (Cohen, 2013). Personality has had relatively small effects on behaviour in previous studies (Gignac & Szodorai, 2016). Many other factors besides personality will also contribute to complex everyday decision-making about pandemic behaviour. Nevertheless, under a pandemic with exponential infection rates, small effects that changes the behaviour of a few people can have a large impact on the pandemic’s development in the population. This may protect many people from infection, and impact health outcomes for people at-risk. On the other hand, we should also be aware that arbitrary variation may produce significant effects in large sample sizes. We will therefore set a “smallest effect size of interest” at ƒ2 = .001.

We will use McDonald’s omega for internal consistency of the items. We will report descriptive statistics and a correlation table between all seven variables in the model. Bivariate correlations will be reported and investigated in order to describe the data and to test for multicollinearity. Correlations above .7 between independent variables will be interpreted as multicollinearity, as recommended in Pallant (2020). In addition, the tolerance and variance inflation factors will also be investigated to check for multicollinearity in which tolerance factors below .10 or variance inflation factors above 10 will be interpreted to suggest issues with multicollinearity (Pallant, 2020).

Table 2: Study design overview

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Question | Hypothesis | Sampling plan | Analysis Plan | Rationale for test sensitivity | Interpretation given different outcomes | Theory that could be shown wrong by the outcomes |
| What is the influence of conscientiousness on compliance with health precautions during a pandemic? | H1: Positive association between Conscientiousness and Compliance. | All data was collected among a representative sample of Norwegian adults, through the Norwegian Citizen Panel.  The survey measuring personality traits was collected in May and June of 2019 (*n* = 8,105).  The survey measuring pandemic risk perception and compliance was collected in September of 2020 (*n* = 5,531).  The matched sample between personality and pandemic measures were *N* = [exact number is not yet known at Stage 1 but is estimated to be > 2,000]. | H1, H3b, H2, H4b and H5b will be tested in a multiple linear regression where Compliance is the outcome variable, and the predictor variables are Conscientiousness, Extraversion, Agreeableness, Openness, and Neuroticism, respectively.  H3a, H4a and H5a will be tested in a multiple linear regression where Risk perception is the outcome variable, and the predictor variables are Extraversion, Openness, and Neuroticism, respectively.  Each association will be tested against an alpha level of *p* < .01, one-tailed according to the directions expressed in the hypotheses. | The panel data-collection sample size was determined by other factors than the current research questions. See above discussion of expected effect sizes for personality trait impact on behaviour.  We will consider effects larger than ƒ2 = 0.01 to be meaningful from a public health perspective.  A sensitivity analysis using alpha level of .01, a beta level of .85, an estimated sample of 2,000 and 5 regression predictors, yields a sensitivity to detect effects of ƒ2 = 0.01. | Support for H1 would indicate that personalities associated with adhering to rules, following norms, and prioritizing long-term gains lead to making everyday decisions that are in compliance with infection control measures. | For H1, H2, H3b, H4b and H5b, null-effects or effects contradicting the hypotheses would indicate that previous associations between personality traits and compliance seen in the literature are less robust than previously assumed, or do not hold for the current context (health-behaviour in the first year of the COVID-19 pandemic in Norway).  For H3a, H4a and H5a, null-effects or effects contradicting the hypotheses would indicate that the associations between personality traits and risk perception seen in the literature are less robust than previously assumed, or do not hold for the current context (health-behaviour in the first year of the COVID-19 pandemic in Norway). |
| What is the influence of agreeableness on compliance with health precautions during a pandemic? | H2: Positive association between Agreeableness and Compliance. | Support for H2 would indicate that personalities associated with social compliance, compassion, and concern for others lead to making everyday decisions that are in compliance with infection control measures. |
| What is the influence of extraversion on risk perception and compliance during a pandemic? | H3a: Inverse association between Extraversion and Risk perception. | Support for H3a would indicate that personalities associated with engagement with the external world and social interactions, attending to positive information, and being sensation-seeking lead to seeing pandemic risks to be lower. |
| H3b: Inverse association between Extraversion and Compliance | Support for H3b would indicate that personalities associated with engagement with the external world and social interactions, attending to positive information, and being sensation-seeking lead to less compliance with infection control measures. |
| What is the influence of openness to experience on risk perception and compliance during a pandemic? | H4a: Inverse association between Openness and Risk perception. | Support for H4a would indicate that personalities associated with unconventional thinking lead to seeing pandemic risks to be higher. An inverse association could indicate that openness leads to more easily accepting a changed world with higher risk. Non-linear relationships could indicate a combination of both mechanisms. |
| H4b: Positive association between Openness and Compliance. | Support for H4b would indicate that personalities associated with willingness to make changes in their lives lead to making everyday decisions that are in compliance with infection control measures. An inverse association could indicate that non-conventional thinking may be associated with less trust in government advice. |
| What is the influence of neuroticism on risk perception and compliance during a pandemic? | H5a: Positive association between Neuroticism and Risk perception. | Support for H5a would indicate that personalities associated with focusing on negative information and tendency to worry leads to seeing pandemic risks to be lower. |
| H5b: Positive association between Neuroticism and Compliance. | Support for H5b would indicate that personalities associated with fear and anxiety lead to making everyday decisions that are in compliance with infection control measures. |

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## Contributions

B.S.: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Writing - original draft.

E.K.E.: Conceptualization, Formal analysis, Writing - original draft.

S.B.B.: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Writing - original draft.

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