Individual Differences in Compliance with Covid-19 Containment Measures in V4 Countries

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The present study corroborates the role of personality in predicting adherence to containment measures in the Visegrád Four countries (Czech Republic, Hungary, Poland, and Slovakia) with a total sample of N = 7463 participants. The Big-five traits predicted compliance both directly and indirectly, via concerns over coronavirus and trust in organizations. Openness, Conscientiousness, and Extraversion predicted compliance positively, while Neuroticism and Agreeableness negatively. Furthermore, the effect was mediated by corona concerns. Although Agreeableness, Neuroticism, Openness, and Conscientiousness predicted compliance negatively, the mediating role of trust was corroborated only for Conscientiousness, Agreeableness, and Neuroticism and the effect size was smaller. The implications are that personality could be considered an important factor in compliant behavior even in an "extreme" situation such as a pandemic, and that this effect is also indirect via concerns over coronavirus and trust in institutions (although to a much lesser degree). The findings might help practitioners tailor effective messages in times of pandemic.

Key words: Covid-19, personality, Big-five, trust, concerns, compliant behavior

Introduction

Adherence to official containment measures is critical for controlling the spread of Covid-19 and protecting the health and life of people. Existing evidence concerning covid related deaths justifies the importance of examining the factors that may eventually contribute to the understanding of the aspects that can play role in the mitigation of the pandemic. One of the most currently studied factors is the role of individual differences in terms of personality dimensions. However, the results concerning the role of personality in compliance with containment measures are mixed (Aschwanden et al., 2021; Barceló & Sheen, 2020; Carvalho et al., 2020). This

might be due to many factors, such as different types of containment measures that were studied, different operationalization of personality, various methodological differences, and so on (Blagov, 2020; Carvalho et al., 2020; Zajenkowski et al., 2020). One theoretically potentially important factor is the existence of hypothetical mediating factors – an aspect that we focused on in the present study.

Evidence of disinformation questioning the trust towards governments (Kačmár, 2021) and spread of Covid-19 related concerns served as an inspiration for the present study as both seem to be important for communication in order to promote compliant behavior (Wright et al., 2021). The main aim of the present study is to better understand the role of individual differences in terms of Big-five domains in compliance with containment measures, where not only a direct but also an indirect effect of personality on behavior is assessed via 1) corona concerns and 2) institutional trust. Moreover, in the present study, we focused on the Visegrád Four, which represents a political and cultural alliance of post-communist countries, namely Slovakia, Czech Republic, Hungary, and Poland. These countries were selected as they share a socio-historic heritage, which is an aspect that could be of utter importance in the present context. Also, their political as well as pandemic situation and measures implemented during the first wave of the Covid-19 pandemic were relatively similar (COVID-19 pandemic in the Czech Republic, 2021; COVID-19 pandemic in Hungary, 2021; COVID-19 pandemic in Poland, 2021; COVID-19 pandemic in Slovakia, 2021), potentially allowing for meaningful data integration and even comparison across these countries.

The current study brings several practical implications in terms of pandemic management. Specifically, present results speak to the effectiveness of appeal via concerns, the strength of trust towards government and its institutions and comparison of their role in one's behavior in the broader context of personality domains of citizens.

Big Five Model and Compliance with Containment Measures

Several studies indicate relations between adherence to containment measures and personality traits. In the context of the recent Covid-19 pandemic, emphasis has been given especially to the Big-five model, nevertheless, existing results are not fully consistent. Research has shown that Agreeableness (as a trait characterizing kind, cooperative, prosocial people with a strong tendency to altruism and helping behavior) seems to be the strongest predictor of accepting containment measures (Aschwanden et al., 2021; Blagov, 2020; Zajenkowski et al., 2020). Similarly, it has been shown that people with high Consciousness (responsible, dutiful, self-disciplined people, who are following social norms) tend to keep social distance, wear a facial mask and adhere to other containment measures (Abdelrahman, 2020; Bogg & Milad, 2020; Brouard et al., 2020). However, the role of Openness is more nuanced. On one hand, this trait (reflecting curious people with fewer difficulties adjusting to a new situation and finding new unconventional ways of coping) was positively related to compliance with containment measures (Aschwanden et al., 2021; Blagov, 2020; Bogg & Milad, 2020). On the other hand, however, Openness was also found to be insignificant in numerous instances (Abdelrahman, 2020; Brouard et al., 2020). Neuroticism and Extraversion were shown as the least straightforward predictors of compliance behavior. Some studies document positive and others negative associations with compliance (Abdelrahman, 2020; Aschwanden et al., 2021; Brouard et al., 2020). For

example, in the case of Neuroticism, positive relationship with adherence to containment measures was explained by susceptibility to feel distressed and anxious (Abdelrahman, 2020). A negative relationship was explained by undesirable coping behavior (Aschwanden et al., 2021).

These inconsistencies may be explained in two ways. Firstly, behavior and personality were differently operationalized in different studies. Secondly, additional variables could mediate the relationship between personality traits and compliance. In the next section, we will introduce two factors that can play an important role in precautionary behavior, namely 1) anxiety and concerns and 2) institutional trust.

Anxiety and Concerns about Health

The enormous health, psychological, and social impact of the Covid-19 pandemic has led to an increase in stress and anxiety levels. For example, Salari's (2020) meta-analysis of 23 studies examined the prevalence of anxiety and stress at the beginning of the pandemic. The observed prevalence of anxiety was 31.9%. Crucially, besides the health-related concerns, containment measures (e.g., self-isolation) may also have negative consequences for an individual's psychological well-being (e.g., Ozamiz-Etxebarria et al., 2020). Note, however, that in addition to general anxiety and stress, more specific covid related concerns are widely researched (see e.g., Jørgensen et al., 2021) and could be crucial in the present context as discussed below.

In the discussion about the role of personality, it might be assumed that a pandemic is such an "extreme situation" that it may mute its effect (Meyer et al., 2010; but see also Kohút et al., 2021). There are, however, findings pointing to the role of personality in explaining the effects of anxiety. In most of the studies, Neuroticism is seen as a vulnerability factor, especially in regards to anxiety, and the remaining factors can be considered protective and had a negative relation to anxiety or concerns (Bunevicius et al., 2008; Nikčević & Spada, 2020).

This is crucial, as experiencing anxiety and fear or concerns has not only negative well-being implications but also motivates a range of behaviors that can reduce the engagement in risky behavior. For example, recent research has shown a positive association with adherence to containment measures in the context of the Covid-19 pandemic (Brouard et al., 2020; Zajenkowski et al., 2020; but see also Wang et al., 2020 for opposite results in China).

Crucially, although some preliminary attention was given to the topic, concerns were either not assessed directly (Bogg & Milad, 2020; Zajenkowski et al., 2020) or they were measured as a dependent variable together with compliant behavior (Aschwanden et al., 2021). The mutual relationship of concerns, personality, and adherence to containment measures was not sufficiently explored, although it is reasonable to expect that concerns mediate the influence of personality on compliant behavior. Focusing on the role of the Big-five traits in Covid-19 related concerns, we hypothesize that there will be negative relations of all traits (Bunevicius et al., 2008), except Neuroticism as it may serve as a vulnerability factor (Nikčević & Spada, 2020). Subsequently, we anticipate that higher levels of concerns will relate to more compliant behavior (Harper et al., 2020; Zajenkowski et al., 2020).

Institutional Trust and Trust toward Government and Institutions

In states where a democratic system is in place, trust in government and institutions

(and related aspects as ignoring disinformation) should make the implementation of containment measures much easier. This assumption was corroborated by several studies (e.g., Sibley et al., 2020; Wang et al., 2021; Wright et al., 2021), where higher levels of institutional trust increase adherence to containment measures. Research has focused on the perception of government in terms of good organization, disseminating clear messages and knowledge about Covid-19 (e.g., Vardavas et al., 2021), perceived fairness (Han, 2021), and policy stringency (Pak et al., 2021). Nevertheless, not enough attention has been given to individual differences in terms of personality in the development of trust. Mondak and Halperin's (2008) study showed that while Openness was related to lower levels of political trust, Agreeableness was positively correlated with it. Contrary to these findings, Freitag and Ackermann (2016) corroborated Neuroticism and Extraversion as the only predictors of trust, and both were negatively related to it. To our knowledge, only Schmeisser et al. (2020) examined the more nuanced impact of personality traits on compliance with containment measures during the pandemic with regards to trust in institutions as a mediator. The results pointed to the mediated effect of Agreeableness and a negative effect of Neuroticism and Openness, where higher Neuroticism and Openness led to a lower level of trust in Public Health Agency and in the end decreased compliance with precautionary measures. The current study aims to replicate the effect in four post-communist countries.

We propose a model where the Big-five personality domains will predict compliance with containment measures directly (Aschwanden et al., 2021; Blagov, 2020; Kohút et al., 2021) and also indirectly via trust in institutions (Schmeisser et al., 2020) and Corona concerns (Nikčević et al., 2021). We expect to find positive relations of all Big-five factors (Abdelrahman, 2020) with compliant behavior, except Extraversion, due to the necessity of social isolation which is in contradiction to peoples' basic needs (Carvalho et al., 2020). Furthermore, we assume that concerns will have a stronger effect than trust (Brouard et al., 2020). Besides the confirmatory part, we aimed to explore and compare the differences in variables of interest across the V4 countries.

Methods

Sample

Our ample consisted of 7463 participants from the V4 countries (1995 from the Czech Republic, 3088 from Poland, 942 from the Slovak Republic, and 1438 from Hungary). 80% were females with M_{age} = 36.61 years (Med$_{age}$ = 34; Mod$_{age}$ = 32; Min/max = 18 − 88 years; SD = 13.18).

Data were collected online between 30th March and 30th May 2020 via COVIDiSTRESS Global survey collaboration (Yamada et al., 2021) – "an open science effort to improve understanding of the human experiences of the 2020 COVID-19 pandemic" (Yamada et al., 2021; p. 1)[1].

Based on power analysis for SEM (Satorra & Saris, 1985) via Web-power (Zhang, 2018), we should have 99% power to detect an effect as small as 0.04 given expected degrees of freedom and a more stringent significance level of 0.01. This effect has been chosen as Smallest Effect Size of Interest (SESOI) based on Funder and Ozer (2019) notion that an effect size of .05 represents "the effect that is very small for the explanation of singe events but potentially consequential in the not-very long run" (p. 166).

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[1] A total of 39 countries are represented in COVIDiSTRESS data-set; only participants from V4 countries were selected for the present analysis.

Materials

The following measures were selected from COVIDiSTRESS Global survey (Yamada et al., 2021):

Big-five personality domains were measured via BFI-S Lang et al. (2011) (6-point Likert Scale – 1 = *strongly disagree*, 6 = *strongly agree*). Examples of items: "I see myself as a person who…" "…is extrovert and sociable" (Extraversion), "…appreciates art and aesthetics" (Openness to experience), "…is kind and considerate towards almost everyone" (Agreeableness), "…is often concerned" (Neuroticism), "…is thorough and meticulous" (Conscientiousness). Internal consistency in terms of McDonald's ω was as follows: .74 regarding Extraversion; .60 regarding Conscientiousness; .58 regarding Openness to experience; .62 regarding Agreeableness; and .69 regarding Neuroticism[2].

Institutional trust was measured via a scale based on OECD guidelines 2017 on measuring institutional trust (11-point scale: 0 = *too little*, 5 = *appropriate*, 10 = *too much*): "Please tell us, on a score of 0-10, how much you personally trust each of the institutions below 0 means you do not trust an institution at all, and 10 means you have complete trust". Four items were selected for the present analysis, covering [Country's] Parliament/government, police, civil service and health system[3]. Inter-

nal consistency in terms of McDonald's ω was .84.

Concerns were measured via concerns over the coronavirus scale (6-point Likert Scale: 1 = *strongly disagree*, 6 = *strongly agree*): "How much do you agree, that you are you concerned about the consequences of the Coronavirus …". Three items were selected, assessing concerns "for yourself", "your family", and "your friends"[4]. Internal consistency in terms of McDonald's ω .86.

Compliance was assessed via a scale capturing compliance with prevention measures (6-point Likert Scale: 1 = *strongly disagree*, 6 = *strongly agree*). In the time of data collection, the official measures were very similar across the V4 countries, including social distancing, wearing facemasks, restrictions about public actions. We selected three items: "I have done everything I could possibly do as an individual to reduce the spread of Coronavirus"; I feel well informed about steps I can take to help reduce the spread of Coronavirus"; "I have done everything I could possibly do to keep physical distance to others"[5]. Internal consistency in terms of McDonald's ω was .69.

Descriptive statistics for all scales can be found in Appendix A, descriptives for individual countries can be found Online in Appendix 2.

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[2] Although some values of internal consistency were under the recommended 0.70 for Big-five domains, we decided to proceed with analysis due to the fact that a shortened version of the scale was used. Lower values of internal consistency were expected due to the short nature of the scale. Moreover, it was not possible to improve the internal consistency by omitting potentially problematic items as there were only three items per dimension in the scale.

[3] We did not include trust in "WHO" as we were interested in the country level "trust in government's effort to handle Coronavirus" since we were interested in more general institutional trust. Note, however, that the main

results are qualitatively no different when all items are included (see Alternative model 1 in robustness analysis).
[4] We did not include items "… for your country?" or "…for other countries across the globe" as we were interested in more personally close concerns. Note, however, that the main results are qualitatively no different when all items are included (see alternative model 3 in robustness analysis).
[5] We did not include "I feel that keeping a physical distance from others would have a high personal cost to me"; "I trust others around me to follow guidelines to stop the spread of Coronavirus", and "I have bought large extra supplies of food or grocery items" as these items were not related to personal compliance. Furthermore, internal consistency of a whole scale was far from acceptable. Note, however, that as in previous cases, the main results are qualitatively no different when all items are included (see alternative model 4 in robustness analysis).

Data Analysis

In the first step, V4 countries were selected from COVIDiSTRESS Global survey dataset (Yamada et al., 2021). We used the cleaned version of a file where some issues were already dealt with (e.g., cases without consent and younger than 18 years old were omitted; cases before the official launch were omitted and so on). In the next step, missing data were imputed via the MICE package via PMM (Predictive Mean Matching) method. No attention check items were used for filtering the participants in the present study; univariate and multivariate normality was assessed with the Anderson-Darling test and Mardia tests, respectively, and multivariate outliers were handled with Mahalanobis distance. This led to $N = 7209$ participants. Since the results indicated a violation of univariate and multivariate normality, we used the WLSM estimator (Weighted least-squares mean adjusted) with Robust Statistical Tests based on polychoric correlation matrix. For SEM analysis (Gana & Broc, 2018) we used the Lavaan package (Rosseel, 2012) in R environment (R Core Team, 2017).

Model fit was considered as very good if chi-square was non-significant and CFI > .95, RMSEA < .05, and SRMR < 0.08 and as still acceptable when CFI > .90, RMSEA < .08, and SRMR < 0.08 (Gana & Broc, 2018). Indirect effects were corroborated via bootstrap procedure with 5000 samples (Hayes, 2018). Data, analytic code, materials, and additional analyses can be found at https://osf.io/5a2r6/.

Results

The hypothesized model provided an acceptable fit to the data except the significant chi-square statistics that could be oversensitive due to bigger sample size (χ^2(248, $N = 7209$) = 10866.719, $p < .001$, $CFI_{robust} = .96$, $RMSEA_{robust} = .064$, 90% CI [0.063, 0.065], SRMR = 0.056). In the second step, we focused on specific paths of the model (for a summary see Table 1 and Figure 1). First, *all items significantly loaded to latent variables* (all $p < 0.001$ for the measurement component of the model). Second, when considering the structural component of the model and focusing on *main criterion variable – compliance* in combination with more distal predictors – *Big-five dimensions*, Openness ($\beta = .227$, $p < 0.001$), Conscientiousness ($\beta = .364$, $p < 0.001$), and Extraversion ($\beta = .078$, $p < 0.001$) predicted compliance positively; and Neuroticism ($\beta = -.152$, $p < 0.001$) and Agreeableness ($\beta = -.339$, $p < 0.001$) negatively. When considering potential mediators, both *concerns* ($\beta = .230$, $p < 0.001$) and *trust in institutions* ($\beta = .043$, $p < 0.001$) predicted compliance positively (but note that the effect size was lower for the trust). Third, when considering the first potential mediator, *corona concerns*, Openness did not predict concerns ($\beta = -.009$, $p = .513$), but Conscientiousness ($\beta = .107$, $p < 0.001$), Extraversion ($\beta = .137$, $p < 0.001$) and Neuroticism ($\beta = .252$, $p < 0.001$) predicted corona concerns positively and Agreeableness ($\beta = -.047$, $p = 0.002$) negatively. Similarly, when considering second potential mediator, *trust in institutions*, Agreeableness ($\beta = -.134$, $p < 0.001$), Neuroticism ($\beta = -.074$, $p < 0.001$), Openness ($\beta = -.042$, $p = .003$) and Conscientiousness ($\beta = -.031$, $p = .036$) predicted trust in institutions negatively. Extraversion did not predict trust ($\beta = .024$, $p = .138$).

In the third step, we explicitly corroborated *the role of two proposed mediators*. As bias-corrected bootstrapped confidence interval with 5,000 samples did not include zero, *the indirect effect of Big-five domains to compliance via first hypothesized mediator, Covid-19 concerns*, was corroborated for Openness ($b = .023$, $\beta = .034$, $p < 0.001$,

Table 1 *Summary of regression paths*

Effect	*β*	SE	Z	95% CI		*p*
				LL	UL	
The effect of Big-5 Domains on Trust						
Openness	-.042	.014	-3.020	-.070	-.015	.003
Conscientiousness	-.031	.015	-2.100	-.059	-.002	.036
Extraversion	.024	.014	1.690	-.004	.051	.090
Agreeableness	-.134	.015	-9.090	-.163	-.105	.001
Neuroticism	-.074	.015	-5.040	-.103	-.045	.001
The effect of Big-5 Domains on Concern						
Openness	-.009	.014	-.654	-.037	.019	.513
Conscientiousness	.107	.015	7.100	.078	.137	.001
Extraversion	.137	.014	9.630	.109	.165	.001
Agreeableness	-.047	.015	-3.160	-.077	-.018	.002
Neuroticism	.252	.014	17.600	.224	.280	.001
The effect of Trust and Concern on Compliance						
Trust	.043	.015	2.930	.014	.072	.003
Concern	.230	.014	17.000	.203	.257	.001
The effect of Big-5 Domains on Compliance						
Openness	.227	.015	14.700	.197	.258	.001
Conscientiousness	.364	.015	23.700	.334	.394	.001
Extraversion	.078	.016	4.990	.048	.109	.001
Agreeableness	-.339	.016	-21.300	-.370	-.308	.001
Neuroticism	-.152	.016	-9.530	-.183	-.120	.001

95% CI [0.018, 0.028]), Conscientiousness (*b* = .030, *β* = .039, *p* < 0.001, 95% CI [0.024, 0.036]), Extraversion (*b* = .021, *β* = .040, *p* < 0.001, 95% CI [0.017, 0.026]), Agreeableness (*b* = -.022, *β* = -.023, *p* < 0.001, 95% CI [-0.029, -0.016]), and Neuroticism (*b* = .042, *β* = .071, *p* < 0.001, 95% CI [0.035, 0.049]). *Indirect effect of Big-five domains to compliance via second hypothesized mediator, institutional trust*, was corroborated for Conscientiousness (*b* = -.006, *β* = -.007, *p* < 0.001, 95% CI [-0.009, -0.002]), Agreeableness (*b* = -.004, *β* = -.005, *p* = 0.011, 95% CI [-0.008, -0.001]), and Neu-

roticism (*b* = -.004, *β* = -.007, *p* = < 0.001, 95% CI [-0.002, -0.007] (but note that effects were smaller in comparison to first mediator and negligible in terms of effect size). Indirect effects of Openness (*b* = .001, *β* = .001, *p* = 0.485, 95% CI [-0.001, 0.002) and Extraversion (*b* = .001, *β* = .001, *p* = 0.639 95% CI [-0.001, 0.001]) were not statistically significant (Table 2).

In the fourth step, we aimed to provide a comparison of means of latent constructs between the analyzed countries. However, as invariance testing (considered as a prerequisite to comparing group means; see Putnick and
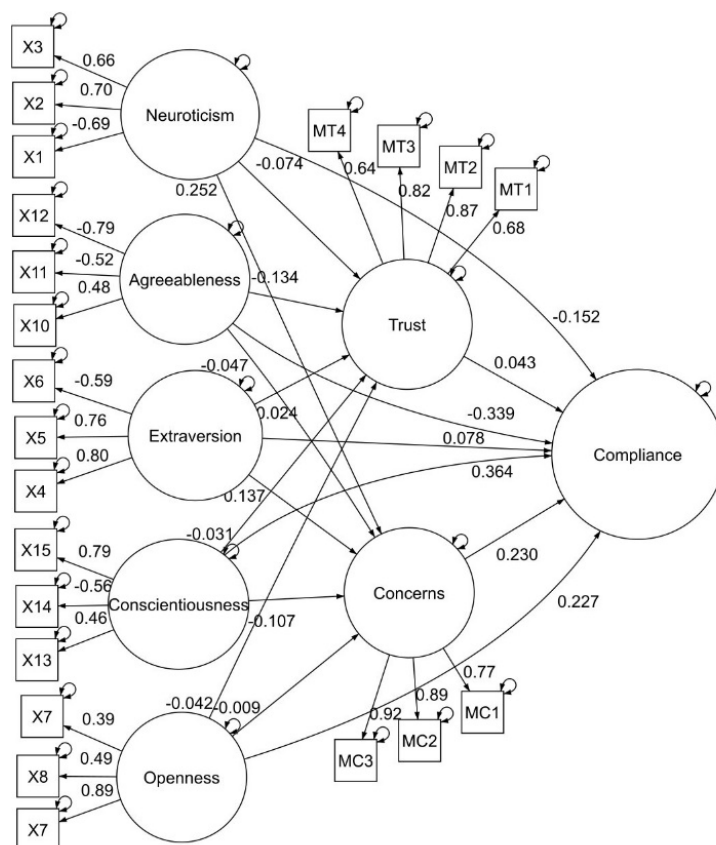
Figure 1 Path diagram.

Bornstein, 2016) suggested that *invariance was not established* according to the stricter criteria (see Appendix B for summary table), we decided not to compare means across countries in the main manuscript. Nevertheless, to provide some preliminary information regarding potential differences across the V4 countries, *patterns of regression paths across all countries* are presented Online in Appendix 1, and *differences between countries in institutional trust, covid concerns, and compliance* (compared via Kruskal-Wallis test) are shown Online in Appendix 2 (but caution in the interpretation is recommended).

In the last step, we aimed to provide a *robustness analysis* in terms of simplified multiverse style analysis for the main results concerning decisional node related to item selection. One can argue that all available items could be used; therefore, besides the main model, four alternative models were examined where the alternative combinations of items are used. It can be summarized that relationships between variables were qualitatively convergent across all meaningful alternative models in the majority of cases (see Online Appendix 3).

Table 2 *Summary of indirect paths*

Hypothesised mediator	β	SE	Z	95% CI		p
				LL	UL	
*Indirect effect of **Openness** on Compliance via proposed mediators:*						
Concern	.028	.002	9.240	.018	.028	.001
Trust	.001	.001	.698	-.001	.002	.485
*Indirect effect of **Conscientiousness** on Compliance via proposed mediators:*						
Concern	.039	.003	9.73	.024	.036	.001
Trust	-.007	.002	-3.51	-.009	-.002	.001
*Indirect effect of **Extroversion** on Compliance via proposed mediators:*						
Concern	.040	.002	9.40	.017	.026	.001
Trust	.001	.001	-.47	-.001	.001	.639
*Indirect effect of **Agreeableness** on Compliance via proposed mediators:*						
Concern	-.023	.003	-6.58	-.029	-.016	.001
Trust	-.005	.002	-2.55	-.008	-.001	.011
*Indirect effect of **Neuroticism** on Compliance via proposed mediators:*						
Concern	.071	.004	11.93	.035	.049	.001
Trust	-.007	.001	-3.91	-.006	-.002	.001

Discussion

During the Covid-19 pandemic, governments around the globe attempted to protect their citizen from serious consequences of the disease by enforcing containment measures. People's reactions varied widely, and in this study, we sought to better understand why. Previous research investigated the role of Big-five personality traits since personality is considered as a relevant predictor of behavior (Aschwanden et al., 2021; Blagov, 2020). However, results were mixed, opening room for discussion about the underlying factors mediating the relationship between personality and compliant behavior. Trust in institutions and corona concerns appeared to have considerable value concerning both, therefore, we decided to explore their role in more complex mediation model. In the following

section, we'll describe the most interesting relations between personality and its direct as well as indirect impact on behavior during the Covid-19 pandemic.

Direct Impact of Big Five Model on Compliance with COVID-19 Measures

Based on our data, all Big-five traits are significantly related to compliant behavior during the first wave of the pandemic. The strongest link was identified with Conscientiousness. People high in this trait tend to follow containment measures to a higher degree. A stronger connection is reasonable, as people high in Conscientiousness, in comparison to other Big-five personality traits, have natural tendency to follow rules, be self-disciplined, and be responsible (McCrae & Costa, 2003). Consistent findings during the Covid-19 pan-

demic from many other countries support this evidence (e.g., Blagov, 2020; Brouard et al., 2020; Zajenkowski et al., 2020).

Surprising results were connected to Agreeableness and Neuroticism. We expected a positive connection between Agreeableness and adherence to measures, as agreeable individuals care about others and are naturally prosocial. Their adherence to containment measures should be motivated by protecting others (Blagov, 2020; Carvalho et al., 2020; Chan et al., 2020; Zajenkowski et al., 2020). Our findings have shown an opposite relationship where high Agreeableness predicted a low level of compliant behavior. To our knowledge, only Abdelrahman (2020) who focused on social distancing, personal hygiene practices, and risk perception in connection to personality during the Covid-19 pandemic had similar results, which corroborated that agreeable individuals may prioritize social interactions over the obligation to keep social distance due to their altruism.

Neuroticism was another trait showing opposite results than expected. A deeper analysis of the published data shows that Neuroticism is mostly connected positively with keeping a social distance (Abdelrahman, 2020; Blagov, 2020) and negatively with washing hands or touching face (Aschwanden et al., 2021; Bogg & Milad, 2020). A study by Aschwanden and his colleagues (2021) verified that the negative relation of Neuroticism and compliant behavior was mostly driven by the facet of depression, which indicates that higher Neuroticism leads to undesirable coping behavior (Aschwanden et al., 2021). Nevertheless, the gap between our results and the published data regarding both traits might be caused by different measurements of compliant behavior, which in our case had only a general character. Therefore, a deeper analysis of the above relationships is needed.

Indirect Impact of Big Five Model on Compliance with COVID-19 Measures

Our main aim was to find out more about how the Big-five model relates to compliant behavior. Following our predictions, personality can influence behavior not only directly but also via mediators, specifically through corona concerns and institutional trust. According to the results, both variables were positively associated with adherence to containment measures, therefore, individuals with higher trust and higher corona concerns reported increased levels of compliant behavior. It is not surprising, as public trust in state institutions is central to the legitimacy of the government's decision. Not only does Covid-19 outbreak provide a vivid example (e.g., Sibley et al., 2020; Wang et al., 2021; Wright et al., 2021), but older health crises, as the recent outbreak of Ebola in the Democratic Republic of Congo in 2018-2019, testify to a broad environment of distrust making it difficult to combat the disease. The general belief in misinformation about the Ebola virus and mistrust in government institutions were strongly related to poor compliant behavior (Vinck et al., 2019). Similarly, higher levels of concern render individuals to opt for risk-aversive behavioral strategies (Lerner & Keltner, 2001) – in this case, avoiding infection by showing increased compliant behavior (Harper et al., 2020; Zajenkowski et al., 2020). However, the indirect effect via trust was significant in the majority of cases, but very small considering the size of the effect.

In fact, the connection of corona concerns and compliant behavior was approximately 5 to 10 times stronger than the one via trust, which underlines the importance of emotional factors during the behavior generating process. Unfortunately, it was not possible to compare differences between levels

of trust and corona concerns in our sample (due to non-equivalency of the Likert scales) or compare V4 countries (due to insufficient measurement invariance). Nevertheless, the stronger effect of corona concerns at the beginning of the pandemic is reasonable considering the protective role of emotions in unknown and insecure situations. In addition, similar to the present study, Brouard with colleagues (2020) assessed the role of Big-five personality traits, age, extreme ideology, fear, and trust towards government and science in the adherence to containment measures. By estimating four linear regression models where covariates were incrementally added, it was shown that the strongest positive predictor of compliant behavior when considering all variables was fear – we see that in our case as well.

Because mediation via trust had negligible effect on behavior in comparison to corona concerns, in the following section we will focus mostly on interesting results in the indirect relationship of personality traits and behavior via corona concerns. Nevertheless, Neuroticism, Agreeableness, and Conscientiousness seem to play a role in both cases.

Focusing on Agreeableness, our findings reveal more of a non-compliant behavior background. In alignment with previous findings, our results corroborated that Agreeableness serves as an anxiety protective factor (Nikčević et al., 2021; Nikčević & Spada, 2020; Shi et al., 2015). People scoring high in this trait tend to experience fewer corona concerns, which under pandemic circumstances leads to lower levels of adherence to containment measures.

Contrary to Agreeableness, individuals high in Conscientiousness tend to experience more Corona concerns and therefore they adhere to containment measures more. At first glance, such a result is quite rare because most researchers held Conscientiousness as another anxiety protective factor (e.g., Ferguson, 2004; Nikčević & Spada, 2020). Nevertheless, several studies have shown that anxiety and Conscientiousness can coexist. For example, Vreeke and Muris (2012) verified Conscientiousness as a positive predictor of behavioral inhibition, which is one of the anxiety components. Another study by Scher and Osterman (2002) showed a significant relationship between anxious arousal and Conscientiousness in the prediction of professional ambition, where people with higher physical anxiety had also higher levels of professional ambition.

The previously mentioned results regarding the direct effect of Neuroticism compliance indicated that neurotic individuals tend not to respect containment measures. However, an additional explanation could lie in their distrust towards institutions (second mediator), which may be referred to as their inclination to an unfair and unsatisfactory interpretation of political and societal development (Freitag & Ackermann, 2016; Mondak & Halperin, 2008). Nevertheless, because the impact of trust on behavior was small, we assume that another mediator may be present (e.g., coping as was mentioned earlier) which was not measured in this study.

Differences and Similarities across V4 Countries

To provide a more comprehensive although rather preliminary understanding of the results and to inform future studies, we intended to present an exploratory overview of interrelations between the examined variables separately for every V4 country (see Online Appendix 1) and show differences between mean scores in trust, concerns, and compliance, which would be compared across V4 countries (see Online Appendix 2). However, as invariance testing was not established, in

the manuscript we will not discuss our results more thoroughly and we urge the interested reader to take Online Appendix 2 for possible differences in trust, concerns, and compliance across V4 countries with a grain of salt.

Limitations and Perspectives for Future Studies

Since the COVIDiSTRESS global survey (Yamada et al., 2021) was a large-scale international project requiring researchers to be frugal with the resources, brief scales with limited psychometric properties were used. Thus, future studies should replicate the present results with well-established full versions of questionnaires, such as the BFI-2 which has already been adapted to various languages (see e.g., Halama et al., 2020 for the Slovak version of BFI-2). BFI-2 can provide better psychometric properties than the Short 15-item Big Five Inventory (BFI-S). This is important as measurement invariance was not established in the present study and, thus, a comparison of the means for latent factor was discussed in the main text. Furthermore, as BFI-2 allows for the analysis of not only the general domain level but also the more specific facet level. Thus, BFI-2 can meaningfully extend the present results and provide more fine-grained details regarding the role of personality in compliance with containment measures.

The samples we used, albeit large, were not representative. They were heavily biased towards females – 80% of respondents identified as a woman. This is a limitation as, according to published evidence, females might be more likely to adhere to precautions (Chan et al., 2020). Additionally, previous research suggests that women are less involved in politics than men and this factor could be related to trust in institutions, since institutional trust can be affected by salient political issues (Lieberoth et al., 2021). Thus, future verifica-

tion of the results on representative samples is needed, since the goal of COVIDiSTRESS collaboration was to collect the data as soon as possible to capture unique situations related to the surge of a covid pandemic, rather than work with a representative sample.

Finally, our data are cross-sectional and future longitudinal replication is necessary to establish causality. Relatedly, in Kohút et. al.'s (2021) study, the effect of personality traits was lower in the second wave than in the first wave. As a similar pattern of results could be expected in the present context, the role of personality should be examined in an additional wave of the pandemic to assess the role of psychological adaptation and shift of the perception of the pandemic in a society.

Although there are some limitations, the present study provides also some benefits. First and foremost, COVIDiSTRESS (Yamada et al., 2021) enabled us to work with data assessed during an unprecedented and crucial period, with a relatively big sample size, and with a sample that is beyond the individual country level. Thus, although somehow preliminary, present results can inform future studies and provide some theoretical and practical implications.

Theoretical and Practical Implications

Based on the analysis, personality is an important predictor of compliant behavior even in an extreme situation such as a pandemic. Currently, the most attention has been given to conveying the necessary information of containment measures implemented to minimize the spread of the coronavirus. In the light of our study, the information provided by the government, institutions, and media, which fosters an individual's concern about getting sick (relatives or themselves), might be effective but only to some degree – concerns explain 5% of the variance in behavior and only

for neurotic, extroverted, and conscientious people. On the other hand, despite worries, conscientious individuals tend to change their behavior in alignment with containment measures, simply due to their inherent need to be responsible and follow social norms. Similarly, reflecting the direct negative impact of Agreeableness on compliant behavior, the recommendation is for institutions to highlight and promote other – more protective forms of social events and volunteering activities (e.g., helplines, virtual meetings, etc.). We assume that it might be helpful to encourage and train citizens, for example, in distant forms of communication with relatives which may lead to reinforcement of adaptive coping strategies. In addition, it might be of use to focus on various strategies reflecting individual differences during campaigns promoting compliance rather than use a one-fits-all approach.

Furthermore, it is important to note that information regarding the danger of Covid-19 should be presented sensibly. According to Witte and Allen (2000), effective fear appeal messages should have references to the severity of the threat and references to the target population's susceptibility to the threat. Strong fear appeals are effective in changing one's behavior only when they are accompanied by strong efficacy messages, which make the target population believe that if they can change their behavior it will minimize the threat. Nevertheless, its effect is still relatively weak (correlation between fear manipulation and behavior was at 0.15 (Witte & Allen, 2000)). At the same time, it is important to keep in mind that various sources of stress related to Covid-19 among the population should be minimized, since research has shown that higher level of stress in populations leads to lower level of compliance (Lieberoth et al., 2021).

Furthermore, the results of this study corroborated a very small but significant effect of trust in institutions on compliance in general. Thus, working with trust in institutions, especially in countries where trust is generally low, could be an additional way to bolster compliance in a time of pandemics, even though it is difficult to achieve. Due to strong evidence in other states about the direct connection of trust to containment measures (see e.g., Pak et al., 2021; Sibley et al., 2020) we want to highlight the need for further research attention to this issue in V4 countries and beyond, where trust in the institutions may be limited due to various reasons.

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Appendix

Appendix A: Descriptive statistics

Table A *Descriptives*

	Openness	Conscientiousness	Extroversion	Agreeableness	Neuroticism	Concerns	Trust	Compliance
Mean	4.41	4.06	3.98	3.94	3.76	4.42	4.64	4.99
Median	4.33	4.00	4.00	4.00	3.67	4.67	4.75	5.00
Mode	4.33	4.00	4.00	4.00	3.67	5.00	5.00	5.00
Standard deviation	0.83	0.55	0.64	0.58	0.65	1.13	1.98	0.70

Appendix B: Invariance testing

To test for measurement invariance, we conducted four steps: configural, weak factorial (metric), strong factorial (scalar), and strict (residual). The main criterion was the significance of the change in χ^2 for two models. As can be seen in Table B, according to the significance of the change in χ^2, invariance was not established[1]. For this reason, means in latent factors were not compared across countries (see e.g., Putnick & Bornstein, 2016).

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[1] Note that some authors argue that significance of the change in χ^2 criterion is overly sensitive (see Putnick and Bornstein, 2016, for discussion). Thus, to provide more nuanced results, we also report change in CFI, RMSEA and SRMR across nested models. For example, -0.01 change in CFI, 0.015 in RMSEA and of 0.030 (metric) and 0.015 (scalar/residual) for SRMR can be used as a criterion according to the Chen (2007). When these criteria will be applied, results are more nuanced compared to significance of the change in χ^2 criterion. However, as there is no consensus, some conditions were not met and it was not possible to establish invariance unequivocally even when Chen (2007)'s criteria will be applied, we inclined to work with significance of the change in χ^2 as the main criterion.

Table B Results of measurement invariance test

Model	χ^2 (df)	CFI	RMSEA (90% CI)	SRMR	Model comp	$\Delta\chi^2$ (Δdf)	ΔCFI	ΔRMSEA	ΔSRMR	Decision based on ΔCFI ΔRMSEA ΔSRMR	Decision based on $\Delta\chi^2$	Final decision
M1: Configural Invariance	7689.471(992)***	0.916	0.049	0.046								
M2: Metric Invariance	8217.464(1043)***	0.906	0.051	0.049	M1	466(51)***	-0.010	0.02	0.003	Reject (ΔCFI), Reject (ΔRMSEA), Accept(ΔSRMR)	Reject	Reject - at least one loading is not equivalent across the groups, and metric invariance is not supported.
M3: Scalar Invariance	13453.797(1094)***	0.839	0.065	0.061	M2	6238(51)***	-0.067	0.014	0.012	Reject (ΔCFI), Accept/borderline (ΔRMSEA), Accept/borderline (ΔSRMR)	Reject	Reject - at least one item intercept differs across the two groups, and scalar invariance is not supported.
M4: Residual Invariance	14616.965(1169)***	0.826	0.066	0.065	M3	1172(75)***	-0.014	0.001	0.004	Reject (ΔCFI), Accept (ΔRMSEA), Accept (ΔSRMR)	Reject	Reject - at least one item residual is different across the two groups, and residual invariance is not supported.

Note. N per group = 1933; 2988; 1381; 907.