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Personality and Individual Differences

Big Five predictors of pandemic-related behavior and emotions in the first and second COVID-19 pandemic wave in Slovakia

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ABSTRACT

This study explores the effect of Big Five personality traits on behavioral and emotional responses to the COVID-19 pandemic. Personality traits of 248 Slovak persons were assessed twice before the pandemic using the Big Five Inventory 2. Behavioral and emotional responses to the pandemic were collected during the first and second pandemic wave (April and September 2020). The results showed a statistically significant decrease in all response domains and in COVID-19 fear between the first and the second pandemic wave, suggesting that psychological adaptation to the pandemic occurred during the interim period. The results identified several meaningful links between the traits and pandemic-related behavior and emotions, especially for neuroticism, extraversion, and conscientiousness. However, the effects of personality were higher for the first pandemic wave, suggesting that these effects vary across time probably because of changes in pandemic perception in the society.

1. Introduction

The new worldwide situation concerning COVID-19 disease changed the daily life of people all over the world. Disease outbreaks in general evoke various psychological responses. Some of them directly follow government recommendations, e.g. handwashing, mask-wearing, or social distancing as in the case of the COVID-19 pandemic (www.korona.gov.sk/en/). Other behavioral responses arise as a reaction to the unknown threatening situation, including overbuying and stockpiling (e.g. Badgaiyan & Verma, 2015), searching for information (e.g. Jang & Baek, 2019) or helping others (e.g. Smith et al., 2009). Responses also relate to emotional reactions to a crisis such as fear, anger, boredom due to the quarantine (e.g. Brooks et al., 2020), or behavior that mitigates the negative emotional reactions, for instance self-distraction or engaging in activities to improve one's mood like relaxing, art (e.g. Diefendorff et al., 2008), praying, etc. (e.g. Bentzen, 2019).

Several studies showed that the pandemic responses might be related to personality traits. People higher in conscientiousness and agreeableness showed higher compliance with guidelines (Bogg & Milad, 2020; Zajenkowski et al., 2020) as well as handwashing (Blagov, 2020; Carvalho et al., 2020; Shook et al., 2020). Social distancing during pandemic was higher in people with high conscientiousness, openness to experience, agreeableness, and low extraversion (Blagov, 2020; Carvalho et al., 2020; Chan et al., 2020). Greater stockpiling was predicted

by higher extraversion and neuroticism and lower conscientiousness and openness (Dammeyer, 2020; Garbe et al., 2020). Prosocial behavior such as helping or donating was found to be positively connected to agreeableness (Habashi et al., 2016), which was confirmed by a meta-analysis which, in addition, found the importance of openness for experience for such behavior (Kline et al., 2019). The negative emotional response to COVID-19 as worries, negative repetitive thoughts or boredom were affected by neuroticism (Caci et al., 2020; Kroencke et al., 2020).

Many of these relationships are consistent with the patterns of associations between personality and disease avoidance, which includes perceived infectability and germ avoidance (Duncan et al., 2009). Duncan et al. (2009) showed that perceived infectability correlated weakly with high neuroticism, low agreeableness and conscientiousness, and germ aversion with high neuroticism, low openness, agreeableness, and extraversion. Oosterhoff et al. (2018) made a meta-analysis, which showed that personality correlates of disease avoidance were high neuroticism, high conscientiousness, low extraversion, and low openness. They attributed their results the to the activity of the Behavioral Immune System (Schaller, 2006), which detects and responds to potential sources of contamination. Oosterhoff et al. (2018) emphasized, that specific traits can be more or less conducive to its activity. This suggests that links between personality traits and COVID-19 responses may be mediated by general disease avoidance.

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1.1. Current study

The basic aim of this study is to explore how Big Five personality traits measured before pandemic of COVID-19 predict the behavioral and emotional responses to it. The current study contributes to previous ones by using a longitudinal design and focusing on 2 different waves of pandemic in Slovakia. It is based on previous research and assumption, that some of the traits can stimulate the expression of disease avoidance behavior, which is applied to COVID-19 as well.

The COVID-19 pandemic is a long-lasting life-threatening situation, which may provoke various strong reactions. However, peoples' responses might change in time due to adaptation to major negative life events (Infurna & Luthar, 2018). In our study, we focus on the question whether personality traits affect the response to pandemic differently in the first COVID-19 wave (April 2020) and the second one (September 2020). We assume that these situations are different because adaptation to a pandemic happened during the interim period. To confirm this in our study, we also explore the differences in behavioral and emotional responses between these time points. Moreover, we decided to include the measure of COVID-19 fear as control variable of adaptation, which we assumed to be lower in the second wave compared to the first wave. Finally, we decided to explore whether this change in the responses is predicted by personality traits.

2. Method

2.1. Sample

The sample used in this study builds on the longitudinal sample used in Kohút et al. (2020), to which we added two rounds of data collection. Altogether, four rounds were done using an online panel. Participants were recruited by a research agency, agreed-upon informed consent, and were compensated for their participation. Preliminary analysis was done using data from the third round on 280 participants (57.1% men) who were between 19 and 75 years old (M = 47.20, SD = 14.29). The final sample consists of 248 participants, 142 (57.3%) men and 106 (42.7%) women, who passed the attention-check items and completed each round. These participants were between 19 and 75 years old (M = 48.00, SD = 14.30), M = 46.40 (SD = 14.30) for men and M = 50.20 (SD = 14.10) women.

2.2. Measures

The *Slovak Big Five Inventory-2* (BFI-2; Halama et al., 2020, Soto & John, 2017) contains 60 items focused on measuring five broad personality traits – Extraversion, Agreeableness, Conscientiousness, Negative Emotionality, and Open-Mindedness. This inventory was used in the first two rounds of data collection. In the current study, we averaged each item score from the first and second round and calculated composite domain scores. Cronbach's alpha ranged from 0.83 for Extraversion domain to 0.90 for Negative emotionality domain, suggesting strong internal consistency of composite domain scores.

To assess the fear of COVID-19 in the first and the second pandemic wave, we used the newly developed *Fear of COVID-19* scale (Ahorsu et al., 2020). This inventory is focused on assessing the fear of COVID-19 infection. In our study, we used the full 10 items version. Participants indicate the agreement or disagreement with these statements using 5-point scales. Cronbach's alpha was 0.91 in both waves.

Behavioral and emotional responses connected to the COVID-19 pandemic situation were assessed by 37 self-constructed items about various behavioral acts, activities, or emotions in the last 2 weeks. The items were created to cover the most relevant behavioral and emotional manifestations related to COVID-19, such as following recommendations, interpersonal behavior, emotional response, etc. These items shared the same stem "For the last 2 weeks…" and continued with various statements, e.g. "I was disinfecting my personal stuff".

Participants indicated their involvement in these activities using 5-point scales: "Never", "Rarely", "Occasionally", "Often" and "Every time". These options were explained in more detail in the introduction of the questionnaire. These items were used for the third round of data collection. Only 29 items were retained after the preliminary exploratory factor analysis in the last round of data collection.

2.3. Analysis

In the first step, we did a preliminary analysis of items mapping behavioral and emotional responses to the pandemic. The correlation matrix showed high correlations between the items (some reaching the level of 0.6–0.7), suggesting substantial shared variance between the items. Due to this reason, we decided to reduce the number of variables measuring behavioral and emotional responses through exploratory factor analysis (EFA). As we expected the factors to correlate, principal axis factoring extraction with oblimin rotation was used. One item had unsatisfactory value in the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (<0.5), therefore, we reran the analysis without this item. Following the EFA results, we then focused on the meaning of these factors and adjusted the final set of items to be used in the final data collection. Twenty-nine items were used in the final round of data collection. Based on the content of items in each factor, we named them "Active protection, following recommendations", "Stockpiling and purchasing", "Relaxation and emotional improvement", "Negative emotional response", "Search for information" and "Helping others" domains. The factor loadings and items' assigned domain are presented in Appendix in Table A.

To verify the factor structure from the preliminary EFA analysis, we conducted confirmatory factor analysis (CFA) using robust maximum likelihood estimator and correlated factors. We then computed the internal consistency of each domain, using Cronbach's alpha. To assess the change of these domains in time, we computed difference variables by subtracting the second pandemic wave domain score from the first pandemic wave domain score. Then we focused on assessing the difference of the COVID-19 domains and the fear of COVID-19. For this, we used the paired samples *t*-test. Subsequently, we assessed the effect of the Big Five personality domains on the COVID-19 behavior domains using multiple hierarchical linear regression analyses. In these, we set each of the COVID-19 behavioral and emotional domains separately as the outcome variable. In the first step, gender and age was used as predictors. In the second step we added BFI-2 domains. These analyses were computed separately for the first and the second pandemic wave. To assess how personality predicts the change of COVID-19 domains, we used the change score as outcome.

3. Results and discussion

3.1. CFA of COVID-19 behavioral and emotional responses

The results of CFA with items focused on behavioral and emotional response to pandemic showed acceptable model fit (CFI = 0.88, TLI = 0.87, RMSEA = 0.06, 95%CI [0.05, 0.07], SRMR = 0.07). Detailed results of CFA are presented in Table B in the Appendix. The latent factor correlations, as well as Cronbach's alpha for COVID-19 domains and correlations between manifest domain scores in both pandemic waves are presented in Table C in the Appendix.

3.2. Comparison between the two COVID-19 pandemic waves

Table 1 reports the results of *t*-tests of the COVID-19 domains and fear of COVID-19 between the two pandemic waves. There was a significant decrease for fear of COVID-19 and all COVID-19 domains, with the largest differences for active protection and following rules and purchasing and stockpiling. These results confirmed the assumed changes between two pandemic waves attributed to adaptation to major

Table 1
Paired samples *t*-test of COVID-19 domains and fear of COVID-19.

	First wave		Second wave		Paired t-test				Pearson's r
Domain	Mean	SD	Mean	SD	t	df	Cohen's d	95% CI	
APFR	3.77	0.60	3.27	0.78	13.15	247	0.84	[0.69; 0.98]	0.67
PS	2.38	0.95	2.05	0.97	6.43	247	0.41	[0.28; 0.54]	0.64
REI	3.05	0.69	2.86	0.78	4.04	247	0.26	[0.13; 0.38]	0.54
NER	2.52	0.79	2.35	0.73	3.78	247	0.24	[0.11; 0.37]	0.58
SFI	3.11	0.90	2.75	1.02	6.07	247	0.39	[0.26; 0.51]	0.52
HO	1.97	0.77	1.78	0.74	3.60	247	0.23	[0.10; 0.35]	0.37
FOC	2.60	0.84	2.21	0.77	9.07	247	0.58	[0.44; 0.71]	0.64

Note. APFR – Active protection, following recommendations; PS – Purchasing and stockpiling; REI – Relaxation and emotional improvement; NER – Negative emotional response; SFI – Search for information; HO – Helping others; FOC – Fear of COVID-19. All differences are significant at p < 0.01.

negative life events (Infurna & Luthar, 2018). The recent results from other countries confirmed that this adaptation happens all around the world, e.g. in the US, where psychological distress, after rapid increase in March 2020, significantly decreased in April and achieved almost pre-pandemic level by June 2020, although the number of cases and deaths rose (Daly & Robinson, 2020). The study of Sadiković et al. (2020) found similar results for Serbia, where the level of negative emotions decreased during the 5 weeks of the pandemic period, even though the number of deaths increased. In Slovakia, the first wave occurred in the spring of 2020, when state restrictions were strong, but the number of cases and deaths were relatively low (e.g. circa 700 active infected cases in the second week of April 2020). Although the number of infected people in September 2020 was higher than in the first wave (circa 2100 active infected cases in the second week of September 2020), only weak restrictions were imposed by the government and people were less cautious even though concerns started to rise. The idea of adaptation between the first and the second wave is also supported by sociological data showing that the percentage of people feeling fear of COVID-19 weakened from 32.7% in April to 27.2% in September. Moreover, the decrease was found for social distancing as well (in April, 46% of respondents limited social contacts compared to just 12.2% in September) and increase for feeling no danger concerning COVID-19 (from 21% in April to 25.8% in September) (Slovensko, 2020).

3.3. Effect of Big Five traits on COVID-19 domains

To explore the effect of personality traits on COVID-19 domains controlled for gender and age, we carried out multiple hierarchical linear regression analysis, the results of which we report in Table 2. Full correlation matrix for variables used in these analyses is presented in the Appendix (Table D). The results showed several meaningful predictive effects of personality traits. For the first wave, extraversion predicted positively purchasing and stockpiling as well as negative emotional response. Although the effect of extraversion on negative emotional response can be surprising and inconsistent with the results on personality correlates of general disease avoidance (Oosterhoff et al., 2018), we believe that extraversion, which can increase reliance on interpersonal sources of information (Mooradian & Swan, 2006), can facilitate the feelings of threats especially when this is the dominant emotion shared in the society. We expect similar mechanism behind the effect of extraversion on purchasing and stockpiling, which is supported by the fact that another predictor of such behavior is negative emotionality. Based on this, purchasing and stockpiling seems to be a compulsive activity activated by feelings of threats mediated by other people. The negative emotionality predicted two other kinds of response: negative emotions and search for information. Both these effects are in line with other studies (eg. Caci et al., 2020) and the assumed activity of the Behavioral Immune System (Oosterhoff et al., 2018). Our data suggests that also search for information during the pandemic can be stimulated by feelings of anxiety or disgust and can be attributed to the general disease avoidance.

A contradictory effect in the first wave was found for

conscientiousness. Based on previous research (Bogg & Milad, 2020; Zajenkowski et al., 2020), we assumed a positive relationship with active protection and following recommendation, however, this effect was not confirmed. Instead, conscientiousness was found to predict purchasing and stockpiling (positively) and relaxation and emotional improvement (negatively). As conscientious people are goal oriented and have higher consideration for *future consequences* (Cao & Xia, 2020), we assume that this mechanism of conscientiousness can play a role in both increasing purchasing and stockpiling (to avoid shortage of important things in the future) and decreasing relaxation and emotional improvement, as this one deals more with the current state than with future consequences. However, relaxation and emotional improvement was predicted positively by open-mindedness. The analysis of the items in this factor shows, that it includes the effort to find new ways of overcoming limitations caused by the pandemic, and open-mindedness can increase this activity. Finally, helping others in the first wave was predicted by agreeableness, which again is a predictable result, as pro-social behavior such as helping or donating is frequently associated with agreeableness (Habashi et al., 2016; Kline et al., 2019).

However, most of these effects diminished in the second wave. Our results clearly show that the effect of personality traits was lower in the second wave than in the first wave. This is also evident from the comparison of the explained variance by full models (Table 2). In the first wave, the average explained variance across all COVID-19 domains was 12.08%, for the second wave, it was only 5.67%. More specifically, the average amount of variance added by personality traits was 9.11% for the first wave and only 6.18% for the second wave.

Concerning the change in behavioral and emotional response to the pandemic, the analysis showed almost no predictive effect of personality traits. The percentages of variance explained by the models were low across all domains (ranging from 2,3% to 5,5%). Only extraversion positively predicted a decrease in purchasing and stockpiling and agreeableness positively predicted a decrease in helping others, however, both of these effects could be attributed to the fact, that these traits substantially predicted these behaviors in the first wave, but the effects diminished together with the decrease of these behaviors in the second wave. Significant regression coefficients in these cases are rather statistical artefacts coming from the differences between the effects in both waves than personality driven changes.

To explain the different effect of personality in two pandemic waves, we need to understand the differences in the overall situation perceptions of these two time points. The first weeks and months of pandemic brought substantial changes in people's lives together with unknown threats. Feeling of lack of control over the pandemic, which is associated with increased level of disinformation and conspiracy theories (Srol et al., 2021), can increase the level of perceived threats and this perception has the potential to elicit some personality expressions (Bedford-Petersen & Saucier, 2021). On the other hand, in the second pandemic wave people got used to restrictions and changes in daily lives (Levkovich & Shinan-Altman, 2020) and their anxiety decreased. According to Zajenkowski et al. (2020), a perception of the situation might be a more important source of COVID-19 related behavior than

Table 2

Results of linear regression analysis predicting COVID-19 domains.

Predictor	First wave of COVID-19		Second wave of COVID-19		Difference	
	β	95% CI	β	95% CI	β	95% CI
Active protection, following recommendations						
	$R^2 = 0.115$, $\Delta R^2 = 0.041$		$R^2 = 0.087$, $\Delta R^2 = 0.026$		$R^2 = 0.029$, $\Delta R^2 = 0.017$	
Gender	*0.43*	[0.16, 0.70]	*0.36*	[0.08, 0.63]	−0.03	[−0.31, 0.25]
Age	0.00	[−0.12, 0.12]	0.09	[−0.04, 0.21]	−0.11	[−0.24, 0.01]
Extraversion	0.08	[−0.07, 0.24]	−0.03	[−0.18, 0.13]	0.12	[−0.04, 0.28]
Agreeableness	0.11	[−0.04, 0.26]	0.05	[−0.11, 0.20]	0.05	[−0.11, 0.21]
Conscientiousness	0.11	[−0.03, 0.26]	0.12	[−0.03, 0.27]	−0.04	[−0.19, 0.11]
Negative emotionality	0.11	[−0.05, 0.27]	0.11	[−0.05, 0.27]	−0.04	[−0.20, 0.13]
Open-mindedness	0.03	[−0.12, 0.18]	0.08	[−0.07, 0.23]	−0.07	[−0.23, 0.08]
Purchasing and stockpiling						
	$R^2 = 0.114$, $\Delta R^2 = 0.086$		$R^2 = 0.094$, $\Delta R^2 = 0.044$		$R^2 = 0.038$, $\Delta R^2 = 0.030$	
Gender	0.20	[−0.07, 0.47]	*0.35*	[0.08, 0.62]	−0.18	[−0.46, 0.10]
Age	−0.02	[−0.15, 0.10]	0.03	[−0.10, 0.15]	−0.06	[−0.19, 0.07]
Extraversion	*0.27*	[0.12, 0.43]	0.11	[−0.04, 0.27]	*0.18*	[0.02, 0.35]
Agreeableness	0.03	[−0.12, 0.18]	−0.01	[−0.16, 0.15]	0.05	[−0.11, 0.20]
Conscientiousness	*0.17*	[0.02, 0.31]	0.12	[−0.03, 0.26]	0.06	[−0.09, 0.21]
Negative emotionality	*0.28*	[0.12, 0.44]	*0.24*	[0.08, 0.39]	0.05	[−0.12, 0.21]
Open-mindedness	*−0.20*	[−0.35, −0.05]	−0.10	[−0.25, 0.05]	−0.11	[−0.27, 0.04]
Relaxation and emotional improvement						
	$R^2 = 0.152$, $\Delta R^2 = 0.108$		$R^2 = 0.122$, $\Delta R^2 = 0.074$		$R^2 = 0.033$, $\Delta R^2 = 0.021$	
Gender	*0.33*	[0.07, 0.59]	0.23	[−0.03, 0.50]	0.07	[−0.22, 0.35]
Age	0.02	[−0.10, 0.14]	*0.14*	[0.02, 0.26]	*−0.13*	[−0.26, 0.00]
Extraversion	0.05	[−0.10, 0.20]	0.02	[−0.14, 0.17]	0.03	[−0.13, 0.19]
Agreeableness	0.15	[0.00, 0.29]	0.05	[−0.10, 0.20]	0.09	[−0.07, 0.25]
Conscientiousness	*−0.15*	[−0.29, −0.01]	−0.08	[−0.23, 0.06]	−0.05	[−0.20, 0.10]
Negative emotionality	0.07	[−0.09, 0.22]	0.14	[−0.02, 0.30]	−0.09	[−0.25, 0.07]
Open-mindedness	*0.29*	[0.14, 0.43]	*0.28*	[0.13, 0.42]	−0.02	[−0.18, 0.13]
Negative emotional response						
	$R^2 = 0.188$, $\Delta R^2 = 0.183$		$R^2 = 0.158$, $\Delta R^2 = 0.147$		$R^2 = 0.030$, $\Delta R^2 = 0.017$	
Gender	0.01	[−0.25, 0.27]	0.09	[−0.17, 0.35]	−0.09	[−0.37, 0.20]
Age	0.01	[−0.11, 0.13]	0.11	[−0.01, 0.23]	−0.11	[−0.24, 0.02]
Extraversion	*0.18*	[0.03, 0.33]	0.09	[−0.06, 0.24]	0.10	[−0.06, 0.27]
Agreeableness	−0.04	[−0.19, 0.10]	−0.12	[−0.27, 0.03]	0.08	[−0.08, 0.23]
Conscientiousness	−0.09	[−0.23, 0.05]	−0.02	[−0.16, 0.12]	−0.08	[−0.23, 0.07]
Negative emotionality	*0.42*	[0.27, 0.57]	*0.35*	[0.20, 0.50]	0.11	[−0.05, 0.28]
Open-mindedness	−0.05	[−0.19, 0.10]	−0.01	[−0.16, 0.13]	−0.04	[−0.20, 0.12]
Search for information						
	$R^2 = 0.054$, $\Delta R^2 = 0.050$		$R^2 = 0.058$, $\Delta R^2 = 0.039$		$R^2 = 0.023$, $\Delta R^2 = 0.013$	
Gender	−0.04	[−0.31, 0.24]	0.07	[−0.21, 0.34]	−0.11	[−0.39, 0.17]
Age	0.01	[−0.12, 0.14]	0.09	[−0.03, 0.22]	−0.09	[−0.22, 0.04]
Extraversion	0.02	[−0.14, 0.18]	−0.09	[−0.25, 0.07]	0.12	[−0.04, 0.28]
Agreeableness	0.13	[−0.03, 0.28]	0.07	[−0.09, 0.23]	0.05	[−0.11, 0.21]
Conscientiousness	0.11	[−0.03, 0.26]	0.13	[−0.02, 0.28]	−0.03	[−0.18, 0.12]
Negative emotionality	*0.21*	[0.05, 0.37]	0.16	[0.00, 0.32]	0.03	[−0.14, 0.19]
Open-mindedness	0.08	[−0.07, 0.24]	0.07	[−0.08, 0.23]	0.00	[−0.16, 0.16]
Helping others						
	$R^2 = 0.102$, $\Delta R^2 = 0.079$		$R^2 = 0.048$, $\Delta R^2 = 0.041$		$R^2 = 0.055$, $\Delta R^2 = 0.038$	
Gender	0.15	[−0.12, 0.42]	0.08	[−0.20, 0.36]	0.07	[−0.21, 0.35]
Age	−0.11	[−0.24, 0.01]	0.04	[−0.08, 0.17]	*−0.14*	[−0.27, −0.02]
Extraversion	0.15	[−0.01, 0.30]	0.09	[−0.07, 0.25]	0.05	[−0.11, 0.21]
Agreeableness	*0.19*	[0.04, 0.34]	0.01	[−0.15, 0.16]	*0.17*	[0.01, 0.32]
Conscientiousness	0.07	[−0.07, 0.22]	0.01	[−0.14, 0.16]	0.06	[−0.09, 0.21]
Negative emotionality	0.09	[−0.07, 0.25]	0.12	[−0.05, 0.28]	−0.02	[−0.18, 0.14]
Open-mindedness	0.03	[−0.12, 0.18]	*0.16*	[0.00, 0.31]	−0.11	[−0.27, 0.04]

Note. CI - Confidence interval; R^2 - values for full model; ΔR^2 - unique variance explained by BFI-2 domains. Values significant at $p < 0.05$ are italicized. Gender: men were coded as 1 and women as 2.

personality traits. The results of our study suggest that situation perception can interact with personality traits in prediction of behavior, specifically, a situation perceived as more threating can evoke responses driven by personality traits.

3.4. Limitations and future directions

This study has some important limitations that need to be mentioned. Firstly, our research was exploratory, and we did not set specific hypothesis. This was caused mainly by the lack of sources at the time of the planning and by the lack of time to start the data collection. Secondly,

the method used for behavior measurement was self-report, which may be biased by social desirability and the fact that respondents gave only one evaluation each time. Using daily behavior reports would be more appropriate, to better reflect their behavior. In the context of the method used, the items were created by brainstorming, trying to focus on behavior connected to a pandemic situation without targeting any ad-hoc specific domains. The domains used were created post-hoc, using exploratory factor analysis. Furthermore, in our design we did not include other important variables such as subjective evaluation of the current situation. Finally, our findings are limited by the low number of participants. Although, a longitudinal sample was used, its size does not

necessarily fully represent the whole Slovak population.

Our study confirmed several meaningful links between Big Five personality traits assessed before pandemic of COVID-19 and behavioral and emotional response during the pandemic. Some of these relationships (e.g. for neuroticism) corresponded with the pattern of associations between personality traits and general disease avoidance (Oosterhoff et al., 2018), some of them (e.g. for extraversion) suggested that other mechanisms can be involved. However, we found that these effects vary across time, probably because of psychological adaptation to the pandemic, which occurs along with its duration. Our study is the first which pointed to this variation using a longitudinal design. Our findings suggested that when studying personality traits as predictors of behavior in a pandemic or a similar situation, one needs to consider specific characteristics of a concrete situation (e.g., actual perception of threats in the society). Future research should focus on controlling for these specific situation characteristics and exploring the mechanisms of their interaction with personality traits.

CRediT authorship contribution statement

Acknowledgements

Appendix A

Table A

Results of EFA of COVID-19 related behavior items from the first pandemic wave.

Final domain	Item/extracted factor	1	2	3	4	5	6
APFR	Warning others, who do not follow COVID-19 recommendations	0.43					0.30
APFR	Wearing a mask while outside of my home	0.39					
APFR	Washing my hands as frequently as possible	0.42					
APFR	Violating recommendations for reducing the spread of COVID-19	−0.40					
APFR	Limiting gatherings with high number of people			0.31			
APFR	Disinfecting my personal stuff	0.76					
APFR	Disinfecting the area around me	0.84					
APFR	Spending time at home as much as possible						
APFR	Taking medicine to improve my immunity	0.32					
APFR	Trying to listen to advice from others of how to protect myself	0.30					
PS	Collecting supplies of food		0.78				
PS	Collecting supplies of hygienic products		0.72				
PS	Collecting supplies of medicine		0.80				
REI	Using online platforms to connect with others			0.30		0.41	
REI	Trying to disperse my worries of COVID-19 by relaxing			0.41			
REI	Looking for ways to overcome limitations caused by COVID-19			0.42			
REI	Looking for ways to please my relatives in a situation of limitations caused by COVID-19			0.38			
REI	Relaxing to improve my situation caused by COVID-19			0.70			
REI	Searching for art to improve my feelings caused by COVID-19			0.41			
NER	Arguing with others about themes connected with COVID-19				0.43		
NER	Angry about the COVID-19 situation				0.56		
NER	Bored because of restrictions				0.47		
NER	Feeling endangered by COVID-19				0.47		
SFI	Searching for COVID-19 information, not to miss anything important					0.62	
SFI	Trying to share COVID-19 information with others					0.40	
SFI	Studying medical information about protection from COVID-19					0.45	
HO	Spending time helping others restricted by COVID-19 situation						0.56
HO	Donating money or other resources to help others restricted by COVID-19						0.39
HO	Taking over organization and management in situations that needed to be addressed because of COVID-19						0.40
–	Praying or doing religious acts to protect myself and others from COVID-19		0.31				
–	Eating healthy to improve my immunity			0.31			
–	Trying to reconcile with pandemic situation						
–	Working more than usual to avoid thinking about COVID-19						
–	Trusting that government will deal with the situation						
–	Trying to reconcile with others, worrying that it would not be possible in the future						0.35
–	Searching for contact through online social networks						
Latent factor correlations							
Factor 1		–	0.49	0.50	0.10	0.45	0.35
Factor 2			–	0.35	0.30	0.48	0.32
Factor 3				–	0.16	0.50	0.31
Factor 4					–	0.25	0.21
Factor 5						–	0.24

Note. Only the loadings of 0.30 and higher are displayed. The domain in which the item was assigned in the final analysis is shown in first column. The items without this information were not used in the final analysis. APFR – Active protection, following recommendations; PS – Purchasing and stockpiling; REI – Relaxation and emotional improvement; NER – Negative emotional response; SFI – Search for information; HO – Helping others.

Table B

Standardized factor loadings from CFA of the COVID-19 behavior scale.

Item/domain	APFR	PS	REI	NER	SFI	HO
Warning others, who do not follow COVID-19 recommendations	0.63					
Wearing a mask while outside of my home	0.66					
Washing my hands as frequently as possible	0.64					
Violating recommendations for reducing the spread of COVID-19	−0.26					
Limiting the gatherings with high number of people	0.62					
Disinfecting my personal stuff	0.68					
Disinfecting the area around me	0.71					
Spending time at home as much as possible	0.62					
Taking medicine to improve my immunity	0.51					
Trying to listen to advice from others how to protect myself	0.73					
Collecting supplies of food		0.82				
Collecting supplies of hygienic products		0.85				
Collecting supplies of medicine		0.83				
Using online platforms to connect with others			0.41			
Trying to disperse my worries of COVID-19 by relaxing			0.69			
Looking for ways to overcome limitations caused by COVID-19			0.62			
Looking for ways to please my relatives in a situation of limitations caused by COVID-19			0.55			
Relaxing to improve my situation caused by COVID-19			0.61			
Searching for art to improve my feelings caused by COVID-19			0.65			
Arguing with others about issues connected with COVID-19				0.50		
Angry about the COVID-19 situation				0.22		
Bored because of restrictions				0.36		
Feeling in danger by COVID-19				0.64		
Searching for COVID-19 information, not to miss anything important					0.75	
Trying to share COVID-19 information with others					0.78	
Studying medical information about protection from COVID-19					0.80	
Spending time helping others restricted by COVID-19 situation						0.51
Donating money or other resources to help others restricted by COVID-19						0.47
Taking over organization and management in situations that needed to be addressed because of COVID-19						0.63

Note. APFR – Active protection, following recommendations; PS – Purchasing and stockpiling; REI – Relaxation and emotional improvement; NER – Negative emotional response; SFI – Search for information; HO – Helping others. All factor loadings are significant at $p < 0.05$. Item pairs with correlated residuals: "Washing your hands as frequently as possible" and "Violating recommendations for reducing the spread of COVID-19", "Limiting gatherings with high number of people" and "Spending time at home as much as possible", "Disinfecting my personal stuff" and "Disinfecting the area around me", "Spending time helping others restricted by COVID-19 situation" and "Donating money or other resources to help others restricted by COVID-19", "Angry about the COVID-19 situation" and "Bored because of restrictions".

Table C

Correlations between latent factors, COVID-19 domains, and internal consistency.

Domain	APFR	PS	REI	NER	SFI	HO
Active protection, following recommendations	**0.79/0.86**	0.43/0.61	0.54/0.62	0.23/0.24	0.57/0.73	0.27/0.49
Purchasing and stockpiling	0.70	**0.81/0.87**	0.24/0.53	0.27/0.40	0.41/0.59	0.21/0.48
Relaxation and emotional improvement	0.76	0.64	**0.69/0.76**	0.25/0.34	0.49/0.60	0.27/0.49
Negative emotional response	0.61	0.70	0.64	**0.63/0.56**	0.38/0.35	*0.06*/0.32
Search for information	0.89	0.70	0.76	0.73	**0.71/0.82**	0.27/0.50
Helping others	0.76	0.73	0.75	0.80	0.78	**0.50/0.63**

Note. APFR – Active protection, following recommendations; PS – Purchasing and stockpiling; REI – Relaxation and emotional improvement; NER – Negative emotional response; SFI – Search for information; HO – Helping others. Bolded values are Cronbach's alphas from the first and the second pandemic wave. Values under diagonal are correlations between latent factors. Values over diagonal are correlations between COVID-19 domains from the first/second pandemic wave. All correlations except one (italicized) are significant at $p < 0.05$.

Table D

Gender differences and correlations for variables used in hierarchical linear regression analyses.

	Gender	Age	Extraversion	Agreeableness	Conscientiousness	Negative emotionality	Open-mindedness
Age	**−0.26**	–	–	–	–	–	–
T1 APFR	**−0.57**	0.05	0.12	**0.21**	**0.18**	0.01	**0.13**
T2 APFR	**−0.48**	0.12	0.02	0.13	0.14	0.06	0.11
T1-T2 APFR	0.06	−0.11	0.09	0.03	0.00	−0.07	−0.01
T1 PS	**−0.33**	−0.02	0.10	0.02	0.10	**0.14**	−0.06
T2 PS	**−0.46**	0.03	−0.02	−0.01	0.04	**0.19**	−0.07
T1-T2 PS	0.15	−0.06	**0.14**	0.03	0.07	−0.07	0.00
T1 REI	**−0.42**	0.08	**0.15**	**0.23**	0.05	−0.02	**0.29**
T2 REI	**−0.33**	**0.17**	0.08	0.12	0.02	0.07	**0.24**
T1-T2 REI	−0.04	−0.10	0.07	0.10	0.02	−0.10	0.02
T1 NER	−0.11	−0.04	−0.10	**−0.21**	**−0.23**	**0.40**	**−0.14**
T2 NER	−0.17	0.07	**−0.13**	**−0.22**	**−0.17**	**0.36**	−0.11
T1-T2 NER	0.05	−0.11	0.02	−0.02	−0.08	0.08	−0.04
T1 SFI	−0.13	0.02	0.04	0.12	0.12	0.08	**0.13**
T2 SFI	**−0.22**	0.10	−0.06	0.08	0.10	0.10	0.07

Table D (*continued*)

	Gender	Age	Extraversion	Agreeableness	Conscientiousness	Negative emotionality	Open-mindedness
T1-T2 SFI	0.11	−0.09	0.10	0.03	0.01	−0.04	0.05
T1 HO	**−0.27**	−0.06	**0.20**	**0.24**	**0.18**	−0.08	**0.17**
T2 HO	−0.13	0.06	0.12	0.07	0.07	0.02	**0.18**
T1-T2 HO	−0.12	−0.11	0.07	**0.16**	0.10	−0.09	0.00
Extraversion	0.04	0.06	–	–	–	–	–
Agreeableness	**−0.57**	**0.19**	**0.321**	–	–	–	–
Conscientiousness	−0.19	0.07	**0.379**	**0.402**	–	–	–
Negative emotionality	**−0.35**	−0.10	**−0.501**	**−0.418**	**−0.397**	–	–
Open-mindedness	0.00	0.08	**0.501**	**0.375**	**0.429**	**−0.296**	–

Note. Gender – Cohen's d, negative number indicate higher value for women. T1 – first COVID-19 pandemic wave; T2 – second COVID-19 pandemic wave; T1-T2 – difference between two pandemic waves. APFR – Active protection, following recommendations; PS – Purchasing and stockpiling; REI – Relaxation and emotional improvement; NER – Negative emotional response; SFI – Search for information; HO – Helping others. Bolded values are significant at $p < 0.05$.

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