

Personality Trait Change Across a Major Global Stressor

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Abstract

The current research examined three related questions in a 21-month longitudinal study of a diverse sample of U.S. participants ($N = 504$): (a) How did Big Five traits change during the COVID-19 pandemic? (b) What factors were associated with individual differences in trait change? and (c) How was Big Five trait change associated with downstream well-being, mental health, and physical health? On average, across the 21-month study period, conscientiousness increased slightly, and extraversion decreased slightly. Individual trajectories varied around these average trajectories, and although few factors predicted these individual differences, greater increases in conscientiousness, extraversion, and agreeableness, and greater decreases in neuroticism were associated better well-being and fewer mental and physical health symptoms. The present research provides evidence that traits can change in the context of a major global stressor and that socially desirable patterns of trait change are associated with better health.

Keywords

Big Five, COVID-19, health, personality traits, trait change, well-being

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A growing body of empirical evidence suggests that major life events can drive personality trait change (Bleidorn et al., 2018; Bühler et al., 2023; Roberts & Jackson, 2008, 2016; Roberts & Wood, 2006; Schwaba et al., 2023). A largely separate body of research has found that personality trait change may have important consequences for health (Hampson, 2019; Letzring et al., 2014; Magee et al., 2013; Mroczek & Spiro, 2007; Siegler et al., 2003; Turiano et al., 2012; Wright & Jackson, 2023). The COVID-19 pandemic is an interesting and important context in which to examine personality trait change and its implications for health, given the pandemic's wide-reaching impact on people's daily lives, well-being, and mental and physical health. The present research examined three related questions in the context of the COVID-19 pandemic: (a) How did Big Five traits change during the COVID-19 pandemic? (b) What factors are associated with individual differences in Big Five trait change? and (c) How was Big Five trait change associated with downstream well-being, mental health, and physical health? This research provides a unique opportunity to examine longitudinal trait change in the novel context of a major global stressor and to investigate associations between trait change and health in the context of a public health crisis.

Personality Trait Change

Despite early theories stating that adult personality is static and “set like plaster” (Costa & McCrae, 1986, 1994; James,

1890/1950; McCrae et al., 2000), a growing body of evidence suggests that personality continues to change in adulthood. A recent meta-analysis of 276 studies found mean-level personality trait change such that socially desirable traits tend to increase across most of the adult lifespan (i.e., in the direction of greater “maturity”; Bleidorn et al., 2022). Mean-level trait change is possible in response to a variety of major life events (e.g., Bleidorn et al., 2018). For example, the TESSERA (Triggering situations, Expectancy, States/State expressions, and Reactions) model posits that changes to daily routines as a result of major life events may repeatedly influence personality states, leading to changes in personality traits (Wrzus & Roberts, 2017). Furthermore, the Neo-Socioanalytic Theory describes a process by which investment and adaptation into new social roles, such as those that might occur following a major event, lead to subsequent personality trait change (Roberts & Nickel, 2021).

This expanding area of research has mainly focused on comparing people who experienced a specific life event to people who did not experience that same event or examining within-person change within subsamples of individuals who

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experienced a specific event. For example, research has shown that conscientiousness tends to increase upon starting one's first job (Specht et al., 2013) and neuroticism tends to increase following adverse life events (Boals et al., 2014). A limitation to this approach is that certain people may be more or less likely to experience particular life events because of their traits. Fewer studies have focused on personality trait change following major events experienced by entire populations (e.g., natural disasters), and existing findings remain inconclusive in part due to rare opportunities to study this type of event. For example, some research has found that personality is stable following a major environmental stressor such as Hurricane Harvey (Damian et al., 2020), whereas other research has observed a slight increase in neuroticism following a similar major stressor, the Christchurch earthquakes (Milojevic et al., 2014).

The unprecedented COVID-19 pandemic is a major global stressor that disrupted the daily lives of the entire population and thus could be a catalyst for trait change. For example, the pandemic led many individuals to change their social and health-related behaviors, introduced new financial and health-related stressors, and caused broader societal shifts. All of these factors could accumulate to cause enduring trait change. A handful of studies have examined Big Five trait change from pre-pandemic declaration (e.g., January–early March 2020) to the first few months of the pandemic (e.g., late March–June 2020). Together, these studies provide initial evidence for trait change early in the pandemic, but the patterns of trait change are inconsistent across studies. For example, one study found decreases in neuroticism and no change in the other Big Five traits from February to March 2020 in an age-stratified U.S. American sample (Sutin et al., 2020). However, a different study found no change in neuroticism and increases in extraversion when comparing January to March 2020 with March to June 2020 in a similar sample (Condon & Weston, 2021). Another study assessed personality indicators in the content of tweets made by U.S. health care workers from February 2020 to March 2020 and found increases in extraversion, conscientiousness, and neuroticism, and decreases in agreeableness and openness (Ahmed et al., 2020). These studies focused on trait change across a relatively narrow and early band of time when the pandemic situation was still fluctuating widely for people, which may account for the mixed findings. Examining longer-term enduring trait change across later phases of the pandemic, as in the present study, may provide a clearer picture.

One recent study examined personality trait change across a longer time period during the pandemic from March to December 2020 and from January 2021 to February 2022 (Sutin et al., 2022). Neuroticism decreased early in the pandemic, and extraversion, openness, agreeableness, and conscientiousness slightly declined when comparing pre-pandemic personality levels to personality measured

later in the pandemic (Sutin et al., 2022). Age and Hispanic and Latino ethnicity were significant moderators of these average trait change trajectories (Sutin et al., 2022). The current study expands on this past work by examining factors related to the individual and to the pandemic context that may explain individual differences in personality trait change, and by considering how personality trait change is associated downstream health in the context of a public health crisis.

Individual Differences in Personality Trait Change

Current personality theories posit that individuals differ from one another in their patterns of trait change due to various factors. For example, the TESSERA framework suggests that because individuals differ in the level and types of changes made to their daily routines, they may subsequently differ in their levels of trait change (Wrzus & Roberts, 2017). Furthermore, individuals differ in their investment in and adaptation to new roles, which can impact levels of trait change as posited by the Neo-Socioanalytic perspective (Roberts & Nickel, 2021). Therefore, it is important to understand which individuals are more or less likely to experience trait change by examining an array of potential factors, including sociodemographic characteristics and factors related to their experiences of major events. In the context of the pandemic, individuals may differ from one another in the extent to which the pandemic impacted their lives, they may experience different patterns of behavior change in response to the pandemic such as engagement in preventive health measures, and they may experience different discrete events related to the larger pandemic event such as losing a loved one to COVID-19. In turn, these factors may influence the degree and type of trait change that people experience during the pandemic.

Given that mean levels of personality traits are associated with health (e.g., Turiano et al., 2018), and given evidence that personality traits are malleable (e.g., Bleidorn et al., 2022), it is crucial to understand how individual differences in personality trait change are associated with downstream health. The pandemic is a novel context in which to test this question because the entire population experienced the pandemic, which allows for a more controlled yet fulsome test of the hypothesis that trait change matters for health. Moreover, the pandemic context is unique in that it is a major public health crisis with environmental influences on health. A handful of studies have begun to link trait change with well-being and health (Human et al., 2013; Mroczek & Spiro, 2007; Wettstein et al., 2022; Wright & Jackson, 2023). For example, longitudinal increases in neuroticism have been associated with lower life satisfaction (Human et al., 2013; Magee et al., 2013) and increased mortality risk (Mroczek & Spiro, 2007), and longitudinal increases in conscientiousness

and extraversion have been associated with improved life satisfaction (Magee et al., 2013) and better physical health (Human et al., 2013). Several potential mechanisms may explain the observed associations between personality trait change and health, such as corresponding changes in health behaviors (e.g., Turiano et al., 2018; Willroth et al., 2021), or changes in stressor exposure and stress reactivity (Bogg & Roberts, 2013; Connor-Smith & Flachsbart, 2007; Hampson, 2019; Lee-Baggeley et al., 2005; Penley & Tomaka, 2002; Schneider, 2004; Vollrath, 2000; Wang et al., 2018).

We do not yet know whether trait change during the COVID-19 pandemic is associated with health. However, a handful of studies have provided evidence that personality trait level during the COVID-19 pandemic is associated with health, including health behaviors, perceived stress, and psychological well-being (Kocjan et al., 2021; Liu et al., 2020; Willroth et al., 2021; Zhang et al., 2021). Taken together, there is emerging evidence for the presence of personality trait change during the COVID-19 pandemic, and for associations between personality trait level and health in the context of the COVID-19 pandemic, but we do not yet know whether personality trait change during the pandemic is associated with health.

The Current Investigation

The present study focused on three related questions:

Research Question 1: How did Big Five traits change during the COVID-19 pandemic?

Research Question 2: What factors are associated with individual differences in Big Five trait change?

Research Question 3: How was the Big Five trait change associated with downstream well-being, mental health, and physical health?

To examine these questions, we measured the Big Five personality traits at four time points across nearly 2 years of the COVID-19 pandemic (March 2020, July 2020, April 2021, and December 2021). These time points roughly mapped onto the pandemic declaration and onset of a nationwide lockdown in the United States (March 2020), the end of the first wave and the lifting of the strictest pandemic-related restrictions in the United States (July 2020), widespread availability of COVID-19 vaccines in the United States (April 2021), and a large wave of infections in the United States during the spread of the omicron variant (December 2021). To examine factors associated with individual differences in trait change, we measured sociodemographic factors (age, gender, income, education, racial, and ethnic identity), general perceived stress, and pandemic-specific factors (perceived positive and negative impact of the pandemic, self-isolating and social-distancing behaviors, losing a loved one to COVID-19, and being exposed to COVID-19 at home). We assessed the sociodemographic factors at study baseline

(February 2020). We assessed perceived stress and pandemic-specific factors across the study period to capture the context during which trait change may have occurred. To examine associations between personality trait change and health, we assessed a broad array of health domains, including well-being (e.g., satisfaction with life), mental health symptoms (e.g., anxiety), and physical health symptoms (e.g., headaches) in April 2021 and December 2021. See Figure 1 for the Study Timeline and Context.

The COVID-19 pandemic provided a unique opportunity to examine personality trait change, given that the entire population experienced the same major stressor. This controls for self-selection effects that could influence who is more likely to experience certain major life events and subsequent trait change. A few emerging studies have examined the nature of personality trait change across the pandemic, but no consistent pattern has been found (Ahmed et al., 2020; Condon & Weston, 2021; Sutin et al., 2020, 2022). The present study assessed personality at four time points across 21 months, which allows us to better understand the longitudinal nature of trait change across the enduring COVID-19 pandemic.

We also examined general factors and pandemic-specific factors that may be associated with individual differences in personality trait change. Identifying such factors would allow for the identification of individuals at risk of maladaptive personality trait changes during and following stressful life events. Previous research has shown that age and Hispanic and Latino ethnicity are associated with personality trait change in the COVID-19 context (Sutin et al., 2022). Furthermore, given that individuals differ in their trajectories of trait change, we examined other sociodemographic factors, general perceived stress, and factors related to the pandemic that may lead to individual differences in trait change. We also examined associations between personality trait change and health during the pandemic. Given evidence for the malleability of personality traits following major life events (Bleidorn et al., 2018, 2021) and the importance of personality trait change for health (e.g., Human et al., 2013; Mroczek & Spiro, 2007; Wettstein et al., 2022), we hypothesized that personality trait change should be associated with health. Given mixed evidence for the direction of personality trait change during the pandemic and because the pandemic is a novel context relative to most prior research on personality trait change, we did not make specific directional predictions for any of the research aims.

Method

The present research is part of a large longitudinal study aimed at understanding how psychosocial factors influence individuals' responses to the COVID-19 pandemic (see Smith et al., 2021 for more details). Additional measures were collected for this larger study but are outside the scope of the current investigation. We report all manipulations and exclusions. Analysis preregistrations are available at <https://>

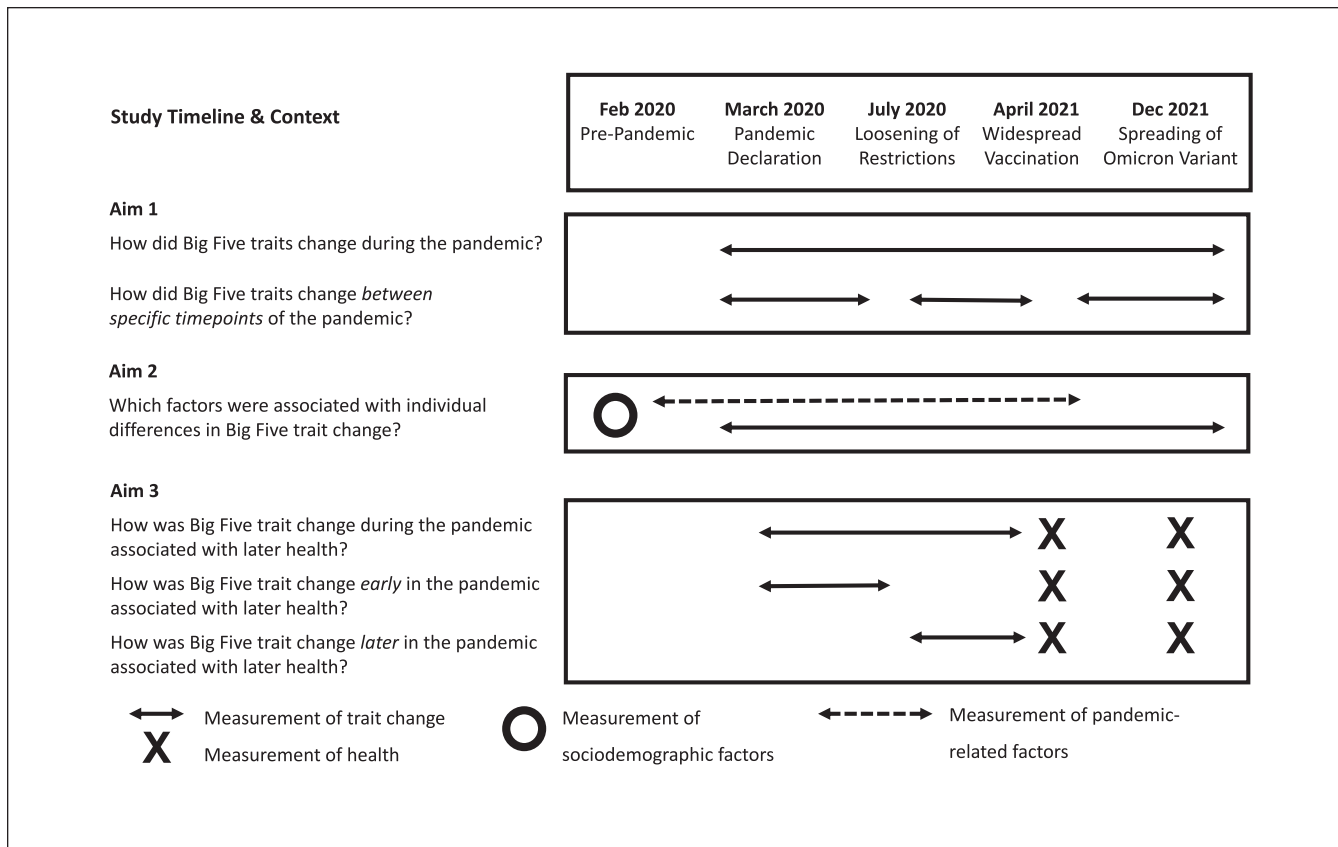


Figure 1. Study Timeline and the Broader Pandemic Context.

osf.io/cu4qb (Aim 1) and <https://osf.io/x6muh> (Aims 2 and 3). Analyses were preregistered in November 2021 and updated in March 2021 after an additional wave of data were collected. Although we did not have specific directional hypotheses, the analysis preregistrations provide time-stamped documentation of our analytic plans. Data, codebook, methods and materials, and R code are available at <https://osf.io/b4ct5/>.

Participants

U.S. participants were recruited from Amazon's Mechanical Turk, an online platform that allowed us to rapidly collect time-sensitive data from diverse participants, between February 2020 and December 2021. Participants were specifically recruited to be diverse with respect to racial and ethnic identity. To enhance data quality, participants were required to have a 95% approval rating and to have completed at least 100 tasks on the Mechanical Turk platform, and surveys with failed attention checks or incomplete data were excluded from the analysis. Sample size was based on an a priori goal of the larger study to recruit at least 200 people from the three different racial and ethnic backgrounds, which was met. At Time 1, the full sample included 742 participants.

Five hundred and four participants provided at least two measurement occasions of personality data and were included in at least one analysis. Because subsets of the 504 participants met inclusion criteria for analyses focused on different time points, the number of participants included in a given model ranged from 234 (in models involving only April 2021 and November 2021 time points) to 428 (in models involving only March 2020 and July 2020 time points). The participants included in at least one analysis ranged from 18 to 73 years ($M = 38.34$, $SD = 11.22$), were 54.0% women, 44.2% men, 0.6% nonbinary, and 1.2% declined to report their gender; and 36.7% European American/White/Caucasian, 28.4% African or African American, 22.8% East Asian or East Asian American, 7.7% South Asian or South Asian American, 2.4% other racial or ethnic identities, and 1.2% declined to report their racial and ethnic identity.

Procedure

Participants were invited to complete a baseline survey in late February 2020 (Time 1). Participants who passed attention checks at Time 1 were invited to participate in future monthly waves of the study at the end of March 2020 (T2), April (T3), May (T4), June (T5), July (T6), August (T7), October (T8), November (T9), January 2021 (T10), March

(T11), and April (T12), December (T13), and shorter weekly surveys in March 2020 (T1a, T1b, and T1c) and April (T2a, T2b, and T2c).

Participants provided informed consent and were compensated approximately \$9 per hour. All procedures were approved by the ethics board at the University of Toronto (Protocol No. 33962).

Measures

Big Five Personality Traits. Personality traits were assessed in March 2020 (T1c), July 2020 (T6), April 2021 (T12), and December 2021 (T13; see Table 1). We assessed personality traits using the extra-short form of the Big Five Inventory (BFI-2-XS; Soto & John, 2017). The BFI-2-XS is a brief, 15-item measure that has been shown to efficiently and reliably assess the Big Five personality traits: conscientiousness (e.g., “Is reliable, can always be counted on”; $\alpha = 0.70\text{--}0.78$), extraversion (e.g., “Tends to be quiet”; $\alpha = 0.62\text{--}0.65$), agreeableness (e.g., “Is compassionate, has a soft heart”; $\alpha = 0.61\text{--}0.64$), neuroticism (e.g., “Worries a lot”; $\alpha = 0.77\text{--}0.79$), and openness (e.g., “Is fascinated by art, music, or literature”; $\alpha = 0.59\text{--}0.67$).

Sociodemographic Characteristics, Perceived Stress, and Pandemic-Related Factors. Sociodemographic factors (age, gender, income, education, racial, and ethnic identity) were assessed in February 2020 (Time 1). To understand how individuals differed from one another in their average pandemic experience, we averaged across all available time points for perceived stress and pandemic-specific factors. Perceived stress was averaged across all available time points between April 2020 and April 2021 (T3, T4, T5, T6, T7, T8, T9, T11, and T12) using the four-item perceived stress scale (e.g., “I was unable to control the important things in my life”; Cohen et al., 1983). Perceived positive and negative impacts of the pandemic were averaged across all available time points between April 2020 and March 2021 (T3, T4, T5, T6, T7, and T11; e.g., “Recently, how much of a negative impact has the coronavirus had on your daily life?”). Self-isolating (e.g., “please indicate how often you engaged in the following actions over the past 4 weeks: “Engaged in self-isolation [e.g., avoided leaving your home for any reason.”]”) and social distancing (e.g., please indicate how often you engaged in the following actions over the past 4 weeks: “Stayed at least 2 arms lengths [approximately 6 feet] away from other people, except for the people I live with.”) behaviors were averaged across all available time points between March 2020 and March 2021 (T2, T3, T4, T5, T6, T7, T8, T9, T10, and T11). To assess exposure to COVID-19 at home, participants were asked “Since the beginning of the outbreak, have you or anyone you know tested positive for (contracted) the coronavirus (COVID-19)?” at T2 T3, T4, T5, T6, T7, and T11. We created a dummy-coded variable to compare participants who selected

Table 1. Descriptive Statistics for Personality Traits Across Time Points.

Models	M	SD	Cronbach's α
Conscientiousness			
March 2020	2.92	0.94	.76
July 2020	2.92	0.92	.70
April 2021	3.05	0.94	.72
December 2021	3.05	1.02	.78
Extraversion			
March 2020	1.68	0.94	.63
July 2020	1.62	0.94	.62
April 2021	1.62	0.95	.65
December 2021	1.61	0.95	.63
Agreeableness			
March 2020	2.78	0.84	.61
July 2020	2.78	0.87	.64
April 2021	2.78	0.87	.63
December 2021	2.82	0.87	.64
Neuroticism			
March 2020	1.59	1.08	.77
July 2020	1.63	1.14	.78
April 2021	1.50	1.14	.79
December 2021	1.57	1.15	.79
Openness			
March 2020	2.81	0.89	.67
July 2020	2.82	0.88	.62
April 2021	2.75	0.93	.67
December 2021	2.83	0.85	.59

Note. The possible range for all personality variables is 0 to 4.

“A member of your immediate family (e.g., family you live with)” or “A roommate” to participants who did not. Because this item refers to a specific event rather than general perceptions or behaviors, we treated it as time-varying. Participants received a score of 0 at all time points until they responded “yes.” For all time points after a “yes” response, participants received a score of 0. We also intended to create a variable indicating whether or not participants themselves contracted COVID-19. However, only 3% of the sample reported contracting COVID-19, and thus we did not proceed with the planned analyses. Finally, losing someone to COVID-19 was assessed once in March 2021 (T11; e.g., “Since the beginning of the outbreak, has anyone you know died due to COVID-19 or COVID-19-related complications?”; 19% of participants reported losing someone to COVID-19).

Health. We assessed multiple indicators of health in April 2021 (T12) and December 2021 (T13) including well-being, mental health symptoms, and physical health symptoms. Well-being was assessed as a mean composite of z-scored life satisfaction and z-scored psychological well-being. Life Satisfaction was assessed with the five-item Satisfaction with Life Scale (e.g., “In most ways my life is close to my

ideal”; Diener et al., 1985), and psychological well-being was assessed with the three-item Meaning in Life Questionnaire (e.g., “I feel a clear sense of purpose in my life”; Steger et al., 2006). Mental health symptoms were assessed as a mean composite of z-scored anxiety and z-scored depression. To assess anxiety symptoms over the past 4 weeks, we used the anxiety items from the Hospital Anxiety and Depression Scale (e.g., “Worrying thoughts go through my mind”; Zigmond & Snaith, 1983). To assess depressive symptoms over the past 4 weeks, we used the Center for Epidemiological Studies Depression Scale (e.g., “I felt depressed”; Radloff, 1977). Physical health symptoms were assessed with the Physical Health Questionnaire (PHQ; e.g., “How often have you had difficulty getting to sleep at night?”; Schat et al., 2005), which was z-scored for comparability with the well-being and mental health measures.

Analytic Approach

All analyses were conducted in R version 4.2.1 using the nlme (Pinheiro et al., 2022) and lm.beta (Behrendt, 2023) packages.

Attrition Analyses. To investigate the potential impact of attrition, we compared individuals who provided data at all four personality measurement occasions ($N = 230$) to those who completed only 2 or 3 personality measurement occasions ($N = 274$) on sociodemographic characteristics, baseline well-being and health (T1), and the first measurement occasion of Big Five personality traits (T1c). Relative to those who did not complete all four measurement occasions, participants who completed all four measurement occasions were, on average, older, 40.8 versus 36.3 years old, $t(437.3) = 4.46, p < .001$; more conscientious, 3.03 versus 2.81, $t(484.3) = 4.46, p = .009$; and had fewer baseline physical health symptoms, 14.62 versus 17.73, $t(487.9) = 3.91, p < .001$. The same pattern was observed when comparing people who were included in the present investigation ($N = 504$) to those who provided zero or one measurement of personality and thus did not meet inclusion criteria.

Aim 1: How Did Big Five Traits Change During the COVID-19 Pandemic? To estimate trajectories of each Big Five personality trait across all four measurement occasions of personality (March 2020, July 2020, April 2021, and December 2021), we used a series of random-intercept, random-slope multilevel growth curve models. To estimate linear trajectories, we modeled a fixed and random slope for discrete time (in months). The fixed slope indicates average trait change at the group level. The distribution of random slopes reflects individual differences in trait change. To test whether individuals significantly differed from one another in their trait change trajectories, we compared nested models with and without the random slope for time. Based on preregistered inclusion criteria, participants were included in the growth

curve model analyses if they provided personality trait data for at least three of the four time points. Although it is possible to include participants with fewer observations, we were concerned that including participants with one or two personality trait assessments would not produce reliable individual slopes for subsequent analyses involving health.

We also examined change in each Big Five personality trait between each set of two consecutive time points (i.e., March to July 2020; July 2020 to April 2021; April 2021 to December 2021). To do this, we used an analytic approach that was more appropriate for two measurement occasions. Specifically, to examine mean-level personality trait change at the group level, we used a series of paired sample t tests. To examine personality trait change at the individual level, we computed reliable change indices (RCIs). RCIs compare the total amount of change to the amount of change that would be expected due to measurement error alone, using the following formula: $(\text{Trait}_{\text{Time}2} - \text{Trait}_{\text{Time}1}) / \text{SEdiff}$, where $\text{SEdiff} = \sqrt{2 * \text{SEM}1^2}$, where $\text{SEM}1 = \text{SD}1 * \sqrt{(1 - \text{test-retest } r)}$. Based on preregistered inclusion criteria, participants were included in the t -test and RCI analyses if they provided personality trait data for both time points involved in the analysis.

In Aim 1, we used an alpha level of .05, given the already conservative nature of RCIs, and for comparability between analyses that used RCIs and analyses that used growth curve models.

Aim 2: What Factors Were Associated With Individual Differences in Big Five Trait Change? To examine factors associated with individual differences in Big Five personality trait change from March 2020 to November 2021, we conducted a series of random-intercept, random slope growth curve models. In each model, we predicted personality from discrete time, the focal predictor, and the interaction between discrete-time and the focal predictor. Each predictor and each Big Five trait were examined in separate models.

Aim 3: How Was Big Five Trait Change Associated With Downstream Health? We used a two-step approach to examine associations between trait change and health. In Step 1, we extracted random intercepts (i.e., trait level) and random slopes (i.e., trait change) from the growth curve models described in Aim 1. To allow for the appropriate temporal structure in which the predictor (trait change) does not include time points that occur after the assessment of the outcome, we used only the first three measurement occasions of personality (March 2020, July 2020, April 2021) in the growth curve models. In Step 2, we separately regressed each health domain onto trait level (i.e., the random intercept) and trait change (i.e., the random slope) for each trait. In the initial iteration of our preregistration, April 2021 health variables were used as outcomes. Once December 2021 data were cleaned and available to analyze, we updated the preregistration to use December 2021 health variables as

additional outcomes. In most cases, results were directionally consistent across both sets of analyses, with some differences in statistical significance.

We also conducted exploratory analyses in which we tested associations between trait change during the first wave of the pandemic (i.e., March to July 2020) and health, and separately tested associations with trait change that occurred later in the pandemic after the nationwide lockdown lifted through widespread availability of the COVID-19 vaccine in the United States (i.e., July 2020 to April 2021). We used a similar two-step approach to conduct these analyses; however, we used RCIs rather than growth curve models in Step 1. Specifically, in Step 1, we computed RCIs using the method described in Aim 1, a more appropriate statistical choice for estimating change across two time points. In Step 2, we separately regressed each health domain (assessed in April 2021 and December 2021) onto trait level (i.e., March 2020 personality for the early model and July 2020 personality for the late model) and trait change (i.e., the RCI corresponding to the given time window). In Aim 3, we used a more conservative alpha level of .01 to account for testing each hypothesis across three outcome measures and two outcome time points.

Results

Aim 1: How Did Big Five Traits Change During the COVID-19 Pandemic?

Figure 2 shows observed mean levels of each Big Five trait at each study time point. First, we examined trait change across the entire study period from March 2020 through December 2021 using growth curve models (see Table 2). On average, conscientiousness increased slightly (approximately one tenth of a scale point across the 21-month study period) and extraversion decreased slightly (less than one tenth of a scale point across the 21-month study period). To test the possibility that observed conscientiousness change could be due to less conscientious participants dropping out at later time points, we conducted sensitivity analyses in the subsample of $N = 230$ participants who completed all four measurement occasions of personality. The direction and statistical significance of the effect remained the same and the magnitude of change was similar ($b = .004, p = .029$).

Individuals differed around the average personality trait change trajectories, as indicated by the standard deviations of the random effects shown in Table 2. The inclusion of a random slope explained significantly more variance for all traits ($ps < .037$) with the exception of openness ($p = .805$). This suggests that individuals significantly differed from one another in their change trajectories for conscientiousness, extraversion, agreeableness, and neuroticism, but did not significantly differ from one another in their openness trajectories.

Next, we examined trait change across more specific time windows using t -tests and RCIs (See Table 3). During the

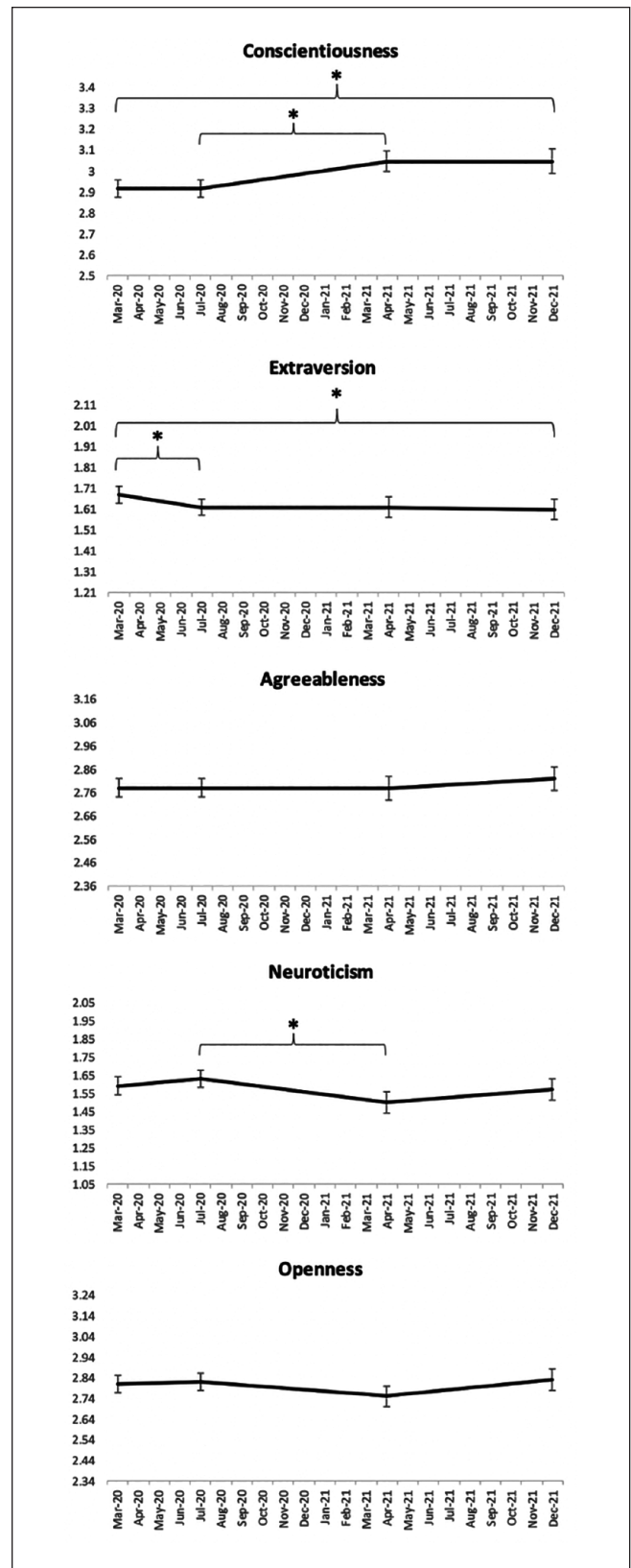


Figure 2. Observed Mean for Each Big Five Trait at Each Time Point in the Full Analytic Sample.

Note. Error bars depict standard errors. The range of the y axis has been truncated and depicts 1 full baseline standard deviation.

Table 2. Linear Growth Curve Models Predicting Personality Trait Change From March 2020 Through December 2021.

Models	Fixed effects		Random effects	
	<i>b</i>	<i>p</i>	<i>SD</i>	Correlation
Conscientiousness				
Intercept	2.972	<.001	0.835	-.029
Time	0.005	.008	0.023	—
Extraversion				
Intercept	1.656	<.001	0.874	-.118
Time	-0.003	.049	0.016	—
Agreeableness				
Intercept	2.796	<.001	0.783	-.060
Time	0.000	.973	0.014	—
Neuroticism				
Intercept	1.590	<.001	1.046	.016
Time	-0.003	.126	0.014	—
Openness				
Intercept	2.796	<.001	0.803	-.070
Time	0.000	.915	0.006	—

Note. Analytic $N = 1,334$ observations from 368 participants. Statistical significance for Aim 1 was evaluated at an alpha level of .05.

first wave of the pandemic, from March to July 2020, mean-level extraversion decreased 0.08 *SDs*, and there were no significant mean-level changes in the other traits. Later in the pandemic, from July 2020 to April 2021, mean-level conscientiousness increased by 0.11 *SDs* and mean-level neuroticism decreased by 0.08 *SDs*. There were no significant group-level changes in the other traits. Finally, from April 2021 to December 2021, there were no significant group-level changes in any of the Big Five traits.

In addition to these mean-level changes, individuals also differed from one another in the direction and degree of trait change, with some individuals reliably decreasing (i.e., $RCIs < -1.96$) and others reliably increasing ($RCIs > 1.96$) in each trait and each time window. However, across all traits and time windows, the majority of individuals (88.4% to 97.4% across traits and time windows) did not demonstrate reliable trait change ($RCIs$ between -1.96 and 1.96), suggesting that the most common response to the pandemic was trait stability.

Aim 2: What Factors Were Associated With Individual Differences in Big Five Trait Change?

In growth curve models, we found evidence for individual differences in trait change for all traits except openness. Thus, in primary analyses for Aim 2, we examined associations between sociodemographic and pandemic-related factors and changes in all traits except openness (see Table 4). At our preregistered alpha level of .01 for Aim 2, we only found one statistically significant factor associated with individual differences in trait change. Losing someone to

COVID-19 was associated with steeper decreases in extraversion, $b = -.0122$, $p = .008$.

Aim 3: How Was Big Five Trait Change Associated With Downstream Health?

In growth curve models, we found evidence for individual differences in trait change for all traits except openness. Thus, in primary analyses for Aim 3, we examined associations between health and change in all traits except openness. To ensure the appropriate temporal ordering of our predictor and outcome, we assessed trait change across the first three measurement occasions of personality (March 2020–April 2021), and we assessed health in April 2021 and December 2021 (see Table 5 and Supplementary Table S1). The initial growth curve model for neuroticism change across the first three time points did not converge. After changing optimization parameters, the model converged; however, the random slopes were not statistically significant. This is a different pattern than the one observed in Aim 1 because the growth curve model in Aim 1 examined individual differences in neuroticism change across four time points rather than the three time points included in the growth curve model for Aim 3. Because individuals did not significantly differ from one another in neuroticism change, we did not proceed with Aim 3 primary analyses for neuroticism.

In exploratory analyses for Aim 3, we also examined trait change at two more specific, meaningful time windows: In particular, we examined associations between trait change *during the first wave of the pandemic* (March 2020–July 2020) and health (assessed in April 2021 and December 2021) as well as trait change *later in the pandemic* (July 2020–April 2021) and health (assessed in April 2021 and December 2021; see Table 6 and Supplementary Table S2). Although RCI analyses suggested that trait stability was more common than trait change in each of these time windows, we found evidence for reliable individual-level change for several traits and time windows and substantial between-person variability in trait change estimates.

Conscientiousness. In primary analyses, changes in conscientiousness across the first year of the pandemic were not associated with health in April or December 2021. However, in exploratory analyses using $RCIs$ rather than random effects to examine trait change at the two more specific time windows, a different pattern emerged. Increases in conscientiousness during the first wave of the pandemic were associated with better well-being and fewer mental and physical health symptoms in April 2021 and December 2021. Increases in conscientiousness later in the pandemic were associated with fewer physical health symptoms in April 2021, and while the direction of effect replicated when considering December 2021 health, the effect was not statistically significant at an alpha level of .01 (i.e., $.01 < p < .05$).

Table 3. Personality Trait Change Between Consecutive Time Windows From March 2020 to April 2021.

A. March 2020 to July 2020	t(428)	d	p	% reliable decrease	% no reliable change	% reliable increase
Conscientiousness	-0.80	-0.02	.423	1.9	96.0	2.1
Extraversion	-2.86	-0.08	.005	1.4	97.4	1.2
Agreeableness	-1.30	-0.04	.194	5.6	90.0	4.4
Neuroticism	0.52	0.01	.601	3.5	91.4	5.1
Openness	-0.79	-0.02	.431	2.6	95.3	2.1
B. July 2020 to April 2021	t(310)	d	p	% reliable decrease	% no reliable change	% reliable increase
Conscientiousness	2.98	0.11	.003	1.6	93.9	4.5
Extraversion	0.25	0.01	.806	5.1	90.0	4.8
Agreeableness	0.25	0.01	.799	1.3	95.8	2.9
Neuroticism	-2.93	-0.08	.004	5.5	93.9	0.6
Openness	-0.55	-0.02	.583	7.1	88.4	4.5
C. April 2021 to November 2021	t(259)	d	p	% reliable decrease	% no reliable change	% reliable increase
Conscientiousness	0.82	0.03	.415	3.8	91.9	4.2
Extraversion	-0.59	-0.02	.555	3.8	91.5	4.6
Agreeableness	-0.61	-0.02	.543	3.8	92.7	3.5
Neuroticism	1.49	0.05	.138	1.5	96.5	1.9
Openness	0.70	0.02	.482	3.1	91.5	5.4

Note. Columns 2 to 4 show the results of paired sample *t*-tests comparing mean levels of each trait between two consecutive time points. Cohen's *d* is coded such that a positive value indicates an increase in mean levels of the trait and a negative value indicates a decrease in mean levels of the trait. Columns 5 to 7 show the percentage of people who reliably decreased ($RCI < -1.96$), did not reliably change ($-1.96 < RCI < 1.96$), and reliably increased ($RCI > 1.96$) in each trait between two consecutive time windows based on reliable change indices. Statistical significance for Aim 1 was evaluated at an alpha level of .05. RCI = reliable change index.

Effect sizes for conscientiousness and health associations ranged from nearly zero to medium (|.01|-.22|).

Extraversion. In primary analyses, increases in extraversion across the first year of the pandemic were associated with significantly fewer mental and physical health symptoms in April 2021. The direction of these effects replicated when considering December 2021 health, however, these effects were not statistically significant at an alpha level of .01 (i.e., $.01 < ps < .05$). In exploratory analyses using RCIs rather than random effects to examine trait change at two more specific time windows, increases in extraversion during the first wave of the pandemic were associated with fewer mental and physical health symptoms in April 2021. The direction of effects replicated when considering December 2021 health, however, these effects were not statistically significant at an alpha level of .01 (i.e., $.01 < ps < .05$). Increases in extraversion later in the pandemic were associated with better well-being and fewer mental and physical health symptoms in April 2021 and December 2021. Effect sizes for extraversion change and health associations ranged from small to medium (|.10|-.25|).

Agreeableness. In primary analyses, changes in agreeableness across the first year of the pandemic were not significantly associated with well-being or health in April 2021 or December 2021. In exploratory analyses using RCIs rather

than random effects to examine trait change at the two more specific time windows, increases in agreeableness during the first wave of the pandemic were associated with significantly better well-being in April 2021. A similar pattern emerged for well-being in December 2021; however, these effects were not statistically significant at an alpha level of .01 (i.e., $.01 < ps < .05$). Increases in agreeableness later in the pandemic were associated with significantly better well-being in April 2021 and December 2021. Agreeableness change was not associated with mental or physical health symptoms in either time window. Effect sizes for agreeableness change and health associations ranged from nearly zero to medium (|.01|-.20|).

Neuroticism. Because individuals did not significantly differ from one another in neuroticism change across the first three time points, we did not proceed with Aim 3 primary analyses for openness.

In exploratory analyses using RCIs rather than random effects to examine trait change at two more specific time windows, decreases in neuroticism during the first wave of the pandemic as well as decreases in neuroticism later in the pandemic were associated with significantly better well-being and fewer mental and physical health symptoms in April 2021 and December 2021. Effect sizes for neuroticism change and health associations ranged from small to large (|.15|-.35|).

Table 4. Predictors of Individual Differences in Big Five Trait Change.

Models	Conscientiousness		Extraversion		Neuroticism		Agreeableness	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Sociodemographic factors								
Men (Ref = Women)	.0046	.195	-.0008	.810	-.0031	.362	.0021	.458
Age	-.0001	.557	.0000	.931	.0000	.924	.0000	.886
Income	.0012	.164	.0005	.526	-.0004	.639	.0011	.134
Education	.0012	.567	.0009	.615	-.0003	.891	.0010	.569
A/AA (Ref = White)	-.0026	.559	.0005	.892	.0063	.130	.0018	.615
EA/EAA (Ref = White)	.0055	.245	-.0068	.100	.0023	.607	-.0056	.137
Other (Ref = White)	.0060	.329	-.0017	.753	.0057	.332	-.0019	.706
A/AA (Ref = EA/EAA)	-.008	.116	.0073	.103	.0040	.408	.0073	.072
Other (Ref = EA/EAA)	.0005	.937	.0050	.386	.0034	.595	.0037	.486
A/AA (Ref = Other)	-.0085	.185	.0022	.696	.0006	.919	-.0036	.485
General perceived stress								
Perceived Stress	-.0138	.023	-.0117	.027	.0133	.023	.0062	.199
Pandemic-specific factors								
Pandemic pos. impact	-.0028	.181	.0009	.616	.0016	.410	-.0004	.793
Pandemic neg. impact	.0000	.992	-.0044	.018	.0033	.113	-.0022	.189
Self-isolating	-.0009	.606	-.0018	.208	-.0005	.756	.0005	.727
Social-distancing	-.0048	.046	-.0020	.341	-.0006	.806	-.0016	.387
Loss of a loved one	-.0049	.343	-.0122	.008	-.0020	.673	-.0027	.525
Home exposure	.0031	.764	-.0054	.581	NC	NC	-.0012	.894

Note. For each model, the focal predictor, time, and the interaction between the focal predictor and time were included as predictors of the personality trait. Only the interaction effect is shown. Openness is not shown because we did not observe statistically significant individual differences in openness change; thus, it did not make conceptual sense to examine factors associated with individual differences in openness change. Statistical significance for Aim 2 was evaluated at an alpha level of .01. Ref = reference group; A/AA = African/African American; EA/EAA = East Asian/East Asian American; Other = Other racial or ethnic identity; NC = model did not converge.

Table 5. Multiple Regressions Predicting April 2021 Health From Personality Trait Change Across March 2020 Through April 2021.

March 2020 through April 2021	Well-being		Mental health symptoms		Physical health symptoms	
	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>
Conscientiousness						
Level (intercept)	0.46	<.001	-0.46	<.001	-0.42	<.001
Change (slope)	-0.01	.911	-0.01	.828	-0.09	.090
Extraversion						
Level (intercept)	0.46	<.001	-0.35	<.001	-0.30	<.001
Change (slope)	0.12	.023	-0.20	<.001	-0.20	<.001
Agreeableness						
Level (intercept)	0.35	<.001	-0.29	<.001	-0.22	<.001
Change (slope)	0.13	.021	-0.02	.773	-0.01	.845

Note. Openness and neuroticism are not shown because we did not observe statistically significant individual differences in openness or neuroticism change; thus, it does not make conceptual sense to examine associations between individual differences in change and health. Statistical significance for Aim 3 was evaluated at an alpha level of .01. Effect sizes are standardized betas computed with the `lm.beta()` function in R.

Openness. Like with neuroticism, because individuals did not significantly differ from one another in openness change, we did not proceed with Aim 3 primary analyses for openness.

In exploratory analyses using RCIs rather than random effects to examine trait change at two more specific time windows, openness change was not significantly associated with any health domains. Effect sizes for openness change

and health associations ranged from nearly zero to small ($|.01|$ – $|.13|$).

Discussion

The present research examined (a) how Big Five traits changed during the COVID-19 pandemic, (b) what factors

Table 6. Multiple Regressions Predicting April 2021 Health From Personality Trait Change Between Consecutive Time Windows From March 2020 to April 2021.

	Well-being		Mental health symptoms		Physical health symptoms	
	β	p	β	p	β	p
A. March 2020 to July 2020						
Conscientiousness						
Level (March 2020)	0.47	<.001	-0.47	<.001	-0.42	<.001
Change (RCI)	0.22	<.001	-0.19	<.001	-0.14	.009
Extraversion						
Level (March 2020)	0.47	<.001	-0.35	<.001	-0.31	<.001
Change (RCI)	0.11	.040	-0.20	<.001	-0.17	.003
Agreeableness						
Level (March 2020)	0.36	<.001	-0.29	<.001	-0.23	<.001
Change (RCI)	0.15	.007	-0.09	.108	-0.02	.748
Neuroticism						
Level (March 2020)	-0.56	<.001	0.67	<.001	0.53	<.001
Change (RCI)	-0.25	<.001	0.35	<.001	0.26	<.001
Openness						
Level (March 2020)	0.16	.009	-0.18	.002	-0.17	.005
Change (RCI)	0.10	.101	-0.10	.099	-0.13	.027
B. July 2020 to April 2021						
Conscientiousness						
Level (July 2020)	0.47	<.001	-0.45	<.001	-0.44	<.001
Change (RCI)	0.00	.967	-0.03	.565	-0.14	.009
Extraversion						
Level (July 2020)	0.47	<.001	-0.38	<.001	-0.35	<.001
Change (RCI)	0.22	<.001	-0.18	.001	-0.19	<.001
Agreeableness						
Level (July 2020)	0.40	<.001	-0.29	<.001	-0.21	<.001
Change (RCI)	0.17	.002	-0.09	.126	-0.09	.112
Neuroticism						
Level (July 2020)	-0.63	<.001	0.78	<.001	0.60	<.001
Change (RCI)	-0.25	<.001	0.27	<.001	0.21	<.001
Openness						
Level (July 2020)	0.17	.004	-0.20	<.001	-0.19	<.001
Change (RCI)	0.06	.339	-0.08	.158	-0.06	.280

Note. Statistical significance for Aim 3 was evaluated at an alpha level of .01. Effect sizes are standardized betas computed with the `lm.beta()` function in R. RCI = reliable change index.

were associated with individual differences in Big Five trait change, and (c) how Big Five trait change was associated with downstream health. This study provides insight into how personality traits can change, at least modestly and for some people, in response to a major global stressor, and expands on previous research by providing exploratory evidence that trait change in this context is associated with multiple aspects of health. Although the effect sizes were small compared with average effect sizes in psychology (Funder & Ozer, 2019), the largest observed change (i.e., change in conscientiousness across the study period) was approximately one tenth of a standard deviation across a 21-month timespan. This is equivalent to more than a decade of normative

adult personality trait change (Bleidorn et al., 2022), and suggests that the observed changes are not due solely to normative maturation processes which typically occur over longer timespans.

How Did Big Five Traits Change During the COVID-19 Pandemic?

The present research found some evidence that some Big Five traits changed, on average, during the pandemic. Specifically, conscientiousness slightly increased on average, particularly in the later months of the pandemic. This increase in conscientiousness may reflect sustained

engagement in conscientious behaviors to adhere to public health precautions and restrictions. Extraversion slightly decreased on average, particularly during the first wave of the COVID-19 pandemic. This decrease in extraversion could be explained by people being less sociable due to the introduction of social distancing measures and the enforcement of lockdowns during this time period. In addition, given that extraversion is associated with increased positive emotionality (Watson & Clark, 1997), the observed decrease in extraversion could be explained by people experiencing fewer positive events and emotions during the early phase of the pandemic (Willroth et al., 2023). Interestingly, prior research has observed the opposite pattern (i.e., slight increases in extraversion) when comparing participants' personalities in the months before (January-March 2020) and after (March-June 2020) the pandemic declaration (Condon & Weston, 2021). Condon and Weston (2021) interpreted this surprising increase in extraversion as a deprivation effect whereby people reported higher levels of extraversion in response to restricted opportunities to socialize. It is possible that this deprivation effect was short-lived and our study missed it due to our first measurement occasion occurring at the onset of the pandemic and our second measurement occasion occurring 4 months later. Finally, neuroticism slightly decreased, on average, but only later in the pandemic. This decrease may have occurred because people began to adapt to the new COVID-19 context over time, resulting in more emotional stability (Willroth et al., 2023).

In addition to the aforementioned group-level trait changes, we also examined individual-level trait changes. Across all traits and time windows, individuals differed in the direction and degree of trait change with some individuals increasing and others decreasing. For all traits, the majority of individuals did not reliably change according to reliable change indices (RCIs). This may be due in part to the conservative nature of our individual-level change measure (i.e., RCIs). However, this also suggests that even for traits that significantly changed on average (i.e., at the group level), most individuals did not change substantially. This is consistent with the small size of the group-level effects. Several theoretical models can inform our understanding of *why* subtle shifts in traits may have occurred during the pandemic. For example, the sociogenomic model of personality posits that major life events influence personality through repeated influences on personality states (i.e., momentary thoughts, feelings, and behaviors), which in turn drive changes to personality traits (i.e., enduring patterns of thoughts, feelings, and behaviors; Roberts & Jackson, 2008; Roberts & Wood, 2006). In the context of the pandemic, people experienced changes to their daily routines which may have influenced their personality states, and in turn led to the observed changes in personality traits. The TESSERA (Triggering situations, Expectancy, States/State expressions, and Reactions) framework posits that long-term personality change occurs as a result of repeated influences by short-term experiences known as TESSERA sequences in a bottom-up manner

(Wrzus & Roberts, 2017). The short-term state changes through TESSERA sequences accumulate, and through reflective (e.g., self-reflection) and associative (e.g., habit formation) processes lead to long-term changes in personality (Wrzus & Roberts, 2017). The COVID-19 context forced people into a new routine and caused people to adopt lifestyle changes and habits (either adaptive or maladaptive) that accumulated across a long timeframe and could have led to the observed changes in personality traits. These findings contribute to the literature by detailing longer-term enduring personality trait change across later phases of the pandemic.

Which Factors Were Associated With Individual Differences in Big Five Trait Change?

We did not find evidence for associations between sociodemographic characteristics, general perceived stress, or pandemic-specific factors and individual differences in Big Five trait change, with one exception. Participants who lost a loved one due to COVID-19 experienced steeper declines in extraversion relative to those who did not experience a loss. In contrast to one prior study, we did not find evidence for age as a predictor and our sample. This prior study also found that Hispanic and Latino ethnicity was associated with trait change during the pandemic (Sutin et al., 2022); However, our sample did not include enough Hispanic and Latino participants to attempt to replicate this finding.

The largely null results for Aim 2 are consistent with previous research on predictors of change following a negative life event (e.g., Haehner et al., 2022), highlighting the complexity and difficulty of predicting or explaining individual differences in personality trait change. This may be explained in part by individuals responding differently even in response to similar experiences. For example, two people who were negatively impacted by the pandemic may respond with different patterns of personality trait change. One person may become more neurotic; whereas the other person may experience no change in neuroticism and instead may increase in conscientiousness. This possibility is consistent with a recent study that found that individuals who experienced the same event had notably different perceptions of how that event changed their personality (Schwaba et al., 2023). Coupled with the current findings, factors such as event impact may be insufficient to explain why individuals differ in their patterns of personality trait change in response to the same event. While evidence supports reliable and specific yet small effects of life events on personality trait change (Bühler et al., 2023), the present research highlights the difficulties of identifying factors that account for those individual differences.

How Was Big Five Trait Change Associated With Downstream Health?

The present research provides evidence that personality traits and trait change are associated with health, even in contexts with strong situational influences on health. Specifically,

individuals who experienced socially desirable patterns of personality trait change during the pandemic (i.e., increases in conscientiousness, extraversion, and agreeableness, and decreases in neuroticism) experienced better health. In primary analyses, longitudinal increases in extraversion were associated with better health across domains. This finding may suggest that maintaining or increasing in extraversion is protective within a context in which extraversion decreases are normative. In exploratory analyses that examined personality trait change separately between March 2020 to July 2020 and July 2020 to April 2021 using RCIs, increases in conscientiousness and agreeableness and decreases in neuroticism were also associated with better health. This may suggest that experiencing socially desirable patterns of personality trait change in the stressful pandemic context reflects resilience or can be drawn upon as a protective factor. Results were generally stronger for health in April 2021 compared with health in December 2021, which may reflect the closer proximity of the health measurement to the trait change measurement windows or the lower statistical power in the second set of models due to greater attrition at the December 2021 time point.

Consistent with prior research (Turiano et al., 2012; Willroth et al., 2021), we also observed strong associations between trait level and health (see Tables 5 and 6). The presence of associations between trait change and health above and beyond these strong trait level–health associations provides strong evidence that even small changes in traits may be important for health. At the same time, the large effect sizes for associations between personality level and health also underscore the documented conceptual and empirical overlap between personality traits, well-being, and mental health. It is not clear from the present results whether personality trait level and change impacted health, or whether people with better health were more likely to experience socially desirable patterns of trait change across the pandemic. It is possible that a third variable influenced both trait change and health. However, given the limited number of factors associated with individual differences in trait change in Aim 2, it is not clear which factors would be most important to consider as potential confounders of the relation between trait change and health.

Limitations and Future Directions

The present study used longitudinal measures to examine Big Five trait change in a diverse sample and to investigate associations between this change and a broad array of health domains in the context of the COVID-19 pandemic. However, the following limitations and constraints on generalizability should be considered. First, our first measurement occasion occurred just days after the pandemic declaration. Thus, we cannot distinguish between trait change that was initiated by the pandemic versus trait change that simply reflects returns to baseline trait levels following unmeasured changes that occurred very early in the pandemic before our first

measurement occasion. Relatedly, it is possible that trait change was coincidental to the pandemic or caused by other events happening during the same timeframe. It seems likely that trait change is multiply determined by pandemic-related factors, other events during the same time period, and individual factors unrelated to the historical context. Second, all of our measures assessed with self-report and thus associations may be inflated due to shared method variance. Third, participants who were younger, less conscientious, and who had more physical health problems were more likely to drop out of the study or skip measurement occasions. Although we cannot completely eliminate the effects of selective attrition, patterns of personality trait change were similar in primary analyses requiring two measurement occasions (reliable change indices) and three or more measurement occasions (i.e., growth curve models) and in sensitivity analyses within the subsample of participants who provided personality data at all four measurement occasions. This provides some assurance that the observed patterns of trait change were not driven solely by selective attrition. Finally, our sample was comprised of U.S. Amazon Mechanical Turk users. This sample approach allowed for the collection of data in a diverse sample in a time sensitive manner and past research has shown that MTurk samples are representative of the general population for many but not all psychosocial characteristics (McCredie & Morey, 2019). The present findings are constrained to a U.S. context and future work would benefit from studying trait change in other settings.

Future research should aim to understand the specific mechanisms driving trait change and individual differences during and following a major life event. Objective features of the event and the context surrounding the event, subjective experiences and individual's appraisals of the event, and the fit between the person and their changing context, are strong candidates for potential predictors of individual differences in trait change (Bühler et al., 2023; Schwaba et al., 2023). In a recent meta-analysis of the life events and personality change literature, Bühler and colleagues (2023) proposed four methodological innovations to advance research on this topic: theoretically timed measurement occasions, multimethod assessments, diverse samples, and experimental methods. In addition, more sophisticated causal inference approaches will be useful to disentangle the effects of trait change on health, and the effects of health on trait change.

Concluding Remarks

The present research provides evidence that traits can change in the context of a major global stressor and that socially desirable patterns of trait change are associated with health in the context of a public health crisis.

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Supplemental Material

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