Effect of the COVID-19 Pandemic and Big Five Personality on Subjective and Psychological Well-Being

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Abstract

The current study assessed the effect of the COVID-19 (coronavirus) pandemic on subjective well-being (SWB) and psychological well-being (PWB) and whether the pandemic moderated the effect of personality on well-being. Measures of Big Five personality, SWB (life satisfaction, positive affect, negative affect) and PWB (positive relations, autonomy, environmental mastery, personal growth, purpose in life, self-acceptance) were obtained from a sample of young adults in Melbourne, Australia ($n = 1132$; 13 July to 11 August, 2020) during a second wave of viral transmission and lockdown, and an identically recruited Pre-COVID sample ($n = 547$). Well-being was lower in the COVID sample and differences were largest for positive affect ($d = -0.48$) and negative affect ($d = 0.70$). While the effect of personality on well-being was relatively robust, the effect of personality on well-being was slightly reduced and the effect of extraversion on positive affect was particularly attenuated during the pandemic.

Keywords: COVID-19, coronavirus, pandemic, personality, well-being

In 2020, the COVID-19 pandemic profoundly altered the way people live their lives and experience the world. The combined effects of the virus and the strategies to control its spread have caused increased social isolation, financial insecurity, and uncertainty about the future (Van Bavel et al., 2020). Many commentators have expressed concerns that the pandemic may induce elevated levels of depression, loneliness, and suicide (Brooks et al., 2020; Courtet et al., 2020; Van Bavel et al., 2020), and many cross-sectional surveys suggest that people are experiencing elevated levels of distress (Sher, 2020; Xiong et al., 2020). However, initial longitudinal studies conducted during early-stage lockdown suggest that well-being may have remained relatively stable (Sibley et al., 2020) and that it is mostly viral spread rather than lockdown that causes psychological distress (Foa et al., 2020). More broadly, research on well-being shows that well-being (a) is relatively stable over time (Anglim

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et al., 2015; Fujita & Diener, 2005; Schimmack & Oishi, 2005), (b) has a hereditary component (Røysamb et al., 2018; Weiss et al., 2008), (c) is influenced by homeostatic processes (Cummins, 2015; Headey & Wearing, 1989; Headey & Wearing, 1992), and (d) is driven substantially by broad personality traits such as neuroticism, extraversion, and conscientiousness (Anglim et al., 2020; Steel et al., 2019). Nonetheless, life events do influence well-being (Luhmann et al., 2012) and the effect of a modern global pandemic on well-being is not yet well understood. It is unclear whether the personality profile that thrives under normal circumstances also thrives during a pandemic. As such it is particularly important to understand how the COVID-19 pandemic is affecting well-being and what kinds of people are most psychologically vulnerable to its negative effects (Van Bavel et al., 2020).

Despite an emerging literature on the effect of the COVID-19 pandemic on well-being (for reviews, see Sher, 2020; Xiong et al., 2020), many gaps in understanding remain. First, most studies examining the effect of COVID-19 on well-being are cross-sectional surveys conducted during the pandemic that lack a meaningful Pre-COVID comparison group. Second, of the current longitudinal studies that overcome this issue (e.g., Foa et al., 2020; Sibley et al., 2020; Zacher & Rudolph, 2020), most concern the early stages of the pandemic. In particular, little is known about the effects of sustained or second-wave lockdowns. Third, many of the large panel studies that may ultimately examine changes in well-being employ abbreviated measures of well-being, particularly in relation to more humanistic conceptions of well-being related to meaning, purpose, and social connection (Ryff, 1989; Ryff & Keyes, 1995). Fourth, although a few studies have looked at the relationship between personality and well-being in the COVID-19 context, very little research has yet compared the effect of personality on well-being before and after onset of the pandemic. Understanding whether the COVID-19 pandemic moderates the effect of personality on well-being has practical implications for knowing how to assist different types of people during the pandemic. It also provides a powerful natural experiment to assess theoretical expectations for how personality and the environment interact.

Thus, the current study aimed to assess the effect of personality and the COVID-19 pandemic on subjective well-being (SWB) and psychological well-being (PWB). Specifically, it sought to assess the degree to which different aspects of well-being were affected by the COVID-19 pandemic and whether the pandemic moderated the effect of personality on well-being. While researchers have adopted a range of different perspectives to well-being (for reviews, see Diener et al., 1999; Lucas & Diener, 2008), we adopt the complementary perspectives of SWB and PWB, where SWB is operationalized as high life satisfaction combined with high levels of positive affect and low levels of negative affect (Deci & Ryan, 2008; Diener, 1984; Lucas et al., 1996), and PWB is operationalized as positive relations, autonomy, environmental mastery, personal growth, purpose in life, and self-acceptance (Ryan & Deci, 2001; Ryff & Keyes, 1995). To achieve these aims, we compared data on Big Five personality, SWB, and PWB from two samples of young adult university students from Melbourne, Australia. Importantly, the measures used and the population that the two samples were recruited from were identical in almost all respects. The Pre-COVID sample was obtained in 2017 and the COVID sample was obtained in July

2020. Importantly, people in Melbourne had experienced two months of initial lockdown, followed by a few weeks of re-opening, before increasing cases signaled the onset of a second-wave of infections, which triggered a second lockdown. As such, the Melbourne context provides an example of people experiencing sustained social isolation without a clear sense of when the restrictions will end or whether they will be effective.

The Effect of Pandemic on Well-Being

Several studies have assessed well-being during the COVID-19 pandemic either cross-sectionally (e.g., Evans et al., 2020; Mazza et al., 2020; Qian & Yahara, 2020; Zhao et al., 2020) or longitudinally (e.g., Recchi et al., 2020; Wang et al., 2020). While results are mixed, this research has often found relatively high levels of distress. Nonetheless, these cross-sectional and longitudinal studies generally lack a pre-COVID comparison group, which limits inferences about the causal effect of the pandemic. The most insightful data arguably comes from longitudinal studies that have measured well-being before and after the onset of COVID-19. For instance, Foa et al. (2020) examined weekly mood data from Great Britain's mood tracker survey before and during various phases of the pandemic. They found that positive mood dropped when the virus began rapidly spreading in the community, but that mood returned almost to pre-COVID levels once lockdown restrictions were put in place.

It seems that the greatest distress of the pandemic may be caused by widespread viral transmission resulting in fear of sickness and death. Nonetheless, lockdown and other social distancing restrictions involve a wide range of economic, social, and psychological stressors and it is likely that the negative effects of lockdown will escalate over time. In particular, returning to a second lockdown presents additional challenges given that it is an admission that one lockdown is insufficient. It is also clear that the effect of the COVID-19 pandemic varies dramatically between people (Evans et al., 2020; Van Bavel et al., 2020). In addition to the uneven distribution of objective economic and health impacts, people also vary in how they experience and adapt to lockdown and the pandemic (Lades et al., 2020). Some people may even thrive in lockdown, enjoying digital entertainment, online delivery, online communication, reduced commute times, and more time with their immediate family (Evans et al., 2020). Ultimately, how people respond to the pandemic is likely due to a combination of both objective (e.g., health, finances, duration and extent of deprivation of personally important activities) and subjective effects related to the varying ways that people perceive and adapt to the pandemic.

Personality and Well-being under COVID

To understand these subjective factors that influence the effect of COVID-19 on well-being, it is helpful to review the broader personality literature. Research on this relationship between personality and well-being has exploded in recent years (for meta-analytic reviews, see Anglim et al., 2020; DeNeve & Cooper, 1998; Steel et al., 2008). Recently, Anglim et al. (2020) conducted a meta-analysis showing how robust the relationship is between Big Five personality (i.e., neuroticism, extraversion, openness, agreeableness, and conscientiousness) and SWB and PWB (see meta-analytic correlations in Table 1). They found that, in particular, neuroticism, extraversion, and conscientious are strong correlates of well-being. This research also consolidates evidence from primary studies (Anglim & Grant, 2016; Grant et al.,

2009; Meléndez et al., 2019; Sun et al., 2018) showing how certain pairs of personality traits and well-being dimensions correlate more than would be expected from their respective average correlations (e.g., see decomposition of cross-correlations in Anglim and Grant (2016)). In particular, these include neuroticism with negative affect, extraversion with positive affect and positive relations, openness with personal growth, agreeableness with positive relations, and conscientiousness with environmental mastery and purpose in life.

Table 1

Meta-Analytic Correlations of Big Five Personality with SWB and PWB from Anglim et al (2020)

Trait	SWL	PA	NA	PR	AU	EM	PG	PL	SA
Neuroticism	-.39	-.34	.56	-.43	-.45	-.58	-.34	-.45	-.60
Extraversion	.32	.44	-.21	.47	.26	.38	.39	.39	.43
Openness	.08	.24	-.05	.20	.24	.11	.44	.21	.16
Agreeableness	.20	.19	-.25	.39	.10	.28	.31	.28	.28
Conscientiousness	.27	.35	-.25	.32	.30	.51	.32	.50	.44

Note. For SWB criteria studies = 120 to 224, $n = 39,023$ to 158,934. For PWB criteria, studies = 13 to 19, $n = 5,281$ to 6,840. SWL = satisfaction with life, PA = positive affect, NA = negative affect, PR = positive relations, AU = autonomy, EM = environmental mastery, PG = personal growth, PL = purpose in life, SA = self-acceptance.

While meta-analytic literature highlights the robustness of the relationship between personality and well-being (Anglim et al., 2020), the environment may still moderate this relationship. In particular, the effect of personality on well-being may be influenced by person-environment fit (Edwards et al., 2006). So, for instance, by definition, extraverts enjoy social interactions, agreeable people appreciate social harmony, conscientious people enjoy working towards longer term goals, and open people enjoy learning about creative ideas. Typically, people are able to influence their environment in the short and long term. However, social distancing measures induced by the pandemic have created a range of constraints on personal freedom, particularly in relation to the ability to engage in social interactions. Many articles in the popular press have suggested that extraverts will struggle more with the social constraints of lockdown (e.g., Smillie & Haslam, 2020). If this is true, then the normally positive relationship between extraversion and well-being will be attenuated.

Alternatively, the overall magnitude of the relationship between personality and well-being may be altered by the pandemic. In particular, the pandemic is a "strong situation". Casale and Flett (2020) argued that the last time such a strong situation affected so many people was World War II. By definition, where the environment is weak, people are more able to select and alter their environment and choose how they behave. In the context of a pandemic, the enforcement of public health measures mean that people's environments are more constrained. Choices about social activities, work arrangements, and other lifestyle choices are all constrained by emergency health guidelines. The pandemic also presents a substantial and persistent external stressor that may exert relatively objective effects on well-being that are highly variable across individuals. Collectively, these effects may attenuate the effect of personality.

There is now also an emerging literature on the relationship between personality and well-being during various phases of the COVID-19 pandemic (e.g., Jørgensen et al., 2020; Kroencke et al., 2020; Michinov & Michinov, 2020; Modersitzki et al., 2020; Qian & Yahara, 2020; Russo et al., 2020; Zajenkowski et al., 2020). However, the lack of a pre-COVID comparison group in this research makes it unclear whether the relationship between personality and well-being is altered by the pandemic. One exception is a longitudinal study by Folk et al. (2020) that examined the ability of extraversion to predict lethargy and social connection before and during the early-stages of the pandemic. They found some evidence of a reduced correlation between extraversion and lethargy during the pandemic. Nonetheless, a few limitations were present. In particular, a full set of Big Five measures is required to determine whether declines in correlations are general or trait-specific. It is also important to measure traits both pre- and post-COVID in order to rule out any general decline in correlations due to a cross-lagged design. Finally, it seems likely that the size of any moderating effect of personality will be related to the size of the effect of the pandemic on well-being, and this effect is likely to be the larger after a sustained period of lockdown and exposure to health risks.

Method

Data, analysis scripts, and study materials are available on the OSF at https://osf.io/tpa3x/?view_only=c734d8cd874d414f8f1a84ad1a7c33e9

Participants and Procedure

Participants in both COVID and Pre-COVID groups were undergraduate psychology students drawn from two units at a university based in Victoria, Australia, with its main campus in Melbourne. As part of their studies, students had the option to complete an online survey that consisted of personality measures and various criterion measures. They also had the option to allow their data to be used for research purposes. Students received their personality scores which informed an assessment task. Because the survey was voluntary and students received feedback about their personality, students were incentivized to answer the survey conscientiously. Examination of survey completion times were almost universally consistent with conscientious completion. The survey received ethics approval from the first author's institutional Human Research Ethics Committee.

The COVID Sample completed the survey mostly in July 2020 (97% between July 13th and July 31st; and 3% between August 1st and 11th). Further details about the COVID-19 context in Melbourne is provided in the online supplement, but the essential aspect is that Melbourne had experienced two months of lockdown. This was followed by a brief relaxation of restrictions, a rapid resurgence of cases, and a return to a second lockdown. Results for the COVID sample reported in this paper focus on participants that resided in Greater Melbourne ($n = 1132$; 80.9% female, 18.1% male, and 1.0% other with mean age of 24.5 ($SD = 8.1$, range: 18 to 86; 27% aged over 25). This was drawn from an overall COVID sample ($n = 1470$) was 81.6% female, 17.5% male, and 1.0% other with mean age of 25.5 ($SD = 8.6$, range: 18 to 86; 33% aged over 25) with 77% residing within Greater Melbourne, 83% within 500km of Melbourne and the remainder residing in other parts of Australia. Results for the overall COVID sample are reported in the online supplement. The final overall sample was obtained after excluding 42 participants for one or more of the following reasons:

(a) not residing in Australia ($n = 23$), (b) less than 3 distinct response options on the PWB measure ($n = 5$), the personality measure ($n = 1$), the PANAS ($n = 17$).

The Pre-COVID Sample was collected in 2017 (84% in July, 3% in August, 11% in November, and 2% in December). The Pre-COVID sample ($n = 547$) was 79.4% female and 20.6% male ("other" was not an option in this survey) with mean age of 25.0 ($SD = 7.68$, range: 18 to 65; 26% aged over 25) and 81% residing within Greater Melbourne, and 88% within 500km of Melbourne. Analyses of this Pre-COVID sample were previously reported in Anglim et al. (2020). This final sample was obtained after excluding 3 participants for one or more of the following reasons: less than 3 distinct response options on the PWB measure ($n = 3$), the personality measure ($n = 0$), the PANAS ($n = 3$).

The sample size was determined by the recruitment source. There was 96.9% power to detect a small difference in well-being of $d = 0.2$, and a 99.99% power to detect a difference of $d = 0.3$, and 80% power to detect a difference of $d = .146$ (two-tailed, $\alpha = .05$). There was 80% power to detect a change in population correlation from .40 Pre-COVID to .27 during COVID. Confidence intervals are provided in the results where appropriate, but are omitted from correlation matrices given that the standard errors are small and would distract from extracting information from the tables.

Materials

Big Five Personality

Big Five personality was measured using 50 items drawn from the IPIP NEO (Goldberg, 1999; Goldberg et al., 2006). In the Pre-COVID sample items were rated on a 5-point scale (1 = very inaccurate, 2 = moderately inaccurate, 3 = neither inaccurate nor accurate, 4 = moderately accurate, 5 = very accurate). In the COVID sample, items were rated on a scale from (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree). Because the response options were slightly different, personality scores were z-score standardized within Pre-COVID and COVID samples. A comparison of COVID personality scores with some other available normative data is presented in the online supplement, which suggests that personality was relatively unchanged under the COVID pandemic. Alphas Pre-COVID and COVID respectively were as follows: neuroticism (.87, .86), extraversion (.81, .80), openness (.75, .73), agreeableness (.74, .74), and conscientiousness (.80, .77).

Satisfaction with Life Scale

This well-established 5-item measure (Diener et al., 1985) provides a measure of overall life satisfaction. Items were rated on a 7-point scale (1 = strongly disagree, 2 = disagree, 3 = slightly disagree, 4 = neither agree nor disagree, 5 = slightly agree, 6 = agree, 7 = strongly agree). The scale score was the mean of items.

Positive and Negative Affect

Positive and negative affect was measured using the 20-item PANAS (Watson et al., 1988). The PANAS consists of two scales that measure the frequency with which positive and negative affect is experienced on a 5-point scale (1 = very slightly or not at all, 2 = a little, 3 = moderately, 4 = quite a bit, 5 = extremely). Participants were asked about how frequently they had experienced the emotions in "the past few weeks" in the Pre-COVID sample and in "the past few months" in the COVID

Sample. The rationale for using months in the COVID sample was to capture the experience of the COVID pandemic. Scales were scored as the mean of items.

Psychological Well-Being

The 42-item measure of Ryff's (1989) scales were used to measure the six proposed dimensions of psychological well-being. Items were rated on a 6-point scale (1 = strongly disagree, 2 = disagree somewhat, 3 = disagree slightly, 4 = agree slightly, 5 = agree somewhat, 6 = strongly agree). Note that in the 42-item measure is a subset of the 84-item measure and in the Pre-COVID sample, the 84-item measure was administered. But to enable comparison, we scored both time points using only the 42-item measure. Scale scores were the mean after item reversal.

COVID Comparisons

Five items were administered to the COVID sample assessing subjective perceptions of changes to experience during the COVID-19 pandemic. Items assessed perceived changes to stress, loneliness, boredom, fear, and optimism. A sample item was "How much stress have you experienced during the Coronavirus pandemic?" Response options were "Much less than usual", "less than usual", "same as usual", "more than usual", and "much more than usual".

Results

Group Differences in Means

Table 2 presents the mean differences between the Pre-COVID and COVID groups on well-being variables. There was a consistent pattern of the COVID sample experiencing less well-being. The largest differences in well-being were observed for the more time-constrained mood variables whereby COVID participants were experiencing significantly more negative affect ($d = 0.70, p < .001$) and significantly less positive affect ($d = -0.48, p < .001$). Effect sizes for positive relations, autonomy, environmental mastery, and self-acceptance ranged from $d = -0.25$ to -0.32 . Differences for purpose in life and life satisfaction were smaller again, and finally there was no significant difference for personal growth.

Table 2

Differences in Well-Being in Pre-COVID and COVID Samples

Variable	Pre-COVID (<i>n</i> = 547)			COVID (<i>n</i> = 1132)			Difference		
	α	<i>M</i>	<i>SD</i>	α	<i>M</i>	<i>SD</i>	<i>t</i>	sig.	<i>d</i> [95% <i>CI</i>]
Life Satisfaction	.85	4.74	1.34	.86	4.46	1.34	-4.06	***	-0.21 [-0.31, -0.11]
Positive Affect	.88	3.32	0.76	.88	2.95	0.75	-9.32	***	-0.48 [-0.59, -0.38]
Negative Affect	.87	2.05	0.74	.89	2.57	0.84	12.82	***	0.70 [0.59, 0.80]
Positive Relations	.78	4.76	0.85	.77	4.55	0.86	-4.74	***	-0.25 [-0.35, -0.15]
Autonomy	.76	4.13	0.83	.77	3.90	0.86	-5.30	***	-0.28 [-0.38, -0.18]
Environmental Mastery	.80	4.12	0.90	.82	3.83	0.93	-6.14	***	-0.32 [-0.43, -0.22]
Personal Growth	.78	4.96	0.75	.76	4.88	0.72	-1.87		-0.10 [-0.20, 0.00]
Purpose in Life	.77	4.59	0.86	.76	4.43	0.83	-3.55	***	-0.18 [-0.28, -0.08]
Self-Acceptance	.88	4.17	1.06	.88	3.88	1.07	-5.25	***	-0.27 [-0.38, -0.17]

* $p < .05$, ** $p < .01$, *** $p < .001$

In order to provide a more nuanced understanding of changes to affective experience under COVID, an item-level comparison of the PANAS was performed.

Table 3 shows the percentage of participants who reported experiencing a given emotion "quite a bit" or "extremely" in the Pre-COVID and the COVID samples. While all positive emotions were less prevalent and all negative emotions were more prevalent during the pandemic, there was also a distinct pattern to the magnitude of these differences. With regards to positive emotions, emotions related to being happy and engaged (i.e., excited, interested, enthusiastic) showed the biggest differences. With regards to negative emotions, the differences were fairly generalized across emotions related to anxiety and sadness.

Table 3

Differences in PANAS Mood Variables in Pre-COVID and COVID Samples

Emotion	Pre-COVID (n = 547) %	COVID (n = 1132) %	Difference %
Positive Affect			
Excited	55	27	-28***
Interested	66	41	-25***
Enthusiastic	51	30	-21***
Active	44	29	-15***
Determined	59	44	-14***
Proud	42	29	-13***
Attentive	48	36	-12***
Strong	40	29	-11***
Inspired	42	31	-11***
Alert	41	36	-5*
Negative Affect			
Ashamed	6	12	6***
Guilty	11	18	7***
Hostile	5	13	7***
Scared	10	23	13***
Jittery	14	28	14***
Depressed	16	32	15***
Nervous	27	42	15***
Afraid	10	25	15***
Irritable	22	39	16***
Upset	18	39	21***

Note. Percentages are the percentages of people reporting that they have experienced the emotion quite a bit or extremely (see online supplement for equivalent analysis using item means).

* $p < .05$, ** $p < .01$, *** $p < .001$

We also asked participants in the COVID sample about the extent to which they had various experiences more or less than usual during the Coronavirus pandemic (see Table 4). Over half the participants reported experiencing more stress, loneliness, and boredom, and less optimism during the pandemic compared to their Pre-COVID experience.

Table 4*Self-reported Differences in Experience during the COVID-19 Pandemic*

Experience	Less than usual %	Same as Usual %	More than usual %	More % - Less %
Stress	6	29	65	58
Loneliness	10	30	60	50
Boredom	8	25	68	60
Fear	10	41	49	39
Optimism	54	37	9	-45

Note. $n = 1132$. Responses indicate the degree to which participants report experiencing the experience during the pandemic more or less than usual. "Less than usual" includes participants who reported experiencing "much less than usual" or "less than usual". "More than usual" includes participants who reported experiencing "much more than usual" or "more than usual".

Correlations

Table 5 presents the correlations between personality and well-being for the Pre-COVID and COVID samples along with the significance tests of the differences between these correlations. In general, the correlation matrices were significantly different ($p < .001$) using `cortest` in the `psych` package (Revelle, 2018). The average absolute correlation between personality and well-being was significantly larger in the Pre-COVID sample (mean $r = .35$) than in the COVID sample (mean $r = .30$). The 95% bootstrap confidence interval of this difference was .011 to .088. Overall, 9 of the 45 correlation differences (COVID versus Pre-COVID) between personality and well-being were significant at the .05 level, which is a lot more than would be expected by chance if there were no underlying difference. Two of the most noteworthy differences were (a) extraversion and positive affect (Pre-COVID $r = .44$; COVID $r = .31$; difference $p = .004$), and (d) agreeableness and positive affect (Pre-COVID $r = .22$; COVID $r = .09$; difference $p = .007$).

Table 5*Correlations between Big Five Personality and Well-Being in Pre-COVID and COVID Samples*

	SWL	PA	NA	PR	AU	EM	PG	PL	SA	Mean abs <i>r</i>
Pre-COVID (<i>n</i> = 547)										
Neuroticism	-.56	-.54	.70	-.48	-.43	-.72	-.48	-.45	-.72	.56
Extraversion	.33	.44	-.28	.51	.34	.40	.42	.29	.43	.38
Openness	.04	.25	-.05	.17	.31	.09	.42	.21	.18	.19
Agreeableness	.22	.22	-.27	.43	.02	.24	.30	.25	.26	.25
Conscientiousness	.28	.38	-.30	.28	.30	.49	.40	.58	.41	.38
Mean abs <i>r</i>	.29	.37	.32	.37	.28	.39	.40	.35	.40	.35
COVID (<i>n</i> = 1132)										
Neuroticism	-.56	-.45	.65	-.46	-.38	-.68	-.41	-.41	-.72	.52
Extraversion	.33	.31	-.18	.44	.32	.37	.38	.28	.42	.34
Openness	-.01	.18	.02	.09	.27	-.01	.36	.13	.05	.12
Agreeableness	.22	.09	-.22	.36	-.06	.24	.22	.19	.22	.20
Conscientiousness	.32	.36	-.18	.22	.17	.48	.29	.50	.40	.32
Mean abs <i>r</i>	.29	.28	.25	.32	.24	.36	.33	.30	.36	.30
Difference										
Neuroticism	-.01	.09*	-.05	.01	.05	.05	.07	.04	.00	.04
Extraversion	.01	-.13**	.10*	-.07	-.02	-.03	-.03	-.01	-.01	.05
Openness	-.05	-.07	.08	-.08	-.04	-.10	-.06	-.08	-.12*	.08
Agreeableness	.00	-.14**	.05	-.06	-.08	.00	-.08	-.06	-.04	.06
Conscientiousness	.04	-.02	.12*	-.06	-.12*	-.01	-.11*	-.08*	-.02	.06
Mean abs <i>r</i>	.02	.09	.08	.06	.06	.04	.07	.05	.04	.06

Note. Difference is COVID correlation minus Pre-COVID correlation. Absolute Pre-COVID sample correlations greater than or equal to .09, .12, and .15 are significant at .05, .01, and .001 respectively. Absolute COVID sample correlations greater than or equal to .06, .08, and .10 are significant at .05, .01, and .001 respectively. Significance of differences between correlations are as follows: * $p < .05$, ** $p < .01$, *** $p < .001$. SWL = satisfaction with life, PA = positive affect, NA = negative affect, PR = positive relations, AU = autonomy, EM = environmental mastery, PG = personal growth, PL = purpose in life, SA = self-acceptance. The mean abs *r* are row and column mean absolute correlations.

Regression Models

Regression models were estimated in order to provide an overall assessment of the importance of demographics, personality, and the pandemic. Table 6 presents regression models predicting each well-being dimension from demographics, personality, COVID pandemic status, and COVID by personality interactions (see online supplement for a comparison of regression models decomposing variance explained by demographics, COVID, and personality). Age was coded as over 25 or not because of the substantial skew in the data. Well-being was z-score standardized to facilitate parameter interpretation. COVID was coded as 0 for Pre-COVID and 1 for during COVID. Thus, the intercept reflects the expected well-being of a non-female aged 25 or less, prior to COVID, and who has average scores on all Big Five traits.

Table 6

Regression Models Predicting Well-Being from Demographics, Personality, the COVID-19 Pandemic, and Personality by COVID Interactions

Predictor	SWL	PA	NA	PR	AU	EM	PG	PL	SA
Coefficient									
Intercept	-0.02	0.41***	-0.45***	0.01	0.21***	0.13**	-0.08	-0.03	0.06
Female	0.25***	-0.10	0.09*	0.18***	-0.13*	0.10*	0.11*	0.14**	0.17***
Age > 25	-0.15***	-0.07	-0.17***	0.07	0.25***	0.06	0.25***	0.19***	-0.04
Neuroticism	-0.50***	-0.32***	0.58***	-0.22***	-0.28***	-0.57***	-0.25***	-0.21***	-0.59***
Extraversion	0.08*	0.23***	0.01	0.34***	0.17***	0.13***	0.23***	0.11**	0.13***
Openness	-0.04	0.14***	0.06	0.05	0.18***	-0.05	0.29***	0.10**	0.06*
Agreeableness	0.04	0.05	-0.08*	0.28***	-0.14***	0.00	0.13***	0.06	0.03
Conscientiousness	0.08*	0.21***	-0.04	0.07	0.16***	0.26***	0.21***	0.45***	0.16***
COVID	-0.19***	-0.45***	0.60***	-0.25***	-0.25***	-0.31***	-0.09*	-0.17***	-0.25***
COVID by Neuroticism	0.02	0.00	0.07	-0.05	-0.03	0.04	0.03	-0.01	-0.02
COVID by Extraversion	0.08	-0.09*	0.03	-0.01	0.00	0.04	0.01	0.04	0.06
COVID by Openness	0.00	0.01	-0.01	-0.03	0.04	0.00	0.01	0.00	-0.05
COVID by Agreeableness	0.00	-0.12**	0.02	-0.03	-0.04	0.02	-0.03	-0.05	-0.04
COVID by Conscientiousness	0.04	0.05	0.08	-0.03	-0.06	0.02	-0.05	-0.05	0.02
95% CI									
Intercept	-.13, .09	.30, .52	-.55, -.35	-.09, .12	.10, .33	.04, .22	-.19, .02	-.13, .08	-.03, .15
Female	.15, .35	-.20, .01	.00, .19	.08, .28	-.24, -.02	.01, .18	.01, .20	.04, .24	.09, .26
Age > 25	-.24, -.06	-.16, .02	-.25, -.09	-.02, .16	.15, .34	-.01, .13	.17, .34	.10, .28	-.12, .03
Neuroticism	-.59, -.42	-.40, -.24	.50, .65	-.30, -.14	-.37, -.19	-.63, -.50	-.33, -.17	-.29, -.13	-.66, -.52
Extraversion	.00, .16	.15, .30	-.06, .08	.27, .42	.09, .25	.06, .19	.16, .31	.03, .18	.07, .19
Openness	-.11, .03	.07, .21	.00, .12	-.01, .12	.11, .26	-.11, .01	.22, .35	.03, .17	.00, .12
Agreeableness	-.03, .11	-.02, .12	-.15, -.02	.21, .35	-.21, -.06	-.06, .06	.06, .20	-.01, .13	-.03, .08
Conscientiousness	.01, .16	.13, .28	-.11, .03	-.01, .14	.08, .24	.20, .32	.13, .28	.37, .52	.10, .22
COVID	-.27, -.11	-.53, -.37	.53, .67	-.33, -.17	-.34, -.17	-.37, -.24	-.17, -.01	-.25, -.09	-.32, -.19
COVID by Neuroticism	-.08, .12	-.10, .09	-.02, .15	-.15, .04	-.13, .07	-.04, .12	-.07, .12	-.10, .09	-.10, .06
COVID by Extraversion	-.01, .17	-.19, .00	-.05, .11	-.10, .08	-.09, .10	-.03, .12	-.08, .10	-.05, .13	-.01, .13
COVID by Openness	-.08, .09	-.07, .10	-.09, .06	-.11, .05	-.05, .13	-.07, .07	-.07, .09	-.08, .08	-.11, .02
COVID by Agreeableness	-.09, .08	-.20, -.03	-.06, .10	-.12, .05	-.13, .06	-.06, .09	-.11, .05	-.14, .03	-.11, .03
COVID by Conscientiousness	-.05, .13	-.04, .14	.00, .16	-.12, .05	-.15, .03	-.06, .09	-.14, .04	-.14, .04	-.06, .09
Adjusted R ²	0.37	0.37	0.49	0.40	0.30	0.58	0.41	0.39	0.58

Note. Female is coded 1 = Female, 0 = Male or Other; Age is coded 1 = 26 or older, 0 = 18 to 25; COVID is coded 0 = Pre-COVID ($n = 547$), 1 = COVID ($n = 1132$). Well-being variables are z-score standardized. Personality variables are z-score standardized within COVID groups. Interactions are the product of the 0–1 COVID variable and the standardized personality variables. SWL = satisfaction with life, PA = positive affect, NA = negative affect, PR = positive relations, AU = autonomy, EM = environmental mastery, PG = personal growth, PL = purpose in life, SA = self-acceptance.

* $p < .05$, ** $p < .01$, *** $p < .001$

The coefficients for personality were largely as one would expect with many large coefficients, especially for neuroticism, extraversion, and conscientiousness. There was also the typical personality–well-being pairs where personality coefficients were larger than average for the trait. For example, elevated pairs of predictors included openness on personal growth, extraversion and agreeableness on positive relations, and neuroticism on negative affect. The parameter for the COVID-19 pandemic corresponds to a z-score of the difference between COVID and Pre-COVID controlling for personality and demographics. This parameter largely mirrors the pattern of results of raw group differences in Table 2. With regards to interactions

between COVID and personality, there were only two significant effects. First, extraversion interacted with COVID status such that the effect of extraversion on positive affect was reduced during COVID-19 ($\beta = 0.09$, $p = .045$). Second, agreeableness interacted with COVID status such that the effect of agreeableness on positive affect was reduced during COVID-19 ($\beta = -0.12$, $p = .008$). As a robustness check, we examined the effect of not standardizing personality within samples, and this reduced the estimated standardized effect of the pandemic by an average 0.08 (see online supplement for details).

Discussion

The current study sought to assess the effect of the COVID-19 pandemic on well-being and whether the effect of personality on well-being was moderated by the pandemic. Several key findings emerged. First, it was clear that the young adults were experiencing lower levels of well-being during the pandemic. This effect was strongest for positive and negative affect. The effect on other well-being indicators was smaller, but it still suggested some targeted and slightly larger effects for positive relations, autonomy, and environmental mastery compared to purpose in life, life satisfaction, and personal growth. Second, consistent with the theory of strong situations, the effect of personality on well-being was slightly weaker during the pandemic. Third, there was some evidence of COVID-19 moderating the effect of personality on well-being. In particular, the benefits of extraversion on positive affect were attenuated.

COVID 19 and Well-being

Overall, after four months of social restrictions, concerns about a second wave of viral spread, and the arrival of a second lockdown, the well-being of young adults in Melbourne, Australia was lower than it was pre-COVID. In particular, the differences in negative affect ($d = 0.70$) and positive affect ($d = -0.48$) were quite substantial. These findings differ from the study of early stages of lockdown in New Zealand (Sibley et al., 2020) that found minimal changes in well-being, but share some similarity with the United Kingdom experience (Foa et al., 2020) where positive mood declined when the virus started spreading. Presumably, the effect of lockdown and social distancing provisions vary over time and by environmental conditions. In particular, lockdown likely involves both adjustment and fatigue processes. While lockdown appears to result in improved well-being compared to uncontrolled viral spread (Foa et al., 2020), over time, it likely becomes more draining both economically and psychologically.

Positive and negative affect appeared to be most affected by the pandemic. In particular, people reported much lower levels of interest, enthusiasm, and excitement whereas the effect on negative affect was more generalized. Overall, this is consistent with affect being a time-constrained appraisal more directly influenced by recent events, whereas life satisfaction and PWB are broader appraisals of life that are less impacted by negative events of relatively fixed duration. Nonetheless, there was some evidence of reduced levels of PWB, particularly in relation to autonomy and positive relations which is consistent with the reduced freedoms and scope for social interaction during lockdown (Cantarero et al., 2020).

Personality and Well-being under COVID 19

Overall, the relationship between personality and well-being was not substantially altered by the pandemic, albeit some small theoretically important differences were observed. Focusing first on the similarities, the results reiterate the importance of personality to well-being. It shows that people's mood even in extreme circumstances is driven more by personality than by the general experience of a pandemic. It also suggests that the effect of personality and the pandemic are mostly additive. In other words, if an individual has high neuroticism, low extraversion and low conscientiousness, they are likely to have lower well-being, and irrespective of personality, the COVID pandemic tends to result in reduced well-being.

Nonetheless, the average correlation between personality and well-being was slightly lower during the pandemic. In particular, while everyone is exposed to the pandemic, the social, economic, and health effects are not distributed evenly. While some of these effects may be influenced by personality, many effects such as unemployment, increased financial insecurity, and suffering from COVID-19 are presumably relatively independent of personality. Thus, in addition to lockdown reducing the capacity of personality to be expressed in the form of people selectively entering into environments, the varied degree of negative effects of the pandemic may attenuate the effect of personality on well-being.

There was also some evidence that the pandemic differentially moderated the relationship between personality and well-being. Of the 45 correlations between personality traits and well-being, 9 were significant at .05, which is more than would be expected by chance. Given that positive and negative affect were the well-being dimensions most influenced by the pandemic, these seem the most likely candidates for moderator effects. In particular, the reduced effect of extraversion on positive affect seems noteworthy. Theory suggests that extraverts seek out social interaction and are energized by it. From this perspective, lockdown has the potential to deprive extraverts of some of their sources of happiness. While most people enjoy social contact (Jacques-Hamilton et al., 2019; Zelenski et al., 2012), theory and the current results suggest that extraverts will feel more deprived by lockdown. Results provide some support for theories of extraversion that emphasize the effect of instrumental processes and situation selection in addition to the effects of temperament (for discussion, see Lucas et al., 2008). Thus, while extraversion still promotes positive affect under lockdown, results suggest that the normal beneficial effects of extraversion on mood are attenuated.

Limitations

Several limitations should be noted. First, because the study used a between-subjects design as opposed to a longitudinal design, it is possible that extraneous factors may have influenced observed group differences. We dealt with this challenge by obtaining data from the same population of undergraduate psychology students at the same university. In general, demographic differences were very small, and our main regression analyses controlled for age and gender. We also performed analyses, available through the online scripts, where we examined the robustness of the results (by, for example, excluding interstate participants or excluding people over age 25) and the results were not materially altered. The online supplement also presents archival and historical evidence of the stability of Australian society in the years prior

to the pandemic (Wilkins et al., 2020). Second, there were a few minor differences in test administration between the two contexts. But, the underlying context to complete the survey in order to learn about their own personality was unchanged.

Conclusion

The current study makes several notable contributions. First, it contributes to an understanding of the well-being effects of second-wave lockdowns during the COVID-19 pandemic. The large sample sizes and the presence of a Pre-COVID comparison group are also major strengths. Second, it provides one of the first comprehensive assessments of a full spectrum of SWB and PWB measures during the COVID-19 pandemic. Third, it provides the first, to our knowledge, comprehensive assessment of whether the pandemic moderated the effect of personality on well-being (although, see also Folk et al., 2020). In so doing, it contributes more generally to an understanding of how personality interacts with pandemics and other major population-level events to influence well-being. In particular, the finding that the well-being benefits of extraversion are reduced during sustained lockdown is particularly interesting and worthy of further research.

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Online Supplement

Context of COVID-19 in Melbourne

To provide context to the present results, we briefly discuss the experience of the COVID-19 pandemic in Melbourne and Australia up to August 2020. Melbourne is the second most populous city in Australia and is the capital city of the state of Victoria. On March 10, the State premier warned Victorians to expect "extreme measures" in order to deal with the COVID-19 pandemic. On March 19, international borders were closed to non-residents and non-Australian citizens. From March 22, social distancing restrictions were gradually introduced in Victoria. In April and May, Melbourne operated largely under "Stage 3" restrictions which meant that there were only four reasons to leave home: (1) work and study that could not be done from home, (2) personal exercise, (3) essential shopping, and (4) caring responsibilities. While there was some community transmission of coronavirus, most of Australia's cases were returned travelers who were placed into hotel quarantine arrangements. As a result of moving early to introduce restrictions, Australia almost reduced community transmission to zero, and in some states and territories it appeared to do so, although there were a few small isolated outbreaks in Melbourne.

At the beginning of June, there was a general easing of restrictions in Melbourne (e.g., hotels, restaurants, galleries, and community centers were open with some restrictions, and small social gatherings were permitted) with plans for further easing of restrictions by June 22. However, as June progressed, there were gradual increases in the number of people in Melbourne testing positive to COVID-19. This second wave of infections was believed to have been seeded by ineffective hotel quarantine arrangements and compounded by a range of factors including inadequate contact tracing. Cases grew in various lower socio-economic-status suburbs in Melbourne and these suburbs were placed back into Stage 3 lockdown on June 30. When this failed to contain the spread of the virus, all of Melbourne was again placed into Stage 3 lockdown on July 7. As case counts continued to rise, it became clear that social distancing measures would need to be amplified relative to the first wave of the virus. Compulsory mask wearing outside the home was announced on July 19. Stage 4 restrictions were introduced on August 2. Stage 4 restrictions involved all but essential retail shops being closed, an 8pm to 5am curfew, a one hour limit on private exercise, and people being forbidden to travel more than 5km from home unless for a permitted purpose. It was in this context that the survey was administered in the second half of July 2020. Thus, while the rest of Australia had very little community transmission and was experiencing a semblance of normality, people in Melbourne were preparing to go into a second lockdown with an unknown end-point and unclear potential for lasting success.

Alternative Analysis of PANAS Items

In the main text, we report differences in item responses to the PANAS in terms of percentage endorsement. Table S1 provides the equivalent analysis using means and standard deviations on the original 5-point scale.

Table S1*Comparison of Means and Standard Deviations of PANAS Items*

Emotion	Pre-COVID (n = 547)		COVID (n = 1132)		<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Excited	3.46	1.07	2.79	1.06	-0.63
Interested	3.72	1.00	3.16	1.02	-0.56
Enthusiastic	3.38	1.06	2.88	1.06	-0.47
Active	3.18	1.19	2.80	1.16	-0.32
Determined	3.58	1.04	3.24	1.11	-0.33
Proud	3.16	1.18	2.79	1.14	-0.31
Attentive	3.33	1.00	3.07	0.98	-0.26
Strong	3.12	1.15	2.87	1.10	-0.22
Inspired	3.15	1.14	2.86	1.14	-0.25
Alert	3.15	1.06	3.06	1.07	-0.08
Ashamed	1.56	0.95	1.96	1.14	0.42
Guilty	1.92	1.09	2.21	1.20	0.27
Hostile	1.65	0.94	2.08	1.09	0.46
Scared	1.82	1.06	2.46	1.22	0.60
Jittery	1.99	1.13	2.61	1.24	0.55
Depressed	2.20	1.15	2.71	1.31	0.44
Nervous	2.65	1.19	3.08	1.22	0.36
Afraid	1.81	1.07	2.52	1.24	0.66
Irritable	2.51	1.13	3.03	1.11	0.46
Upset	2.42	1.09	3.04	1.16	0.57

Note. Cohen's *d* uses Pre-COVID standard deviation.

Regression Model Comparison

To further quantify the relative importance of personality and the COVID pandemic, regression models predicting well-being outcomes were estimated for various predictor sets: (1) only the demographics of age and gender as coded earlier, (2) demographics and Big 5 personality, (3) demographics and the COVID pandemic, (4) demographics, Big 5 personality, and the COVID pandemic. The results in Table S2 clearly show that personality is a much stronger predictor of well-being than the pandemic. That said, the size of difference varies across the well-being indicators. Specifically, the pandemic is a strong predictor over and above demographics of positive affect and negative affect, although even for these variables, personality is a much stronger predictor.

Table S2*Adjusted R-squared for Regression Models Predicting Well-being from Sets of Predictors*

Predictors	k	SWL	PA	NA	PR	AU	EM	PG	PL	SA	Mean
1. Demog	2	.001	.005	.032	.008	.045	.010	.037	.031	.004	.019
2. Demog + Big 5	7	.361	.321	.415	.389	.286	.557	.409	.382	.568	.410
3. Demog + COVID	3	.009	.050	.113	.020	.058	.032	.038	.038	.018	.042
4. Demog + COVID + Big 5	8	.369	.364	.493	.402	.300	.577	.410	.388	.581	.431

Note. Predictors in regression models are indicated as follows: Demog = Female and Aged over 25, Big 5 = the big 5 personality scores, COVID = The dummy coded variable indicating

COVID. SWL = satisfaction with life, PA = positive affect, NA = negative affect, PR = positive relations, AU = autonomy, EM = environmental mastery, PG = personal growth, PL = purpose in life, SA = self-acceptance. Mean is the mean adjusted r-squared value for the set of predictors averaged over the 9 well-being outcomes.

Comparison of Melbourne versus Non-Melbourne COVID Sample

All participants in the sample resided in Australia. Most resided in Melbourne (capital of Victoria). But some resided elsewhere in Victoria or elsewhere in Australia. We initially thought it would be best to retain all participants for the primary analyses presented in the manuscript. First, we wished to maximize comparability with the Pre-COVID sample. Second, we wanted to maximize statistical power. Third, we wanted to avoid making arbitrary exclusion decisions. Finally, all participants in Australia had experienced the first wave of lockdown and were living under at least modest social distancing restrictions as well as the threat of a second wave. Furthermore, many of these "non-Melbourne" participants resided in the state of Victoria, of which Melbourne is the capital. In particular, many of the regional cities in Victoria (e.g., Geelong, Bendigo, Ballarat, etc.) are very connected to Melbourne, and in general, regional Victoria was experiencing a milder form of a second wave of viral transmission with plans for a milder form of lockdown.

However, we were persuaded by reviewer feedback which suggested that it would be better to focus on the Melbourne sample in the manuscript and present the full sample in the online supplement. The Melbourne sample had a more homogenous experience of the COVID pandemic. The experience of the Melbourne sample experienced a greater threat in terms of public health. They also experienced more severe and longer-term consequences of lockdown. In particular, at the time of testing, it was unclear when the Melbourne sample would come out of second-wave lockdown and whether the efforts to control the virus would be effective.

Ultimately, the general pattern of results are consistent regardless of whether the Melbourne or Overall sample is examined. The main difference is that the estimated reduction in well-being in the COVID sample is slightly elevated when analyzing the Melbourne sample.

We first present here a supplementary analysis examining whether the participants in Greater Melbourne were experiencing lower levels of well-being than other participants (see Table S1). Greater Melbourne residents were exposed to a second lockdown and a second wave of viral transmission. Thus, we examined whether this led to reduced well-being relative to other people in Victoria and Australia.

Results generally show limited differences in personality with the exception that non-Melbourne participants were slightly more conscientiousness, and a general pattern of Melbourne participants having lower levels of well-being.

Table S3*Comparison of Greater Melbourne and Other Participants in the COVID*

<i>Sample</i>	Other (n = 338)		Melbourne (n = 1132)		<i>t</i>	<i>sig</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Female	0.84	0.37	0.81	0.39	1.18		-0.07
Age	28.98	9.27	24.50	8.05	7.95	***	-0.48
Neuroticism	2.88	0.74	2.96	0.72	-1.75		0.11
Extraversion	3.27	0.71	3.31	0.70	-0.76		0.05
Openness	3.86	0.53	3.83	0.52	0.81		-0.05
Agreeableness	3.82	0.50	3.78	0.49	1.27		-0.08
Conscientiousness	3.57	0.59	3.43	0.59	3.71	***	-0.23
Life Satisfaction	4.71	1.25	4.46	1.34	3.20	***	-0.20
Positive Affect	3.18	0.77	2.95	0.75	4.83	***	-0.30
Negative Affect	2.39	0.83	2.57	0.84	-3.44	***	0.21
Positive Relations	4.59	0.86	4.55	0.86	0.80		-0.05
Autonomy	4.03	0.82	3.90	0.86	2.62	**	-0.16
Environmental Mastery	4.03	0.91	3.83	0.93	3.47	***	-0.22
Personal Growth	5.07	0.69	4.88	0.72	4.35	***	-0.27
Purpose in Life	4.63	0.84	4.43	0.83	3.87	***	-0.24
Self-Acceptance	4.07	1.04	3.88	1.07	3.06	***	-0.19

Analyses of the Overall Dataset including Non-Melbourne Participants

We also reproduce the main analyses reported in the primary manuscript using the larger overall COVID sample which includes additional cases where participants reside in Victoria (but outside Greater Melbourne) or in other states of Australia (see Table S4, Table S5, Table S6, and Table S7). The general observation is that this makes very little difference to the results except that the difference between the pre-COVID and COVID samples is slightly reduced.

Table S4*Differences in Well-Being in Pre-COVID and Overall COVID Samples*

Variable	Pre-COVID (n = 547)			Overall COVID (n = 1470)			<i>t</i>	<i>sig.</i>	Difference <i>d</i> [95% CI]
	α	<i>M</i>	<i>SD</i>	α	<i>M</i>	<i>SD</i>			
Life Satisfaction	.85	4.74	1.34	.86	4.52	1.33	-3.37	***	-0.17 [-0.27, -0.07]
Positive Affect	.88	3.32	0.76	.89	3.01	0.76	-8.26	***	-0.41 [-0.51, -0.32]
Negative Affect	.87	2.05	0.74	.89	2.53	0.84	12.36	***	0.64 [0.54, 0.74]
Positive Relations	.78	4.76	0.85	.76	4.56	0.86	-4.71	***	-0.24 [-0.34, -0.14]
Autonomy	.76	4.13	0.83	.76	3.93	0.85	-4.79	***	-0.24 [-0.34, -0.14]
Environmental Mastery	.80	4.12	0.90	.81	3.88	0.93	-5.40	***	-0.27 [-0.37, -0.17]
Personal Growth	.78	4.96	0.75	.77	4.93	0.72	-0.78		-0.04 [-0.14, 0.06]
Purpose in Life	.77	4.59	0.86	.77	4.48	0.83	-2.60	**	-0.13 [-0.23, -0.03]
Self-Acceptance	.88	4.17	1.06	.88	3.92	1.07	-4.61	***	-0.23 [-0.33, -0.13]

* $p < .05$, ** $p < .01$, *** $p < .001$

Table S5*Differences in PANAS Mood Variables in Pre-COVID and Overall COVID Samples*

Emotion	Pre-COVID (<i>n</i> = 547) %	Overall COVID (<i>n</i> = 1470) %	Difference %
Positive Affect			
Excited	55	29	-26***
Interested	66	43	-23***
Enthusiastic	51	32	-19***
Active	44	31	-13***
Determined	59	47	-11***
Proud	42	31	-11***
Attentive	48	38	-10***
Strong	40	31	-9***
Inspired	42	33	-9***
Alert	41	38	-4
Negative Affect			
Ashamed	6	12	5***
Guilty	11	18	6***
Hostile	5	12	7***
Scared	10	22	12***
Depressed	16	29	13***
Jittery	14	27	14***
Nervous	27	41	14***
Afraid	10	24	14***
Irritable	22	37	15***
Upset	18	38	19***

Note. Percentages are the percentages of people reporting that they have experienced the emotion quite a bit or extremely.

* $p < .05$, ** $p < .01$, *** $p < .001$

Table S6

Correlations between Big Five Personality and Well-Being in Pre-COVID and Overall COVID Samples

	SWL	PA	NA	PR	AU	EM	PG	PL	SA
Pre-COVID									
Neuroticism	-.56	-.54	.70	-.48	-.43	-.72	-.48	-.45	-.72
Extraversion	.33	.44	-.28	.51	.34	.40	.42	.29	.43
Openness	.04	.25	-.05	.17	.31	.09	.42	.21	.18
Agreeableness	.22	.22	-.27	.43	.02	.24	.30	.25	.26
Conscientiousness	.28	.38	-.30	.28	.30	.49	.40	.58	.41
Overall COVID									
Neuroticism	-.55	-.45	.65	-.46	-.38	-.68	-.41	-.42	-.71
Extraversion	.31	.30	-.15	.43	.32	.34	.38	.27	.40
Openness	.01	.18	.02	.10	.28	-.01	.36	.10	.07
Agreeableness	.23	.10	-.22	.37	-.06	.25	.23	.17	.22
Conscientiousness	.31	.37	-.20	.22	.19	.48	.28	.50	.40
Difference									
Neuroticism	.01	.09*	-.05	.01	.04	.04	.07	.03	.01
Extraversion	-.01	-.14**	.13**	-.08*	-.02	-.06	-.04	-.02	-.03
Openness	-.04	-.06	.07	-.07	-.03	-.10*	-.06	-.11*	-.11*
Agreeableness	.01	-.13**	.05	-.05	-.08	.01	-.07	-.07	-.04
Conscientiousness	.03	-.01	.10*	-.07	-.11*	-.01	-.12**	-.08*	-.01

Note. Difference is COVID correlation minus Pre-COVID correlation. Absolute Pre-COVID sample correlations greater than or equal to .09, .12, and .15 are significant at .05, .01, and .001 respectively. Absolute COVID sample correlations greater than or equal to .06, .07, and .09 are significant at .05, .01, and .001 respectively. Significance of differences between correlations are as follows: * $p < .05$, ** $p < .01$, *** $p < .001$.

Table S7

Regression Models Predicting Well-Being from Demographics, Personality, the COVID-19 Pandemic, and Personality by COVID Interactions (Overall COVID Sample)

Predictor	SWL	PA	NA	PR	AU	EM	PG	PL	SA
Intercept	-0.07	0.35***	-0.41***	-0.01	0.18***	0.10*	-0.14**	-0.07	0.01
Female	0.28***	-0.07	0.05	0.21***	-0.11*	0.11**	0.12**	0.15**	0.20***
Age > 25	-0.12**	-0.01	-0.20***	0.07	0.23***	0.09**	0.27***	0.17***	-0.02
Neuroticism	-0.51***	-0.32***	0.58***	-0.22***	-0.28***	-0.57***	-0.25***	-0.21***	-0.60***
Extraversion	0.08*	0.23***	0.01	0.34***	0.17***	0.13***	0.24***	0.11**	0.13***
Openness	-0.04	0.13***	0.06	0.05	0.19***	-0.05	0.29***	0.10**	0.06*
Agreeableness	0.04	0.05	-0.08*	0.28***	-0.14***	0.00	0.13***	0.06	0.02
Conscientiousness	0.08*	0.20***	-0.03	0.06	0.16***	0.26***	0.21***	0.45***	0.15***
COVID	-0.16***	-0.40***	0.58***	-0.25***	-0.24***	-0.29***	-0.06	-0.15***	-0.23***
COVID by Neuroticism	0.04	0.00	0.06	-0.05	-0.03	0.03	0.03	-0.02	-0.01
COVID by Extraversion	0.06	-0.10*	0.05	-0.02	0.01	0.02	0.00	0.04	0.05
COVID by Openness	0.01	0.02	-0.01	-0.03	0.04	-0.01	0.00	-0.03	-0.04
COVID by Agreeableness	0.01	-0.11**	0.04	-0.03	-0.05	0.02	-0.02	-0.06	-0.04
COVID by Conscientiousness	0.04	0.07	0.05	-0.04	-0.05	0.01	-0.06	-0.06	0.02
Adjusted R ²	0.36	0.35	0.48	0.40	0.30	0.57	0.40	0.38	0.58

Note. Female is coded 1 = Female, 0 = Male or Other; Age is coded 1 = 26 or older, 0 = 18 to 25; COVID is coded 0 = Pre-COVID, 1 = COVID. Well-being variables are z-score standardized.

Personality variables are z-score standardized within COVID groups. Interactions are the product of the 0–1 COVID variable and the standardized personality variables.

* $p < .05$, ** $p < .01$, *** $p < .001$

Analyses Examining Personality Differences

Table S8 shows the descriptive statistics for the personality variables in the Pre-COVID and COVID sample using unstandardized variables. In general, the standard deviations in the Pre-COVID sample were slightly larger. This was caused by the use of slightly different response scales in the two surveys. In particular, the response scale in the Pre-COVID sample encouraged slightly more responding to 1 and 5 than 2 and 4 compared to the response scale used for the COVID sample. This was the principal reason why we decided to z-score standardize the personality measures. In general, the differences were small, although the COVID sample was slightly higher on neuroticism.

Table S8

Means and Standard Deviations for Big Five Personality Pre-COVID and COVID

	Pre-COVID ($n = 547$)		COVID ($n = 1132$)		d
	M	SD	M	SD	
Neuroticism	2.75	0.81	2.96	0.72	0.28
Extraversion	3.26	0.71	3.23	0.63	-0.05
Openness	3.76	0.65	3.84	0.53	0.14
Agreeableness	3.76	0.58	3.68	0.53	-0.15
Conscientiousness	3.54	0.63	3.46	0.54	-0.15

To further investigate whether personality in the COVID sample (2020) was different in some way, we also compared Big Five personality to data collected in 2018 and 2019. The 2018 and 2019 samples were recruited from the same university undergraduate psychology unit in the same way as the 2017 Pre-COVID sample and the 2020 COVID sample. However, they contained no well-being measurement. Big Five personality was also measured using a slightly different subset of 50 items in 2018 and 2019. The 2020 data collection included the superset of items that enabled comparison with both 2017 and 2018/2019. In all three years, the same response scale was used. Table S9 mostly shows that scores are very similar, although openness is slightly higher. Importantly, this suggest that the COVID-19 pandemic was not having a major effect on responses to the personality test.

Table S9*Means and Standard Deviations for Big Five Personality*

	2018 (n = 701)		2019 (n = 1412)		COVID (n = 1132)		<i>d</i> 2019	<i>d</i> 2018
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Neuroticism	2.92	0.75	2.91	0.73	2.96	0.72	0.08	0.06
Extraversion	3.27	0.69	3.26	0.68	3.31	0.70	0.07	0.06
Openness	3.70	0.57	3.78	0.52	3.83	0.52	0.11	0.26
Agreeableness	3.74	0.51	3.74	0.49	3.78	0.49	0.08	0.09
Conscientiousness	3.40	0.61	3.46	0.60	3.43	0.59	-0.04	0.05

Note. *d* 2019 is the Cohen's *d* effect size of the COVID sample compared to the 2019 sample using the 2019 sample standard deviation. *d* 2018 is the Cohen's *d* effect size of the COVID sample compared to the 2018 sample using the 2019 sample standard deviation.

Effect of Standardizing Personality within Groups

To further examine the decision to standardize personality within groups, we report the analyses where personality was not standardized within groups (See Table S10). The effect of standardization was negligible for main effects of personality, main effects of demographics, and personality by covid interactions (i.e., max absolute change in coefficient was 0.02). The intercept was changed in a few cases (e.g., satisfaction with life, negative affect and environmental mastery, and self-acceptance) where they were around .10 lower (or higher in the case of negative affect). Similarly, the COVID coefficient was reduced in magnitude (see comparison in Table S11). This is all presumably driven by the fact that neuroticism was slightly higher in the COVID sample and neuroticism correlates highly with well-being and negative affect in particular. When controlling for personality, the COVID effects are still quite substantial for positive affect (-0.40) and negative affect (0.40). With regards to the well-being indicators, positive relations (-0.20) and autonomy (-0.23) stand out relative to the remaining well-being scales.

Table S10

Regression Models Predicting Well-Being from Demographics, Personality, the COVID-19 Pandemic, and Personality by COVID Interactions where Personality was not Standardized within Groups

Predictor	SWL	PA	NA	PR	AU	EM	PG	PL	SA
Intercept	-0.12	0.37	-0.34	-0.02	0.19	0.02	-0.08	-0.07	-0.04
Female	0.25	-0.10	0.10	0.18	-0.13	0.09	0.10	0.14	0.17
Age > 25	-0.15	-0.07	-0.17	0.07	0.25	0.06	0.26	0.19	-0.04
Neuroticism	-0.50	-0.32	0.57	-0.21	-0.28	-0.55	-0.24	-0.20	-0.58
Extraversion	0.08	0.23	0.01	0.35	0.17	0.13	0.23	0.11	0.13
Openness	-0.04	0.13	0.06	0.05	0.18	-0.05	0.28	0.10	0.06
Agreeableness	0.04	0.05	-0.09	0.29	-0.13	0.01	0.13	0.06	0.03
Conscientiousness	0.09	0.20	-0.05	0.07	0.15	0.26	0.20	0.43	0.15
COVID	-0.06	-0.40	0.45	-0.20	-0.23	-0.15	-0.11	-0.13	-0.12
COVID by Neuroticism	0.01	-0.01	0.08	-0.06	-0.03	0.03	0.02	-0.01	-0.03
COVID by Extraversion	0.08	-0.09	0.04	-0.01	0.01	0.04	0.01	0.04	0.06
COVID by Openness	0.00	0.02	-0.01	-0.03	0.05	-0.01	0.03	0.00	-0.05
COVID by Agreeableness	-0.01	-0.12	0.03	-0.04	-0.03	0.01	-0.03	-0.05	-0.04
COVID by Conscientiousness	0.04	0.07	0.08	-0.04	-0.05	0.03	-0.04	-0.03	0.02
Adjusted R ²	0.37	0.37	0.49	0.40	0.30	0.58	0.41	0.39	0.58

Note. Female is coded 1 = Female, 0 = Male or Other; Age is coded 1 = 26 or older, 0 = 18 to 25; COVID is coded 0 = Pre-COVID ($n = 547$), 1 = COVID ($n = 1132$). Well-being variables are z-score standardized. Personality variables are z-score standardized within COVID groups. Interactions are the product of the 0–1 COVID variable and the standardized personality variables.

Table S11

Changes in the COVID Regression Coefficient based on whether Personality was or was not Standardized within Groups

Outcome	Personality Standardized within Groups COVID Coefficient	Personality Not Standardized with Groups COVID Coefficient	Difference	% Reduction
Life Satisfaction	-0.19	-0.06	0.13	0.68
Positive Affect	-0.45	-0.40	0.05	0.11
Negative Affect	0.60	0.45	0.15	0.25
Positive Relations	-0.25	-0.20	0.05	0.20
Autonomy	-0.25	-0.23	0.02	0.08
Environmental Mastery	-0.31	-0.15	0.16	0.52
Personal Growth	-0.09	-0.11	-0.02	-0.22
Purpose in Life	-0.17	-0.13	0.04	0.24
Self-Acceptance	-0.25	-0.12	0.13	0.52
Mean	-0.15	-0.11	0.08	0.26

Discussion of Group Differences

It is worth considering whether other factors might explain the observed

differences in reported well-being besides the COVID pandemic, especially considering that the Pre-COVID sample was obtained in mid to late 2017. As is described below, Australian society has been very stable for many years prior to the COVID-19 pandemic. There have been no major economic or political changes, and the best available data on life satisfaction supports this claim.

Economy: Prior to the COVID-19 pandemic, the last time that Australia had experienced an economic recession was 30 years earlier (1990-1991).

Government: There have been no changes to either state or federal government in the time between pre- and post-COVID assessments. The state government at the time of the pandemic had been in office since 2014. The federal government had been in office since 2013.

Other Estimates of Well-being: Participants from the largest nationally representative panel survey (HILDA) in Australia illustrates how mean levels of life satisfaction has been both high and very stable over the 18 waves that have so far been reported (2001 to 2018). In each wave, participants rated their life satisfaction on a single life satisfaction item on a scale from 0 to 10. The standard deviation of life satisfaction in these samples is approximately 1.5. Since 2010, mean life satisfaction has ranged from 7.87 and 7.93. I.e., the Cohen's d movement from a mid-point of 7.9 has been no more than plus or minus 0.02. While equivalent data is not yet available for 2019 and 2020, the data does illustrate how stable well-being has been in Australian society prior to the onset of the COVID-19 pandemic. See Figure S1 and Figure S2.

Figure S1

Mean Life Satisfaction for All Persons and By Sex based on the Australian Household Income and Labour Dynamics Survey

Note. The above figure is from (Wilkins, Botha, & Vera-Toscano, 2020) and licenced Creative Commons CC-BY Attribution 3.0 Australia. Data is based on

between 12,408 and 13,834 interviews per wave.

Figure S2

Mean Life Satisfaction by Age Group based on the Australian Household Income and Labour Dynamics Survey

Note. The above figure is from (Wilkins et al., 2020) and licenced Creative Commons CC-BY Attribution 3.0 Australia.

It also interesting to consider whether there is other corroborating evidence that the COVID-19 pandemic is impacting well-being in Australia. In general, this evidence is only just beginning to emerge. For instance, Terry, Parsons-Smith, and Terry (2020) compared mood profiles to pre-COVID norms and obtained Cohen's d values of .28 for tension, 0.66 for depression, 0.58 for anger, 0.54 for vigor, 0.62 for fatigue, and 0.70 for confusion.

Some other external evidence also points to the idea that the COVID pandemic and the associated lockdown has been particularly unpleasant for young people. For instance, a report released in November 2020 by the Victorian Agency for Health Information found an increase in emergency presentations for self-harm and suicidal ideation in those aged under-18 [compared to 2019] and calls to the counselling line Beyond Blue were elevated when new restrictions were announced (Houston & Butt, 2020).

Houston, C., & Butt, C. (2020). Experts warn of deepening mental health crisis as youth bear brunt of COVID-19 lockdown. *The Age*. Retrieved from <https://www.theage.com.au/national/victoria/experts-warn-of-deepening-mental-health-crisis-as-youth-bear-brunt-of-covid-19-lockdown-20201113-p56e9d.html>

Terry, P. C., Parsons-Smith, R. L., & Terry, V. R. (2020). Mood Responses Associated with COVID-19 Restrictions. *Frontiers in Psychology*, 11, 3090.

Wilkins, R., Botha, F., & Vera-Toscano, E. (2020). *The Household, Income and Labour Dynamics in Australia Survey: Selected Findings from Waves 1 to 18*. Retrieved from