

Individual differences and changes in lifestyle behaviours predict decreased subjective well-being during COVID-19 restrictions in an Australian sample

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ABSTRACT

Background Due to the coronavirus disease 2019 (COVID-19) pandemic, social distancing practices were introduced to curb infection rates in many countries. The purpose of this study was to assess the effects of these restrictions on behaviours and well-being and whether individual differences predict changes in well-being.

Methods Australian adults participated in a cross-sectional, online survey during May 2020. The survey captured demographic information; health behaviours; personality traits; life satisfaction and COVID-19-related attitudes, financial concerns, perceived risks and impacts.

Results In total, 3745 (86.8% of 4313) participants completed all items. Participants were mostly female (85.7%) and 56.4 years (standard deviation [SD] = 12.6) on average. Over 95.0% of the sample indicated they had been social distancing or isolating. Health behaviours and well-being had generally worsened, with social connections being the most negatively affected. Life satisfaction was significantly lower since restrictions. For changes in life satisfaction, extroversion was a risk factor and openness to experience was a protective factor.

Conclusions Overall, well-being was negatively impacted by the COVID-19 pandemic and associated social distancing particularly in this sample containing mainly older women. In future, it will be crucial to understand why and who may be differentially affected, to encourage behaviours that are protective of well-being.

Keywords COVID-19, life satisfaction, personality, social distancing, well-being

Coronavirus disease 2019 (COVID-19) is a respiratory virus pandemic that has now spread globally, infecting >20 million people and resulting in the death of >700 000 people at the time this paper was prepared.¹ Social distancing measures have been fundamental to the mitigation of viral pandemics by limiting opportunity for person-to-person transmission and slowing disease spread, particularly when antiviral drugs and vaccines are not available.²

Many jurisdictions have implemented social distancing to control COVID-19 throughout 2020 to date. Common approaches include: physical distancing practices encouraging individuals to maintain at least 1.5 m (6 feet) between one another; home confinement instructions that discourage or prohibit people from leaving their homes except for specific causes such as emergencies, grocery shopping or medical treatment; complete or partial travel restrictions to minimize risk of spreading COVID-19 from one location to another

and mandated quarantine or self-isolation orders for those exposed to or infected with COVID-19 or returning from high-risk scenarios including travel abroad.

While social distancing is effective at controlling viral disease outbreaks² it also disrupts day-to-day freedoms and routines, leads to widespread closures of non-essential facilities and businesses and restricts opportunities for public gatherings. Under such conditions people's opportunities to socialize, work and exercise are typically limited. Rules are also subject to sudden change.³ As a result, social distancing can

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be detrimental to health behaviour and mental health amongst the population.^{4,5}

In the scientific literature, documented negative shifts in mental health associated with COVID-19 have potentially resulted from isolation from friends and family, removal of routine leading to frustration and boredom and contagion anxiety.^{6,7} Negative impacts on various health behaviours have been reported. For example, one study reported a one-third reduction in physical activity under COVID-19 social distancing measures with a commensurate increase in sedentary behaviour, a leading behavioural determinant of ill health and non-communicable disease.⁸ This same study also reported increases in unhealthy dietary habits such as late-night snacking and out-of-control eating.

At present there are only a handful of studies reporting on the well-being impacts of COVID-19 with these early studies confirming that COVID-19 may be having widespread impacts on a range of health behaviours and, ultimately, mental health.⁵ However, the existing published literature is primarily descriptive. Prior research indicates significant heterogeneity in response to life stressors with factors including socio-demographics, personality trait profiles and other contextual variables likely to play a role.^{9,10}

The current study aimed to examine drivers of differential outcomes in terms of lifestyle behaviours and the acute impact of social distancing measures on subjective well-being. Understanding these effects and how they differentially impact populations is needed to help to manage ongoing effects of COVID-19 and to optimize future pandemic plans. Therefore, the objective of the present study was to assess the effects of social distancing on the lifestyle behaviours and to determine how these effects might be modulated by individual differences including personality trait profiles.

Methods

Participants and design

The current study involved a cross-sectional, online survey of adults (aged 18 years and older) currently residing in Australia. In Australia, social distancing rules were imposed by the government with the number and type of restrictions escalating between 13 March and 30 March 2020 and being relaxed on a state-by-state basis in early June. The survey was live for 1 week during early May 2020. Participants were recruited from those had previously participated in research studies and given their consent to be contacted for further research. The study was approved by the Commonwealth Scientific and Industrial Research Organization (CSIRO) Human Research Ethics Low-Risk Committee (LR2020/026).

Measures

The survey featured validated scales where possible. In some instances, these were modified from their validated format to ask participants to reflect on changes ‘over the last month’ to allow us to better understand change.

COVID-19 general attitudes, perceived risk and wider impacts

COVID-19-related impacts Participants were asked to select the top three areas most impacted by COVID-19 from a list of 18 items (e.g. own well-being, work/life balance, finances/-money). For each of the three items selected, participants indicated whether the impact was positive, negative or neutral.

Impacts on working/living arrangements Participants were asked to indicate whether they were currently working and what their living circumstances were over the last 2 weeks (e.g. social distancing, self-isolating at home, directed self-isolation or none of the above).

COVID-specific concerns The 14-item COVID-19 concerns scale¹¹ asked participants about their views surrounding COVID-19 on a 5-point scale ranging from 1 (to a great extent) to 5 (I do not know). Participants also indicated whether they knew anyone with a confirmed diagnosis of COVID-19, and if so, how many.

The 14 items were factor analysed using Principle Components Analysis with oblique rotation into two factors that represented concerns around infection and infecting others and wider concerns about societal implications of the pandemic. Each factor included 7 items, which were averaged to create scores ($\alpha_{\text{infect}} = 0.81$; $\alpha_{\text{society}} = 0.75$).

COVID-19 perceptions Items included ‘How serious do you think the COVID-19 outbreak has been in Australia?’, ‘How confident are you that you can avoid contracting COVID-19?’ and were rated on a 7-point Likert Scale.

Financial stress Participants rated indicators of financial stress and food insecurity adapted from the Australian Bureau of Statistics. Items were rated on a 7-point Likert scale.

Lifestyle behaviours and well-being

Vegetable consumption Participants indicated their daily servings of vegetables.

Physical activity Participants indicated the number of days that they had done a total of 30 minutes or more of moderate physical activity during the past month.¹²

Changes due to COVID-19 pandemic

Lifestyle behaviours impacted by COVID-19 Participants were asked to indicate how much COVID-19 had impacted diet,

Table 1 Factor analysis pattern matrix of changes to lifestyle behaviours. extracted using Principal Component Analysis with oblimin rotation with Kaiser normalization

	Component		
	Unhealthy eating changes	Higher screen use	Higher engagement with hobbies
Eat more junk food	0.736	0.200	
Eat more takeaways	0.703		
Eat more vegetables	-0.797		
Eat more fruit	-0.689		
Eat more home-cooked food	-0.666	0.286	
Eat more snacks	0.584	0.259	
Watch more TV		0.550	
Use phone more		0.755	
Read social media more		0.820	
Post on social media more		0.625	
More internet shopping		0.323	
More time on hobbies			0.717
More free time			0.756
More exercise	-0.317		0.371
Talk more with family			0.455
Work more			-0.399
Talk to friends more			0.474

exercise, social connections, sleep, free time (amount/quality) and mental well-being with reference to the same time last year. Each item was rated on a 6-point scale ranging from 0 = 'unsure' to 5 = 'a lot better'. They were also asked to rate how much they were doing 17 specific lifestyle activities (e.g. eating junk food, exercising, using phone) on a scale ranging from 0 = 'unsure' to 5 = 'a lot more'. Principle Components Analysis with oblique rotation was used to factor reduce the lifestyle behaviours. Three factors representing unhealthy eating changes, higher screen use and higher engagement with hobbies were extracted (Table 1). Due to four items cross-loading, regression scores were calculated for each factor and used as an index of overall lifestyle change in each domain.

The Satisfaction with Life Scale (SWLS)—modified Global life satisfaction was assessed with the SWLS.¹³ The SWLS includes five items rated on a 7-point scale. We modified the SWLS such that participants rated each item twice: once in response to 'Right now' and once in response to 'Before the COVID-19 outbreak in Australia'. Total scores range from 5 to 35 with

higher scores indicating higher satisfaction. The SLWS had good internal reliability ($\alpha_{\text{now}} = 0.91$; $\alpha_{\text{before}} = 0.93$).

Personality traits

Big Five Inventory-2 Short (BFI-2-S) The BFI-2-S¹⁴ uses 30 items to assess the Big Five personality domains and 15 facets. As per recommendation of the authors, we used only the higher-order domains (Extraversion, Agreeableness, Conscientiousness, Negative Emotionality and Open Mindedness) in our analysis due to the use of the short form of the questionnaire. The BFI-2-S had good internal consistency ($\alpha = 0.72$, averaged across domains).

Demographics

Participants provided demographic information including sex, age in years, born in Australia (yes/no), marital status, number of dependents, education level and occupation.

Procedure

The survey was programmed in Survey Gizmo and then shared via email with potential participants that were recruited from a database of participants from previous research studies. Participants were informed that once they started the survey, they were providing consent to participate and that they were free to withdraw from the study at any time by closing their browser. The survey took 15–20 minutes to complete.

Data analysis

Data were analysed in IBM SPSS Statistics 25. The primary analysis was a multiple regression predicting change in satisfaction with life since the COVID-19 outbreak. Predictor variables included personality, financial and food security, demographics, unhealthy eating, screen time and hobbies index scores, the two COVID-19 concerns scales and several psychological outcomes assessing confidence in measures and perceived seriousness of COVID-19. Any response that included an 'unsure' response was treated as missing data. Five cases were identified as multivariate outliers based on Mahalanobis distances and excluded from analyses. All cases with missing data were included listwise resulting in a final sample of 2885 for the regression. Due to the large sample size, beta values higher than 0.05 were considered significant.

Results

Sample characteristics

A total of 4313 individuals commenced the survey and of these 3745 provided complete data (86.8% completion rate).

All available data were used for each item and therefore numbers are reported separately for each analysis (n).

Around one-third (35.0%, $n = 4235$) were in fulltime employment with 63.3% of those employed ($n = 2375$) were currently working from home. Respondents who completed demographics ($n = 3745$) were predominantly female (85.7%) and born in Australia (79.4%) with a mean age of 56.4 years (standard deviation [SD] 12.6). Most were married (59.2%), had completed a university degree (56.8%) and/or had no children living at home (65.4%). Some respondents worked in the health sector (13.1%) and/or in academia (14.4%) representing 16.8% and 19.7%, respectively, of those working.

COVID-19 concerns and impacts

The majority (90.9%, $n = 4234$) of the sample indicated that they had been social distancing for the past 2 weeks, 6.6% were isolating and 2.5% were not doing either. A small proportion of the sample (12.5%) knew a person who had a confirmed COVID-19 diagnosis and <0.5% had been diagnosed themselves (11 in total).

In terms of overall well-being and lifestyle behaviours, participants indicated that these had mainly changed for the worse (Table 2), with social connections being the most negatively affected. Of the possible areas that could be impacted by the COVID-19 pandemic, the most commonly selected were: celebration of special events ($n = 1223$), exercise ($n = 1188$), certainty about the future ($n = 981$) and immediate family ($n = 910$). For the first three, 90.0%, 77.6% and 66.3% of respondents reported negative impacts on these areas, respectively. Impacts on immediate family were rated as negative by 56.2% of those selected this, whereas 24.5% indicated they were positively affected.

We found moderate relationships between the index score for increases in unhealthy eating and the overall rating of lifestyle changes for diet and exercise (Table 2). Small correlations were found between screen time and all lifestyle changes. The hobbies score was moderately associated with exercise, mental well-being, quality of free time and amount of free time.

Changes in emotional well-being

Participant's pre-COVID-19 SWLS ratings were compared with their current scores. A paired samples t -test showed that scores were significantly lower at the time of the survey ($M = 21.38$, $SD = 7.28$) compared with before COVID-19 pandemic estimates ($M = 24.73$, $SD = 6.62$), $t(2886) = -26.13$, $P < .001$.

The regression (Table 3) accounted for 19.2% (adjusted r^2) of the total variance and included 10 predictors with beta values >0.05 . Interestingly, few of the demographic variables contributed to the model. Two personality variables (Extraversion and Agreeableness) were associated with reduced life satisfaction, as were greater societal concerns, higher belief that social distancing measures impacted people's lifestyle, increased unhealthy eating and increased screen time. Factors positively associated ($P = < 0.05$) with change in life satisfaction were Open Mindedness, having children at home, working and increased time spent on hobbies.

Discussion

Main findings of this study

This study examined the impact of COVID-19 social distancing measures on changes in health behaviours and well-being in an Australian sample. Moreover, the aim was to determine whether individual differences were related to reported changes in health behaviours and well-being. Our key findings were that health behaviours and well-being were negatively impacted, with social connections most adversely impacted. Over three quarters of the sample felt that their social connections were worse. In addition, being unable to celebrate special events like birthdays was the area most impacted by restrictions. Certain personality traits were risk factors (e.g. Extraversion) and protective (e.g. Open Mindedness) of changes in well-being. Other protective factors included working and having children living at home.

What is already known on this topic

The COVID-19 pandemic is a unique stressor because it affects such a great proportion of the population and is unpredictable in terms of its severity and duration. At the individual level, the pandemic has resulted in massive disruptions to existing work, leisure and domestic routines, while simultaneously, posing a real and immediate threat to health.³ Previous observations have been made of increased sitting and consumption of unhealthy foods during the pandemic.⁸ In this sense, it is unsurprising that the current global crisis, the threat of serious illness and accompanying social restrictions has a negative impact on emotional well-being and behaviours. Fiorillo and Gorwood⁶ suggest a mixture of cognitive strategies (focus on positives), avoidance (avoid too much information) and social supports (communicate with friends and family) as a method to reduce possible negative impacts on well-being.

Table 2 Self-reported changes in lifestyle behaviours and relationships between changes in lifestyle

	<i>Changes in lifestyle behaviours (%)</i>		<i>Relationships to index scores</i>		
	<i>Worse to any degree (4 or 5)</i>	<i>Better to any degree (1 or 2)</i>	<i>Correlation with unhealthy eating score</i>	<i>Correlation with screen time score</i>	<i>Correlation with hobbies score</i>
Diet (<i>n</i> = 3461)	36.0	21.2	0.623	0.254	-0.239
Exercise (<i>n</i> = 3464)	47.1	24.3	0.400	0.205	-0.345
Social connections (<i>n</i> = 3467)	77.7	3.2	0.103	0.111	-0.204
Sleep (<i>n</i> = 3462)	32.2	11.2	0.162	0.160	-0.230
Amount free time (<i>n</i> = 3460)	18.3	44.2	0.130	-0.053	-0.619
Quality of free time (<i>n</i> = 3462)	38.0	29.0	0.217	0.081	-0.525
Mental well-being (<i>n</i> = 3457)	41.1	10.4	0.254	0.201	-0.326
Weight gain (<i>n</i> = 3472)	40.6 ^a	19.3 ^b	0.151	-0.211	0.426

^aGained weight^bLost weightAll correlations significant $P < 0.01$

What this study adds

The impact of social distancing measures on social connectedness was clear and raises the question of how to remain socially connected while implementing physically distancing.

The pandemic differentially affected people high in trait extraversion and agreeableness. These people are generally observed to have higher levels of well-being and more resilient coping styles,¹⁵ partly because of the social networks that they have developed. Yet, the nature of distancing measures limits access to these coping resources in a time of need. Those high in agreeableness may have also had decreases in their well-being due to their tendency to be other focussed. Taken together with the observation that higher societal concerns surrounding COVID-19 also predicted greater decreases in well-being, these findings indicate a tendency for people with broader viewpoints to be negatively affected.

With the current ubiquity of mobile phones and face-timing applications, it is curious that people high in extraversion were unable to fulfil their social needs, and, that the sample in general felt their social connections had worsened. Furthermore, increases in screen use composite scores that encompassed social media posting and reading negatively predicted changes in well-being. This is consistent with other studies in young adults that suggest social media use to manage emotional stresses may have negative impact on well-being.¹⁶ Other studies have also observed that extraversion is associated with higher WhatsApp use¹⁸ and receiving more phone calls,¹⁷ admittedly predominantly in younger adults. However, if those high in extraversion already heavily engage

in using these technologies, they may have been unable to compensate for the loss of face-to-face interaction.

Overall, participants observed various negative changes in their lifestyle behaviours with almost 40% ultimately reporting they had gained weight. This supports previous research by showing the relationship between these changes and overall emotional well-being. Although increased screen time and unhealthy food consumption was predictive of decreased well-being, increased engagement with hobbies and activities that provide mental space was protective against negative well-being changes. The observation that Open Mindedness was also positively associated with emotional well-being further supports the idea that people who were able to harness their free time in positive ways, fared better during restrictions. About 44% of the sample identified that they had more time, but only 29% felt that this time was better quality. Further, almost a quarter of people felt their family relationships had improved. All these observations further support the general notion that it is not simply the presence of more time, but the way that it is used that is critical for well-being during lockdown.

Finally, it is important to consider other protective factors for well-being during the pandemic, including working and having children at home. Although, low in the ability to modify, they may provide some broader insight. It is possible that keeping busy and having a sense of purpose was beneficial for well-being. Purpose and eudemonic well-being are thought to be a critical part of subjective well-being.¹³ Therefore, strategies that can instil or promote a sense of purpose may be critical companions for distancing measures.

Table 3 Regression values predicting change in life satisfaction (SWLS) since the COVID-19 outbreak

Survey area	Variable	B	Standard error	Beta	P
Demographic information	Female	-0.555	0.353	-0.028	0.116
	Age (years)	-0.009	0.011	-0.016	0.444
	Married	-0.510	0.253	-0.036	0.044
	Born in Australia	0.106	0.296	0.006	0.721
	Currently working	1.264	0.275	0.090	0.000
	Have a university degree	0.052	0.248	0.004	0.836
	Number of children living with	0.479	0.127	0.069	0.000
Diet and exercise	Daily vegetable serves	-0.147	0.081	-0.033	0.071
	Days per month 30mins or more activity	-0.017	0.013	-0.025	0.169
Financial and food security	Over the last month, I have run out of groceries and been uncertain I can get more (food security)	-0.019	0.091	-0.004	0.837
	I am unsure how I will pay upcoming bills on time (financial security)	-0.022	0.100	-0.005	0.825
Lifestyle during restrictions	Gained weight during restriction	-0.196	0.279	-0.014	0.482
	Unhealthy eating increased in restriction (composite)	-0.843	0.132	-0.122	0.000
	Screen time increased in restriction (composite)	-0.638	0.129	-0.092	0.000
	Hobbies increased in restriction (composite)	1.008	0.128	0.145	0.000
Big 5	Extraversion	-1.151	0.179	-0.123	0.000
	Agreeableness	-0.687	0.208	-0.061	0.001
	Conscientiousness	-0.371	0.187	-0.037	0.048
	Negative Emotionality	0.066	0.162	0.008	0.684
	Open Mindedness	0.925	0.182	0.092	0.000
COVID-19 concerns/perceptions	C19 concerns: Infection	0.428	0.201	0.040	0.034
	C19 concerns: Society	-1.617	0.242	-0.139	0.000
	Number of people known with confirmed C19 diagnosis	-0.337	0.347	-0.016	0.332
	C19 measures impacted lifestyle	-1.052	0.083	-0.231	0.000
	Have been following social distancing, etc. as close as possible	-0.176	0.162	-0.020	0.278
	Belief measures can reduce risk of infection	0.149	0.113	0.024	0.185
	Perceived seriousness of C19	0.145	0.150	0.018	0.334
	Belief life will return to normal after outbreak	0.006	0.070	0.002	0.926

Limitations of this study

The sample, while large, relied on self-report data and a cross-sectional sample that included a high proportion of women, with university degrees. This was due, in part, to our use of a convenience sample of people who had already subscribed to a health and lifestyle list. Reassuringly, none of these variables significantly contributed to changes in well-being. Furthermore, this study is unlike others as it considered a variety of factors including personality.

Conclusions

Commentary about the impact of COVID-19 largely focusses on numbers infected, deaths and the social and economic

consequences. The global response has seen the implementation of social distancing measures designed to slow the spread of the virus, essentially 'flattening the curve' in efforts to reduce the stress on national health care systems and fatalities. To work, this global health crisis requires large-scale compliance with measures requiring significant and disruptive changes to behaviour. The changes implemented in Australia were sudden and quite severe. Our data suggest, even amongst individuals who had not contracted the virus, the pandemic had a measurable impact on social connectedness, relationships, financial stress, health promoting behaviours and emotional well-being. Importantly, the challenges are not ubiquitous, with the pandemic having a greater impact, in terms of well-being, amongst those for example scoring higher in extraversion. These findings may provide some

insights into why social distancing presents significant challenge for some individuals, which may ultimately may underpin non-compliant behaviours. Through further investigation, the identification of protective may offer direction for public health strategies designed to maintain population well-being through a global health crisis.

Data availability statement

The data underlying this article cannot be shared publicly due to the conditions of the ethics approval, which stated that the data would remain confidential to protect the privacy of individuals that participated in the study. The data will be shared on reasonable request to the corresponding author.

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Conflict of interest

Authors have no known conflict of interest to disclose.

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