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Covid 19's Social Quarantine-Moderated Self-Reported Mental Health and Substance Use Among US Adults

Shelby Rubino, Rodger K. Bufford *

Graduate School of Clinical Psychology, George Fox University, Newberg, OR, US; E-Mails: srubino19@georgefox.edu; rbufford@georgefox.edu

* **Correspondence:** Rodger K. Bufford; E-Mail: rbufford@georgefox.edu

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Abstract

In 2019 the novel coronavirus spread quickly throughout the world. It was easily transmitted, resulting in a sudden increase in infection and death rates that overwhelmed hospitals. This sudden pandemic resulted in government and health officials mandating physical and social quarantines to decrease the spread of COVID-19. All these unexpected factors induced traumatic stress across the world. The impact of this trauma is seen to date, as many studies reported adverse mental health effects in an array of populations and researchers speculate these effects will continue long after COVID-19. The role of social quarantine as a moderating factor to these adverse mental health symptoms was assessed in a Qualtrics sample of 596 US adults. Participants completed a demographic survey, Adverse Childhood Experiences (ACEs) Questionnaire, COVID-19 Pandemic Mental Health Questionnaire, Patient Health Questionnaire-9, Generalized Anxiety Disorder Scale-7, International Trauma Questionnaire, Brief Resiliency Scale, and the Tobacco, Alcohol, Prescription Medication and Other Substances Tool. Hierarchical regressions with demographic and risk factors as predictors assessed the role of social quarantine as a moderator in predicting mental health symptoms. ACEs and risk factors were stronger predictors of mental health symptoms, but social

quarantine added significant incremental variance in self-reported anxiety, depression, PTSD, complex PTSD, and substance use; β ranged for 0.24 to 0.30. Quarantine had a significant adverse impact on mental health symptoms among these adults. Fostering resilience and distress tolerance is a proposed clinical intervention.

Keywords

COVID-19; quarantine; mental health; substance use; moderator variable

1. Introduction

Change of any kind creates stress in the human body. It activates the sympathetic nervous system and focuses the body's energy on addressing the stressor. This function is natural and often times is easily managed, allowing the body to quickly return to homeostasis. However, if the change seemingly removes an individual's autonomy, is perceived as unmanageable, or becomes chronic, the body may not regulate. Instead, the body may experience traumatic stress, undergo neurological rewiring, and get stuck in a state of sympathetic dominance [1, 2]. Some effects of this state may include decreased immune system functioning and increased health complications, increased fatigue, interpersonal distress, poor concentration and other cognitive functioning difficulties, and behavioral changes to mitigate the stress such as isolation, substance use, or hypervigilance [2, 3]. Living in this state results in many biological, social, psychological, and spiritual problems. However, according to Polyvagal Theory, a way to decrease nervous system activation is to socially engage, or to co-regulate with others [4].

In 2019 the world was exposed to a novel virus that spread and induced near-global traumatic stress. As the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) quickly made its way across the world, those infected with the coronavirus disease (COVID-19) filled hospital beds looking for medical relief; many hospitals were quickly overwhelmed [5]. To slow the spread of COVID-19, many health and government officials encouraged a two-week isolation period for those with mild symptoms [6, 7]. Many also enforced social distancing measures for uninfected individuals. Social distancing enforcement and adherence varied among jurisdictions; however, some manifestations of it included working remotely, distance learning, decreasing capacities of public places, wearing masks, limiting group gatherings, discouraging travel, curfews, and job loss [7-9]. With an emphasis on isolation, normal opportunities for social engagement decreased considerably. For many, life as they had known it changed drastically in the span of a few days.

Although these measures have proven to be successful for their intended effect of protecting physical health [10], studies have shown many negative impacts on mental health [6-9] and substance use (e.g., [11]). Research indicates the general public experienced panic and fear, financial stress, loss of social supports, and increased isolation [3, 6, 9, 12, 13]. From 2019 to 2020, self-reported substance abuse and misuse increased 13% and there has been an observed increase in opiate overdoses [14, 15]. Additionally, individuals positive for COVID-19 and their caregivers who engaged in a 2-week quarantine experienced an increase in post-traumatic stress disorder, anxiety, aggression, psychological distress, and implemented maladaptive coping mechanisms [6, 16]. Although United States suicide rates declined from 2018 to 2020, long-term effects of quarantine

measures included an increase of suicides in the following years [17-19]. Lastly, many health care workers reported symptoms of burn-out; these results were greater in countries with greater stringency, life expectancy, literacy, and social capital [6, 8, 16, 20].

A number of studies have indicated that the traumatic stress COVID-19 created has significantly affected individuals worldwide. Despite the development of vaccinations and a reduction in quarantine mandates, the effects of COVID-19 continue. Much like other traumatic experiences, it is likely the psychological effects (i.e., fatigue, interpersonal issues, concentration difficulties, isolation, anxiety, agitation, suicidal ideation, substance use, or hypervigilance) will linger long after COVID-19 as Bernardini et al. [21] theorized. Only a couple studies could be located which examined the effects of moderator variables on the adverse effects of COVID-19 exposure. Haver et al. [22] found that cognitive reappraisal buffered COVID-19 stress effects among women and that suppression exacerbated COVID-19 stress effects among men. In a nationwide health survey of Japanese office workers (*N* = 13.468), after controlling for several demographic factors, Ikegami et al. [23] found that job control scores were higher and job stress scores were lower among Japanese office workers who were more frequent telecommuters. Telecommuting, shorter work days, and being married were associated with lower job stress. While not conclusive, authors proposed that reduced infection anxiety may contribute to reduced job distress among more frequent telecommuters.

In addition to the impact of Covid-19, many individuals have also experienced a variety of childhood adversities such as abuse, neglect, parental separation/divorce, and so on. The literature on childhood adversity is robust and demonstrates multiple effects on both physical and mental health (e.g., [24, 25]). Exposure to childhood adversity could potentiate, be unrelated to, or diminish the effects of Covid-19 experiences.

Existing literature supports adverse mental health effects resulting from the traumatic stress caused by COVID-19. Rooted in Polyvagal Theory about the regulatory effects of social engagement, the purpose of this study is to look at the impact COVID-19 quarantine had on the general public, as opportunities for social engagement decreased during COVID-19. Due to the prolonged stress that COVID-19 created, the general public has experienced many outcomes consistent with this study's dependent variables, including depression as manifested by symptoms such as isolation, suicidal ideation, poor concentration, lack of interest, irritability, and impaired sleep; anxiety as manifested by worry about catching and transmitting COVID-19, trauma symptoms such as nightmares, hypervigilance, interpersonal conflict; and substance use including consumption of illicit, legal, or prescribed substances in excess. Current research supports an observed increase in these symptoms since the onset of COVID-19. The researchers hypothesized quarantine behaviors such as isolation, social distancing, and remote work and school closures had a negative impact on the general population's mental health and substance use that adds to any effects associated with childhood adversity while controlling for social support.

2. Method

2.1 Participants

Participants were recruited and accessed the survey through Qualtrics, a data collection website. Participants included 596 United States adults that ranged in age from 18-85 years; 66.6% of the sample identified as female, 32.2% as male, 0.7% as transgender female, and 0.5% as non-binary.

Regarding ethnicity, 68.6% of participants identified as White, 18.8% Black, 8.2% Hispanic or Latino, 2.7% Asian, 0.7% American Indian or Alaskan native, 0.2% native Hawaiian or other pacific islander, and 0.8% reported the available choices of ethnicity did not represent their ethnic identity. Regarding socioeconomic status, 37.9% reported they have no trouble paying bills, obtaining food, and keeping their residence, 31.7% reported difficulty paying bills, obtaining food, and worry about losing their residence, and 30.4% reported struggling to pay bills and obtain food, but do not worry about losing their residence. Of the sample, 36.9% of participants reported experiencing a COVID-19 related loss; among these, 15.9% reported loss of a family member, 15.3% loss of job, and 5.7% reported loss of another kind.

2.2 Instruments

2.2.1 Demographic Survey

All participants answered demographic questions. These items included questions about age, gender identity, ethnic identity, employment status, state of residence, socioeconomic status (SES), importance of religious and spiritual practices [26], and the impact of COVID-19 on their lives. COVID-19 impact questions included subsequent loss of job or family members. This information was used to describe participants of the study, and control for different demographic factors that could increase the risk of or account for protective factors for negative mental health effects from quarantine.

2.3 Predictors

2.3.1 Adverse Childhood Experiences

Adverse Childhood Experiences (ACEs; [24]) is a survey used to collect information about childhood maltreatment, household dysfunction, and parental substance use before the participant's 18th birthday. The 1998 ACEs study found higher ACEs scores impact an individual's health and well-being [24]. However, the ACEs survey does not account for the number of traumatic experiences, incidents outside of the household, or protective factors the child may have had [27].

This study applied the ACEs survey to assess the relationship between ACEs scores and impact of mental health after quarantine. This self-report measure has 10 yes/no items. Each "yes" is valued at 1 point. Scores ranged from 0-10. Low scores suggested minimal traumatic experiences in childhood, while high scores suggested substantial traumatic experiences in childhood. Though originally used as a checklist, alpha for ACEs is reported as 0.77 [28]. ACEs alpha for this study was 0.89.

2.3.2 Brief Resiliency Scale

The Brief Resiliency Scale (BRS; [29]) is a 6-item self-report measure assessing perceived ability to recover from stressful events. This study presented this measure to evaluate if resiliency correlates with outcomes of quarantine. The BRS asked participants to rate each item on a Likert Scale from 1 (strongly disagree) to 5 (strongly agree). Items 2, 4, and 6 were reverse coded and are rated on a scale of 1 (strongly agree) to 5 (strongly disagree). Mean item scores were reported and range from 1 to 5. Low scores indicated lower levels of resilience in participants while higher scores

indicated greater resilience. Smith et al., reported an alpha of 0.79 [30]. This study's alpha level was 0.72.

2.3.3 COVID-19 Pandemic Mental Health Questionnaire

The COVID-19 Pandemic Mental Health Questionnaire (CoPaQ; [31]) was developed in 2020 to assess the personal and social impact of the pandemic. This 213-item survey measures overall attitudes and behaviors regarding COVID-19 and quarantine as well as socio-demographic factors. This self-report measure is a mixture of yes/no and Likert scale items. Table S1 provides a breakdown of question types and expected response pattern.

The CoPaQ is extensive and covers many important areas. However, as indicted by the asterisks in Table S1, not all questions were asked for the purpose of this study**.** These categories have been removed from the survey because other statically supported measures for anxiety, depression, trauma, substance use, and resilience were used to assess the prevalence of those symptoms. Other items about the infection status of participants' social network, antibodies, and social media usage were also excluded because they do not directly affect participants' psychological presentation or are better assessed through other measures. Lastly, some items were adjusted to capture the duration of COVID-19 more accurately. For example, instead of stating "for the past two weeks…" items asked "for the past year…".

This study presented the CoPaQ to measure participation in quarantine behaviors. In all, 158 CoPaQ items and 10 CoPaQ subscales were used in data collection. Among those subscales, 3 separate measures were created and used to establish moderating variables. These measures included risk factors for oneself, risk factors for others in one's home, and adherence to quarantine. In the present study, alpha for risk for oneself was 0.85, risk for others in one's home was 0.83, and adherence was 0.79.

2.4 Dependent Measures

2.4.1 Patient Health Questionnaire-9

Patient Health Questionnaire-9 (PHQ-9; [32]) is a symptom checklist used to assess symptoms of depression as defined by the American Psychiatric Association's Diagnostic and Statistical Manual-Fifth Edition [33]. The study presented this as one of the measures to determine presence and prevalence of depressive symptoms in participants. For this study, the PHQ-9 instructions were adjusted to measure the duration of COVID-19 more accurately. The instructions stated, "Rate on a scale from 0 (not at all) to 3 (nearly every day) how often you have been bothered by each of the following symptoms since the onset of COVID-19?" The PHQ-9 asked participants to rate 9 items on a Likert scale from 0 (not at all) to 3 (nearly every day), as noted in the instructions. Scores ranged from 0-27. Low scores indicated depressive symptoms are not present, while high scores indicated depressive symptoms are present and disrupt daily functioning. A score of greater than or equal to 10 is commonly treated as a sign of active, moderate depression [32]. Spitzer et al. reported an alpha of 0.89 [34]. PHQ-9's alpha for this study was 0.94.

2.4.2 Generalized Anxiety Disorder Scale-7

Generalized Anxiety Disorder Scale-7 (GAD-7; [35]) is a symptom checklist used to assess the severity of anxiety symptoms as defined by the DSM-5 [33]. Instructions for the GAD-7 were adjusted to, "Rate on a scale from 0 (not at all) to 3 (nearly every day) how often you have been bothered by each of the following symptoms since the onset of COVID-19?" This scale asked participants to rate 7 items on a Likert scale from 0 (not at all) to 3 (nearly every day). Scores ranged from 0-21. Low scores indicated anxious symptoms are not present, while high scores indicated symptoms of anxiety are present and may disrupt daily functioning. The study presented the GAD-7 as one of the measures to determine the level of anxiety symptoms and behaviors in participants. A score of greater than or equal to 10 is commonly treated as a sign of active, moderate anxiety [35]. Spitzer et al. reported an alpha of 0.88. The alpha level for this study was 0.95.

2.4.3 International Trauma Questionnaire

The International Trauma Questionnaire (ITQ; [36]) is an 18-item, self-report diagnostic measure of posttraumatic stress disorder (PTSD) and complex PTSD (CPTSD), as defined by the World Health Organization. For this study, the ITQ instructions were adjusted, asking participants to "indicate how much you have been bothered by COVID-19 in the past year." This study presented the ITQ as one of the measures to determine the appearance and pervasiveness of posttraumatic stress in participants. The ITQ asked participants to rate each item on a Likert Scale from 0 (not at all) to 4 (extremely). The ITQ is divided into two parts. In each half, scores ranged from 0-32, with higher scores indicating an increased number of symptoms and severity. A score greater than or equal to 8 on the first half is commonly treated as a sign of active, moderately impairing posttraumatic stress, while a score greater than or equal to 8 on the second half typically indicates moderate disturbances in self-organization, thought to be a marker of complex trauma [36]. Cloitre, et al. reported an alpha of 0.77 [36]. The ITQ's alpha for this study was 0.97.

2.4.4 The Tobacco, Alcohol, Prescription Medication and Other Substances Tool

The Tobacco, Alcohol, Prescription Medication and Other Substances (TAPS; [37]) is a 4-item screening tool that asks about the prevalence of substance use in the past year. The TAPS tool was adjusted by combining items 2 and 3, as they asked the same question but required answers from different genders. This study used the TAPS tool to assess the prevalence and severity of substance use during quarantine. The TAPS tool is on a Likert Scale ranging from 1 (*never*) to 5 (*daily* or *almost daily*). Scores ranged from 4-20 with lower scores suggesting little to no substance abuse, while high scores suggested a greater frequency and severity of substance use. McNeely et al., reported an alpha of 0.74 [37]. The TAPS tool reported alpha for this study was 0.79.

2.5 Procedure

Participants completed a US national survey administered by Qualtrix. They consented electronically and answered roughly 220 items from the demographic survey, ACEs, CoPaQ, PHQ-9, GAD-7, BRS**,** ITQ, and TAPS tool. The survey was not timed, allowing as much time as needed to complete the questionnaires. The median time to complete the survey was 11 minutes 45 seconds. Questionnaires were completed individually.

Following IRB approval on December 17, 2021 (GFU#2211163), data were gathered in a manner consistent with ethical guidelines for research with human participants. No personally identifying data were gathered. Responding to the study materials following a review of the consent statement was treated as informed consent.

2.6 Design and Analysis

In this study demographics, COVID-19 risk factors, ACEs, and BRS were used to predict the presence of mental health symptoms during the COVID-19 pandemic. Adherence to quarantine measures, as identified in CoPaQ, was used as a moderating variable. Mental health symptoms were assessed using the PHQ-9, GAD-7, ITQ, and TAPS tool. The influence of the predictor and moderator variables was examined by means of hierarchical regression analyses.

Not all collected data were used for these analyses. These additional data included questions regarding state of residence, importance of faith, infection status, employment status, mental health diagnoses and treatment history, perceptions of solidarity measures, stress due to COVID-19, coping behaviors during quarantine, and paranoia. These data were excluded from analysis because, although interesting moderating factors, they did not accurately operationalize adherence to quarantine or mental health symptomology.

Data analysis involved a series of stepwise regressions in which demographic variables were entered in Model 1, moderators of ACEs and BRS were entered, then Quarantine was entered in Model 3 to assess incremental variance of Quarantine in predicting dependent measures of psychological symptoms.

3. Results

Prior to running the hierarchical regression analyses, assumptions of independence, linearity, collinearity, normality, and equal variance were tested and met. Results showed that all measures had good internal consistency. One outlier was identified. This outlier was the single native Hawaiian or other pacific islander in the sample. Due to the uniqueness of this outlier, they were excluded from the following analyses. Descriptive statistics were computed for the predictor variables (ACEs, resilience, and risk factors of self and others), moderating variables (adherence to quarantine mandates), and criterion variables (PHQ-9, GAD-7, ITQ; PTSD and CPTSD, and TAPS). Table 1 provides descriptive data.

Table 1 Descriptive Data for Scores on Predictor, Criterion, and Outcome Variables.

Variable	α	*M*	*SD*	Skew	Skew/SE-skew	Kurtosis	Kurtosis/SE-kurtosis
ACEs	0.89	2.82	2.94	0.87	0.10	-0.33	0.20
Risk factors	--	--	--	--	--	--	--
Self	0.85	7.36	3.55	2.27	0.10	4.89	0.20
Others	0.83	6.87	3.04	2.49	0.10	6.91	0.20
BRS	0.72	3.21	0.78	0.20	0.10	0.68	0.20
Quarantine	0.79	8.20	3.43	-0.76	0.10	-0.09	0.20
PHQ-9	0.94	11.21	8.18	0.17	0.10	-1.10	0.20
GAD-7	0.95	9.20	6.99	0.12	0.10	-1.27	0.20

ITQ	0.97	--	--	--	--	--	--
PTSD	--	4.98	5.42	0.90	0.10	-0.26	0.20
CPTSD	--	6.18	6.10	0.53	0.10	-1.08	0.20
TAPS	0.72	9.23	4.66	0.49	0.10	-0.79	0.20

Note. SES = socioeconomic status; ACEs = Adverse Childhood Experiences; BRS = Brief Resiliency Scale; PHQ-9 = Patient Health Questionnaire; GAD-7 = Generalized Anxiety Disorder Scale; ITQ = International Trauma Questionnaire; PTSD = posttraumatic stress disorder; CPTSD = complex posttraumatic stress disorder; TAPS = The Tobacco, Alcohol, Prescription Medication, and Other Substances Tool.

3.1 Hierarchical Regression Results

The research hypothesis that quarantine has negatively impacted the general population's mental health was tested by means of five, three-model hierarchical regressions. The effects of demographics, risk and protective factors, and quarantine on each cluster of mental health symptoms were examined. Regressions were computed to predict depression, anxiety, simple and complex PTSD symptoms, and substance abuse.

3.1.1 Depression

Regarding depressive symptoms, demographic factors showed significant contribution to Model 1 and accounted for 15.00% of the variance in PHQ-9 scores (R^2 = 0.15; $F_{5,213}$ = 7.36, p < 0.001). Significant predictor variables included age (β = -0.185; t = -2.80, p = 0.006) and SES (β = -0.292; t = -4.50, p < 0.001) as negative predictors of PHQ-9 scores.

When risk and protective factors were entered in Model 2, there was a significant increase in R^2 (R^2 = 0.37, ΔR^2 = 0.22; $F_{4,209}$ = 17.92, p < 0.001). Demographic factors lost their significance; ACEs became a positive predictor (β = 0.390; t = 5.55, $p \leq 0.001$), while BRS was a negative predictor (β = 0.360; t = -6.28, $p \leq 0.001$).

In Model 3, COVID-19 quarantine was added and predictive power increased (R^2 = 0.43, ΔR^2 = 0.06; $F_{1,208}$ = 22.52, p < 0.001). SES regained its significance, and again was inversely related to PHQ-9 scores (SES: β = -0.129, t = -2.20, p = 0.029). Risk factors remained significant predictors (ACEs: β = 0.367, t = 5.47, p < 0.001; BRS: β = -0.363, t = -6.65, $p \leq 0.001$). Quarantine became a significant predictor (β = 0.257, t = 4.75, $p \leq 0.001$). Together, these five predictors accounted for 43.00% of the variance. Of these, ACEs had the highest effect size (β = -0.367), followed by BRS (β = 0.363), then quarantine (β = 0.257), and SES (β = -0.129). The effect size for quarantine alone was small, while together demographic factors, moderators and quarantine had a large effect on depression scores. These results are detailed in Table 2.

Table 2 Predicting Depressive Symptoms (Patient Health Questionnaire-9) Through Hierarchical Regression of Demographic Variables, ACEs, BRS, and Risk Factors for Oneself and Others.

Variable	*F*	*Df*	*sig*	*R*	R^2	ΔR^2	β	*t*	Sig.
Model 1	7.36	5, 213	<0.001	0.38	0.15	0.15			
Age							-0.185	-2.80	0.006
Gender							0.089	1.39	0.166
Ethnicity							0.117	1.79	0.076
SES							-0.292	-4.50	<0.001
COVID-19 loss							-0.010	-0.15	0.883
Model 2	17.92	9, 209	<0.001	0.60	0.37	0.22			
Age							-0.066	-1.09	0.278
Gender							0.052	0.94	0.348
Ethnicity							0.096	1.66	0.099
SES							-0.119	-1.93	0.055
COVID-19 loss							-0.031	-0.55	0.581
Risk to self							-0.089	-1.02	0.310
Risk to other							-0.123	-1.45	0.149
ACEs							0.390	5.55	<0.001
BRS							-0.360	-6.28	<0.001
Model 3	22.52	10, 208	<0.001	0.65	0.43	0.06			
Age							-0.107	-1.84	0.068
Gender							0.029	0.54	0.593
Ethnicity							0.086	1.56	0.120
SES							-0.129	-2.20	0.029
COVID-19 loss							0.015	0.28	0.782
Risk to self							-0.064	-0.77	0.442
Risk to other							-0.142	-1.75	0.081
ACEs							0.367	5.47	<0.001
BRS							-0.363	-6.65	<0.001
Quarantine							0.257	4.75	<0.001

Note. N = 595; SES = socioeconomic status; ACEs = Adverse Childhood Experiences; BRS = Brief Resiliency Scale.

3.1.2 Anxiety

Regarding anxiety symptoms, demographic factors showed significant contribution to Model 1 and accounted for 14.00% of the variance in GAD-7 scores (R^2 = 0.14; $F_{5,213}$ = 6.81, p < 0.001). Significant predictor variables included SES (β = -0.253; t = -3.87, $p \leq 0.001$) and age (β = -0.204; t = -3.07, p = 0.002) as negative predictors of GAD-7 scores, and ethnicity (β = 0.140; t = 2.12, p = 0.036) as a positive predictor.

When risk and protective factors were entered in Model 2, there was a significant increase in R^2 (R^2 = 0.33, ΔR^2 = 0.19; $F_{4,209}$ = 14.52, p < 0.001), accounting for an additional 19.00% of variance. Age

and SES lost significance, while ethnicity maintained significance (β = 0.120; *t* = 2.02, *p* = 0.045); ACEs became a positive predictor of GAD-7 scores (β = 0.328; *t* = 4.52, *p* ≤ 0.001), while BRS was a negative predictor (β = -0.356; *t* = -6.02, *p* ≤ 0.001).

In Model 3, COVID-19 quarantine was added and predictive power increased (R^2 = 0.39, ΔR^2 = 0.06; $F_{1,208}$ = 20.96, *p* < 0.001). Age regained significance (β = -0.138; *t* = -2.29, *p* = 0.023), and again was inversely related to GAD-7 scores. Ethnicity lost significance. Risk factors remained significant predictors (ACEs: β = 0.304, *t* = 4.38, *p* ≤ 0.001, BRS: β = -0.359, *t* = -6.36, *p* ≤ 0.001); and quarantine became a positive predictor of GAD-7 scores (β = 0.257; *t* = 4.58, *p* ≤ 0.001). Together, these five predictor variables accounted for 39.00% of the variance. Of these predictors, BRS had the highest effect size (β = -0.359), followed by ACEs (β = 0.304), then quarantine (β = 0.257), and age (β = -0.138). Detailed results are seen in Table 3.

Table 3 Predicting Anxiety Symptoms (Generalized Anxiety Disorder Scale-7) Through Hierarchical Regression of Demographic Variables, ACEs, BRS, and Risk Factors for Oneself and Others.

Variable	*F*	*df*	*sig*	*R*	R^2	ΔR^2	β	*t*	Sig.
Model 1	6.81	5, 213	<0.001	0.37	0.14	0.14			
Age							-0.204	-3.07	0.002
Gender							0.102	1.59	0.113
Ethnicity							0.140	2.12	0.036
SES							-0.253	-3.87	<0.001
COVID-19 loss							-0.009	-0.15	0.885
Model 2	14.52	9, 209	<0.001	0.57	0.33	0.19			
Age							-0.097	-1.55	0.122
Gender							0.068	1.18	0.238
Ethnicity							0.120	2.02	0.045
SES							-0.093	-1.46	0.146
COVID-19 loss							-0.030	-0.51	0.609
Risk to self							-0.049	-0.54	0.588
Risk to other							-0.107	-1.23	0.221
ACEs							0.328	4.52	<0.001
BRS							-0.356	-6.02	<0.001
Model 3	20.96	10, 208	<0.001	0.62	0.39	0.06			
Age							-0.138	-2.29	0.023
Gender							0.044	0.80	0.425
Ethnicity							0.110	1.94	0.054
SES							-0.103	-1.69	0.092
COVID-19 loss							0.016	0.29	0.772
Risk to self							-0.024	-0.27	0.780
Risk to other							-0.126	-1.51	0.133
ACEs							0.304	4.38	<0.001
BRS							-0.359	-6.36	<0.001
Quarantine							0.257	4.58	<0.001

Note. N = 595; SES = socioeconomic status; ACEs = Adverse Childhood Experiences; BRS = Brief Resiliency Scale.

3.1.3 Posttraumatic Stress

As depicted in Table 4, the effects of demographics, risk and protective factors, and quarantine on PTSD symptoms were examined. In Model 1, demographic factors contributed significantly and made up 10.00% of variance in PTSD symptoms, as identified in the ITQ (R^2 = 0.10*;* $F_{5,213}$ = 4.56*,* p < 0.001*).* Significant predictor variables included SES (β = -0.212; t = -3.18, p = 0.002) and age (β = -0.214; t = -3.14, p = 0.002) as negative predictors of PTSD scores.

Table 4 Predicting Posttraumatic Stress Symptoms (International Trauma Questionnaire; Posttraumatic Stress Disorder) Through Hierarchical Regression of Demographic Variables, ACEs, BRS, and Risk Factors for Oneself and Others.

Variable	*F*	*df*	*sig*	*R*	R^2	ΔR^2	β	*t*	Sig.
Model 1	4.56	5, 213	<0.001	0.31	0.10	0.10			
Age							-0.214	-3.14	0.002
Gender							0.048	0.73	0.469
Ethnicity							0.041	0.60	0.546
SES							-0.212	-3.18	0.002
COVID-19 loss							0.055	0.83	0.408
Model 2	14.27	4, 209	<0.001	0.54	0.29	0.19			
Age							-0.080	-1.26	0.210
Gender							0.018	0.31	0.754
Ethnicity							0.033	0.53	0.594
SES							-0.037	-0.57	0.568
COVID-19 loss							-0.036	0.60	0.547
Risk to self							-0.209	-2.27	0.024
Risk to other							0.034	0.38	0.707
ACEs							0.403	5.42	<0.001
BRS							-0.313	-5.16	<0.001
Model 3	28.46	1, 208	<0.001	0.61	0.38	0.09			
Age							-0.129	-2.12	0.035
Gender							-0.010	-0.17	0.863
Ethnicity							0.021	0.37	0.715
SES							-0.049	-0.81	0.424
COVID-19 loss							0.090	1.58	0.115
Risk to self							-0.180	-2.08	0.039
Risk to other							0.012	0.14	0.891
ACEs							0.376	5.36	<0.001
BRS							-0.316	-5.55	<0.001
Quarantine							0.302	5.34	<0.001

Note. N = 595; SES = socioeconomic status; ACEs = Adverse Childhood Experiences; BRS

= Brief Resiliency Scale.

There was a significant increase in R^2 when risk and protective factors were added in Model 2 (R^2 = 0.29, ΔR^2 = 0.19; $F_{4,209}$ = 14.27, p < 0.001), accounting for an additional 19.00% of the variance in PTSD scores. Demographic variables lost significance; ACEs (β = 0.403; t = 5.42, $p \leq 0.001$) became a positive predictor of PTSD scores, while BRS (β = -0.313; t = -5.16, $p \leq 0.001$) and risk factors for oneself (β = -0.209; t= -2.27, p = 0.024) were negative predictors.

In Model 3, COVID-19 quarantine was added and predictive power increased (R^2 = 0.38, ΔR^2 = 0.09; $F_{1,208}$ = 28.46, p < 0.001). Age regained significance and along with risk factors was inversely related to PTSD scores (age: β = -0.129, t = -2.12, p = 0.035; BRS: β = -0.316, t = -5.55, $p \leq 0.001$; risk to self: β = -0.180, t = -2.08, p = 0.039), while ACEs (ACEs: β = 0.376, t = 5.36, $p \leq 0.001$) remained a positive predictor. Quarantine became a positive predictor of PTSD scores (β = 0.302; t = 5.34, $p \leq$ 0.001). Together, these five variables accounted for 38.00% of the total variance. Of these predictors, ACEs had the highest effect size (β = 0.376), followed by BRS (β = -0.316), then quarantine (β = 0.302), risk to oneself (β = -0.180), and age (β = -0.129).

3.1.4 Complex Posttraumatic Stress

Regarding complex trauma symptoms as identified in the ITQ, demographic factors displayed significant contribution to Model 1 and accounted for 13.00% of the variation in CPTSD scores (R^2 = 0.13; $F_{5,213}$ = 6.06, p< 0.001). Significant predictor variables included SES (β = -0.241; t = -3.67, $p \leq$ 0.001) and age (β = -0.187; t = -2.79, p = 0.006) as negative predictors.

When risk and protective factors were added in Model 2, there was a significant increase in R^2 (R^2 = 0.34, ΔR^2 = 0.21; $F_{4,209}$ = 16.60, p< 0.001), accounting for an additional 21.00% of the variance. Demographic factors lost their significance; ACEs (β = 0.313; t = 4.35, $p \leq 0.001$) became a positive predictor of CPTSD scores, while BRS (β = -0.392; t = -6.68, $p \leq 0.001$) was a negative predictor.

COVID-19 quarantine was added in Model 3 and predictive power increased (R^2 = 0.40, ΔR^2 = 0.05; $F_{1,208}$ = 18.67, p < 0.001). Risk and protective factors remained significant (ACEs: β = 0.291, t = 4.20, $p \leq 0.001$; BRS: β = -0.395, t = -7.01, $p \leq 0.001$). Quarantine became a positive predictor of CPTSD scores (β = 0.242; t = 4.32, $p \leq 0.001$). These predictor variables accounted for 49.00% of the total variance in CPTSD scores. Of these predictors, BRS had the highest effect size (β = -0.395), followed by ACEs (β = 0.291), and quarantine (β = 0.242). These results are detailed in Table 5.

Table 5 Predicting Complex Posttraumatic Stress Symptoms (International Trauma Questionnaire; Complex Posttraumatic Stress Disorder) Through Hierarchical Regression of Demographic Variables, ACEs, BRS, and Risk Factors for Oneself and Others.

Variable	*F*	*df*	*sig*	*R*	R^2	ΔR^2	β	*t*	Sig.
Model 1	6.06	5, 213	<0.001	0.35	0.13	0.13			
Age							-0.187	-2.79	0.006
Gender							0.123	1.90	0.059
Ethnicity							0.100	1.48	0.142
SES							-0.241	-3.67	<0.001
COVID-19 loss							-0.011	-0.17	0.865
Model 2	16.60	9, 209	<0.001	0.58	0.34	0.21			

Age							-0.074	-1.20	0.233
Gender							0.089	1.56	0.121
Ethnicity							0.084	1.42	0.157
SES							-0.066	-1.04	0.298
COVID-19 loss							-0.033	-0.56	0.574
Risk to self							-0.015	-0.17	0.862
Risk to other							-0.068	-0.78	0.436
ACEs							0.313	4.35	<0.001
BRS							-0.392	-6.68	<0.001
Model 3	18.67	10, 208	<0.001	0.63	0.39	0.06			
Age							-0.113	-1.88	0.062
Gender							0.066	1.21	0.230
Ethnicity							0.075	1.31	0.190
SES							-0.075	-1.24	0.216
COVID-19 loss							0.011	0.20	0.845
Risk to self							0.008	0.09	0.928
Risk to other							-0.086	-1.03	0.306
ACEs							0.291	4.20	<0.001
BRS							-0.395	-7.01	<0.001
Quarantine							0.242	4.32	<0.001

Note. N = 595; SES = socioeconomic status; ACEs = Adverse Childhood Experiences; BRS = Brief Resiliency Scale.

3.1.5 Substance Use

As depicted in Table 6, the effects of demographics, risk and protective factors, and quarantine have on substance use were examined. In Model 1, demographic factors contributed significantly, accounting for 15.00% of the variance in substance use (R^2 = 0.15; $F_{5,213}$ = 7.40, p < 0.001*).* Significant predictors included SES (β = -0.269; t = -4.15, $p \leq 0.001$) and age (β = -0.229; t = -3.47, $p \leq 0.001$) as negative predictors of TAPS scores.

Table 6 Predicting Substance Use (Tobacco, Alcohol, Prescription Medication and Other Substances) Through Hierarchical Regression of Demographic Variables, ACEs, BRS, and Risk Factors for Oneself and Others.

Variable	*F*	*df*	*sig*	*R*	R^2	ΔR^2	β	*t*	Sig.
Model 1	7.40	5, 213	<0.001	0.39	0.15	0.15			
Age							-0.229	-3.47	<0.001
Gender							-0.077	-1.21	0.229
Ethnicity							-0.076	-1.16	0.246
SES							-0.269	-4.15	<0.001
COVID-19 loss							0.004	0.06	0.953
Model 2	2.83	9, 209	0.026	0.44	0.19	0.04			
Age							-0.193	-2.82	0.005

Gender							-0.080	-1.28	0.203
Ethnicity							-0.077	-1.18	0.239
SES							-0.197	-2.82	0.005
COVID-19 loss							-0.001	-0.02	0.987
Risk to self							0.005	0.05	0.959
Risk to other							-0.110	-1.15	0.251
ACEs							0.253	3.19	0.002
BRS							-0.007	-0.15	0.917
Model 3	14.69	10, 208	<0.001	0.50	0.25	0.05			
Age							-0.231	-3.45	<0.001
Gender							-0.103	-1.68	0.095
Ethnicity							-0.086	-1.36	0.174
SES							-0.206	-3.05	0.003
COVID-19 loss							0.042	0.67	0.505
Risk to self							0.028	0.29	0.769
Risk to other							-0.128	-1.38	0.171
ACEs							0.232	3.01	0.003
BRS							-0.009	-0.15	0.880
Quarantine							0.238	3.83	<0.001

Note. N = 595; SES = socioeconomic status; ACEs = Adverse Childhood Experiences; BRS = Brief Resiliency Scale.

In Model 2 risk and protective factors were entered and there was a significant increase in R^2 (R^2 = 0.19, ΔR^2 = 0.04; $F_{4,209}$ = 2.83, p = 0.026), making up an additional 4.00% of the variance. Demographic factors maintained their significance (SES: β = -0.197, t = -2.82, p = 0.005; age: β = -0.193, t = -2.82, p = 0.005); ACEs (β = 0.253; t = 3.19, p = 0.002) became a positive predictor of TAPS scores.

Model 3 added COVID-19 quarantine, and predictive power increased (R^2 = 0.25, ΔR^2 = 0.05; $F_{1,208}$ = 14.69, p < 0.001). Demographic and risk factors maintained their significance (SES: β =-0.206, t = -3.05, p = 0.003; age: β = -0.231, t = -3.45, $p \leq 0.001$; ACEs: β = 0.232, t = 3.01, p = 0.003). Quarantine became a positive predictor (β = 0.238; t = 3.83, $p \leq 0.001$). These four variables accounted for 24.00% of the variance in TAPS scores. Of these predictors, quarantine was ordinally highest (β = -0.238), followed by ACEs (β = 0.232), age (β = 0.231), and SES (β = -0.206).

3.2 Demographic Predictors

Among demographic variables, age, gender, ethnicity, and SES were significant predictors. In Models 1, Age and SES predicted all criteria, while ethnicity only predicted GAD-7 and gender only predicted CPTSD. Age continued to predict GAD-7 and PTSD in Models 3. Gender was not a predictor in Models 3, but ethnicity continued to be significant as a predictor of GAD-7 in Model 3. Finally, SES only predicted PHQ-9 in Model 3. On the whole, demographic variables were very weak predictors or did not predict mental health symptoms in this US adult sample.

In all, risk and protective factors were the biggest predictors of adverse mental health effects during COVID-19. Demographic factors such as age and socioeconomic status were weakly

significant predictors of some symptoms and inversely related to them. Lastly, quarantine was a significant moderating factor that added significant predictive variance with small effect sizes for all dependent measures of mental health symptoms.

4. Discussion

It was hypothesized that engagement in the social limitations of mandated quarantine measures during COVID-19 resulted in adverse mental health effects among United States adults. Results for the present US adult sample suggested that quarantine had a significant effect as a moderating variable, and accounted for some of the variance; but historical events were bigger predictors of these adverse mental health effects. The effect size of quarantine was small (ΔR^2 ranged from 0.05 to 0.09 and β ranged for 0.24 to 0.30) but consistent across all criterion variables, including self-reported depression, anxiety, simple and complex PTSD, and substance use symptoms.

Results indicated that resilience was the strongest predictor of anxiety and complex PTSD symptoms. Resilience was also a strong predictor for symptoms of depression and simple PTSD, although ACEs scores were stronger for both of these. The inverse relationship between resiliency and the above mental health symptoms suggested that the stronger one's ability to cope with and recover from stressful situations, the less likely they were to experience adverse mental health effects due to COVID-19 quarantines. These findings were consistent with and support resiliency research (e.g., [38]) and with research suggesting that social engagement increases resiliency thus reducing adverse mental health effects (e.g., [39]).

An interesting finding in this study was that resiliency was not a predictor of substance use. Prior studies found acquired resiliency is a better predictor of substance use recovery than innate resiliency [40, 41]. Current literature used the BRS and it is unclear what type of resiliency the BRS measures; however, the form or resiliency may be important for interpretation of this study's results.

Results also identified ACEs as a predictor of all adverse mental health effects measured in this study. This suggested that individuals with high amounts of distressful experiences in their childhood were more likely to experience mental health symptomology during COVID-19. ACEs scores were the strongest predictor of depression and simple PTSD symptomology; they were the second strongest predictor of anxiety, complex PTSD symptoms, and substance use. These findings support the extensive existing literature about the adverse effects of ACEs that links ACE scores with greater mental and physical health complications (e.g., [42, 43]).

Although pre-existing events and characterological traits (ACEs and resiliency) accounted for most of the variance in each outcome measure, the data supported the researchers' hypothesis that quarantine had a significant adverse effect on mental health symptoms across clusters. Quarantine was the strongest predictor of substance use, and the third strongest predictor of depression, anxiety, and both simple and complex PTSD symptoms. The relationship between quarantine and mental health symptoms was positive, indicating that quarantine is a significant moderating factor that likely exacerbated mental health and substance symptoms. These findings supported and added to the expanding literature about the adverse mental health effects of COVID-19 [6-9, 13, 39, 44]. These findings, in conjunction with robust research about the negative health and social outcomes of those with high ACE scores [24, 42, 43], are generally consistent with the theory of Bernardini et al. [21] that COVID-19 social policies would have prolonged adverse effects on mental health.

Age and socioeconomic status were significant predictors of all measured mental health and substance symptoms in Models 1. Age remained a significant predictor of anxiety and simple PTSD in Models 3, while socioeconomic status did not remain significant for Models 3, possibly due to shared variance with resilience. Ethnicity consistently predicted anxiety.

A few studies have examined the role of mediator and moderator variables on mental health outcomes. For example, Zhao and Zhou [45] found that greater media use was associated poorer mental health and that negative affect exacerbated this effect. Babore et al. [46] reported that mothers' parenting stress was a predictor of child mental health- during COVID-19.

Ikegami et al. [23] found that among a Japanese population-based sample job stress scores were lower among office workers who were allowed to be more frequent telecommuters; paralleling the present findings, their findings further underscore the role of COVID-19 social policies in moderating distress during this period. In particular, the present findings support those of Haver et al. [22] that emotional regulation moderated the relationship between COVID-19 stresses and mental distress.

Limitations for this study included the fact that all data were derived from self-reports. In addition, as discussed in the methodology, many of the questionnaire's instructions were altered to better measure the entirety of COVID-19 and quarantine. Additionally, the researcher used "I do not feel well represented, I identify as __," instead of "other" as an option for gender and ethnicity in the demographic survey. These deviations from standardization and customary data collection may have altered effects of these measurements, thus altering the results of this study. Other limitations include limited access to the survey. The survey was distributed with respect to social distancing standards and accessed only online. This may have excluded transient and other populations with limited access to computer or the internet; more specifically, results will generalize best to individuals who are disposed to participate in on-line surveys such as those administered by Qualtrics. Lastly, this study did not assess the amount and kind of subsidies participants received, if any, during the pandemic which may have effected participants' level of distress during COVID-19.

This study appears to be unique in its examination of the effects COVID-19 quarantine had on mental health and substance abuse symptoms as it is differentiated from the overall traumatic stress of the pandemic. By measuring compliance with quarantine mandates, such as social distancing, masking, working remotely, and limiting the number of social contacts, this study was able to assess the extent to which adherence to such measures exacerbated stress and mental health conditions during COVID-19. The findings of this study support the hypothesis that quarantine exacerbated mental health symptoms, especially in adults who have had adverse childhood experiences and less ability to cope with and recover from stressful situations. Much like the effects of adverse childhood experiences, the traumatic stress COVID-19 induced on many populations will likely continue long after the pandemic subsides [47]. The findings of this study are important because they examined contextual factors during COVID-19 and confirmed quarantine as a significant moderating factor.

This study also had several implications for future research and clinical practice. Due to the significant predictor of resiliency, future research may focus on best practices for fostering resiliency, especially in populations with adverse childhood experiences or communities disproportionately impacted by COVID-19. Clinically, this may include increasing access to mental health care through group therapy, practicing social engagement, increasing distress tolerance, and advocating for better subsidies for these populations. Furthermore, because the psychological effects of COVID-19 may linger after the pandemic, continued research and clinical practice may include early

intervention in these populations to assist in altering the cycle of intergenerational and enduring trauma. Lastly, future research may examine the prevalence of these symptomologies in the coming years and determine if there are changes in certain symptoms, thus further examining professional opinions of COVID-19's lingering effects.

5. Conclusions

In an adult US sample, COVID-19 quarantine was consistently associated with small incremental adverse mental health outcomes in terms of anxiety, depression, simple and complex PTSD, and substance use after controlling for demographic characteristics, childhood adversity, and resilience. Interventions that foster resilience, distress tolerance, and enhanced social engagement are likely to benefit individuals who were adversely affected by enforced COVID-19 quarantines.

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Author Contributions

Shelby Rubino conceptualized and carried out data gathering and preliminary presentation of the study results. She also led in refinement of the manuscript for this version. Rodger K Bufford contributed to the study's conceptualization, data analysis, synthesizing results, editing and refining this document.

Competing Interests

The authors have declared that no competing interests pertain to this study.

Additional Materials

The following additional materials are uploaded at the page of this paper.

1. Table S1: Covid-19 Pandemic Mental Health Questionnaire Items and Response Alternatives.

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