Psychiatry Research 290 (2020) 113172

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

Factors associated with depression, anxiety, and PTSD symptomatology during the COVID-19 pandemic: Clinical implications for U.S. young adult mental health

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ARTICLE INFO

Keywords:
Psychological stress, Loneliness
University health services
Social support
Ethnicity
COVID-19
Depression
Anxiety
PTSD

ABSTRACT

This study sought to identify factors associated with depression, anxiety, and PTSD symptomatology in U.S. young adults (18-30 years) during the COVID-19 pandemic. This cross-sectional online study assessed 898 participants from April 13, 2020 to May 19, 2020, approximately one month after the U.S. declared a state of emergency due to COVID-19 and prior to the initial lifting of restrictions across 50 U.S. states. Respondents reported high levels of depression (43.3%, PHQ-8 scores ≥ 10), high anxiety scores (45.4%, GAD-7 scores ≥ 10), and high levels of PTSD symptoms (31.8%, PCL-C scores ≥ 45). High levels of loneliness, high levels of COVID-19-specific worry, and low distress tolerance were significantly associated with clinical levels of depression, anxiety, and PTSD symptoms. Resilience was associated with low levels of depression and anxiety symptoms but not PTSD. Most respondents had high levels of social support; social support from family, but not from partner or peers, was associated with low levels of depression and PTSD. Compared to Whites, Asian Americans were less likely to report high levels across mental health symptoms, and Hispanic/Latinos were less likely to report high levels of anxiety. These factors provide initial guidance regarding the clinical management for COVID-19-related mental health problems.

1. Introduction

The COVID-19 pandemic that has upended the lives of individuals worldwide escalated in the U.S. beginning in March of 2020. Although research on acute and widescale stressors (e.g., natural disasters), demonstrates severe implications for mental health (Kessler et al., 2008), there is no precedent for understanding the mental health effects due to COVID-19, as prospective studies investigating the effects of a pandemic are virtually non-existent. In particular, the identification of risk factors associated with depression, anxiety, and post-traumatic stress disorder (PTSD) among U.S. young adults (18-30 years) during the pandemic is urgently needed. Comprising more than one-third of the current U.S. workforce, young adults (often referred to as "Millennials" and "Generation Z") will be a dominant workforce group for the next decade, and our societal functioning depends on how they emerge from the pandemic. Understanding their health and well-being now is crucial as it sets the stage for later outcomes.

Certain risk and protective factors are likely to be implicated in pandemic-related mental health. COVID-19-related worry (e.g., maintaining employment, getting tested for coronavirus) may be linked to mental health symptoms. The early weeks of the pandemic saw rapid changes in daily routines, with students moving following university closures and attending classes remotely, and for other young adults, transitioning to remote work or experiencing loss of work. These disruptions may put an already vulnerable group at greater risk for mental health challenges (Conrad, 2020). Furthermore, loneliness may be particularly prevalent and devastating during the pandemic given directives for social distancing and isolation. Those under the age of 25 already show elevated levels of loneliness (Domagala-Krecioch and Majerek, 2013), and the pandemic may exacerbate these feelings. Despite the critical role that social support plays in mitigating the risks to mental health problems, directives on social distancing may impede on

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https://doi.org/10.1016/j.psychres.2020.113172
Received 28 April 2020; Received in revised form 30 May 2020; Accepted 30 May 2020
Available online 01 June 2020
0165-1781/

one's typical means for obtaining such support.

Individual resilience, which refers to one's ability to cope with stress, and distress tolerance, which describes one's ability to manage and tolerate emotional distress, may be salient characteristics that protect against the mental health symptoms that follow major stressors. Individual resilience is a significant protective factor for depression, PTSD, and general health after natural disasters (Kukihara et al., 2014). Findings have generally demonstrated distress tolerance to be associated with lower symptoms of depression and PTSD following tornadoes (Cohen et al., 2016). However, the extent to which these factors are associated with mental health symptoms during a pandemic is unknown.

This study sought to identify potential factors that contribute to mental health outcomes among young adults during the COVID-19 pandemic. The CARES 2020 Project (COVID-19 Adult Resilience Experiences Study, www.cares2020.com) was launched to track the health and well-being of young adults in the U.S. across multiple time points in 2020 and 2021. This present analysis assessed depression, anxiety, and PTSD symptomatology, and psychological experiences including distress tolerance, resilience, social support, and loneliness. We included depression and anxiety as these are common mental health symptoms among young adults (Blazer et al., 1994; Chen et al., 2019; Eisenberg et al., 2007; Liu et al., 2019; Mojtabai et al., 2016). We assessed PTSD symptoms given documented high rates of trauma by young adulthood (Costello et al., 2002; Reynolds et al., 2016; Vrana and Lauterbach, 1994); a concern was that the pandemic would either create and/or exacerbate symptoms related to prior trauma (Breslau et al., 2008, 1999; Brunet et al., 2001). New items that assessed COVID-19-specific concerns were also included. The objective of this work is to identify salient psychosocial risks for mental health symptoms and to prioritize intervention targets for addressing mental health symptoms among young adults.

2. Methods

2.1. Study population

This present cross-sectional study assessed potential risk and protective factors for mental health outcomes based on preliminary CARES 2020 data obtained from Wave 1 data collection ($N = 898$) conducted from April 13, 2020 to May 19, 2020, approximately one month after the U.S. declared a state of emergency due to COVID-19 and prior to the initial lifting of restrictions across 50 U.S. states. Eligible participants were young adults aged 18 to 30 years currently living in the U.S. or receiving education from a U.S. institution. Participants were recruited online via email list serves, social media, and word of mouth (i.e., list serves and Facebook groups for school organizations or clubs, alumni groups, classes, churches). This took place initially through organizations from the New England area before additional list serves from other regions of the U.S. (Midwest, South, and West) were targeted. Respondents were asked to complete a 30-minute online Qualtrics survey regarding COVID-19-related experiences, risk and resilience, and physical and mental health outcomes. To ensure data quality, human verification and attention checks were implemented throughout the survey; the data were further inspected visually for response irregularities indicative of bots. Participants were compensated via raffle in which one out of every 10 participants received a $25 gift card. All procedures were approved by the Institutional Review Board at Boston University.

2.2. Measures

Binary scores were created after calculating the mean or sum of each measure. Rather than relying on the sample characteristics to categorize our data (e.g., mean, median, tertile or quartile split), the determination of the cutoff score was based on standard cutoffs from previous research; when a standard was not available, scale response descriptors to determine the cutoffs.

2.2.1. Risk and protective factors

Psychological resilience was measured using the 10-item Connor-Davidson Resilience Scale (CD-RISC-10, Connor and Davidson, 2003), which assesses one's ability to cope with adverse experiences. Participants indicated how they felt in the past month on a 5-point scale, with 0 indicating “not true at all” and 4 indicating “true nearly all the time.” Sum scores were recoded dichotomously into “high resilience” and “low resilience” with a cutoff score of 30 or greater. This cutoff score characterizes responses that tended to be “often true” and “true nearly all the time,” with those endorsing a score ≥ 30 considered to be at “very high risk with mental disorders” (Andrews and Slade, 2001; Kessler and Mroczek, 1992).

The Distress Tolerance Scale is a 15-item measure that assesses participants’ abilities to withstand and cope with emotional distress (Simons and Gaher, 2005). Respondents rated personal attitudes towards feelings of emotional distress on a 5-point scale, ranging from 1 (“strongly agree”) to 5 (“strongly disagree”), with higher ratings indicating greater distress tolerance. A global mean score of distress tolerance was calculated. We considered the scale descriptors and followed the cutoffs used for the CD-RISC, which was also a 5-point scale. As such, scores were dichotomously recoded so that global mean scores less than 4 indicated “low distress tolerance” and scores of 4-to-5 indicated “high distress tolerance.”

Perceived social support was measured using the Multidimensional Scale of Perceived Social Support (MSPSS, Zimet et al., 1988), in which participants rated perceived emotional support using a 7-point Likert scale ranging from 1 (“very strongly disagree”) to 7 (“very strongly agree”). This measure includes three subscales assessing perceived support quality from family, friends, and partners. Because mean scores greater than 5 reflected responses indicating “mildly agree,” “strongly agree,” and “very strongly agree,” each subscale mean scores were recoded so that scores 5 or greater referred to “high perceived social support,” and scores below 5 were referred to as “low perceived social support.”

Instrumental support was assessed through a 4-item subscale of the Two-Way Social Support Scale (Shakespeare-Finch and Obst, 2011). Participants indicated the extent of they received instrumental support based on a 6-point Likert scale ranging from 0 (“not at all”) to 5 (“always”). Items were summed to create a total score with a possible range of 0 to 20. Given scale descriptors, a cutoff score with a sum of 16 or greater indicated “high instrumental support,” whereas scores lower than 16 indicated “low instrumental support.”

Loneliness was measured using an adapted 3-item version of the UCLA Loneliness Scale Short Form (Hughes et al., 2004). Participants rated lack of companionship, feelings of being left out, and isolation from others on a scale of 1-to-3, with 1 as “hardly ever,” 2 as “some of the time,” and 3 as “often.” A sum score for loneliness was calculated with a total possible range of 3 to 9 and recoded dichotomously; a cutoff score of 6 or greater indicated “high loneliness” as used in prior studies (Lowthian et al., 2016; Tymoszuk et al., 2019).

Severity of COVID-19 pandemic-related worry was assessed using a newly developed measure consisting of 6 items, which included the following concerns: “Having enough groceries during city lockdowns/social distancing protocols”, “obtaining a COVID-19 test if I become sick”, “getting treated for COVID-19 if I contract it”, “keeping in touch with loved ones during social distancing protocols”, “maintaining employment during the subsequent economic downturn”, and “having enough money to pay for rent and buy basic necessities.” Participants were asked to indicate their level of worry for each item on a scale of 1 to 5, with 1 being “not worried at all,” and 5 being “very worried.” Sum scores were calculated with a total possible range of 6 to 30 and recoded into a dichotomous variable with a cutoff score of 24 or greater as “highly worried.” Cronbach's alpha for measure items was .70,

indicating good reliability.

2.2.2. Mental health outcomes

Depression was assessed with the 8-item version of the Patient Health Questionnaire (PHQ-8, Kroenke et al., 2009) which assessed frequency of depressive symptoms in the past two weeks on a scale of 0 ("not at all") to 3 ("nearly every day"). Sum scores of the PHQ-8 had a total possible range of 0 to 24 and were recoded dichotomously based on a cutoff score of 10 or higher (Wu et al., 2019).

Anxiety was assessed with the Generalized Anxiety Disorder Scale (GAD-7, Spitzer et al., 2006) a widely used measure assessing the frequency of anxiety symptoms in the past two weeks on a scale of 0 to 3, with 0 being "not at all" and 3 being "nearly every day." Sum scores ranged from 0 to 21. Following the convention of other studies (Plummer et al., 2016), responses were recoded dichotomously based on a cutoff score of 10 or higher to determine elevated anxiety.

The PTSD Checklist—Civilian Version (PCL-C), a validated 17-item measure, was administered to assess PTSD symptoms (Weathers et al., 1993). Participants indicated how much they were bothered by problems and experiences in response to stressful life events in the past month, with 1 as "not at all" and 5 as "extremely." Sum scores of the 17 items were calculated and created into a dichotomous variable with a cutoff score of 45 or greater, based on the psychometric properties for the measure and as suggested by the National Center for PTSD (Blanchard et al., 1996).

2.2.3. Statistical analyses

The variables were normally distributed, with predictors indicating acceptable levels of collinearity (VIF < 5). To identify potential risk and protective factors of mental health symptoms, three logistic regression models were performed to examine depression, anxiety, and PTSD symptoms as primary outcomes. Resilience, distress tolerance, perceived social support, instrumental social support, loneliness, and COVID-19-specific worry were entered as predictors in unadjusted models. Age, gender, income, and race were entered in each of the three adjusted models. All variables were binary with exception to age and income, which were continuous. Two-tailed p-values were used. To guard against Type I error, Bonferroni-adjustments were made to consider the 8 predictors and 4 covariates used in each model (.05/12 = .004). Our results and interpretations are therefore based on a significance set at $p < .004$ (note that the significance in the tables remain unadjusted to provide more rather than less information to the reader). All analyses were performed using SPSS 25.0.

3. Results

Table 1 shows demographic characteristics of our participants and descriptive data on all predictors and outcomes. The sample was racially and ethnically diverse, with 59.6% White, 21.2% Asian, 5.3% Black, 6.0% Hispanic/Latino, 0.1% AI/NA, 6.2% mixed race, and 1.4% indicating another race. The majority of respondents were women (81.3%), U.S.-born (86.3%), employed (66.7%), students (61.3%), and those who earned less than $50,000 per year (82.1%). Among those identifying as students, 89.7% were enrolled as full-time and 7.3% were international students. Overall, participants scored as having high loneliness (61.5%), low resilience (72.0%), and low distress tolerance (74.1%). At the same time, the majority of respondents reported having high levels of social support (family, partners, peer, and instrumental). Finally, 43.3% of our sample had high levels of depression (PHQ-8 scores ≥ 10), 45.4% had high anxiety scores (GAD-7 scores ≥ 10) and 31.8% had high levels of PTSD symptoms (PCL-C scores ≥ 45).

Table 2 displays the associations between predictors and mental health outcomes in each of the three models adjusted for the age, gender, race, and income. The results described here pertain only to significance set at $p < .004$ with Bonferroni corrections. Predictors that were significantly associated with depression, anxiety, and PTSD

Table 1
Demographic characteristics and variable descriptives from Wave 1 of CARES 2020.

Factors	Means (range) or %
Age (years)	24.5 (18.0 – 30.9)
18-21	28.6 %
22-26	34.7 %
26-30	36.6 %
Gender	
Men	14.1 %
Women	81.3 %
Other gender	4.6 %
Race	
White	59.6 %
Asian	21.2 %
Black	5.3 %
Hispanic or Latinx	6.0 %
American Indian/Native American	0.1 %
Mixed	6.2 %
Other	1.4 %
U.S.-born	
Yes	86.3 %
No	13.7 %
Employed	
Yes	66.7 %
No	33.3 %
Individual Income (USD/year)	
No income	11.8 %
< $25,000	45.9 %
$25,000 - $49,999	24.4 %
$50,000 – $74,999	11.6 %
$75,000 – $99,999	2.6 %
$100,000 – $124,999	2.1 %
$125,000 – $149,999	0.3 %
$150,000 - $174,999	0.3 %
$175,000 - $199,999	0.6 %
$200,000 - $249,999	0.2 %
≥ $250,000	0.2 %
Student	
Yes	61.3 %
No	38.7 %
Student Enrollment Status (students only)	
Full time	89.7 %
Part time	8.7 %
Other	1.6 %
International Student	
Yes	7.3 %
No	92.7 %
Loneliness (LS-SF)	6.1 (3.0 – 9.0)
< 6	38.5 %
≥ 6	61.5 %
COVID-19-specific worry	15.9 (6.0 – 30.0)
< 24	89.9 %
≥ 24	10.1 %
Resilience (CD-RISC-10)	26.0 (4 – 40)
< 30	72.0 %
≥ 30	28.0 %
Distress tolerance (DTS)	3.3 (1.0 – 5.0)
< 4	74.1 %
≥ 4	25.9 %
Family social support (MSPSS)	5.1 (1.0 – 7.0)
< 5	37.3 %
≥ 5	62.7 %
Partner social support (MSPSS)	5.6 (1.0 – 7.0)
< 5	26.3 %
≥ 5	73.7 %
Peer social support (MSPSS)	5.7 (1.0 - 7.0)
< 5	16.9 %
≥ 5	83.1 %
Instrumental social support (2-Way SSS)	16.6 (1.0 – 20.0)
< 16	30.1 %
≥ 16	69.9 %
Depression (PHQ-8)	9.0 (0 – 24.0)
< 10	56.7 %
≥ 10	43.3 %
Anxiety (GAD-7)	9.4 (0 - 21.0)
< 10	54.6 %

(continued on next page)

Table 1 (*continued*)

Factors	Means (range) or %
≥10	45.4 %
PTSD (PCL-C)	38.3 (17.0 – 85.0)
<45	68.2 %
≥45	31.8 %

N = 898

included loneliness (OR range = 1.98 – 2.72), COVID-19-specific worry (OR range = 2.87 – 5.05), and distress tolerance (OR range = 0.22 – 0.42). Specifically, those who endorsed high levels of loneliness and worries about COVID-19 and low levels of distress tolerance were more likely to score above the clinical cutoffs for depression, anxiety, and PTSD. Those with high levels of resilience were less likely to score above the cutoff for depression and anxiety. Those with high levels of family support were less likely to score above the clinical cutoff for depression and PTSD (OR = 0.46 and 0.44, respectively). Instrumental support was negatively associated with depression. No associations were obtained between support from partners and friends.

In analyses of associations between covariates and outcomes, age and income were not associated with depression, anxiety, or PTSD. With regard to gender, men who identified as transgender were more likely to report high levels of PTSD (OR = 4.20, CI = 1.62 – 10.89, $p = .003$); no differences were observed between men and women. Asian Americans compared to Whites were less likely to report high levels of depression (OR = 0.50, CI = 0.33 – 0.76, $p = .001$) and PTSD (OR = 0.40, CI = 0.25 – 0.64, $p < .001$). Asians Americans and Hispanic/Latinos were less likely to report high levels of anxiety (OR = 0.35, CI = 0.24 – 0.53, $p < .001$, OR = 0.35, CI = 0.18 – 0.68, $p = .00$, respectively).

4. Discussion

Our findings highlight major psychological challenges faced by young adults during the initial weeks of the COVID-19 pandemic. At least one-third of young adults reported having clinically elevated levels of depression (43.3%), anxiety (45.4%), and PTSD symptoms (31.8%). The rates of depression, anxiety, and PTSD in our study are considerably higher compared to prior studies that have used the same cut points (PHQ-8 ≥ 10; GAD-7 ≥ 10; and PCL-C ≥ 45). For instance, PHQ-8 data collected from a study on U.S. adults in 2006 yielded a prevalence of 6.2% among 18-24-year-olds and a prevalence of 13.1% among 25-34-year-olds (Kroenke et al., 2009). Studies using the GAD-7 showed the following rates among similar groups: U.S. primary care patients (23.0%; Spitzer et al., 2006), U.S. college students (21.0%; Martin et al., 2014), and U.S. non-veteran community college students (17.4%; Fortney et al., 2016). Finally, studies using a cutoff of ≥ 45 on the PCL-C to assess PTSD in trauma survivors showed the following rates: U.S. patients following hospital discharge from traumatic orthopedic injury after one year (22.0%; Archer et al., 2016) and survivors from the Wenchuan, China earthquake also after one year (26.3%; Zhang et al., 2011). The high rates from our sample may reflect ongoing distress, as we measured the symptoms in the weeks following the government directives for closures. Young adults may have been particularly distressed in managing school or work responsibilities during this time while having no sense of certainty regarding the pandemic's end. As well, the high rate of mental health concerns among study participants may be partially attributable to the specific characteristics of our sample; given that the study was launched on the East Coast, our young adult respondents may have been located at pandemic "hot spots," with proximity to a greater number of COVID-19 cases potentially being an added stressor for our sample.

Strikingly, the majority of respondents reported feeling lonely during the first two months of the pandemic, as well as having low resilience and low ability to tolerate distress. However, the majority reported having social support from family, partners, and peers, as well as instrumental support during this time. We note that the absolute rates of low perceived social support seem problematic. For instance, approximately 37% of respondents reported low family support. These

Table 2
Odds ratios and confidence intervals for mental health outcomes from Wave 1 of CARES 2020.

Factors	PHQ-8 – DepressionAdjusted OR[a](95% CI)	GAD-7 – AnxietyAdjusted OR[a](95% CI)	PTSD AdjustedAdjusted OR[a](95% CI)
Loneliness (LS-SF)			
<6	1.0	1.0	1.0
≥6	2.72 (1.92 – 3.87) ***	1.98 (1.41 – 2.77) ***	2.31 (1.55 – 3.43) ***
COVID-19-specific worry			
<24	1.0	1.0	1.0
≥24	2.87 (1.67 – 4.94) ***	4.12 (2.33 – 7.29) ***	5.05 (2.92 – 874) ***
Resilience (CD-RISC-10)			
<30	1.0	1.0	1.0
≥30	0.56 (0.38 – 0.83) **	0.44 (0.30 – 0.64) ***	0.70 (0.46 – 1.07)
Distress tolerance (DTS)			
<4	1.0	1.0	1.0
≥4	0.36 (0.24 – 0.54) ***	0.42 (0.28 – 0.62) ***	0.22 (0.13 – 0.37) ***
Family social support (MSPSS)			
<5	1.0	1.0	1.0
≥5	0.46 (0.32 – 0.66) ***	0.64 (0.44 – 0.91)*	0.44 (0.30 – 0.64)***
Partner social support (MSPSS)			
<5	1.0	1.0	1.0
≥5	1.26 (0.84 – 1.88)	1.32 (0.89 – 1.96)	1.00 (0.66 – 1.52)
Peer social support (MSPSS)			
<5	1.0	1.0	1.0
≥5	1.05 (0.68 – 1.62)	1.27 (0.83 – 1.96)	0.88 (0.56 – 1.39)
Instrumental social support (2-Way SSS)			
<16	1.0	1.0	1.0
≥16	0.60 (0.41 – 0.86)**	0.67 (0.46 – 0.96)*	0.63 (0.43 – 0.93)*

N = 898
* $p < .05$
** $p < .01$
*** $p < .001$ (two-tailed, without Bonferroni adjustment),
[a] Adjusted covariates include age, race, gender, individual income

findings highlight major psychological challenges currently faced by young adults during the initial weeks of the COVID-19 pandemic.

Our study also identified factors associated with clinical levels of depression, anxiety, and PTSD symptoms. High loneliness and low distress tolerance levels were consistently associated with high levels of depression, anxiety, and PTSD. High levels of resilience were associated with low anxiety. Social support from family was associated with low levels of depression and PTSD symptoms, whereas support from partners or friends was not associated with any mental health outcomes. High levels of instrumental support were associated with low levels of depression.

Our data is consistent with findings demonstrating loneliness as a risk factor for mental health (Banerjee et al., 2020; Hawkley and Cacioppo, 2010; Okruszek et al., 2020); this is particularly salient with government directives for social distancing and isolation. Feeling cut off from social groups may lead one to feel vulnerable and pessimistic about one's circumstances, altogether producing negative mood states and anxiety (Muyan et al., 2016) that are further heightened during a pandemic. The high levels of reported loneliness in our sample and its association with depression, anxiety, and PTSD symptoms underscore the severity of experiences of young adults during the pandemic.

Distress tolerance, or one's ability to manage and tolerate emotional distress, was strongly associated low levels of depressive and anxiety, and PTSD symptoms; individual resilience was associated with low levels of depression and anxiety symptoms, but not PTSD. Individual resilience, which encompasses personal competence and trust in one's instincts (Connor and Davidson, 2003), has been associated with low levels of depression, anxiety, and PTSD symptomatology after disasters (Blackmon et al., 2017). One's perceived ability to tolerate negative or aversive emotional and/or physical states may be more protective than the personal qualities that comprise psychological resilience, especially for those experiencing symptoms of PTSD during a pandemic. The pandemic is worldwide stressor without a foreseeable endpoint, and the effects of the pandemic cannot be controlled by a single individual. Furthermore, the pandemic simultaneously impacts various domains (e.g., financial, relational, and health) with this stress potentially exacerbating the sensations associated with PTSD symptoms. As such, psychological resilience that is typically associated with overcoming setbacks may not be sufficient for protecting against PTSD symptoms within the first several weeks of a widespread pandemic. Interventions that target distress tolerance, such as mindfulness-based interventions, may be more effective than cognitive interventions targeting core beliefs about the self especially for those with PTSD symptoms (Nila et al., 2016). Longitudinal approaches would help to examine this possibility further.

Emotional support from family but not from friends and significant others was associated with low levels of depression and PTSD. Friends and significant others may have or are perceived to have less capacity to validate other's emotional experiences during a pandemic, considering that they may be young adults who are experiencing similar struggles. Emotional support provided by family may be more stable and coupled with the provision of material resources that young adults may still receive from parents. Our findings are consistent with prior work showing that family support but not friend and partner support mediates the effects of stress on health (Lee et al., 2018). Family support may be more meaningful in providing reassurance to young adults, considering the possible concrete needs during the pandemic.

Instrumental support, or tangible assistance, may be an important factor for the mental health of young adults during the immediate weeks of the COVID-19 pandemic onset given that many were faced with acute disruptions, such as unemployment, financial stress, and relocation following university campus closures. However, instrumental support was not significantly associated with any of the outcomes after adjusting the p-value to .004. Additional research is needed to clarify the respective roles on both emotional and instrument support given variations in their potential effects on depression, anxiety, and PTSD.

Our newly developed COVID-19-related worry measure uniquely predicted mental health symptoms, underscoring how the specific features of this pandemic give rise to acute stress. The stress resulting from lifestyle changes due to features of COVID-19 itself may lead to greater mental health concerns distinct from the endorsement of other risks. Our analyses showed that the six items in our measure were reliable, and the total subscale score was significantly associated with the symptoms assessed in this study; however, additional work is required to determine the validity of this measure.

In general, Asian Americans were less likely to report high levels of mental health symptoms compared to Whites, with Hispanic/Latinx respondents also being less likely to report high anxiety. Asian and Latinx immigrants compared to those who are born in the U.S. are less likely to endorse psychological distress (Dey and Lucas, 2006; Takeuchi et al., 2007). It is possible that other experiences such as ethnic identity, social networking, and family cohesion serve as a protective factor for mental health, especially for non-U.S.-born participants (Leong et al., 2013). The under-recognition of distress symptoms may also be possible among ethnic minorities (Liu et al., 2020). Although our sample size of gender minorities was small, men who identified as transgender were more likely to report a high level of PTSD symptoms, consistent with prior research (Reisner et al., 2016; Shipherd et al., 2011). Greater attention to gender differences in mental health symptoms as well as a deeper study regarding the specific experiences faced by racial/ethnic and gender minorities during pandemic is warranted.

The cross-sectional design limits our ability to infer causality involved in leading to mental health problems. We used a convenience sample, and caution must be taken in the generalizability of our findings to the broader population of young adults in the U.S. given the uneven sampling of subgroups. The reliance of self-report itself has limitations, such that it may be prone to misinterpretation. Future analyses with the anticipated waves of data collection will enable us to examine the association of our predictors to outcome measures of mental health and to adjust for additional confounds. As well, we will have an opportunity to examine potential moderation effects to understand whether outcomes vary by circumstances or individual characteristics, such as socioeconomic capital, social support type, distress tolerance, and resilience.

To our knowledge, our study is the first prospective cohort study to assess mental health outcomes and risk and resilience factors in U.S. young adults during the first several weeks of the COVID-19 pandemic. In our study, one in three U.S. young adults reported clinical cut-off symptoms of depression, anxiety, and PTSD as well as high levels of loneliness. We present new evidence that signifies the roles of loneliness, distress tolerance, family support, and COVID-19-related worry on mental health outcomes during the first month of the COVID-19 pandemic. Mental health interventions should incorporate these constructs to help mediate the impact of COVID-19 on adverse mental health status among U.S. young adults.

CRediT authorship contribution statement

Cindy H. Liu: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Writing - review & editing, Project administration, Supervision, Funding acquisition. **Emily Zhang:** Data curation, Writing - original draft, Writing - review & editing, Project administration. **Ga Tin Fifi Wong:** Data curation, Writing - original draft, Project administration. **Sunah Hyun:** Writing - review & editing. **Hyeouk "Chris" Hahm:** Conceptualization, Writing - review & editing, Supervision, Funding acquisition.

Declaration of Competing Interest

There are no conflicts of interest to declare.

Acknowledgments

Support for this manuscript was provided through the National Science Foundation (2027553) award (to C.H.L. and H.C.H.), a Mary A. Tynan Faculty Fellowship and a NIMH K23 MH 107714-01 A1 award (to C.H.L.), as well as a T32 MH 16259-39 award (to. S.H.).

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2020.113172.

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