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BRIEF REPORT



Changes in stress predict worse mental health outcomes for college students than does loneliness; evidence from the COVID-19 pandemic

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ABSTRACT

Objectives: Although loneliness and stress have been widely implicated in worse mental health outcomes for college students, the relationship between them remains poorly understood. **Participants:** Data were collected from 111 undergraduates at a large Midwestern university in fall 2019 - winter 2020. A subset (N = 34) of those responded to a follow-up survey during the COVID-19 pandemic (May 2020). **Methods:** At both time points, participants completed measures of loneliness and stress, as well as well-validated measures of depression and anxiety. **Results:** Prior to the pandemic, stress mediated the positive relationship between loneliness and depression. During the pandemic, mental health outcomes, stress, and loneliness all increased. Stress, but not loneliness, predicted college students' worse mental health outcomes during the pandemic. **Conclusions:** Stress plays a key role in college students' worsening mental health. Reducing loneliness may be a potential strategy to mitigate the negative impact of stress on college students' mental health.

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College students are disproportionately susceptible to developing mental health disorders.^{1–3} Although loneliness and stress are key contributors to college students' poorer mental health,^{4,5} the relationship between them is poorly understood. The current study was designed to elucidate the relationship between loneliness, stress, and mental health outcomes in a college population. To gain initial insight into a potential causal pathway between these variables, the study also leveraged follow-up data collected from a subset of the original respondents during the COVID-19 pandemic.

The transition to college is often associated with increased loneliness and stress. Loneliness, or perceived social isolation, has been commonly linked to negative mental health outcomes, notably depression and anxiety.^{6,7} For example, college students who experienced greater loneliness were more likely to experience mental health problems.^{4,8,9} Stress, which also increases in college,^{10–12} has been widely implicated in higher levels of depression and anxiety.^{13,14}

Although loneliness and stress have both been associated with poorer mental health outcomes for college students, it is relatively unknown how, if at all, they might influence one another. One possibility explored in the current investigation is that stress mediates the relationship between loneliness and mental health. Indeed, prior work has demonstrated that loneliness positively predicts students' perceived stress.^{5,15} One reason for this might be that lonely students may feel they do not have sufficient support to cope with their stress. Consistent with this assertion, prior research has shown that having a supportive social network can promote resilience to stress.¹⁶

The current study tested the prediction that stress mediated the relationship between loneliness and mental health by examining loneliness, stress, and mental health (depression, anxiety) together. An ancillary goal of this investigation was to provide preliminary insight into a potential causal pathway between these variables by examining changes in loneliness, stress, and mental health during the COVID-19 pandemic. The COVID-19 pandemic provides a natural experiment for verifying the causal relationship between loneliness, stress, and mental health problems because emerging work suggests that these have all increased during the pandemic.^{17–19} Of interest was whether changes in students' loneliness and/or stress before and after the pandemic was associated with worse mental health outcomes during the pandemic.

An important consideration in understanding the impact of the pandemic on college students' mental health is that individual differences contribute to each. For example, the lifetime prevalence in depression and anxiety disorders is 1.5 times higher in women than in men.²⁰ Similarly, prior work suggests that individuals who self-report having previously sought mental health treatment have worse mental health than those who have not.²¹ To account for these differences, the current study leveraged a longitudinal approach.

Methods

From October 2019 to early March 2020, 111 White undergraduates (Mage = 19.09 years, SD = 1.38; 61 women) at a

large public Midwestern university completed self-report measures of their mental health, stress, and loneliness as part of a study examining the relationship between loneliness and stress on mental health. Participants were enrolled in an introductory psychology course, and participated in exchange for partial course credit. The University Institutional Review Board (IRB) approved this study. The order of these measures was randomized across participants. Mental health was assessed using 8-item Patient Health Questionnaire²² and the 7-item Generalized Anxiety Disorder (GAD) scale,²³ well-validated and widely used measures of depression and anxiety, respectively. Respondents also completed the 3-item UCLA Loneliness Scale loneliness²⁴ and the 10-item measure of perceived stress.²⁵ Item reliability on each of these measures was good (Cronbach's $\alpha \geq .80$). Participants also indicated whether they had ever sought mental health treatment (yes/no).

In May 2020, the same 111 undergraduates were re-contacted and invited to participate in an online survey evaluating the impact of social isolation in response to the COVID-19 outbreak on the population. Surveys were completed by 34 (23 female) of the original 111 participants (response rate = 30.6%). Respondents completed the same mental health, stress, and loneliness measures that they completed during the lab testing session. Item reliability on the measures of interest was good (Cronbach's $\alpha > .83$). Baseline (time 1) measures of loneliness, stress, and mental health did not differ between individuals who responded at both waves and individuals who only responded at time 1, all $t_s < 1.2$, $p_s > .24$. This suggests that individuals who responded at both waves were characteristic of the larger sample.

Results

For clarity, the in-person testing session from fall 2019 – winter 2020 is referred to as time 1, and the online survey from May 2020 (during the pandemic) is referred to as time 2.

Mental health prior to the COVID-19 pandemic

At time 1, respondents reported high levels of depression ($M_{PHQ} = 6.59$, $SD = 4.73$) and anxiety ($M_{GAD} = 6.69$, $SD = 4.96$). These levels are higher than typical norms. The PHQ-8 typically yields scores between 0 and 4,²² whereas average GAD performance is about 5.²³ Respondents also experienced relatively high loneliness ($M = 7.24$, $SD = 2.68$) and stress ($M = 26.62$, $SD = 6.49$). No gender differences emerged. Both stress and loneliness levels were higher than those reported by studies with other college populations (e.g., $M_{male} = 17.4$; $M_{female} = 18.4$),²⁵ or a recent study with older adults.²⁶ Approximately 38% ($N = 42$) of respondents indicated that they had previously sought mental health treatment.

Two linear regressions were used to determine whether loneliness and/or stress were associated with depression and anxiety at time 1. Each model controlled for prior mental health treatment and gender. The overall model was

Table 1. Pre-pandemic predictors for college students' mental health ($N = 111$).

	Depression (PHQ)		Anxiety (GAD)	
	β	t	β	t
Loneliness	.24	3.09*	.10	1.18
Stress	.53	6.50**	.60	7.02**
Prior MH treatment	-.15	-2.29*	-.17	-2.31*
Gender	.02	.28	.09	1.28

Dummy variables were used for gender (0 = female, 1 = male) and prior mental health (MH) treatment (1 = yes, 2 = no).

* $p < .05$. ** $p \leq .001$.

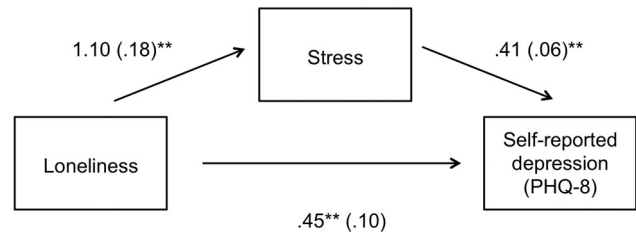


Figure 1. Stress mediated the relationship between college students' ($N = 111$) loneliness and depression at time 1 (prior to the pandemic).

significant for depression: $F(4,109) = 32.57$, $p < .001$, $R^2 = .55$, and anxiety: $F(2,109) = 26.48$, $p < .001$, $R^2 = .50$. In both models, perceived stress was associated with mental health outcomes. Loneliness was significantly associated with depression, but not anxiety. Gender was not a significant predictor of either mental health outcome, although having previously sought mental health treatment was associated with higher depression and anxiety. See Table 1 for regression statistics.

Mediation analyses were then conducted for depression to determine whether stress mediated the relationship between loneliness and depression. Mediation analyses were conducted using PROCESS with 1000 bootstrap samples.²⁷ As predicted, stress mediated the relationship between loneliness and depression ($B = .45$, $SE = .10$, 95% CI [.28, .65]). See Figure 1.

Mental health during the COVID-19 pandemic

Respondents reported higher depression ($M_{Time 1} = 5.85$, $SD = 5.09$; $M_{Time 2} = 8.91$, $SD = 5.42$; $t(33) = 2.77$, $p = .009$, 95% CI [.81, 5.31]) and anxiety ($M_{Time 1} = 6.41$, $SD = 5.14$; $M_{Time 2} = 8.91$, $SD = 6.23$; $t(33) = 2.21$, $p = .034$, 95% CI [.20, 4.80]) during the pandemic than they had experienced prior. They also experienced increased loneliness ($M_{Time 1} = 7.24$, $SD = 2.68$; $M_{Time 2} = 8.87$, $SD = 3.27$; $t(33) = 2.75$, $p = .01$, 95% CI [.39, 2.6]) and stress ($M_{Time 1} = 26.62$, $SD = 6.49$; $M_{Time 2} = 30.26$, $SD = 6.41$; $t(33) = 2.53$, $p = .02$, 95% CI [.71, 6.59]). Approximately 44% ($N = 15$) of respondents in this sample indicated that they had previously sought mental health treatment.

Of interest, though, was whether increases in depression or anxiety between time 1 and time 2 were attributable to changes in loneliness or stress, which both increased during the pandemic. Difference scores were created for mental health, loneliness, and stress (time 2 – time 1), and used in the regression, controlling for prior mental health treatment

Table 2. Predictors for changes in college students' mental health (Δ Depression, Δ Anxiety) during the pandemic as a function of changes in loneliness (Δ Loneliness) and stress (Δ Stress).

	Δ Depression (PHQ)		Δ Anxiety (GAD)	
	β	t	β	t
Δ Loneliness	.33	1.81	.38	2.07*
Δ Stress	.41	2.25*	.39	2.12*
Prior MH treatment	.32	2.44*	.18	1.38

Change is modeled as a difference score (time 2 – time 1). Prior mental health (MH) treatment (1 = yes, 2 = no) is modeled based on self-reported mental health history in time 2. N = 33.

* $p < .05$.

at time 2. The overall model was significant for depression: $F(3,33) = 10.18$, $p < .001$, $R^2 = .50$, and anxiety: $F(3,33) = 9.85$, $p < .001$, $R^2 = .50$. Increased stress was associated with worse mental health outcomes in both models (both β s $> .38$), whereas increased loneliness was only associated with anxiety, $\beta = .28$, and not associated with depression, $\beta = .33$. See Table 2 for regression statistics. Although prior mental health treatment was associated with changes in depression, it was not associated with changes in anxiety. Intriguingly, the impact of prior treatment at time 2 was in the opposite direction than time 1 such that individuals who had not sought prior mental health treatment saw greater increases in depression ($\beta = .32$).

Discussion

Together, these findings suggest that change in stress play a central role in predicting college students' worse mental health outcomes. Specifically, stress was associated with higher depression and anxiety among college students prior to the pandemic. Although loneliness was also associated with higher levels of depression prior to the pandemic, the relationship between loneliness and depression was mediated by stress. Moreover, although loneliness and stress increased during the COVID-19 pandemic,^{17–19} stress, not loneliness, was associated with increased depression and anxiety during the pandemic.

The finding that stress was associated with worse mental health outcomes at time 1 is consistent with prior work implicating stress in college students' increased depression and anxiety.²⁸ An important contribution of the current work is that it suggests that loneliness may just be one factor that influences stress. This could explain why stress, but not loneliness, consistently predicted worse mental health outcomes at time 1 and 2, but loneliness was only associated with certain mental health outcomes (e.g., depression at time 1). Importantly, stress mediated the relationship between loneliness and greater depression at time 1. Loneliness may therefore be considered as a factor that exacerbates stress. In that case, interventions that reduce loneliness may be one potential target for alleviating college students' stress, and, ultimately, be protective against worsening mental health outcomes. Consistent with this assertion, prior research has shown that having a supportive social network, which is associated with less perceived loneliness, can promote resilience to stress.¹⁶

An unexpected finding from the current study was that having previously sought mental health treatment was associated with greater depressive symptoms at time 1, but lower depressive symptoms at time 2. Although speculative, one possibility for this discrepancy may be due to the unique nature of the pandemic. Pandemic-related stressors were expected to exacerbate mental health problems,²⁹ but some individuals may have been more at risk than others. Future research should examine this possibility.

There are several limitations that should be noted in the current study. First, because the number of respondents in the time 2 sample was relatively low (N = 34), null findings should be interpreted with caution. Second, although time 1 and 2 data, were collected via the same virtual platform (Qualtrics), it is possible that the different recruitment modalities (in lab versus online) might have influenced responses.

Together, the results of this study suggest that both loneliness and stress contribute to college students' worse mental health outcomes, but increased stress during college may have particularly pernicious consequences for students' mental health. However, reducing loneliness may provide college students with an important coping strategy to reduce their stress, and, ultimately, serve a protective role against developing mental health problems.

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Conflict of interest disclosure

The authors have no conflicts of interest to report. The authors confirm that the research presented in this article met the ethical guidelines, including adherence to the legal requirements, of the United States of America and received approval from the Institutional Review Board at Indiana University.

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