

Attitudes toward COVID-19 restrictions and COVID-19-related stress and fear among college students across three waves

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Abstract

Background and Aims: The COVID-19 pandemic has significantly impacted the mental health of college students, leading to increased psychological distress. This study explored potential predictors to better understand the factors that influence and mitigate student COVID-19 stress in the evolving landscape of residential colleges. Specifically, we investigated the roles of COVID-19 fear, loneliness, and attitudes toward COVID-19 restrictions.

Methods: Employing a longitudinal online survey design, we collected data over the fall 2020 semester from 122 first-year college students enrolled in a small mid-west liberal arts college. Participants completed the same survey three times: Wave 1 in August, Wave 2 in October, and Wave 3 in November.

Results: Fear of COVID-19 (Time 1) was a significant predictor of increased COVID-19 related stress at both Time 2 and Time 3. Interestingly, loneliness (Time 1) moderated the effect of fear of COVID-19 (Time 1) on attitudes toward COVID-19 restrictions at Time 2. Moreover, students' negative attitudes toward COVID-19 restrictions and feelings of loneliness increased over the course of the semester.

Conclusions: These findings suggest that college students' wellbeing in the context of COVID-19 stress is influenced by a complex interplay of perceptions of COVID-19 (stress, fear, attitudes) and feelings of social isolation (loneliness). Further research in this area is crucial to provide targeted support and interventions to promote students' mental health.

KEYWORDS

attitudes toward COVID-19 restrictions, college students, COVID-19 stress, fear of COVID-19, loneliness

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1 | INTRODUCTION

As of March 2021, COVID-19 has caused over 2.8 million deaths globally¹ and has led to increased psychological distress and declines in mental health.^{2,3,4} Early in the pandemic (March 2020 onwards), factors such as the direct health impacts of the virus, social distancing measures, reduced interpersonal interactions, and global financial consequences (e.g., job losses) likely contributed to deteriorating mental health.^{5,6} Recent research has indicated age differences in the impact of COVID-19 on mental health. For instance, Pieh et al.⁷ found that adults in Austria under 35 years were more likely to report symptoms of depression and anxiety in April 2020 compared to those over 35 years. Additionally, Gen Z adults (age 18–24) in the United States, representing a substantial portion of college students,⁸ were reported to experience worsened mental health since the pandemic's onset.²

College students have also reported poor mental health in response to COVID-19-related stressors. Wilson et al.⁹ found that college students reported increased depressive symptoms and stress post-March 2020 compared to the pre-COVID-19 period (2015 to pre-March 2020; see also Copeland et al.¹⁰). Similarly, Keceojic¹¹ and colleagues observed that undergraduate students in New Jersey, United States, with elevated COVID-19 concern reported higher levels of somatization and anxiety symptoms in April 2020. To contribute to the literature on COVID-19 and college student mental health, our study examined predictors of COVID-19-related stress among first-year college students.

1.1 | Review of the literature

For fall 2020 high school graduates transitioning to college, COVID-19 disruptions posed challenges. Pre-COVID-19 research indicated increased feelings of loneliness,^{12,13} stress,¹⁴ negative emotional wellbeing,¹⁵ and poorer mental health (e.g., depression, anxiety¹⁶) during this period. COVID-19-related disruptions, like distance learning (US Census Bureau, 2020), further impacted students' social and academic experiences, leading to poor mental health.¹⁷ Surveys showed that around April 2020, students at a Texas public university reported increased stress and anxiety¹⁸ due to decreased social interactions and health worries. Longitudinal studies also indicated increased anxiety and depression symptoms in college students during the initial stages of the pandemic.¹⁹

Despite various studies on student responses to COVID-19 disruptions, limited research focused on first-year students' transition to college. Fruehwirth²⁰ and colleagues found increased anxiety and depression symptoms among first-year college students during the pandemic, but no direct relationship between COVID-19 diagnosis and mental health. Overall, more research is needed to understand how COVID-19 impacted college students' transition and mental health. This study adds to the literature by prospectively examining loneliness, attitudes toward COVID-19 restrictions, and fear of

COVID-19 as predictors of COVID-19-related stress among first-year college students.

New social connections and maintaining support from friends and family at home are vital for students' emotional and mental well-being.^{12,13} Loneliness has been linked to poorer mental health, including increased stress.^{21,22} In the context of COVID-19, Fruehwirth et al.²⁰ observed that first-year college students reporting social isolation during the pandemic experienced heightened anxiety and depression symptoms. Perceived loneliness is likely associated with COVID-19-related stress. The Loneliness Model²³ explains that increased loneliness triggers hypervigilance to potential social rejection, leading to a self-reinforcing loop of distancing behaviors. This loop has been linked to stress, anxiety, low self-esteem, and dysregulated stress responses. The social allostasis model of loneliness suggests that social isolation activates the HPA axis chronically, resulting in "allostatic overload" and impaired social cognition, perpetuating loneliness distress.²⁴ It is probable that higher loneliness levels in students are linked to greater stress related to COVID-19. On the other hand, positive attitudes toward COVID-19 restrictions may reduce the risk of COVID-19-related stress.

In the fall semester of 2020, colleges with in-person classes implemented various social distancing policies, such as mask-wearing, physical distancing, virtual learning, and reduced physical interaction.²⁵ Limited research exists on college students' attitudes toward COVID-19 restrictions and their relationship with COVID-19 stress. One study found that college students generally agreed with and followed social distancing measures, with positive attitudes potentially predicting lower stress.^{11,18}

Drawing from the Health Belief Model, positive attitudes toward restrictions are likely associated with less COVID-19-related stress as they encourage engagement in social distancing behaviors.²⁶ However, loneliness may act as a barrier to accepting restrictions, leading to more negative attitudes and greater stress.^{27–29}

Although prior studies explored attitudes and loneliness separately, no research has investigated the indirect relationship of loneliness to COVID-19-related stress through attitudes toward COVID-19 restrictions, both among students and nonstudent samples.²⁰ This study aims to bridge this gap and examine the associations between loneliness, attitudes toward restrictions, and COVID-19 stress in college students.

Positive attitudes toward COVID-19 restrictions may reduce COVID-19 stress risk, while increased fear and concerns about COVID-19 can elevate it among college students. Research shows correlations between fear of COVID-19 and depression and anxiety symptoms.^{30,31} Among college students, higher levels of COVID-19 concern relate to elevated anxiety and somatization.¹¹ Accordingly, greater fear of COVID-19 among first-year college students is likely to predict more COVID-19-related stress. Despite negative mental health consequences, fear of COVID-19 can motivate behavior change to reduce COVID-19-related risks, such as social distancing and improved hand hygiene.³² This fear is positively correlated with perceived COVID-19 risk and infectability,^{30,32} possibly influencing more positive attitudes toward COVID-19 restrictions.

2 | CURRENT STUDY

Student mental health concerns have increased over the past decade and have been further impacted by the COVID-19 pandemic. This study aimed to understand factors that influence college student COVID-19 stress using a longitudinal online survey during the fall 2020 semester. We examined how COVID-19 fear, loneliness, and attitudes toward COVID-19 restrictions predict COVID-19 stress [direct effects]. Additionally, we explored how attitudes toward restrictions buffer against loneliness's negative impact on COVID-19 stress and how fear of COVID-19 exacerbates loneliness's effect on stress [moderated effects]. We also examined whether fear of COVID-19 buffered against loneliness's negative impact on attitudes toward restrictions, leading to lower COVID-19 stress [moderated-mediated effects].

3 | METHODS

3.1 | Design and participants

Participants were first-year college students at a small mid-west, Ohio liberal arts college. We recruited participants through Introductory Psychology courses and community announcements using both convenience and snowball sampling techniques. After recruitment, participants completed an electronic informed consent and were directed to a survey on the Qualtrics online platform. Three survey waves of data were collected: Wave 1 in August 2020 (upon arrival to campus; $n = 122$), Wave 2 in October 2020 (at midterm; $n = 88$), and Wave 3 in November 2020 (at the end of the semester; $n = 71$). Only participants who completed Wave 1 were eligible to take part in Wave 2, and only those who took part in Wave 2 were eligible to take part in Wave 3. To ensure participant privacy, we assigned each participant a randomly generated study ID. We linked these IDs to each participant's name to reimburse them for their involvement in the study. Participants were given \$5 Amazon gift cards or course credit for participating in each survey (i.e., a total of \$15 for participating across all three waves). All surveys took approximately 30 min to complete. Only incoming first-year students were eligible to participate in this study. Full Institutional Review Board approval was obtained before any data collection began. All participants provided informed consent. See Table 1 for participant demographics.

COVID-19 context: In March 2020, the second author's institution suspended all in-person classes and went fully remote. In Fall 2020, the institution mandated several COVID-19 policies, some of which follow: students and faculty were offered the option of either in-person, hybrid, or fully remote teaching and learning methods. All members of the campus community were required to wear masks and to practice social distancing. All classrooms and class sizes were adjusted to ensure proper social distancing (students sitting at least 6-feet apart). Some classes were held outdoors during warmer months. Students were prohibited from visiting each other's dorm rooms, leaving campus, and congregating in groups. Post-

TABLE 1 Participant demographics across Time 1– Time 3.

Variable	Time 1 (N = 126)	Time 2 (N = 88)	Time 3 (N = 71)
Race			
Asian	25 (20.5%)	17 (19.3%)	13 (18.35)
Black or African American	9 (7.4%)	5 (5.7%)	5 (7.0%)
Latinx, Hispanic or Spanish Origin	11 (9%)	4 (4.5%)	2 (2.8%)
White	84 (68.9%)	62 (70.5%)	50 (70.4%)
Other	5 (4.1%)	3 (3.4%)	2 (2.8%)
No response	1 (0.8%)	1 (1.1%)	1 (1.4%)
Gender			
Male	31 (25.4%)	17 (19.3%)	12 (16.9%)
Female	88 (72.1%)	65 (73.9%)	54 (76.1%)
Other	3 (2.4%)	3 (3.3%)	3 (4.2%)
Housing			
On campus	104 (85.2%)	69 (78.4%)	58 (81.7%)
At home	17 (13.9%)	15 (17.0%)	11 (15.5%)
Another location	1 (0.8%)	1 (1.1%)	
Class format			
Fully remote	17 (13.9%)	14 (15.9%)	10 (14.1%)
In-person once weekly for all classes	18 (14.8%)	12 (13.6%)	9 (12.7%)
Some, but not all classes, in person	87 (71.3%)	59 (67.0%)	50 (70.4%)
First generation student status			
Yes	18 (14.8%)	10 (11.4%)	8 (11.3%)
No	99 (81.1%)	70 (79.5%)	59 (83.1%)
Not sure	5 (4.1%)	5 (5.7%)	2 (2.8%)

thanksgiving, the institution went fully remote. In Ohio, several preemptive measures were under-taken in early March 2020 to reduce transmission and spread of COVID-19 (e.g., school closures, restrictions on mass gatherings, social distancing. The state issued a mask mandate in July 2020 that remained in place through the Fall 2020 semester (Ohio Department of Health).

3.2 | Measures

3.2.1 | COVID-19 stress

COVID-19 stress was measured using the 24-item COVID Stress Scale (CSS³²). The CSS measures the degree to which individuals worry about catching, spreading, and habits surrounding the COVID

virus. Sample items include: "I am worried about catching the virus" and "I am worried that social distancing is not enough to keep me safe from the virus." Participants rated each item on a 5-point Likert scale (0 = *not at all* to 5 = *extremely*). All items are averaged, with greater values reflecting more COVID-19-related stress. See Table 2 for scale reliability across Times 1–Time 3.

3.2.2 | Fear of COVID

Fear of COVID was measured using the 7-item Fear of COVID-19 Scale (FCS-19S^{30,34}). The FCS-19S measures the degree to which an individual has emotional and somatic fear reactions to the COVID-19 virus. Sample items include: "I am most afraid of the coronavirus" and "I am afraid of losing my life because of the coronavirus." Participants rated each item on a 5-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*). All items were averaged. Greater values reflect greater fear of COVID-19. See Table 2 for scale reliability across Times 1–Time 3.

3.2.3 | Attitudes toward COVID restrictions

Attitudes towards COVID-19 restrictions was measured using a 4-item author-developed scale. The attitudes towards COVID-19 restrictions scale measures individuals' feelings about COVID-19 social distancing measures. Items include: (1) "Overall, social distancing policy responses to COVID-19 are exaggerated"; (2) "People should be able to choose whether or not to socially distance

or wear masks"; (3) "I find it very stressful to comply with COVID-19 restrictions"; and (4) "COVID-19 restrictions are harming my quality of life." Participants rated all items on a 6-point Likert scale (1 = *strongly disagree* to 6 = *strongly agree*). All items are averaged with greater values reflecting more negative attitudes toward COVID-19 restrictions. See Table 2 for scale reliability across Times 1–Time 3.

3.2.4 | Loneliness

Loneliness was measured using the 20-item revised UCLA Loneliness Scale.³⁵ The Loneliness Scale measures one's subjective feelings of loneliness as well as feelings of social isolation. Participants rate each item on a 4-point Likert scale (1 = *never* to 4 = *often*). Sample items include: "There is no one I can turn to" and "I am no longer close to anyone." Appropriate items were recoded, and all items are averaged with greater values reflecting higher feelings of loneliness. See Table 2 for scale reliability across Times 1–Time 3.

4 | DATA ANALYTIC STRATEGY

4.1 | Missing data

Only participants who completed Wave 1 were eligible to take part in Wave 2, and only those who took part in Wave 2 were eligible to take part in Wave 3. A total of 69% of students who took part in Wave 1 of the study took part in Wave 2 and 81% of students who took part

TABLE 2 Correlations among main study variables and Cronbach's alphas across Time 1–Time 3.

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Attitudes toward COVID-19 restrictions: Time 1	–											
2. COVID-19-related stress: Time 1	0.05	–										
3. Fear of COVID-19: Time 1	–0.03	0.71***	–									
4. Loneliness: Time 1	0.05	0.20*	0.13	–								
5. Attitudes toward COVID-19 restrictions: Time 2	0.57***	–0.14	–0.19	–0.03	–							
6. COVID-19-related stress: Time 2	–0.14	0.74***	0.70***	0.11	–0.16	–						
7. Fear of COVID-19: Time 2	–0.04	0.65***	0.75***	0.13	–0.18	0.70***	–					
8. Loneliness: Time 2	0.11	0.17	0.14	0.72***	–0.01	0.10	0.10	–				
9. Attitudes toward COVID-19 restrictions: Time 3	0.55***	–0.20	–0.13	–0.14	0.62***	–0.24	–0.23	–0.13	–			
10. COVID-19-related stress: Time 3	0.08	0.49***	0.50***	0.08	–0.14	0.61***	0.46***	0.02	0.15	–		
11. Fear of COVID-19: Time 3	–0.04	0.45**	0.63***	0.09	–0.14	0.49***	0.66***	–0.04	0.15	0.77***	–	
12. Loneliness: Time 3	0.18	0.18	0.16	0.42***	0.09	0.19	0.18	0.79***	0.03	0.16	0.11	–
α	0.90	0.89	0.85	0.77	0.83	0.90	0.90	0.88	0.89	0.88	0.93	0.88

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

in Wave 2 took part in Wave 3. Imputed values of missing data are not appropriate with structurally missing data (i.e., data does not exist as participants were not eligible to participate³⁶). We conducted “drop-out control comparisons” using either χ^2 tests or independent-samples *t*-tests to compare differences in our main study (i.e., attitudes toward COVID-19 restrictions, COVID-19-related stress, fear of COVID-19, loneliness) and demographic (i.e., race, gender, housing, class format, and generation status) variables between those completed Wave 1 compared to Wave 2 and those who completed Wave 2 compared to Wave 3.³⁷

4.2 | Primary analyses

4.2.1 | Multivariable regression

We conducted two multivariable regressions to test the hypothesis that attitudes toward COVID-19 restrictions, fear of COVID-19, and loneliness at Time 1 predicted COVID-19-related stress at Time 2 and Time 3. We controlled for Time 1 COVID-19-related stress and demographic variables that vary between Time 1 and Time 2 or between Time 2 and Time 3.

4.2.2 | Moderation analyses

We conducted a series of moderation analysis using SPSS PROCESS macro (Model 1³⁸) to test our hypotheses that loneliness increases risks to experiencing COVID-19-related stress. Specifically, we tested loneliness (Time 1) as a moderator of the relationship between (1) attitudes toward COVID-19 restrictions (Time 1; Model A), and (2) fear of COVID-19 (Time 1; Model B) on COVID-19-related stress (Time 2 and Time 3). For all moderation analyses we controlled for Time 1 COVID-19-related stress and demographic variables that vary between Time 1 and Time or between Time 2 and Time 3. To better understand significant interactions, we used coefficients to calculate predicted probabilities and graphed simple slopes for each conditional effect at one standard deviation above (high) and below (low) the grand mean of each of the predictor variables.³⁹

4.2.3 | Moderated-mediation analyses

We conducted a moderated-mediation analysis to test whether loneliness (Time 1) moderated the indirect effects of fear of COVID-19 (Time 1) on COVID-19-related stress (Time 3) via attitudes toward COVID-19 restrictions (Time 2). We controlled for COVID-19-related stress (Time 1). We conducted this moderated-mediation analysis using SPSS PROCESS macro (Model 7³⁸). Our analysis used bootstrapping, which involves repeatedly sampling from the data with replacement (10,000 bootstrap resamples) to create an approximation of the sampling distribution of the indirect

effect and to generate 95% confidence intervals for these effects. The indirect effect is significant if the confidence interval does not include zero.^{38,40}

5 | RESULTS

Table 1 shows participant demographic information across Time 1, Time 2, and Time 3. Table 2 shows correlations among main study variables: attitudes toward COVID-19 restrictions, COVID-19-related stress, fear of COVID-19, and loneliness across Time 1–Time 3.

5.1 | Missing data

χ^2 tests and independent-samples *t*-tests reveal no demographic or main study variables differences between those who completed Wave 1 but did not complete Wave 2, and those who completed Wave 2 but did not complete Wave 3 (see Table 3). Given these results, we did not include demographic variables as additional covariates in our main analyses.

5.2 | Primary analyses

Table 4 shows means and standard deviations of main study variables across all three waves. *Multivariable regression.* Supporting predictions, fear of COVID-19 at Time 1 predicted increased COVID-19 related stress at Time 2 and Time 3. Against hypotheses, attitudes toward COVID-19 restrictions and loneliness at Time 1 did not predict COVID-19 related stress at Time 2 or Time 3. COVID-19 related stress at Time 1 predicted increased COVID-19 related stress at Time 2 and Time 3 (see Table 5).

5.2.1 | Moderation analyses

Against hypotheses, loneliness (Time 1) did not moderate the effect of either (1) attitudes toward COVID-19 restrictions (Time 1) or (2) fear of COVID-19 on COVID-19-related stress (Time 2 or Time 3; see Table 5).

5.2.2 | Moderated-mediation analyses

Against hypotheses, loneliness (Time 1) did not moderate the indirect effect of fear of COVID-19 (Time 1) on COVID-19-related stress (Time 3) via attitudes towards COVID-19 restrictions (Time 2; see Figure 1). However, supporting hypotheses, results show that loneliness (Time 1) moderated the effect of fear of COVID-19 (Time 1) on attitudes toward COVID-19 restrictions (Time 2). Results show that at high (but

TABLE 3 Drop-out control comparisons of those who completed Wave 1 but not Wave 2 (“stayers”—completed Wave 1 and returned for Wave 2—vs. “goers”—only completed Wave 1), and those who completed Wave 2 but not Wave 3 (“stayers”—completed Wave 2 and returned for Wave 3) vs. “goers”— did not complete Wave 3).

Variable	Wave 1 to Wave 2 (stayers vs. goers)	Wave 2 to Wave 3 (stayers vs. goers)
Race	$\chi^2(5, 207) = 1.95, p = 0.856$	$\chi^2(5, 145) = 0.84, p = 0.975$
Gender	$\chi^2(4, 207) = 0.96, p = 0.916$	$\chi^2(4, 145) = 0.73, p = 0.948$
Housing	$\chi^2(2, 207) = 72, p = 0.699$	$\chi^2(2, 144) = 0.72, p = 0.697$
Class format	$\chi^2(2, 207) = 0.32, p = 0.853$	$\chi^2(42, 144) = 0.12, p = 0.943$
First generation student status	$\chi^2(4, 207) = 1.24, p = 0.537$	$\chi^2(2, 144) = 0.09, p = 0.958$
Attitudes toward COVID-19 restrictions	$t(120) = 0.04, p = 0.969, 95\% \text{ CI: } [-0.483, 0.503]$	$t(83) = 1.08, p = 0.284, 95\% \text{ CI: } [-0.272, 0.918]$
COVID-19-related stress	$t(120) = 0.84, p = 0.404, 95\% \text{ CI: } [-0.377, 0.153]$	$t(83) = 1.04, p = 0.301, 95\% \text{ CI: } [-0.158, 0.506]$
Fear of COVID-19	$t(120) = 1.55, p = 0.124, 95\% \text{ CI: } [-0.546, 0.066]$	$t(83) = 0.142, p = 0.679, 95\% \text{ CI: } [-0.305, 0.466]$
Loneliness	$t(120) = 0.10, p = 0.918, 95\% \text{ CI: } [-0.261, 0.289]$	$t(83) = 0.10, p = 0.811, 95\% \text{ CI: } [-0.374, 0.294]$

TABLE 4 Means and standard deviations (in parentheses) of main study variables at Time 1, Time 2, and Time 3.

Variable	Time 1 (N = 122)	Time 2 (N = 88)	Time 3 (N = 74)
Attitudes toward COVID-19 restrictions	2.03 (1.26) ^a	2.18 (1.15)	2.33 (1.38)
COVID-19-related stress	2.07 (0.68)	1.98 (0.69)	2.05 (0.79)
Fear of COVID-19	2.37 (0.79)	2.30 (0.82)	2.25 (0.88)
Loneliness	2.55 (0.70) ^{b,a}	2.21 (0.69)	2.23 (0.65)

^aStatistically different ($p < 0.05$) from Time 3 average.

^bStatistically different ($p < 0.05$) from Time 2 average.

not low) levels of reported loneliness those who reported less fear of COVID-19 had more negative attitudes toward COVID-19 restrictions compared to those who report greater fear of COVID-19 (see Figures 1 and 2).

6 | DISCUSSION

Supporting predictions, fear of COVID-19 at Time 1 predicted increased COVID-19 stress at Time 2 and Time 3. That is, students' reported fear of COVID-19 at the beginning of the semester predicted their stresses related to COVID-19 at mid-semester and towards the end of the semester. The positive relationship between fear of COVID-19 and COVID-19 stress replicates previous work showing that fear of COVID-19 is associated with poor mental health, including increased somatization, and anxiety and depression symptoms.^{11,30} Contributing to this literature, our findings show that

fear of COVID-19 is associated with increased COVID-19-related fear across 3 months in a sample of first-year college students.

Consistent with our hypotheses, fear of COVID-19 moderated the relationship between loneliness and attitudes toward COVID-19 restrictions, albeit unexpectedly. Among individuals reporting high levels of loneliness, those with less fear of COVID-19 exhibited more negative attitudes toward the restrictions compared to those with greater fear of the virus. This finding suggests that lonely individuals who do not fear COVID-19 may perceive the restrictions as unnecessary or exaggerated responses to a virus they consider “non-threatening.”^{41,42} Additionally, they might view these restrictions as the cause of their loneliness due to limited physical and social interactions, particularly if they perceive the virus as “non-threatening.”^{18,25}

However, contrary to our expectations, the interaction between loneliness and fear of COVID-19 on attitudes toward COVID-19 restrictions did not significantly predict COVID-19 stress. In our moderated-mediation and linear regression analyses, attitudes toward COVID-19 restrictions were not directly measured, as we believed students might hesitate to truthfully report noncompliance with campus policies to avoid severe consequences, including expulsion. Thus, it is likely that COVID-19 related behaviors (e.g., hand washing, social distancing), not assessed in our study, may explain the relationship between attitudes toward restrictions and COVID-19 stress.^{11,18}

Still, future research should examine the extent to which attitudes towards COVID-19 restrictions, loneliness, and fear of COVID-19 predict engagement in COVID-19 restriction-consistent behaviors. For example, to facilitate honest responses about one's engagement in COVID-19 restriction-consistent behaviors, future research should emphasize the importance of ensuring confidentiality and/or anonymity in the study.⁴³ Additionally, researchers could

TABLE 5 Beta estimates (*b*), standard errors (*SE*), *p* values, and 95% confidence intervals (95% CI) for independent and interactive effects of attitudes toward COVID-19 restrictions, COVID-19-related stressful events, fear of COVID-19, and loneliness on COVID-related stress.

Predictor [all predictor variables at Time 1]	Outcome							
	COVID-related stress: Time 2				COVID-related stress: Time 3			
Multivariable regressions	<i>b</i>	<i>SE</i>	<i>p</i>	95% CI	<i>b</i>	<i>SE</i>	<i>p</i>	95% CI
Attitudes toward COVID-19 restrictions	-0.05	0.04	0.246	-0.124, 0.032	0.06	0.07	0.442	-0.087, 0.198
Fear of COVID-19	0.28	0.10	0.004	0.089, 0.468	0.30	0.15	0.049	0.001, 0.591
Loneliness	-0.02	0.07	0.823	-0.158, 0.126	-0.03	0.13	0.814	-0.288, 0.227
COVID-related stress	0.48	0.11	<0.001	0.259, 0.694	0.33	0.19	0.094	-0.057, 0.708
	<i>R</i> ² = 0.59				<i>R</i> ² = 0.29			
Moderations								
Model A								
Attitudes toward COVID-19 restrictions	0.14	0.18	0.464	-0.232, 503	0.20	0.42	0.638	-0.638, 1.034
Loneliness	0.14	0.15	0.369	-0.163, 0.433	0.09	0.29	0.748	-0.485, 0.672
COVID-related stress	0.73	0.07	<0.001	0.578, 0.874	0.60	0.24	<0.001	0.325, 0.871
Loneliness × Attitudes toward COVID-19 restrictions	-0.08	0.07	0.286	-0.221, 0.066	-0.05	0.25	0.735	-0.361, 0.256
	<i>R</i> ² = 0.56				<i>R</i> ² = 0.25			
Model B								
Fear of COVID-19	0.50	0.29	0.089	-0.077, 1.069	0.89	0.50	0.077	-0.100, 1.887
Loneliness	0.18	0.27	0.503	-0.355, 0.717	0.49	0.42	0.252	-0.355, 1.333
COVID-related stress	0.46	0.11	<0.001	0.237, 0.679	0.28	0.19	0.154	-0.592, 0.135
Loneliness × Fear of COVID-19	-0.08	0.11	0.450	-0.297, 0.133	-0.23	0.18	0.214	-0.107, 0.664
	<i>R</i> ² = 0.59				<i>R</i> ² = 0.30			

consider employing various strategies, such as using mobile or smart phone technologies to record and track behavior in real-time,⁴⁴ providing participants with instructions that emphasize the importance of understanding the correlates of COVID-related behaviors regarding illness mitigation,⁴⁵ and/or utilizing computer-based and self-administered surveys.⁴⁶ These approaches may enhance data quality and yield more accurate insights into participants' responses.

Contrary to our expectations, loneliness did not significantly predict COVID-19 stress. Considering that feelings of loneliness are prevalent among first-year college students,^{12,13} it is plausible that students may have attributed their loneliness more to non-COVID-related issues, such as being away from family, rather than solely to COVID-19-related factors. However, it is conceivable that loneliness specifically attributed to the COVID-19 pandemic might have a stronger association with predicting COVID-19 stress. Further investigations focusing on COVID-19-related loneliness may provide deeper insights into its potential impact on COVID-19 stress levels among college students. It is also plausible that resilience may moderate the relationship between loneliness and COVID-19 stress.

Students with higher levels of resilience might exhibit better adaptability to cope with COVID-19 social restrictions, potentially influencing their attitudes toward COVID-19 restrictions, engagement in COVID-19 restriction-consistent behaviors, and, ultimately, their levels of COVID-19 stress.⁴⁷ Future investigations exploring the role of resilience in this context could shed further light on these complex relationships.

Exploratory analysis revealed that students reported more negative attitudes toward COVID-19 restrictions as the semester progressed (see Table 4). Students' increased negative attitudes toward COVID-19 restrictions reflect similar growing negative attitudes towards COVID-19 social restrictions in the United States.⁴⁸ Students also reported less loneliness across the semester. This decrease in loneliness replicates similar work in a non-COVID-19 context, showing that first-year students report feeling less lonely overtime as they form new friendships and social support networks.^{12,13} Last, across the semester, students' fear of COVID-19 and associated stress remained the same. Thus, although students report more negative attitudes toward COVID-19 restrictions, the

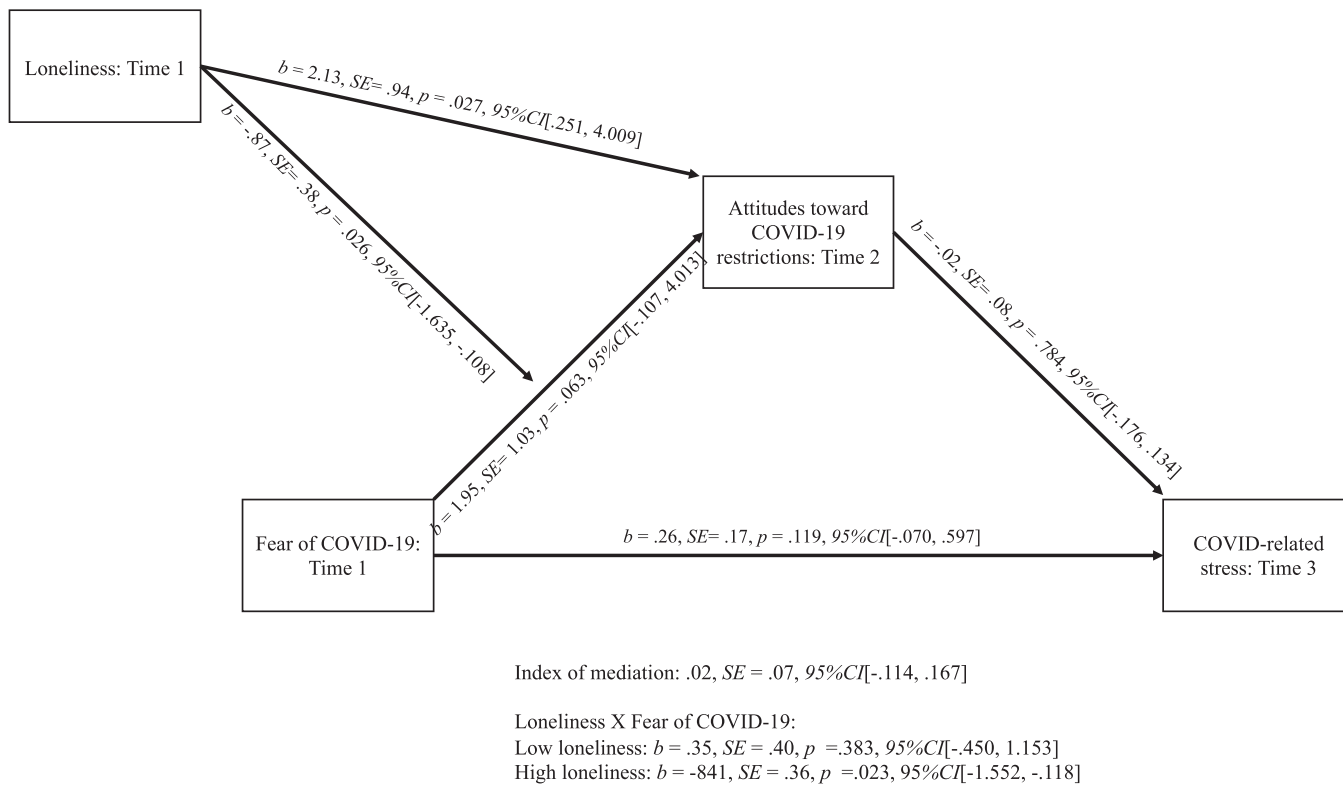


FIGURE 1 The indirect effect of Fear of COVID-19 (Time 1) on COVID-related stress (Time 3) via attitudes toward COVID-19 restrictions (Time 2) and moderated by loneliness (Time 1).

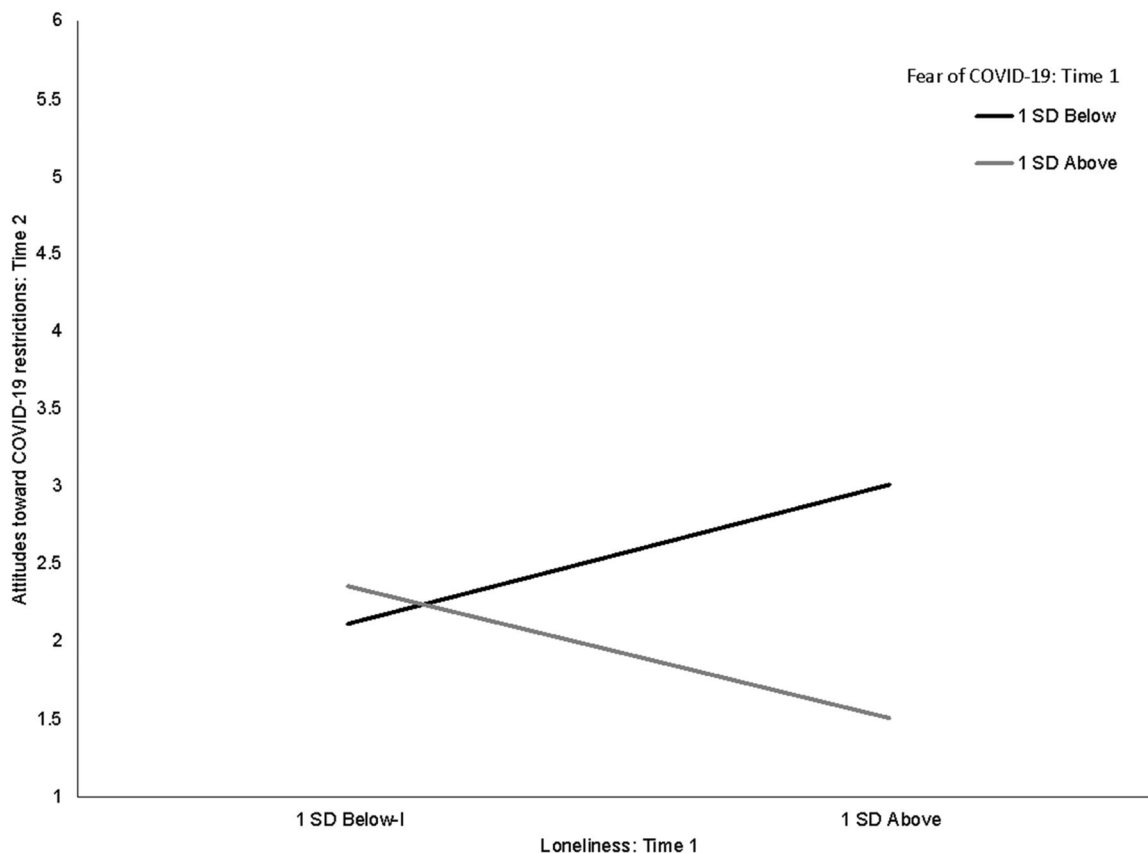


FIGURE 2 Loneliness (Time 1) by Fear of COVID-19 (Time 1) interaction on attitudes toward COVID-19 restrictions (Time 2).

extent to which they view COVID-19 as a serious health issue does not change.

Altogether, results suggest that fear of COVID-19 is an early indicator of subsequent COVID-19-related stress. Specific to undergraduates (given our study's sample), institutions should provide students with additional resources to help them manage COVID-related stressors, maintain positive attitudes toward COVID-19 restrictions, and adhere to COVID-19 protocols. These resources might include interventions aimed at increasing meaning making (i.e., how they construe, understand, and make sense of life events during the COVID-19 pandemic), mindfulness practices, and fostering altruistic attitudes. In a 3-wave longitudinal study, Yang et al.⁴⁹ found that making meaning in negative experiences predicted less psychological distress, including depression, anxiety, and stress. Similarly, Weiss and colleagues⁵⁰ show that students randomly assigned to a 4-week, mindfulness-based group therapy design (vs. control) in Spring 2020 reported lower levels of stress, anxiety, and sleep problems. Additionally, Ebrahimi et al.⁵¹ found that increased altruistic attitudes were associated with greater adherence to social distance protocols.

6.1 | Limitations

This study has some limitations. First, the study's sample size of 122 students, along with attrition across the three time points, limits the power and generalizability of the findings, particularly given the demographic homogeneity of the sample. Future replications should include a larger, more diverse sample of students. These studies should also oversample to account for attrition, especially given this study's structurally missing data. We also acknowledge the role of COVID-19 in our recruitment and retention of participants for this study.

Second, we used self-reported measures to capture COVID-19-related attitudes and behaviors. Given that data were collected before the availability of COVID-19 vaccines, it is likely that participants were even more likely to misrepresent their COVID-19 attitudes and engagement in COVID-19-social distancing protocols for fear of judgment particularly around the socially divisive and rapidly evolving topic of COVID-19 restrictions. Future research should use other tools to capture COVID-19 attitudes and behaviors more accurately (e.g., use mobile or smart phone technologies to record and track behavior in real time⁴⁴). Third, we used a nonvalidated scale to capture attitudes towards COVID-19 restrictions. Although the measure has high internal consistency across the three waves ($\alpha = 0.83-0.90$), we do not know the extent to which this measure of COVID-19 attitudes predicts engagement or adherence to COVID-19-related protocols (e.g., social distancing, hand washing).

Notwithstanding, we believe that our study is critical as it answers questions about the correlates of attitudes towards COVID-19 protocols. Future research should develop reliable and valid measures of attitudes towards COVID-19 restrictions. Fourth, our study focused on COVID-related stress broadly and not different COVID-19 stresses as presented by Taylor³³ and colleagues (e.g., fear

of danger contamination, xenophobia). Given results from Taylor³³ and colleagues, it is conceivable that the relationships among loneliness, attitudes, and fear of COVID-19 might vary as a function of the type of COVID-19 stress. For example, in a US sample, they found that COVID-19 stress related to danger and contamination, but not COVID-19 stress related to xenophobia, was associated with depression. Replication studies should examine the correlates of COVID-19 stress measured using the subscales presented in Taylor³³ and colleagues.

The long-term impact of COVID-19 restrictions and stressors on the unique cohort of students who ended high school and began college under COVID-19 restrictions and school closures will be important to explore in longitudinal studies with larger, more diverse samples. Social and emotional development are important components of the high school to college transition, and the long-term consequences of major socialization restrictions across this critical adolescent transition are unknown. We also acknowledge how the changing COVID-19 landscape might limit the generalizability and replication of some of our findings. Still, we think this study is important, as it captures the experience of first-year college students during relatively early stages of the global pandemic.

7 | CONCLUSION

Our study indicates that among college students commencing their first semester under COVID-19 restrictions, initial COVID-19 fear predicts subsequent stress associated with the pandemic. Additionally, our findings suggest that loneliness moderates the relationship between fear of COVID-19 and attitudes toward COVID-19 restrictions in college students. Taken together, these results underscore the intricate interplay between perceptions of COVID-19 and feelings of social isolation in influencing the wellbeing of college students.

AUTHOR CONTRIBUTIONS

Drexler James: conceptualization; data curation; formal analysis; methodology. **Erin Henshaw:** conceptualization; data curation; investigation; methodology. **Andrea Lourie:** conceptualization; data curation; investigation; Methodology. **Susan Kennedy:** conceptualization; data curation; investigation; methodology. **Blake Glatley:** investigation; project administration.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data will be made available upon reasonable request.

TRANSPARENCY STATEMENT

The lead author Drexler James affirms that this manuscript is an honest, accurate, and transparent account of the study being

reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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