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Emotion regulation difficulties moderate the effects of pandemic-related factors on stress and anxiety during the COVID-19 Pandemic

Kristen Judy, Jared J. McGinley, Sandra J. Llera

Abstract

The COVID-19 pandemic has impacted many people's standard operating procedures in ways that require behavioral and psychological adjustments. Research indicates widespread stress and anxiety during the pandemic. What is still less known is which pandemic-influenced factors are most directly impacting psychological wellbeing, and whether emotion regulation abilities are moderating this impact. Two-hundred thirty participants were recruited through Amazon Mechanical Turk (MTurk) to complete an online survey composed of assessments of perceived stress, state anxiety, emotion regulation abilities, and pandemic-related behavioral and lifestyle impacts. Multiple behavioral and lifestyle impacts were predictors of both stress and anxiety. Additionally, emotion regulation difficulty moderated the relationship between several pandemic-related predictors and stress and anxiety. The current study provides evidence that emotion regulation moderates the degree to which pandemic-related changes impact stress and anxiety. Emphasizing adaptive emotion regulation strategies may strengthen one's ability to cope with these pandemic-related changes and increase mental wellbeing, although even these strategies might have limited efficacy during periods of greater disruption.

COVID-19; coronavirus; stress, anxiety; emotion regulation

1. INTRODUCTION

In December of 2019, a highly infectious acute respiratory disease caused by a novel coronavirus, later named Coronavirus Disease 2019 (i.e. COVID-19) was discovered in Wuhan, China [1]. In addition to the health crisis caused by COVID-19, many unprecedented societal changes have occurred. These changes included closure of public schools and universities, closure of businesses, and stay-at-home orders. They have caused many people to be separated from their friends, family, and communities, and in many cases have led to unemployment. Because of limited treatment options for COVID-19, these were widely considered life-saving precautions. However, as a result of such measures, many have experienced negative impacts on their financial situation [2], emotional states [3] and health behaviors [4]. The resulting psychological ramifications are likely to be impactful.

Indeed, research early in the pandemic assessed the prevalence of mental health issues during the COVID-19 pandemic [2,4,5]. A study with a large sample of Chinese citizens found that greater than one-third reported symptoms that would diagnostically qualify for generalized anxiety disorder, while one-fifth reported symptoms of depression [4]. Another study with

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a Chinese sample revealed that close to one-third reported moderate to severe anxiety symptoms, while three-quarters expressed worry about their family members contracting the virus [6]. While there is value in assessing the prevalence of stress and anxiety during the COVID-19 pandemic, it is also important to identify which factors are contributing to stress and anxiety.

Many of the behavioral and lifestyle changes caused by the COVID-19 pandemic (e.g., job loss, financial burdens, increases in daily responsibilities, and separation from friends and families) have been associated with widespread stress and anxiety, whereas other factors have been associated with fewer mental health problems. A recent study of Chinese college students revealed that financial instability and living alone were positively correlated with experiencing anxiety during the pandemic, whereas social support was associated with lower anxiety [2]. Furthermore, people who were furloughed during the pandemic reported more distress than people who continued working [7], while people who continued to work reported better mental health than people who stopped working [8]. These findings indicate that employment, financial stability, and social support are related to better mental health during the pandemic, while social isolation was related to negative psychological effects.

Additionally, many people have experienced impacts to their health-related behaviors during the pandemic, such as decreases in sleep quality [4] and increases in insomnia [9]. Such sleep disturbances could lead to increased stress and anxiety [10]. Indeed, a recent study of residents in Wuhan, China and surrounding cities found that poor sleep quality and delayed sleep onset significantly predicted posttraumatic stress symptoms [5]. Other health-related factors, such as unhealthy eating habits and decreased exercise, were associated with worsened mood during the COVID-19 pandemic [11].

Although research has identified some of the pandemic-related factors associated with stress and anxiety, more research is needed to explore a broader range of factors, including changes in life situation, negative cognitions about the pandemic, and health-related changes. Broadening the scope of research on pandemic-related factors will help identify which aspects of the COVID-19 pandemic are most associated with stress and anxiety.

1.1 Emotion regulation abilities as a potential moderator of stress and anxiety

While past research has demonstrated relationships between several pandemic-generated changes and mental wellbeing, the magnitude and direction of these relationships can vary across individuals. As such, there is merit in identifying whether trait individual differences could moderate the relationship between these pandemic factors and psychological outcomes. Given the myriad emotional challenges due to the pandemic, individual differences in emotion regulation abilities might influence psychological responses during this time.

Emotion dysregulation is a positive predictor of mental health problems (e.g., [12, 13]) which could play a role in effective coping during a global health crisis. A study conducted during the H1N1 pandemic found that emotion-focused coping (e.g., self-blame, rumination, cognitive distraction) was associated with high levels of anxiety, while problem-focused coping (e.g., problem-solving, cognitive restructuring, active distraction) was associated with lower levels of anxiety [14]. It follows that individual differences in emotion regulation abilities may moderate the impact of pandemic-related factors on psychological wellbeing. Indeed, a recent study found that emotion regulation difficulties moderated the relationship between COVID-19 cyberchondria and health anxiety [15]. Collectively, these studies indicate the need to further explore the moderating role of regulatory abilities.

1.2 The present study

The present study was designed with two foci: 1) to identify which COVID-19-related lifestyle and behavioral changes predicted stress and state anxiety levels, and 2) to identify whether emotion dysregulation moderates the relationship between pandemic-related impacts and perceived stress and state anxiety. Data were collected during April of 2020 via a widely distributed online survey. During this time, many

local governments had implemented stay-at-home orders due to high numbers of new daily COVID-19 cases. Therefore, data was collected during a time of social isolation and unprecedented societal changes.

It was hypothesized that the impact of the pandemic on a range of life-situation, cognitive, and health-related factors would predict greater stress and state anxiety. It was also hypothesized that trait levels of emotion dysregulation would moderate this relationship, such that pandemic-related impact would predict greater stress/anxiety in the context of higher emotion dysregulation.

2. METHOD

2.1 Participants

Qualifying criteria for participation were being at least 18 years of age and fluent in English. 230 individuals were recruited through the Amazon Mechanical Turk (MTurk) and were compensated one US dollar for completion of the study. Twenty-five participants were excluded for careless responding (i.e., maximum long string scores were outliers), 7 for incomplete data, and 16 for a study duration less than three minutes. Therefore, 182 participants (123 male) were eligible for analyses. Ages ranged from 18 to 70 years old (M = 36.71, SD = 11.81) with 54.40% identifying as Caucasian, 4.40% as African American/Black, 7.14% as Hispanic/Latino, 22.53% as Asian, 1.65% as Native American, and 9.89% as biracial/other. Further, nine countries were represented in this sample. This study was approved by the Institutional Review Board (IRB) at Towson University.

2.2 Materials and procedure

2.2.1 Demographic questionnaire

The demographic questionnaire collected information about the participants' age, gender, race, education level, employment status, and geographic location.

2.2.2 COVID-19 Impact Measure

This form contained 27 questions and statements that were developed based on observed societal, cognitive, and health-related impacts of the COVID-19 pandemic. Items of interest were grouped by conceptual similarity to comprise three scales (Life Situation Impact, Cognitive Impact, and Health-Related Behavior).

The Life Situation Impact scale was comprised of four statements to assess situational changes during the pandemic, such as housing or financial changes, increased responsibilities, and number of COVID-19 cases in one's residential area. The Life Situation Impact scale had acceptable reliability (α = .75).

The Cognitive Impact scale was comprised of four statements to assess a range of concerns as a result of the pandemic, including uncertainty about the future, worry about the economy, worry about access to medical care, and concern about contracting COVID-19. Due to the heterogeneous nature items comprising this scale, the reliability alpha was somewhat lower than acceptable levels (α = .65). However, given that the predictive ability of items was also assessed at the individual item level, this reliability was deemed acceptable for these purposes.

Finally, the Health-Related Behavior scale was comprised of five statements to assess health behaviors during the pandemic. These items assessed mental/physical activity, as well as changes in healthy eating, exercise, and sleep quantity/quality. The Health-Related Behavior scale had good reliability (α = .80).

2.2.3 State-Trait Anxiety Inventory – State Version [16]

The state portion of the STAI was used to assess the participants' anxiety levels during the pandemic. This portion of the STAI contains 20 items, such as "I feel calm" and "I feel tense". Participants were instructed to rate each item on a four-point Likert scale on how much each statement applies to them in the present moment, from "not at all" and to "very much so". Past research has shown the state portion of the STAI has shown excellent internal consistency (α = .91) and acceptable test-retest reliability [17]. In the current study, the state-anxiety portion of the STAI had good reliability (α = .87).

2.2.4 Perceived Stress Scale [18]

The PSS was used to assess the participants' perceived stress during the COVID-19 pandem-

ic. This scale contains 10 items, such as "In the last month, how often have you felt on top of things?" and "In the last month, how often have you felt things were going your way?". Participants were instructed to rate each item on a five-point Likert scale on how often that statement applies to them, from "never" and to "very often". A review of the psychometrics of the PSS revealed that the PSS has shown acceptable internal consistency and test-retest reliability [19]. In the current study, the PSS had good reliability (α = .80).

2.2.5 Difficulties in Emotion Regulation Scale [20]

The DERS was used to assess the participants' difficulties in regulating emotion. A higher total score on this scale indicates greater difficulty regulating emotion. The DERS consists of 36 items such as "I have no idea how I am feeling" and "I am confused about how I feel". Participants were instructed to rate each item on a five-point Likert scale on how often that statement applies to them, from "almost never" and to "almost always". Past research has revealed the DERS has excellent internal consistency (α = .93) and good test-retest reliability [20]. In the present study the DERS had excellent reliability (α = .95).

2.3 Data analysis

First, the COVID-19 Impact Measure scale totals were created by summing individual items comprising the three separate scales (Life Situation Impact, Cognitive Impact, and Health-Related Behavior). Following this, separate simple linear regressions were used to test whether each scale predicted stress and state anxiety. If a scale was identified as a significant predictor, a multiple regression analysis was conducted on each of the individual items from that scale to identify which were significant predictors of stress and/or state anxiety. For each analysis, all items from the subscale were entered together in the first step.

Lastly, moderation analyses using Hayes PROCESS model 1 [21] were executed to test whether difficulty in regulating emotions moderated the relationship between the identified individual item predictors and both stress and state anxiety.

3. RESULTS

3.1 Predictors of stress and state anxiety

Of the three COVID-19 impact scale totals, separate simple linear regressions revealed that the Life Situation Impact and Cognitive Impact scales were positive predictors of both stress and state anxiety (p-values < .001; see Table 1). Additionally, the Health-Related Behavior scale was a positive predictor of stress (p = .004) but not state anxiety (p = .813).

Table 1. Simple linear regressions with Life Situation Impact, Cognitive Impact, and Health-Related Behaviors scales as predictors of stress and state anxiety

	PSS					STAI-S			
Variables	*B(SE)*	β	*t*	*p*		*B(SE)*	β	*t*	*p*
Life Situation Impact	.69(.08)	.56	9.03	< .001		.78(.14)	.39	5.71	< .001
Cognitive Impact	.70(.11)	.42	6.20	< .001		1.15(.18)	.43	6.31	< .001
Health-Related Behavior	.21(.07)	.21	2.93	.004		.03(.12)	.02	.24	.813

Multiple regression analyses using the items from each Impact scale to predict stress and state anxiety levels are presented in Table 2. For the Life Situation Impact scale items, the overall model significantly predicted stress, $F(4,177) = 22.89$, $p < .001$, $f^2 = 0.48$. However, only items related to *negative living situation impact* (β = .38) and *residing in an area with a high number of cases* (β = .23) were significant positive predictors of stress (ps < .01). Similarly, the overall model predicting state anxiety was significant, $F(4,177) = 10.26$, $p < .001$, $f^2 = 0.23$. Again, only

negative living situation impact (β = .32) and *residing in an area with a high number of cases* (β = .20) were significant positive predictors of state anxiety (*p*s < .05). None of the other items pertaining to life situation impact were significant predictors of either stress or state anxiety levels.

For the Cognitive Impact scale items, the overall model significantly predicted stress, $F(4,177) = 14.63$, $p < .001$, $f^2 = 0.33$. However, only the items for *uncertainty about the future due to COVID-19* (β = .26) and *concern about contracting COVID-19* (β = .27) were significant positive predictors of stress (*p*s < .01). The overall model predicting state anxiety was also significant, $F(4,177) = 15.84$, $p < .001$, $f^2 = 0.36$. In this case, *uncertainty about the future due to COVID-19* (β = .23), *worry about access to medical care* (β = .17), and *concern about contracting COVID-19* (β = .29), were all positive predictors of state anxiety (*p*s < .05), but *worry about the economy* was not.

Finally, for the Health-Related behavior scale items, the overall model significantly predicted stress, $F(5,176) = 8.75$, $p < .001$, $f^2 = 0.25$. However, *sleeping more over the past few weeks* (β = .47) was the only item that was a significant positive predictor of stress. Because the Health-Related Behaviors scale overall did not predict state anxiety levels, individual items were not explored further.

Table 2. Multiple regressions using as the individual Impact items as predictors of stress and state anxiety

	PSS				STAI-S			
Life Situation Impact	*B(SE)*	β	*t*	*p*	*B(SE)*	β	*t*	*p*
Constant	5.48(1.51)	-	3.63	< .001	31.57(2.70)	-	11.70	< .001
Negative financial impact	.31(.31)	.08	.99	.325	.12(.56)	.02	.22	.829
Negative living situation impact	**1.36(.28)**	**.38**	**4.94**	**< .001**	**1.87(.49)**	**.32**	**3.78**	**< .001**
Increase in responsibilities	.22(.28)	.06	.77	.444	-.11(.51)	-.02	-.22	.823
Residing in an area with a high number of cases	**.79(.24)**	**.23**	**3.30**	**.001**	**1.12(.43)**	**.20**	**2.60**	**.010**
Cognitive Impact								
Constant	6.45(2.29)	-	2.82	.005	26.90(3.65)	-	7.37	< .001
Uncertainty about the future due to COVID-19	**1.20(.36)**	**.26**	**3.37**	**.001**	**1.68(.57)**	**.23**	**2.96**	**.004**
Worry about the economy due to COVID-19	-.56(.34)	-.12	-1.66	.099	-1.01(.54)	-.13	-1.87	.063
Worry about access to medical care during COVID-19	.53(.32)	.13	1.68	.095	**1.11(.50)**	**.17**	**2.22**	**.028**
Concern about contracting COVID-19	**1.59(.43)**	**.27**	**3.67**	**< .001**	**2.70(.69)**	**.29**	**3.90**	**< .001**
Health-Related Behaviors								
Constant	15.99(2.01)	-	7.94	< .001				
Staying mentally/physically active	-.64(.34)	-.13	-1.89	.060				
Sleeping more	**1.58(.31)**	**.47**	**5.17**	**< .001**				
Improved sleep quality	-.01(.35)	-.00	-.02	.983				
Eating healthier	-.31(.37)	-.09	-.85	.395				
Exercising more	-.07(.34)	-.02	-.20	.840				

3.2 Emotion regulation abilities moderating the impact of COVID-19 on stress and state anxiety

The DERS was shown to moderate the relationship between several of the previously identified predictors from the COVID-19 Impact Measure and both stress and state anxiety. In predicting stress, only one item (*negative living situation impact*) was significantly moderated by DERS levels. A simple slopes analysis revealed that *negative living situation impact* was a positive predictor of stress when DERS levels were low, $B = 1.44$, $p < .001$, or moderate, $B = 0.63$, $p = .002$, but not when DERS levels were high, $B = -.19$, $p = .55$ (see Figure 1).

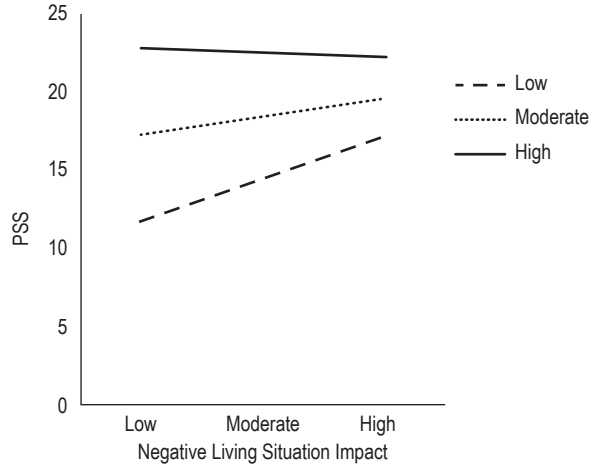

Figure 1. DERS moderating the relationship between negative living impact and stress

In terms of predicting state anxiety, several COVID-19 impact items were significantly moderated by DERS levels (see Figure 2). A simple slopes analysis indicated that *negative living sit-*

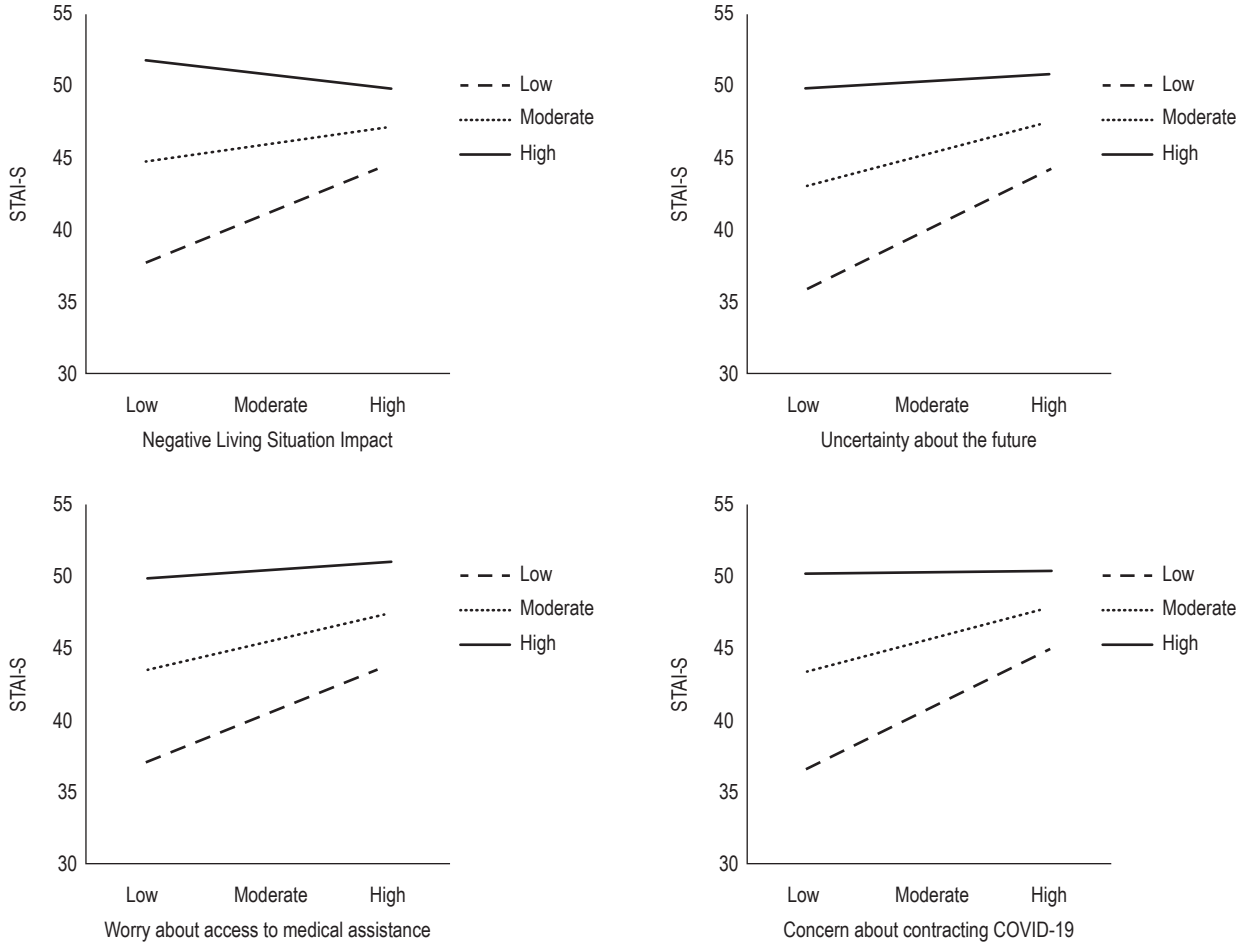

Figure 2. DERS moderating the relationship between Impact predictors and state anxiety.

uation impact was a positive predictor of state anxiety when DERS levels were low, $B = 1.88$, $p < .001$, but not when DERS levels were moderate, $B = 0.66$, $p = .115$, or high, $B = -0.57$, $p = .368$. Next, *uncertainty about the future due to COVID-19* was a positive predictor of state anxiety when DERS levels were low, $B = 2.81$, $p < .001$, and moderate, $B = 1.57$, $p = .001$, but not when DERS levels were high, $B = 0.33$, $p = .648$. Additionally, *worry about access to medical care* was a positive predictor of state anxiety when DERS levels were low, $B = 1.99$, $p < .001$, and moderate, $B = 1.16$, $p = .011$, but not when DERS levels were high, $B = 0.33$, $p = .645$. Lastly, *concern about contracting COVID-19* was a positive predictor of state anxiety when DERS levels were low, $B = 3.61$, $p < .001$, and moderate, $B = 1.89$, $p = .003$, but not when DERS levels were high, $B = 0.17$, $p = .859$.

4. DISCUSSION

The current study was designed to identify which pandemic-related factors predicted stress and anxiety levels during the COVID-19 pandemic and determine if individual differences in emotion regulation difficulty moderated this relationship. Findings from this study indicate that numerous pandemic-related factors predicted increased stress and state anxiety levels, and that emotion regulation difficulties moderated several of these relationships, but not always in the expected ways.

As hypothesized, we identified a number of pandemic-related factors that predicted both stress and state anxiety, which were categorized by conceptual similarity. In terms of life situation impact, we found that having one's living situation negatively impacted by COVID-19 and residing in an area with a high number of cases significantly predicted higher stress and state anxiety levels. This is consistent with results from Cao et al. [2] who found that both living alone and having an acquaintance or relative with COVID-19 were associated with greater anxiety. However, whereas Cao et al., [2] found that financial instability was also associated with increased anxiety, the negative financial impact of COVID-19 did not predict either stress or state anxiety in the current sample. This could be due to differences between extant financial instability versus impact of COVID-19 on finances, or that relative to the other life situation impact factors we measured, financial impact did not explain unique variance.

In terms of the cognitive impact of COVID-19, we found that uncertainty about the future and concern about contracting COVID-19 significantly predicted higher stress and state anxiety levels. Further, worry about access to medical care predicted state anxiety but not stress. Although worry about the economy also trended toward predicting greater anxiety ($p = .063$), this did not reach significance. The relationship between uncertainty about the future and stress/anxiety may be attributable to intolerance of uncertainty. Intolerance of uncertainty has been shown to be a transdiagnostic feature across many anxiety disorders [22]. Further, intolerance of uncertainty has been found to moderate the relationship between perceived COVID-19 risk and health anxiety, such that people who had high intolerance of uncertainty had high health anxiety regardless of perceived COVID-19 risk [23]. Therefore, if people are experiencing feelings of uncertainty, their state anxiety levels are likely to increase. Additionally, the finding regarding the relationship between concern about contracting COVID-19 and state anxiety is consistent with findings from recent research [3] and that perceived COVID-19 risk predicted health anxiety [23]. Further, the relationship between worry about access to medical care and state anxiety was consistent with a finding that having inadequate preventive supplies (i.e., hand sanitizer and rubbing alcohol) was associated with anxiety [3]. Together, these findings suggest that anxiety is likely impacted by worry about uncertain outcomes during the pandemic.

In terms of health-related behaviors, only the item for sleeping more over the past few weeks was a positive predictor of stress. Past research has demonstrated that hypersomnia has been associated with depression [24]. It is therefore possible that in our sample, getting too much sleep could have been experienced as stressful. Interestingly, we did not identify any health-related behaviors that appeared to buffer against stress or anxiety. For example, while others found that poor sleep quality predicted stress [5], we did not find that *improved* sleep quality predicted

less stress. Additionally, while the WHO recognizes regular exercise as important for mental wellbeing [25], we did not find that exercising *more* often predicted less stress. However, the item for staying mentally/physically active while social distancing was trending toward predicting less stress ($p = .060$) but did not reach significance. It is possible that simply *maintaining* sleep quality and physical exercise (rather than improving them) may have buffered against stress, but this was not measured in the current study.

Finally, we identified that emotion regulation difficulties influenced the degree to which several of these pandemic-related factors predicted either stress or state anxiety levels. In terms of stress, emotion dysregulation moderated the predictive power of having a negative living situation due to the pandemic. In terms of state anxiety, emotion dysregulation moderated the predictive power of having a negative living situation, uncertainty about the future, worry about access to medical care, and concern about contracting COVID-19. However, the direction of these moderations was not consistent with our hypothesis. Overall, we found that when emotion dysregulation was *low*, and in some cases *moderate*, pandemic-related lifestyle and cognitive impact predicted greater stress and/or state anxiety. However, pandemic-related impact did not predict stress/anxiety when emotion dysregulation was *high*.

Observation of stress/anxiety levels across different levels of the moderator provides an explanation for these unexpected findings. For those with the highest levels of emotion dysregulation, stress/anxiety levels were high across *all* levels of pandemic-related impact. However, for those with moderate and low levels of emotion dysregulation, stress and anxiety were lower at low levels of these predictors, and only became higher as the predictor levels increased. This may suggest that people who have trouble regulating their emotions were *already* experiencing elevated stress and anxiety levels, regardless of how they were being affected by the pandemic. As such, they were experiencing high stress/anxiety even at lower levels of pandemic-related impact.

These findings suggest that individuals with poor emotion regulation skills may benefit from treatment targeting emotion management, which may in turn improve stress and anxiety. Research has shown that implementing and varying the use of adaptive emotion regulation strategies can lower anxiety [26, 27]. In a similar vein, other research during the pandemic has shown the relationship between intolerance of uncertainty and mental well-being was mediated by emotional responses (e.g., fear) and perseverative thinking (e.g., rumination [28]). Thus, flexible access to situationally adaptive emotion regulation strategies could help to reduce such negative reactions, thus enhancing emotional well-being.

4.1 Limitations and future directions

There were several limitations to this study. First, all participants in the sample were MTurk workers, who have been found more likely to be depressed and less likely to report being in good health than the average population [29]. Additionally, due to the cross-sectional design of the study, the findings are limited in explaining whether these effects are unique to the early stages of the pandemic or specifically stay-at-home orders*. Further, due to the correlational nature of cross-sectional data, we cannot determine if these predictive factors are causally related to stress or state anxiety.

In the future, more research needs to be conducted to explore both the long-term and short-term effects of the COVID-19 pandemic on mental health. Since most of the current research on the psychological impact of the pandemic focuses on the general population, more research needs to be conducted on how the pandemic affects specific groups such as healthcare workers, the elderly, those with chronic health problems, and people who have tested positive for the virus. It is important to assess what specific stressors and psychological effects different groups of people are facing. Additionally, more research needs to be conducted on how stay-at-home orders and self-isolation have affected people's mental wellbeing. Because many people are not used to limiting social interaction, we may find that the stay-at-home orders and self-quarantine mandates negatively impact people's mental health. Indeed, much research has demonstrated the mechanisms for which social iso-

lation and loneliness can lead to negative mental and physical health [30]. Finally, since research has indicated that past pandemics have had long term effects on mental health, it is important to explore the long-term effects of the COVID-19 pandemic as well.

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* Residing in an area under a stay-at-home order was not a criterion of participation. However, 76.37% of participants resided in the US and 42 states in the US were under a stay-at-home order [31] when the study was conducted. Therefore, it is likely that the majority of participants were under a stay-at-home when this study took place.

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