Brief Report

Coping with COVID-19: Testing the stress sensitization hypothesis among adults with and without a history of adverse childhood experiences

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A B S T R A C T

Background: Substantial research suggests that adverse childhood experiences (ACEs) disrupt neurobiology, impacting regulatory processes (i.e., emotion regulation) that may sensitize individuals to psychopathology in response to later life stressors. Given the known increase in mental health distress related to the current ongoing global pandemic, this study investigated the extent to which COVID-related stress moderates the association between emotion regulation difficulties and psychological symptom ratings among individuals with and without exposure to ACEs.
Methods: Participants (N = 315, aged 18-48) provided self-ratings of ACEs, emotion regulation difficulties, COVID-related stress, and symptoms of depression, anxiety, and PTSD. The interaction between emotion regulation difficulties and COVID-related stress on psychological symptoms was examined using path analysis. Multigroup analysis was used to examine the moderating effects of ACEs.
Results: For individuals with ACEs, COVID-stress was associated positively with depression and anxiety symptoms when emotion regulation difficulties were low. Higher emotion regulation difficulties were associated with higher symptom ratings and COVID-related stress did not add a significant effect. Goal-setting difficulties, a subscale of emotion regulation difficulties, accounted for the most variance in these associations.
Limitations: Cross-sectional design precludes determining causality, retrospective reports may be subject to recall bias, and participant demographics may limit generalizability.
Conclusions: The current study provides support for stress sensitization theory and highlights the protective role of emotion regulation in enduring moderate stressors. Significant stressors (e.g., COVID-19), however, may warrant additional skills and supports to mitigate internalizing symptoms, particularly for individuals with a history of ACEs.

Adverse Childhood Experiences (ACEs), including physical and psychological abuse, neglect, and household dysfunction (Felitti et al., 1998), disrupt a variety of developmental processes, including emotion regulation (ER), raising vulnerability to psychopathology following later life stressors (Weissman et al., 2019). ACEs are associated with psychological difficulties persisting through childhood into adulthood, including depression, anxiety, and post-traumatic stress disorders (PTSD; Kessler et al., 2010). ACEs may contribute to the development of psychological disorders through heightened sensitivity to proximal stress (Hammen, 2015). Consistent with stress-sensitization theory, ACEs are hypothesized to reduce the threshold for stress by dysregulating stress-response systems such that progressively minor levels of stress are required to precipitate affective illness over time (Monroe & Harkness, 2005).

Stress sensitization theory has been demonstrated also for generalized anxiety disorder and PTSD (McLaughlin et al., 2020). Heightened sensitivity characterized by persistent dysregulation of stress response systems may result from high stress exposure during developmentally sensitive periods when physiological systems undergo significant maturational changes (Andersen & Teicher, 2008). The finding that individuals with a history of ACEs, compared to those without, report less severe life stressors prior to the onset of depression supports a sensitization, or kindling effect (see Vibhakar et al., 2019). Further support exists from longitudinal controlled studies using laboratory paradigms to uncover sensitization in neuroendocrinological stress response (McLaughlin et al., 2020).

The traditional view of stress as a precursor to negative psychological outcomes is challenged by research highlighting positive outcomes and increased resilience following stress exposure. The steeling effect (Rutter, 2012) suggests that moderate stress supports "optimal" development and functioning. Both theories support dire outcomes following extreme stress, but the steeling effect suggests that best outcomes result from moderate versus minimal stress exposure. It suggests a curvilinear, quadratic relationship between stress and psychological outcomes, contrary to the traditional negative linear dose-response relationship.

1. Global Stressor: COVID-19 Pandemic

Consistent with historical evidence of psychological responses to prior pandemics, COVID-19 has contributed to increased mental health concerns, with rates of anxiety and depressive disorders in the U.S. more than tripled in April 2020 versus April 2019 (Twenge & Joiner, 2020). Data also suggests an increased prevalence of PTSD since the onset of COVID-19, particularly among self-isolated individuals. Required to shift to remote classes and limit social activities, college students may be particularly vulnerable to the negative effects of the pandemic (Zhu et al., 2021). Among public health experts, these negative effects have spurred dialogue on how to mitigate the global mental health burden of COVID-19.

2. Emotion Regulation: A Potential Buffer

The ability to regulate or exert control over one's emotions (Gratz & Roemer, 2004) may serve as an important buffer against chronic stress, of which COVID-19 provides a current example. Prior research examining the impact of child adversity demonstrated that ER plays a key role in determining individual effects (Weisman et al., 2019), and there is evidence linking ER abilities to better mental health functioning during the COVID-19 pandemic (Jiang et al., 2020). Other research suggests that deficits in ER abilities may stem from ACEs due to observed difficulties in classifying and disengaging from negative emotions (see McLaughlin et al., 2020 for a review). Such deficits in ER are associated with numerous psychological difficulties, including depression, anxiety, and PTSD (Cloitre et al., 2019).

3. Current Study

Given the known increase in mental health concerns following COVID-19, this study investigated how ER difficulties and COVID-related stress may relate to symptom ratings for depression, anxiety, and PTSD among individuals with and without ACEs. ER difficulties were hypothesized to be positively associated with symptom ratings. For individuals with higher COVID-stress, stronger associations were expected between ER difficulties and psychological symptoms (i.e., moderation by COVID-stress). Further, it was hypothesized that these effects would be most significant among participants with ACEs (i.e., moderation by ACEs).

4. Method

4.1. Participants

The data utilized in this study was part of a larger online survey on lifetime trauma exposure and associated outcomes, collected between November 2020 and April 2021. Participants ($n = 315$) were recruited through an undergraduate research pool at a Southern University. After completing informed consent, self-report measures were presented in a randomized order to counteract any order effects. All measures have been validated for individuals aged 18 years or older. All procedures were completed remotely via a web-based survey software (Qualtrics®, Provo, UT, USA) due to COVID-19 restrictions. Thus, some participants may have been at school whereas others may have been at home attending school virtually. Participants (71.1% female, 28.3% male) ranged in ages 18-48 years ($M = 19.94$, $SD = 3.76$), and identified as White (79.7%), followed by Black (17.1%), Asian/Asian-American (4.4%), and other ethnicities (3.2%). Participants younger than 18 years old were excluded from the study. Further data on the demographic makeup of the participants is provided in Supplementary Materials.

5. Measures

Traumatic Events Questionnaire (TEQ). The TEQ (Vrana & Lauterbach, 1994) assesses 11 types of traumatic experiences, ranging from interpersonal trauma to natural disaster. For this study, only items related to childhood experiences (e.g., *As a child (before the age of 18) …*) were used to assess ACEs. These items match those assessed in the original ACEs study (Felitti et al., 1998), as outlined in Supplementary Materials. Participants who endorsed at least one experience were categorized in the group with ACEs ($n = 182$), whereas participants who did not endorse any of the listed experiences were categorized in the group without ACEs ($n = 133$). The TEQ demonstrates high test-retest validity (Vrana & Lauterbach, 1994).

Difficulties in Emotion Regulation Scale (DERS). ER difficulties were measured using the DERS (Gratz & Roemer, 2004), a 36-item questionnaire with six subscales: (1) emotional nonacceptance, (2) difficulty with goal-directed behavior, (3) impulse control difficulty, (4) emotional unawareness, (5) limited access to ER strategies, and (6) lack of emotional clarity. Participants rated items on a 5-point scale, with higher scores indicating greater difficulties. The DERS global score, which demonstrated excellent internal consistency ($\alpha = .92$), was used as an indicator of ER difficulties (henceforth abbreviated to ERD).

COVID Stress Scales (CSS). The CSS (Taylor et al., 2020), a 36-item self-report measure, was used to measure COVID-related stress. The CSS consists of five subscales: (1) danger and contamination fears, (2) economic fears, (3) xenophobia, (4) compulsive checking and reassurance seeking, and (5) traumatic stress symptoms. Participants rated items on a 4-point scale, with higher scores indicating higher COVID-stress. The sum of all five subscales demonstrated excellent internal consistency ($\alpha = .96$) in this study.

Revised Beck Depression Inventory (BDI-II). The BDI-II (Beck et al., 1996) is a 21-item self-report inventory that was used to measure depressive symptoms. Participants rated items on a 4-point scale, with higher scores indicating more depressive symptoms. The BDI-II demonstrated excellent internal consistency ($\alpha = .94$) in this study.

Zung Self-Rating Anxiety Scale (SAS). The SAS (Zung, 1971), a 20-item self-report measure, was used to assess total anxiety symptoms. Participants rated items on a 5-point scale, with higher scores indicating more severe anxiety symptomology. The SAS demonstrated excellent internal consistency ($\alpha = .92$) in this study.

PTSD Checklist for DSM-5 (PCL-5). The PCL-5 (Weathers et al., 2013), a 20-item measure, was used to assess PTSD symptoms. Participants rated items on a 4-point scale, with higher scores indicating higher total symptom severity. The PCL-5 demonstrated excellent internal consistency ($\alpha = .96$) in this study.

6. Procedure

Missing data occurred at less than 5% across all variables with no detectable trend and were handled with listwise deletion. Additionally, data were checked for normality and multicollinearity and were found to be within normal limits. Path analyses (using AMOS 27.0) were conducted to examine the interaction between ERD and COVID-stress on psychological symptoms (i.e., depression, anxiety, and PTSD symptoms). Independent variables were centered, and significant interactions were plotted with spotlight analysis at +/- 1 *SD*. Additionally, multigroup analysis (MGA), a statistical test using pairwise parameter comparisons, was used to examine whether the strength of relationships

Table 1

Direct and Interaction Effects of ER Difficulties and COVID-Related Stress on Psychological Symptoms for Individuals With and Without ACEs.

	No ACEs[a]			ACEs[b]		
Symptoms	Depressive	Anxiety	PTSD	Depressive	Anxiety	PTSD
M (SD)	8.51 (9.38)	20.93 (16.35)	15.98 (16.44)	15.37 (11.86)	27.15 (13.96)	24.96 (18.14)
Direct Effects						
ER Difficulties	.12	.18*	.19*	.49**	.41**	.41**
COVID-Stress	.25*	37**	.37**	.23*	.22*	.25**
Interaction Effects						
ER Difficulties x COVID-Stress	-.08	-.03	-.04	-.30**	-.21*	-.13

Note. Total N = 315. ACEs = Adverse Childhood Experiences. M = mean. SD = standard deviation.

[a] *N* = 132
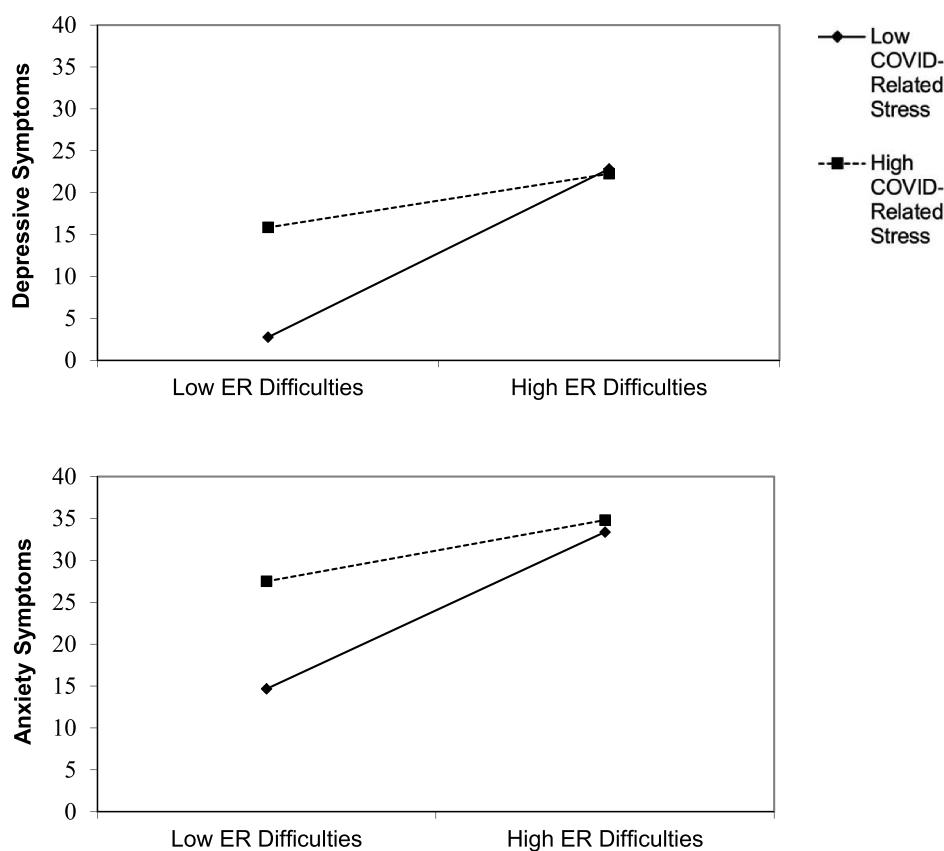[b] *N* = 183
* *p* < .05
** *p* < .001

Fig. 1. Interaction Plots for Participants with ACEs.

varied for those with and without ACEs (i.e., moderation by ACEs).

7. Results

Over 58% of participants endorsed exposure to at least one ACE; bullying, parental separation, and psychological abuse were the most frequently endorsed. ER difficulties were slightly higher among the ACE-exposed group (*M* = 85.55, *SD* = 24.54) than the group without ACE exposure (*M* = 79.48, *SD* = 21.65). COVID-stress was also higher for the ACE-exposed group (*M* = 26.26, *SD* = 2.08) than the group without ACEs (*M* = 28.04, *SD* = 27.56). There were also notable differences in psychological symptom ratings, with the ACE-exposed group endorsing higher symptoms of depression, anxiety, and PTSD. See Table 1 for outcome descriptive statistics and Supplementary Materials for group characteristics.

Path analyses revealed (see Table 1) that ERD associated positively with symptoms of anxiety and PTSD in both groups, whereas a positive association with depressive symptoms was only demonstrated in the group with ACEs. Additionally, COVID-stress had a significant direct effect on all symptom ratings in both groups. A significant interaction effect emerged for COVID-stress and ERD for individuals with ACE exposure, specifically in predicting depressive and anxiety symptoms. For ACE-exposed individuals, higher ratings of depression and anxiety symptoms were linked to higher COVID-stress, although more so when ERD were low than when ERD were high. See Fig. 1 for plots of significant interactions.

MGA further demonstrated differences between the two groups. Specifically, ACE exposure significantly moderated the relation between ERD and symptoms of depression (*Z* = -4.35) and anxiety (*Z* = -2.58), but not PTSD. Additionally, ACEs significantly moderated the relation

between the interaction (ERD and COVID-stress) and total depressive symptoms, $Z = 2.81$.

Given these differences, a post-hoc analysis assessing all six subscales of the DERS was conducted to determine which account for the most variance in the associations between COVID-stress and depression, as well as anxiety, when ERD were low. Specifically, the DERS global scale was replaced with each subscale in the specified model. Results indicated that goal-setting difficulties accounted for the most variance in the association between COVID-stress and depression ($B = -.20$, $p = .002$), as well as anxiety ($B = -.21$, $p = .001$). Like the initial finding, COVID-stress did not significantly affect symptoms of depression or anxiety when goal-setting difficulties were high; however, COVID-stress was associated positively with depression and anxiety when goal-setting difficulties were low.

To assess if differences in the ACE-exposed group were attributable to a few individuals with very high ACEs, we ran the model separately for those with lower (1 to 2) and higher (3 to 9) ACE scores. Direct effects and interactions in the low ACE group were comparable to the original findings for the ACE-exposed group. For the high ACE group, however, there was no direct effect by COVID-stress and there were no significant interactions.

8. Discussion

Although cross-sectional design precludes determining causality, retrospective reports may be subject to recall bias, and participant demographics may limit generalizability, our findings contribute to understanding the interplay of ERD and COVID-stress in a non-clinical sample of adult college students, a vulnerable group identified in COVID-19 research (Zhu et al., 2021). Consistent with hypothesis 1 and prior literature (Cloitre et al., 2019), ERD were associated significantly with symptoms of anxiety and PTSD for both groups, but with stronger effects in the ACE group, and significant for depression in the ACE group only. ER is known as a transdiagnostic risk factor (Weissman et al., 2019), and our results suggest it is particularly impactful for ACE-exposed individuals.

Consistent with hypothesis 2, COVID-stress significantly amplified the risk for anxiety and depressive symptoms (though not PTSD), but this was only among ACE-exposed individuals, and more so in the context of low ERD. Indeed, individuals with ACEs and high ERD were already experiencing elevated symptoms, with COVID-stress making less of a difference. This would be consistent with recent findings that people with pre-morbid symptoms show a less detectible impact from COVID-19 (van der Velden et al., 2020).

Whereas individuals with ACEs and low ERD may reflect a relatively resilient group (Rutter, 2012), faced with higher COVID-stress, they were susceptible to greater depression and anxiety symptoms. This amplified risk was significant only for the group with ACEs, supporting hypothesis 3 and the stress sensitizing effect of ACE exposure (Hammen, 2015). Pandemic-related stress may be particularly distressing for ACE-exposed individuals for whom the disruptions of daily routines are likely to amplify mild difficulties regulating emotions (e.g., to persist with goal-directed behavior). Importantly, the current findings were not driven by a small subgroup of individuals endorsing high ACEs, but rather by those endorsing 1 to 2 ACEs (see Supplementary Materials). For those with higher ACEs (3 to 9), the risk for psychological symptoms was significant and unconditional (i.e., no interaction by COVID-stress), suggesting that those individuals may need additional support regardless of their current stress about COVID. Such findings warrant future research into the additional skills and supports that may mitigate psychological symptoms, particularly for individuals with a history of ACEs.

Declarations of interest

none.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jadr.2022.100379.

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