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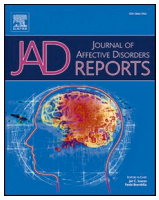

Research Paper

The role of threat appraisal and coping style in psychological response to the COVID-19 pandemic among university students

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ABSTRACT

Background: The COVID-19 pandemic has led to psychological distress among community samples and university students. Some coping behaviors and cognitive appraisals allow individuals to experience positive psychological growth amid such a crisis (Folkman et al. 1986). In the event of continuing waves of COVID-19 infection and future viral outbreaks, understanding the relationships between coping behaviors, stress appraisals, and COVID-related distress and growth can empower public health officials and university leadership to mitigate negative consequences and encourage growth.

Methods: 774 undergraduate students completed online self-report measures of coping (Brief COPE; emotion, problem, avoidant), stress appraisal (SAM; threat/centrality, challenge/self-efficacy, uncontrol, other-control), neuroticism (NEO—N), health anxiety (SHAI), and COVID-19 exposure/impact (C-PIQ; distress and growth). Hypotheses were examined via simple regressions and interactions.

Results: Increased utilization of avoidant coping was associated with high levels of distress regardless of whether it was perceived as threatening or not. Emotion-focused and problem-focused coping strategies were associated with more growth, whereas avoidant coping was associated with less growth. Higher emotion-focused coping and challenge appraisal together predicted the most growth.

Limitations: Cross-sectional design precludes the tracking of distress and growth over time; this study relied on self-report data.

Conclusions: These results underscore the impact of stress appraisals on the mental health of students navigating the COVID-19 pandemic. Findings may inform public health messaging–or have clinical implications, as successful interventions exist for improving coping strategies and stress appraisals.

1. Introduction

On March 11, 2020, the World Health Organization (WHO) formally declared Coronavirus disease 2019 (COVID-19) a pandemic. Highly transmissible, by July 13th of 2020, 12,945,657 confirmed cases and 569,697 deaths were reported globally, doubling to 25,816,820 confirmed cases by September 2, 2020 (Dong and Lauren, 2020). This rapid increase in cases and deaths had sweeping implications for health, the economy, and mental health. Meanwhile, mixed messaging from political leaders, social media sharing, and the scarcity of information left uncertainty about the magnitude and long-term consequences of the virus (Uscinski et al., 2020). This pandemic is now widely recognized as unprecedented in scope and consequence; however, COVID-19 was, in fact, preceded by a series of other viral outbreaks. The negative psychological impacts of the 2002–2004 SARS outbreak (e.g., Cheng et al., 2004; Peng et al., 2010), 2001 H1N1 outbreak (Wheaton et al., 2012), and HIV crisis (e.g., Pence et al., 2012) have been well-described; an emerging body of psychological research shows that the COVID-19 pandemic and the associated changes in day-to-day life are, too, associated with increased psychological distress (Cao et al., 2020). Still, there is limited research exploring psychosocial factors, such as coping strategies and cognitive appraisals, that may affect both negative and positive reactions to pandemics.

Undergraduate students may be particularly vulnerable to poor

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psychological adjustment, given the elevated baseline level of distress in this group and the impact of pandemic-related academic stressors (Pryjmachuk and Richards, 2007), interpersonal stressors (Ross et al., 1999), and concern about employment prospects (Stixrud, 2012). Although young people found themselves largely spared the worst health consequences of COVID-19 (Hedrich 2020), this widespread outbreak led to social distancing measures (e.g., the transition of many universities to an online/remote format) and concerns about the economic climate into which students would be graduating. Closed borders and widely different COVID-19 responses across the globe also presented additional stressors for international and immigrant-origin students. Pandemic events such as COVID-19 are potentially highly impactful for this group, but little is known about how to help them navigate the associated stressors.

Though many individuals experienced a heightened risk of mental health problems in response to this pandemic, intensified distress is not the uniform response to a stressful event; some individuals demonstrate considerable resiliency and/or natural recovery following exposure to potentially traumatic events (Bonanno, 2004). Forty to seventy percent of individuals report experiencing some form of positive change or growth from the struggle with a highly stressful or potentially traumatic event (Tedeschi and Calhoun, 1996). These benefits may include the development of new skills that foster a sense of self-efficacy or increased social connectedness from giving or receiving help. To our knowledge, no study has yet examined distress and growth among emerging adults during the COVID-19 pandemic.

Coping refers to the cognitive and behavioral strategies individuals use in the process of managing difficult circumstances. Folkman and Lazarus's Transactional Model of Stress (1980) distinguishes problem-focused (i.e., attempting to address the problem or source of distress through planning, information-seeking or approach, e.g., *"I have been concentrating my efforts on doing something about the situation I'm in."*) from emotion-focused (i.e., attempting to manage the stressor by changing associated cognitions and feelings instead of directly addressing the source of distress, e.g., *"I have been trying to see it in a different light, to make it seem more positive."*) coping. Cooper et al. (2008) later extended this model to include avoidant coping, which partitions maladaptive from adaptive responses. Self-report data from Chinese students during the 2003 SARS epidemic suggests that active, problem-focused coping predicted higher quality of life, whereas coping that involved disengagement and denial (similar to avoidant coping) predicted psychological symptoms (Main et al., 2011).

These coping behaviors, however, may be differentially associated with psychological growth. In a sample of university students, avoidant coping strategies were positively associated with post-traumatic stress, but problem-focused coping predicted growth (Schuettler and Boals, 2011). A meta-analysis examining growth in cancer patients revealed that emotion-focused and problem-focused coping strategies such as positive reframing, humor, and active coping were consistently associated with growth (Rajandram et al., 2011). Research following the September 11, 2001 terrorist attacks also found that avoidant coping predicted distress, whereas both emotional and problem-focused coping predicted growth (Park et al., 2008).

An individual's coping response is not static but depends on their appraisal of the situation. According to the person-environment transactional model of stress, when confronted with a stressor, an individual makes a primary appraisal of the magnitude and relevance of the threat, and secondary appraisals of whether they have the resources necessary to manage that threat (Folkman and Lazarus, 1986). Peacock and Wong (1990) differentiated three primary appraisals (threat – perceived potential for harm or loss, centrality – relevance of the event to personal well-being, and challenge – perception of opportunity for positive outcomes) and three secondary appraisal dimensions (controllable by self, controllable by others, and uncontrollable by anyone). Given the considerable uncertainty present during the early months of the pandemic, we expected individuals who appraised the situation as highly threatening to show greater distress than those who appraised the situation as less threatening. Similarly, we expected individuals who appraised this situation as uncontrollable to report less growth and more distress compared to those viewing the situation as being more controllable. We also predicted that people who saw the stressor as a challenge would experience more psychological growth.

Perceived situational control impacts the selection of coping strategies employed; problem-focused coping strategies reflect an appraisal of greater perceived control, whereas emotion-focused coping strategies predominate in situations that one must "endure" (Compas et al., 2001; Snow-Turek et al., 1996). Research on viral threats has begun to explore the relationships between appraisals and coping strategies. Pakenham and Rinaldis (2001) collected data from HIV seropositive men and found that problem-focused coping and low threat, high control, and high challenge appraisals were each protective for psychological adjustment, while threat appraisals and emotion-focused coping were associated with distress. Specific to the 2009 H1N1 outbreak, Taha et al. (2014) evaluated stress appraisals, coping strategies, and other putative risk factors in an adult sample. Both threat and control appraisals contributed to H1N1 anxiety; emotion-focused coping was positively associated with anxiety and problem-focused coping was negatively associated with anxiety.

One study of Greek adults in COVID-19 lockdown found a positive association between general coping approaches and growth; researchers, however, did not examine specific coping strategies and appraisals (Kalaitzaki, 2021). Research on a sample of US healthcare workers found that higher threat appraisals predicted worse distress, while problem-oriented rather than emotion-focused coping appeared to protect against anxiety among healthcare practitioners (Rolin et al., 2021). Though these data begin to tap the contribution of coping on psychological outcomes, physicians and other healthcare workers have a unique capacity to solve the problems associated with COVID-19. Thus, the adaptiveness of problem-focused coping and disturbance associated with emotion-focused coping may not generalize to other populations. In fact, in a large sample of adults from 12 countries, avoidance predicted distress, while both emotion-focused and problem-focused coping predicted positive outcomes (Kirby et al., 2021). Conclusions about the effects of different coping strategies on distress during the COVID-19 pandemic have been inconsistent, and few studies have examined the role of stress appraisals or considered potential positive psychological outcomes. The present cross-sectional study builds on prior research by examining the interactions between coping and appraisal on distress and growth during the COVID-19 pandemic.

The present study aims to (a) examine whether coping strategies (problem-focused, emotion-focused, and avoidant) are associated with COVID-19-related distress and growth, (b) examine whether stress appraisals moderate these relationships, and (c) explore moderation models for growth and distress separately. We hypothesized that problem-focused and emotion-focused coping would each be associated with *less* distress and *more* growth. We also expected the opposite relationship for avoidant coping; avoidant coping would correspond with *more* distress and *less* growth. Similarly, we hypothesized that higher appraisals of threat, centrality, and uncontrollability would uniquely predict distress, while challenge appraisals would be associated with growth. Finally, we examined the interactive effects of coping strategies and appraisal types. We hypothesized that emotion-focused coping would moderate the effects of high threat appraisal on distress.

2. Method

2.1. Participants

Participants were undergraduate students at a large public university in California enrolled in the summer of 2020. After removing non-completers and individuals who did not pass the attention check, the final sample consisted of 774 participants. Regarding gender, 554

(71.6%) individuals identified as female, 206 (26.6%) individuals identified as male, 11 (1.4%) individuals identified as nonbinary, third or other gender, and three declined to answer. The majority of the sample was Asian or Asian-American (58.4%) with additional representation by white (14.6%), other race/ethnicity (9.7%), Hispanic/Latinx (7.2%), multiple race/ethnicity (6.7%), Black or African American (2.1%), Native American or Alaska Native (0.5%) or Pacific Islander (0.5%) individuals, with two declining to respond. Many of these students were international students, living abroad ($n = 86$, 11.1%) or in the US ($n = 100$, 12.9%). The average age of the sample was 20.8 years ($SD = 2.5$, range 18–38).

We recruited participants through the university's online subject pool, whereby students receive course credit for research participation. The project was determined to be exempt by the University of California, San Diego Institutional Review Board. After providing consent, participants completed online self-report measures, which took approximately 20 min to complete.

2.2. Measures

The Brief Coping Orientations to Problems Experienced (Brief COPE; Carver, 1997) is a 28-item measure examining coping strategies used in response to stressors. Adapted from the original 53-item scale, the measure is composed of three dimensions (Cooper et al., 2008): problem-focused (e.g., planning, self-distraction, instrumental support-seeking), emotion-focused (e.g., emotional support-seeking, positive reframing, humor), and avoidant (e.g., denial, self-blame, and substance use) coping. Items were rated on a 4-point Likert-type scale (1 = "I have not been doing this at all" to 5 = "I have been doing this a lot"). Internal reliability for this sample was acceptable (Cronbach's alpha > 0.7 for all domains).

The Stress Appraisal Measure (SAM; Peacock and Wong, 1990) is a 28-item measure examining perceptions of a stressful event. The measure taps two dimensions: primary appraisals (assessment of impact of stressor, e.g. *Will the outcome of this situation be negative?),* and secondary appraisals (assessment of what can be done in response to stressor, e.g. *Do I have the ability to do well in this situation?)*. We specified that the stressful event being targeted by this measure was COVID-19. One question inquired about the frequency of use of distraction techniques such as going out to shop or to the movies, which we updated to reflect stay-at-home orders in place at the time of data collection. The reworded item was: "I've been doing something to think about it less, such as watching TV, reading, daydreaming, sleeping, or shopping." Items were rated on a five-point scale (1 = "not at all" to 5 = "extremely"). As previous studies evidence some inconsistency regarding the factor structure of this measure (see Roesch and Rowley, 2005), we conducted a principal component analysis with varimax rotation to determine factor structure in the current data. Four factors constituted the best solution, accounting for 55.27% of the variance. The four-factor solution retained the "other-control" and "uncontrol" subscales of previous versions and collapsed "threat" and "centrality" subscales (new factor = threat/centrality) and "challenge" and "self-control" subscales (new factor = challenge/efficacy). Coefficient alphas for the current sample were good (α > 0.75).

2.2.1. Pandemic exposure and -related impacts

The CAIR Pandemic Impact Questionnaire (C-PIQ) is a 28-item measure assessing COVID-19 exposure and COVID-19-related distress and growth. Specifically, we modified the CoRonavIruS Health Impact Survey (CRISIS V0.2; MacLean and Cloitre, 2020; Taku et al., 2008). The exposure items referred to stressors either directly or through someone close (e.g., "Negatively impacted relationships with family or friends," "Became ill with coronavirus symptoms (fever, dry cough, shortness of breath)"), and were dichotomously coded (yes/no) and summed into self and other subscales. The distress subscale contained five items that examined mental health distress and disturbances due to pandemic (e.g., "how stressful have changes in social (family and friends) contacts been for you?"). The psychological growth subscale contained five items tapping perceived benefits (e.g., "…strengthened your relationships with others or your community"). Both distress and growth items were rated on a five-point scales and summed for total scores. Coefficient alphas for distress ($\alpha = 0.74$) and growth ($\alpha = 0.79$) were good.

Covariates. The Short Health Anxiety Inventory (SHAI; Salkovskis et al., 2002) is an 18-item instrument. Examples of statements include: "I am often aware of bodily sensations or changes," and "If I hear about an illness, I often think I have it myself." Items were rated on a 4-point scale ranging from 0 to 3 and summed for a total score. The SHAI has excellent internal consistency ($\alpha = 0.85$; Abramowitz et al., 2007), as well as high test–retest reliability (coefficient alpha = 0.90) and convergent validity with other measures of health anxiety (0.85; Salkovskis et al., 2002). Internal consistency for this study was excellent ($\alpha = 0.83$).

The Neuroticism subscale of the NEO Five-Factor Inventory (NEO-FFI N; Costa and McCrae, 1989) is a 12-item subscale of the revised NEO 5 factor index. Examples of questions include: "Too often I feel discouraged when things go wrong" and "When under great stress, sometimes I feel I'm going to pieces." It is a widely used, well validated measure of neuroticism with excellent internal reliability ($\alpha = 0.86$; Costa and McCrae, 1992). Coefficient alpha for the current sample was excellent ($\alpha = 0.85$).

2.3. Statistical analysis

Before hypothesis testing, covariates were determined separately for the models predicting distress and growth. Candidate covariates included gender (i.e., female, male, other), race (dichotomously coded as Asian vs. non-Asian), self-exposure to COVID-19, and other-exposure to COVID-19. Health anxiety and neuroticism were also included to examine whether stress appraisal and coping were predictive above and beyond any higher-order factor of general negative affect. In the models of distress, all candidate covariates were retained, as they were all uniquely significantly associated with mental health (all $ps < 0.01$). In the models of psychological growth, only other-exposure to COVID-19 was included as a covariate, as it was the only one uniquely significantly associated with growth ($p = .01$).

Hypotheses were examined via simple regressions and interactions using IBM SPSS Statistics Version 28.0 software and Hayes' PROCESS macro. First, the four subscales of stress appraisal (threat/centrality, challenge/efficacy, other control, uncontrollability) were used to predict mental health or growth, respectively. Similarly, the three different types of coping (problem-focused, emotion-focused, avoidant) were used to predict distress or growth respectively. Finally, interactions between stress appraisal subscales and coping types shown to be uniquely significant in prior models were examined in models with either distress or growth as an outcome.

3. Results

COVID-19 exposures rates are reported in Table 1, and indicators of the mental health of the sample are presented in Table 2. Gender as well as COVID-19 exposure experienced by respondents and respondents' close others were significantly associated with distress (both $ps < 0.001$), with worse outcomes for women and those who scored high on exposure. A significant association was also found between others' COVID-19 exposure and growth. On average, neuroticism in this undergraduate convenience sample was low. Neuroticism correlated significantly with distress but not with growth. Health anxiety correlated significantly with distress but not with growth.

Several significant associations were found among appraisals, coping, and the impact of COVID-19 on participants' mental health. These variables were included in subsequent analyses and are described

Table 1.
Exposure to COVID-19 Stressors ($n = 774$).

Experience	Happened to me (n,%)	Happened to someone close to me (n,%)
1. Became ill with coronavirus symptoms	48 (6.2)	313 (40.4)
2. Hospitalized from exposure to the coronavirus	7 (0.9)	146 (18.9)
3. Died of complications of the coronavirus	*N/A*	50 (6.5)
4. Job has increased risk of exposure to coronavirus	113 (14.6)	358 (46.3)
5. Lost job or lost income due to the coronavirus pandemic	168 (21.7)	397 (51.3)
6. Struggled with responsibilities at home due to the coronavirus pandemic	266 (34.4)	320 (41.3)
7. Difficulty getting food, medication, medical help, or other necessities due to the coronavirus pandemic	127 (16.4)	237 (30.6)
8. Negatively impacted relationships with family or friends	292 (37.7)	299 (38.6)

Table 2
Means and standard deviations of measures ($n = 774$).

Measure (range)	M	SD
Distress (0–23)	12.3	4.4
Growth (0–20)	6.8	4.3
Exposure		
Self (0–7)	1.3	1.4
Someone close (0–9)	2.8	2.4
Coping (1–4)		
Avoidant	1.9	0.4
Emotion-focused	2.4	0.5
Problem-focused	2.5	0.6
Stress Appraisals		
Threat/centrality (0–65)	28.4	6.7
Challenge/self-efficacy (0–40)	24.3	5.2
Uncontrol (0–15)	12.6	3.6
Help available (0–20)	7.3	2.9
Health Anxiety (0–54)	16.7	6.6
Neuroticism (0–48)	22.4	5.6

Table 3
Regression results of four analyses examining the associations among appraisal and coping types with distress and growth respectively.

	B	SE	β	t	p
Distress - Appraisal					
T/C	.29	.02	.43	14.02	<0.001**
C/E	−0.03	.03	−0.03	−0.91	.361
O-C	−0.05	.04	−0.04	−1.32	.187
UN	.05	.04	.03	1.19	.234
Distress - Coping					
Problem	.74	.27	.10	2.73	.007*
Emotion	−1.10	.35	−0.12	−3.14	.002*
Avoidant	1.85	.39	.18	4.71	<0.001**
Growth - Appraisal					
T/C	−0.02	.02	−0.04	−1.06	.292
C/E	.40	.03	.48	12.77	<0.001**
O-C	.05	.05	.04	0.99	.318
UN	.04	.05	.03	0.88	.380
Growth - Coping					
Problem	1.30	.29	.19	4.52	<0.001**
Emotion	2.50	.37	.28	6.75	<0.001**
Avoidant	−0.74	.36	−0.08	−2.08	.038

Note: T/C = Threat/Centrality; C/E = Challenge/Efficacy; O—C = Other-Control; UN = Uncontrollability.
* $p < .01$.
** $p < .001$.

Table 4
Regression results of six analyses examining interactions among appraisal and coping types and their association with distress and growth respectively.

	Interaction				Overall Model		
	B	*SE*	*t*	*p*	R^2	*F*	*p*
Distress							
T/C x Problem	−0.05	.03	−0.194	.050	.46	64.52	<0.001**
T/C x Emotion	−0.02	.04	−0.650	.516	.46	63.16	<0.001**
T/C x Avoidant	−0.08	.04	−2.14	.033	.46	64.04	<0.001**
Growth							
C/E x Problem	.06	.04	1.74	.083	.28	73.92	<0.001**
C/E x Emotion	.13	.05	2.64	.008 *	.31	84.11	<0.001**
C/E x Avoidant	.05	.06	0.94	.348	.26	64.69	<0.001**

Note: T/C = Threat/Centrality; C/E = Challenge/Efficacy.
* $p < .01$.
** $p < .001$.

in terms of distress and growth (Tables 3 and 4).

3.1. Distress

The predicted overall model including all stress appraisals accounted for a significant proportion of distress ($R^2 = 0.46$, $F(11, 753) = 59.74$, $p < .001$). SAM-threat/centrality ($\beta = 0.43$, $SE = 0.02$, $t = 14.02$, $p < .001$) was significantly positively associated with distress; each point increase in threat/centrality was associated with a 0.29-point increase in distress. Neither SAM-challenge/efficacy ($\beta = -03$, $SE = 0.03$, $t = -0.914$, $p = .361$), SAM-other-control ($\beta = -04$, $SE = 0.04$, $t = -1.32$, $p = .187$), nor SAM-uncontrollability ($\beta = 0.03$, $SE = 0.04$, $t = 1.19$, $p = .234$) were found to be related.

The predicted overall model including all coping styles also accounted for a significant proportion of distress ($R^2 = 0.33$, $F(10, 716) = 35.34$, $p < .001$), with each coping style found to be a unique contributor. Problem-focused coping ($\beta = 0.10$, $SE = 0.27$, $t = 2.73$, $p = .007$) and avoidant coping ($\beta = 0.18$, $SE = 0.39$, $t = 4.71$, $p < .001$) were each positively associated with distress; each point increase in problem-focused and avoidant coping was associated with a 0.74-point and 1.85-point increase in distress respectively. Emotion-focused coping ($\beta = -0.12$, $SE = 0.35$, $t = -3.14$, $p = .002$), on the other hand was negatively associated with distress; each point increase in emotion-focused coping was associated with a −1.1-point decrease in distress.

Examining the interactions between threat/centrality and each of the three coping styles separately revealed that each predicted overall model accounted for a significant proportion of distress (problem-focused: $R^2 = 0.46$, $F(10, 738) = 64.52$, $p < .001$; emotion-focused: $R^2 = 0.46$, $F(10, 737) = 63.16$, $p < .001$; avoidant: $R^2 = 0.46$, $F(10, 737) = 64.04$, $p < .001$). However, neither the interaction between SAM-threat/centrality and problem-focused ($b = -0.05$, $SE = 0.03$, $t = -1.94$, $p = .050$) nor SAM-threat/centrality and emotion-focused coping ($b = -0.02$, $SE = 0.04$, $t = -0.65$, $p = .516$) was found to be significant. The interaction between SAM-threat/centrality and avoidant coping ($b = -0.08$, $SE = 0.04$, $t = -2.14$, $p = .033$), on the other hand, revealed that at low levels of threat those using low levels of avoidant coping had less distress than those using high levels of avoidant coping, while at high levels of threat/centrality appraisals distress was similarly high regardless of amount of avoidant coping utilized (see Fig. 1).

3.2. Growth

The predicted overall model including all stress appraisals accounted for a significant proportion of growth ($R^2 = 0.26$, $F(5, 763) = 54.55$, $p <$

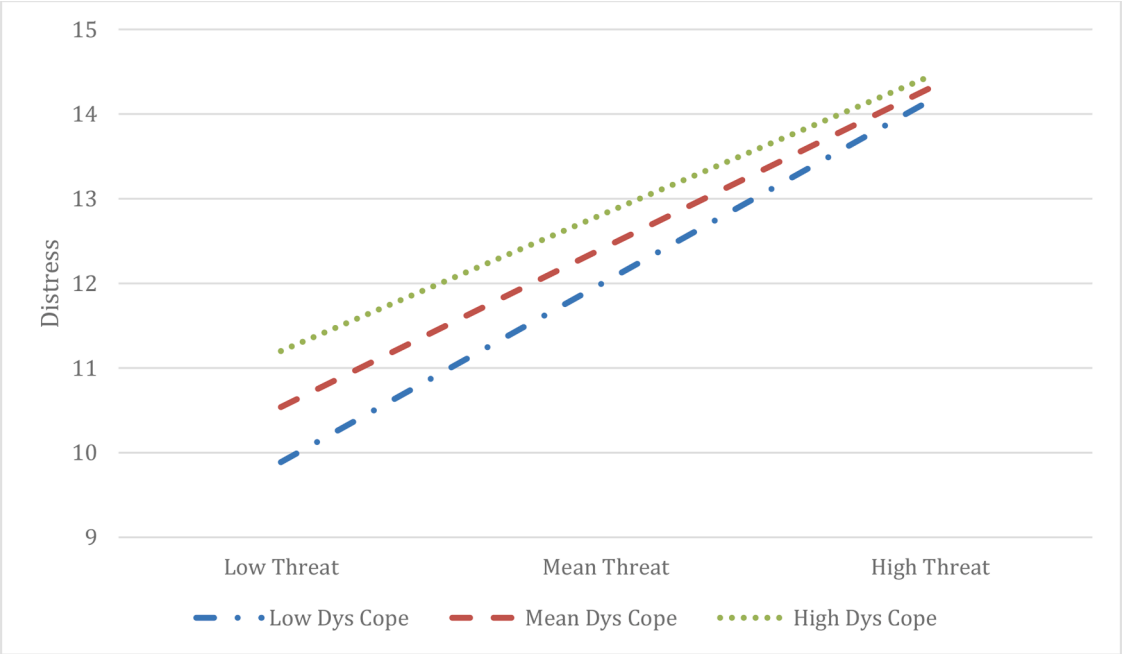

Fig. 1. Interaction between threat/centrality and avoidant/dysfunctional coping style. *Note:* Low Threat = 1SD below mean, High Threat = 1SD above mean.

.001). SAM-Challenge/self-efficacy ($\beta = 0.48$, $SE = 0.03$, $t = 12.77$, $p <$ .001) was significantly positively associated with growth, such that each point increase in SAM-challenge/self-efficacy was associated with a 0.40-point increase in growth. However, SAM-threat/centrality ($\beta =$ −04, $SE = 0.02$, $t = -1.06$, $p = .292$), SAM-other-control ($\beta = 04$, $SE =$ 0.05, $t = 0.99$, $p = .318$), nor SAM-uncontrollability ($\beta = 0.03$, $SE =$ 0.05, $t = 0.88$, $p = .380$) were found to be unique predictors.

The predicted overall model including all coping styles also accounted for a significant proportion of growth ($R^2 = 0.17$, $F\,(4, 728) =$ 37.32, $p < .001$), with each coping style found to be a unique contributor. Problem-focused coping ($\beta = 0.19$, $SE = 0.29$, $t = 4.52$, $p < .001$) and emotion-focused coping ($\beta = 0.28$, $SE = 0.37$, $t = 6.75$, $p < .001$) were each positively associated with growth; each point increase in problem-focused and emotion-focused coping was associated with a 1.30-point and 2.50-point increase in growth respectively. Avoidant coping ($\beta = -0.08$, $SE = 0.36$, $t = -2.08$, $p = .038$), on the other hand was negatively associated with growth; each point increase in avoidant coping was associated with a −0.74-point decrease in growth.

Examining the interactions between SAM-challenge/self-efficacy and each of the three coping styles separately revealed that each predicted overall model accounted for a significant proportion of growth (problem-focused: $R^2 = 0.28$, $F\,(4, 750) = 73.92$, $p < .001$; emotion-focused: $R^2 = 0.31$, $F\,(4, 749) = 84.11$, $p < .001$; avoidant: $R^2 = 0.26$, $F\,(4, 748) = 64.69$, $p < .001$). However, neither the interaction between SAM-challenge/self-efficacy and avoidant ($b = 0.05$, $SE = 0.06$, $t = 0.94$, $p = .35$) or problem-focused coping ($b = 0.06$, $SE = 0.04$, $t = 1.74$, $p =$

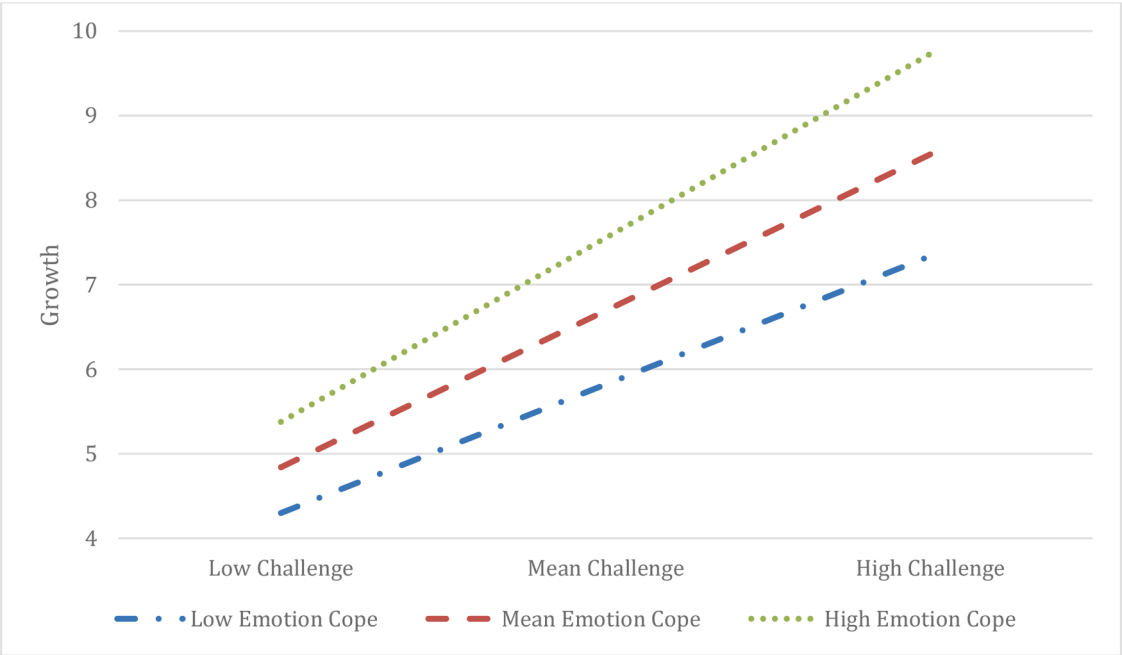

Fig. 2. Interaction between challenge/self-efficacy and emotion-focused coping style. *Note:* Low Challenge = 1SD below mean, High Challenge = 1SD above mean.

.08) was found to be significant. The interaction between SAM-challenge/self-efficacy and emotion-focused coping ($b = 0.13$, $SE = 0.05$, $t = 2.64$, $p = .008$), on the other hand, revealed that at higher levels of perceived challenge, those utilizing more emotion-focused coping had especially high gains in growth while at lower levels of perceived challenge the difference between amount of emotion-focused coping utilized was not quite as distinct (see Fig. 2).

4. Discussion

The current study examined the main and interactive effects of cognitive styles and coping on distress and growth amid the 2019 Coronavirus Disease pandemic. Some COVID-19 research has found that avoidant coping may exacerbate pandemic-related distress, especially among young adults (e.g., Lorenzo et al., 2021); however, the positive effects of this pandemic on university students are largely unknown. Additionally, few studies have explored the role of appraisals and coping in determining young adults' reactions to the pandemic.

Our results indicate that, for stress appraisals, only the perception of threat/centrality uniquely was associated with distress related to COVID-19. This contradicts our prediction that appraisals of uncontrollability would be associated with higher distress and less growth. This contradictory finding could reflect the unprecedented nature of this crisis, and issues with measurement: it is possible that students had varying degrees of familiarity with infection control efforts at the macro and micro level, and a forced choice paradigm did not capture the uncertainty and ambivalence felt by individuals early on in the pandemic.

We also found that emotion-focused, problem-focused, and avoidant coping each uniquely were associated with a significant proportion of distress. Emotion-focused coping was linked to less distress, while problem-focused and avoidant coping were both associated with greater distress. These results appear to contradict those of Taha et al. (2014), who found that while problem-focused coping statistically predicted less distress, emotion-focused coping predicted poorer outcomes. This incongruity might be illuminated by differences in impact in scope between these two pandemics. For example, the US Center for Disease and Control Prevention (CDC, 2009) estimated that between 150,000 and 575,000 people worldwide died of the 2009 H1N1 virus in its first year, compared to the approximately 2 million COVID-19 deaths estimated over its first year (Johns Hopkins Center for Systems Science and Engineering, 2020). H1N1 was declared a pandemic by the WHO on June 11, 2009, and in just over three months, four vaccines had been approved by the Food and Drug Administration (FDA). In contrast, the FDA approved its first vaccine for use with COVID-19 well over a year after its pandemic designation (Food and Drug Administration, 2020). It is certainly possible that strategies to manage distress are not equally effective across different pandemics or populations. Further, as Taha et al. (2014) attributed many avoidant-coping items to their conceptualization of emotion-focused coping, we cannot directly compare our studies.

Examining coping and appraisal interactions, we found that when threat appraisal was lower, people who used more avoidant coping strategies had more COVID-19-related distress than those who used fewer avoidant strategies. On the other hand, when the pandemic was viewed as a highly relevant and immediate threat, distress was high regardless of coping strategy. In short, increased use of avoidant coping strategies was associated with greater mental health issues regardless of how threatening the situation was. Surprisingly, problem-focused coping was also positively associated with distress at high levels of threat appraisal. These results may reflect the limited ability of the average undergraduate student to successfully plan or act their way out of this global crisis–or challenges in asking for or acquiring tangible or physical help due to social distancing recommendations. Similarly, the transition of many interactions into remote and distanced formats may have limited students' access to religious and instrumental social support, reducing their options for problem-focused coping.

Finally, we examined the main and interactive effects of coping and appraisal on COVID-19-related growth. Challenge/self-efficacy emerged as the only appraisal that was significantly related to growth; increased perception of challenge/self-efficacy was associated with increased growth. As predicted, all forms of coping statistically predicted growth, with growth negatively associated with avoidant coping and positively associated with emotion and problem-focused coping.

The interaction between stress appraisal and coping did not illuminate the unexpected results of positive associations between problem-focused coping and both distress and growth. Examining the interactions between coping and challenge/self-efficacy revealed that only the interaction with emotion-focused coping was significant. Emotion-focused coping was related to greater growth even for individuals who didn't view this pandemic as an opportunity for growth. But for those who viewed the COVID-19 as a challenge they could overcome, increased emotion-focused coping was associated with particularly high levels of psychological growth.

4.1. Implications

The emergence of threat appraisal and avoidant coping as a potential vulnerability factor for or reaction to pandemic-related distress may inform both clinical and policy-level decisions. The constellation of risk and protective factors during this pandemic could inform public health campaigns or may be used to screen students and anticipate the differential levels of distress during this crisis. Such monitoring could provide early and informed support for vulnerable individuals.

In this study, stress appraisal emerged as a statistical predictor of distress and growth. Many stress models interpret stress appraisal not as a static level, but as a "skill" that can be developed and honed. This framework positions appraisal as a trainable component of stress response—with training, a stressor appraised as a threat might be reappraised as an opportunity for growth. Taken with our conclusions that challenge/self-efficacy appraisals are a vital component of COVID-19-related growth, but threat/centrality appraisals are associated with COVID-19-related distress, this framework might provide public health and clinical implications. Perhaps, by framing information about the pandemic as a challenge that might be overcome, public health officials might reasonably increase growth responses while decreasing distress.

These results indicate that avoidant and problem-focused coping are associated with distress *even when* the situation is not appraised as highly threatening. On the other hand, emotion-focused coping was associated with *less* distress. Though the directionality of this relationship cannot be determined, it is possible that the training of specifically emotion-focused coping skills (e.g., helping behavior, practicing gratitude) might reasonably enhance reappraisal intervention and public health messaging.

4.2. Strengths and limitations

Strengths of this sample include its size and racial diversity, though the current study has several limitations. First, as this sample included university students, it is possible that the degree of COVID-19 exposure may be systematically different from that of the general population. After all, these students were able to continue their courses remotely, and their age may be associated with a less severe course of COVID-19 illness; any impact on them may have been lessened. This explanation is consistent with our data, as the undergraduates in this study were largely shielded from exposure to the virus. It is also vital to acknowledge the increasingly hostile climate that may have been experienced for our largely Asian-American sample during data collection (Le et al., 2020). Although data were collected regarding exposure to pandemic stressors related to the virus, we did not anticipate the need to collect data examining nuances related to race-based stress. Though the role of race-based stress is beyond the scope of the current paper, research is needed to accurately determine its influence on appraisals, coping, and

mental health outcomes during this pandemic.

Additionally, this data does not permit claims of causation. Though coping and appraisals may affect mental health, it is also reasonable that mental health problems could be risk factors for COVID-19 related stressors (see Fond et al., 2021) or that a third variable affects coping, appraisal, and mental health simultaneously. The hypotheses generated by this work may enable future longitudinal research to determine directionality and explore the role of coping strategies in distress and growth trajectories over time. For example, Bonanno et al. (2008) used latent class analysis to identify four trajectories: chronic dysfunction, delayed dysfunction, stable resilience, and recovery. By considering the heterogeneous trajectories of psychological response, researchers could parse out the coping strategies that may pull individuals out of avoidance and dysfunction, or better serve individuals who may initially appear unimpacted by the pandemic due to responses that worsen over time. More research might explore these factors in individuals most acutely impacted by this pandemic, such as healthcare service providers and frontline essential workers, or individuals experiencing chronic illness or preexisting conditions. The former groups' increased exposure to the virus and its consequences and the latter's heightened vulnerability to the virus and resulting social isolation could spell differential outcomes for the same endorsements of stress appraisal or coping strategies.

Though Folkman and Moskowitz's transactional coping model has received much attention and support, it does not completely explain the variance in situational coping strategies (Bouchard, 2003). A complementary body of research focuses instead on the relatively stable coping dispositions or resources that contribute to coping efforts. Moos and Holahan (2003) have reconciled these perspectives in a model that includes the transactions between dispositions and contextual factors, with environmental stressors/resources and dispositional self-efficacy/coping styles informing how individuals respond to transitory conditions and outcomes of those responses. Demographic factors such as gender, ethnicity, and SES contribute to these enduring environmental stressors and resources (Utsey et al., 2008). In the context of the current pandemic, members of marginalized groups experience objectively worse health outcomes as well as structural and institutional limitations on the coping resources available to them (Richardson et al., 2020; Tai et al., 2021). An integrative framework of coping suggests that demographic- or community-relevant factors will moderate the relationship between coping responses and psychological outcomes. We encourage further research that explores non-college samples and potential moderation by factors such as socio-economic status.

5. Conclusions

These data shed further light on the mental health correlates of viral threats, underscoring the role of coping and stress appraisals of students navigating this crisis. Even for those who appraised a situation as less threatening, increased utilization of avoidant coping was associated with high levels of psychological difficulties. On the other hand, all forms of coping were associated with growth, with more growth for those who utilized high levels of emotion-focused and problem-focused coping strategies and less growth for high levels of avoidant coping. Appraisal of the situation as a "challenge" appears to have a key relationship with growth as well: in this health crisis, increased emotion-focused coping and challenge appraisal together were associated with the most positive outcomes.

Utilization of problem-focused coping was associated with greater endorsement of both distress and growth. This ambivalence may reflect the limited ability of individual university students to affect the course of this pandemic: although they could plan and take action to *try* to address the situation (potentially in alignment with growth), individual students are incapable of materially affecting the pandemic at a population level (potentially related to distress). Meanwhile, emotion-focused coping was associated with lower distress and more growth. Though we cannot assume directionality, one interpretation of these results would suggest that strategies to manage one's response to the crisis (versus the crisis itself) might be the more effective means of reducing negative outcomes and fostering positive ones. Alternatively, individuals who are distressed may develop coping strategies and beliefs that are understood to be less functional. In either case, it may be beneficial to emphasize emotion-focused coping in clinical work and public health communication to help manage distress and growth during a viral outbreak.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jadr.2022.100325.

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