

Emotion Regulation Profiles Associate with Individual Differences in Mental Health Outcomes During a Global Pandemic Context

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Abstract

Emotion regulation (ER) is central to mental health and well-being. Yet, we have limited understanding of how individuals regulate their emotions during a context that is highly uncertain and uncontrollable—a global pandemic. Moreover, despite people's use of a variety of ER strategies, the conventional norm of ER studies is to only focus on the impact of one strategy without simultaneously capturing multiple ER strategies to understand individuals' ER profiles. **Objectives:** Using a data-driven person-centered approach, we first identified individuals' ER profiles. Second, we examined how ER profiles may be associated with a variety of mental health outcomes during a global pandemic. **Method:** We recruited 1,302 participants during the initial outbreak and lockdown period of the COVID-19 pandemic in the United States. **Results:** Based on eight ER strategies (i.e., positive reframing, problem solving, seeking support, acceptance, denial, using substances, venting, and rumination), we identified five distinct latent ER profiles: Low Regulator, Adaptive Regulator, Denier, Substance User, and Maladaptive Regulator. The Maladaptive Regulator exhibited higher levels of anxiety, depression, and loneliness than those from other ER profiles, whereas individuals in the Adaptive Regulator profile reported the highest levels of psychological well-being. **Conclusion:** ER profiles may be an intervention target for reducing psychological burdens in uncertain and stressful circumstances, such as a pandemic.

Keywords: Emotion regulation, coping, mental health, pandemic, stress.

Introduction

How do individuals regulate their negative emotions during a global pandemic context? Emotion regulation (ER) refers to the process of initiating, maintaining, and modifying one's emotional experience and expression in response to the environment (Gross, 2015). The ability to flexibly regulate emotions under stressful circumstances is crucial for adaptive functioning, including better psychological well-being (Bonanno & Burton, 2013). Conversely, emotion dysregulation is considered a fundamental aspect of most forms of psychopathology (Aldao et al., 2010; Sheppes et al., 2015), including anxiety and depression (Campbell-Sills & Barlow, 2007; Joormann & Stanton, 2016). Despite a growing body of literature documenting the critical role of understanding individual differences in ER for mental health outcomes, our understanding of how people regulate their emotions in an uncertain and uncontrollable real-life context—a global pandemic context (see Rajkumaer, 2020 for a review)—remains limited.

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Indeed, many studies have primarily relied on hypothetical vignettes (e.g., Dixon-Gordon et al., 2015) or controlled experimental paradigms (e.g., images or movie clips) that may not reflect real-life situations or may not induce a significant level of stress. Moreover, while individuals employ a variety of ER strategies (e.g., social support, rumination) to cope with stress, most studies tend to focus on examining a single ER strategy, rather than simultaneously assessing a range (profiles) of ER strategies. While numerous studies concentrate on one or two ER strategies (e.g., cognitive reappraisal and expressive suppression), an increasing number of studies is now exploring multiple ER strategies simultaneously (Tan et al., 2022). However, it remains unclear whether people employ a variety of strategies to cope with a global pandemic context and how individual differences in the strategies used may be linked to mental health outcomes. Given the unpredictable and uncontrollable nature of the COVID-19 pandemic, which have imposed significant physical and mental health burdens worldwide (Panayiotou et al., 2021; Rajkumaer, 2020), this context provides a shared naturalistic setting to gain a better understanding of how individuals regulate their emotions in a highly stressful situation. The primary objective of this study is to use a person-centered approach to investigate how individual differences in the utilization of various ER strategies are associated with different mental health outcomes during the pandemic context.

The global COVID-19 pandemic

The COVID-19 pandemic and its resulting physical, social, and economic impacts have had a detrimental effect on many people's mental health (see Rajkumaer, 2020, for a review). Strict quarantine and social distancing measures, which have included restricted social interaction, have led to adverse mental health outcomes (Burtscher et al., 2020; Mazza et al., 2020). Furthermore, the pandemic has triggered fears of financial uncertainty, including financial collapse and an unprecedented rise in involuntary unemployment, which have been associated with poor psychological outcomes (Paul & Moser, 2009). Despite the adverse psychological impact of the pandemic, there is significant variability in how individuals cope with this crisis, and this variability may be linked to different mental health outcomes.

Given the uncertain nature of the pandemic, especially during the initial outbreak period, this context provides an opportunity to study how individuals cope with stressful circumstances in a naturalistic experimental setting. This approach stands in sharp contrast to past studies that often relied on asking individuals to retrospectively recall stressful events, which can vary among individuals and may be subject to recall bias. To investigate how individuals respond to a real-life stressful situational context, we particularly focus on the initial outbreak of the pandemic in the United States (US). This period was characterized by the absence of a vaccine and uncertainty regarding the pandemic's outcome. Understanding the variability in how people regulate their emotions during naturalistic pandemic settings has important implications for designing interventions aimed at alleviating mental health burdens in unpredictable circumstances, such as global pandemics or other natural disasters (Panayiotou et al., 2021).

Emotion regulation and mental health

Emotion Regulation (ER) has been proposed as a transdiagnostic construct to comprehend individual differences in mental health and well-being outcomes (Aldao et al., 2010; Gross, 2015; Sheppes et al., 2015). For instance, a meta-analytic review investigating the impact of various ER strategies across psychopathology, including anxiety, depression, eating disorders, and substance-use disorders, revealed significant effects. Specifically, rumination exhibited a large effect size, avoidance (e.g., denial) demonstrated a medium to large effect, and acceptance exhibited a small effect (Aldao et al., 2010). Some studies have reported that rumination, particularly the brooding aspect (Treynor et al., 2003; Nolen-Hoeksema et al., 2007), and avoidance (Holahan et al., 2005) predicted elevated depressive symptoms over periods ranging from a few days to several years, though findings regarding anxiety have been mixed (e.g., Hong, 2007; Blalock & Joiner, 2000). In contrast, ER strategies such as positive reframing, seeking support, and problem-solving were associated with lower levels of depressive and

anxiety symptoms (Gross & Thompson, 2007). These strategies have consequently been conceptualized as "adaptive" within a specific situational context, as individuals may possess the ability to modify or mitigate the impact of stressors (Aldao et al., 2010).

Understanding individual ER profiles as a risk factor

Individuals may employ various emotion regulation (ER) strategies in different situational contexts, such as during the COVID-19 pandemic. Their choice of strategy can be influenced by both the specific context and the range of ER tactics available to them (Aldao, 2013). While there is a growing body of studies that have explored the associations between multiple ER strategies and their combined impact on mental health outcomes (e.g., Dixon-Gordon et al., 2015; Tan et al., 2022), these studies are exceptions rather than the norm. This is because most studies have traditionally focused on the impact of a single specific ER strategy, such as rumination or positive framing/reappraisal, often neglecting the examination of multiple strategies simultaneously. Additionally, it remains unclear whether individuals with specific ER "profiles," characterized by the endorsement of different ER strategies, may be linked to distinct mental health and well-being outcomes in the context of the COVID-19 pandemic—a natural environmental context marked by heightened psychological distress (Burtscher et al., 2020; Mazza et al., 2020; Paul & Moser, 2009; Rajkumaer, 2020).

When individuals were asked to recall how they cope with stressful events using seven ER strategies (i.e., acceptance, reappraisal, problem-solving, worry/rumination, self-criticism, expressive suppression, avoidance), Dixon-Gordon and colleagues (2015) unveiled five distinct ER profiles: low regulators, high regulators, adaptive regulators, worries/ruminators, and avoiders. Adaptive regulators are characterized by a higher utilization of "adaptive" strategies (e.g., acceptance, positive reframing, problem-solving), while low regulators employ ER strategies sparingly. Both adaptive regulators and low regulators are associated with fewer symptoms of psychopathology (including depression, anxiety, disordered eating, and borderline personality symptoms). In contrast, high regulators, characterized by a higher use of all strategies, are associated with a higher prevalence of symptoms. These findings underscore the importance of investigating how individual ER profiles may be linked to different mental health outcomes during the COVID-19 pandemic.

The Current Study

Utilizing a large sample ($N = 1,302$) of participants recruited during the initial outbreak and lockdown period of the COVID-19 pandemic (April 14 - April 27, 2020) in the US to capture the uncertainty of the pandemic context, the current study has two primary objectives:

First, we employ a data-driven person-centered approach (i.e., latent profile analysis) for the identification of distinct ER profiles across eight different ER strategies (i.e., positive reframing, problem-solving, seeking support, acceptance, denial, substance use, venting, and rumination). These profiles are selected based on their conceptual significance and empirical associations with various adjustment outcomes (Aldao et al., 2010).

Second, we investigate how the identified ER profiles are associated with different mental health outcomes during the COVID-19 pandemic. Mental health outcomes encompass two commonly used measures of depression and anxiety, as well as loneliness, psychological well-being, and COVID-19 domain-specific stress and anxieties (i.e., financial, health, community, activity, and social-related stressors) tailored to the pandemic context.

Our hypotheses include the expectation that we will identify at least three different ER profiles, specifically adaptive, high/maladaptive, and low regulators (Dixon-Gordon et al., 2015). Secondly, we hypothesize that individuals classified as low and adaptive regulators, characterized by higher utilization of adaptive strategies, will exhibit better mental health outcomes, whereas high/maladaptive regulators will experience higher levels of adjustment problems. Additionally, considering prior research indicating that females are twice as likely as males to develop internalizing problems such as depression and anxiety (Gorrese, 2016) and are more inclined to employ certain strategies (e.g., rumination; Nolen-Hoeksema & Jackson, 2001), we also explore whether gender moderates the

associations between ER profiles and mental health outcomes. In our analysis, we include individuals' physical health and the personality trait of neuroticism as covariates, as they may confound the association between ER profiles and mental health outcomes (Lahey, 2009).

Methods

Participants

Our sample consisted of 1,302 participants, with 67% identifying as females, 30% as males, and 0.7% as nonbinary or other genders. These participants were recruited from a large Midwest university through an anonymous online survey. Data collection took place from April 14 to April 27, 2020, during the initial outbreak period of the COVID-19 pandemic in the US. The age of participants ranged from 17 to 52 years (mean = 22.9 years, SD = 4.43). Participants reported various levels of education, spanning from high school or GED (8.5%), some college (41%), 2-year college degree (2%), 4-year college degree (26.2%), master's degree (17%), doctoral and professional degrees (3.6%), with the median education level being a bachelor's degree and 1.7% of our sample did not report their level of education. Regarding racial and ethnic backgrounds, 69.7% of our participants identified as white, 3% as African American, 3.3% as Latino, 10.6% as Asian, 11.9% as of mixed race, and 1.5% as belonging to other racial or ethnic categories.

Measures

ER Strategies

Coping strategies

Due to the absence of existing measures tailored to assess coping and emotion regulation (ER) strategies in the context of a pandemic, we adapted the Brief COPE (Carver et al., 1989) to evaluate strategies employed by individuals during the COVID-19 pandemic. Participants were asked to indicate the "ways they have been coping with the stress related to the Coronavirus (COVID-19) outbreak" on a 4-point Likert scale ranging from "I haven't been doing this at all" (1) to "I've been doing this a lot" (4). The Brief COPE comprises seven subscales, each consisting of two items. In our study, we included the following subscales: a) positive reframing (e.g., I've been trying to see it in a different light, to make it seem more positive), b) problem solving (e.g., I've been turning to work or other activities to take my mind off things), c) seeking support (e.g., I've been getting emotional support from others), d) acceptance (e.g., I've been accepting the reality of the fact that it has happened), e) denial (e.g., I've been saying to myself "this isn't real"), f) using substance (e.g., I've been using alcohol or other drugs to make myself feel better), and g) venting (e.g., I've been saying things to let my unpleasant feelings escape). Higher scores indicated higher endorsement of each strategy during the pandemic.

Rumination

As the Brief COPE did not include an assessment of rumination, we also administered the rumination scale developed by Treynor et al. (2003) to evaluate individuals' tendencies toward rumination. Participants were asked to indicate how frequently they engage in certain thoughts or behaviors when they are feeling down, sad, or depressed. They rated these items on a 4-point Likert scale, ranging from "almost never" (1) to "almost always" (4). The rumination scale consists of two subscales: reflection and brooding. Specifically, for this study, we utilized the 5-item brooding subscale (e.g., "What am I doing to deserve this?"), as previous research has demonstrated that brooding is more strongly associated with depression compared to the reflection subscale (Treynor et al., 2003). Higher scores on the scale indicated a greater endorsement of rumination.

Mental health outcomes

Anxiety, somatization, and depression

We employed the 18-item Brief Symptoms Inventory (BSI; Derogatis, 2000) to evaluate participants' levels of anxiety, somatic symptoms, and depressive symptoms. Participants were asked to assess the extent to which they had been distressed by these symptoms over the preceding 7 days, using a 5-point

scale that ranged from "not at all" (1) to "extremely" (5). The BSI scale comprised three subscales, each consisting of 6 items: anxiety (e.g., "I've been turning to work or other activities to take my mind off things"), somatic (e.g., "Faintness or dizziness"), and depressive (e.g., "Feeling no interest in things"). Higher scores on the scale indicated a greater endorsement of these symptoms.

General depression

For cross-validation, we also evaluated participants' general depression symptoms experienced in the past 2 weeks using the Inventory of Depression and Anxiety Symptoms II (IDAS-II) measure (Watson et al., 2012). Participants were presented with a series of questions that pertained to their feelings, sensations, problems, and experiences during this two-week period. They rated their experiences on a 5-point scale that ranged from "not at all" (1) to "extremely" (5). In this study, we specifically utilized the 20-item broadband scale of General Depression, which encompassed the following symptoms: a) dysphoria (e.g., I had little interest in my usual hobbies and activities), b) suicidality (e.g., I had thoughts of suicide), c) lassitude (e.g., I felt exhausted), d) insomnia (e.g., I had trouble falling asleep) and e) appetite loss (e.g., I did not have much of an appetite). Higher values indicated higher levels of depression.

COVID-19- related stress and anxiety

The COVID-19 Stress and Anxiety Scale (see Appendix A), adapted from Laio et al. (2014) was employed to assess various domains of stress and anxiety related to the COVID-19 pandemic. Participants provided their responses on a 5-point scale, indicating their level of concern during the past 7 days, including today, regarding the impact of the COVID-19 outbreak. The scale comprised five subscales: a) community-related anxiety subscale (6 items; e.g., Persist in the community for long time), b) health-related anxiety (4 items; e.g., How worried were you about catching Coronavirus (COVID-19), c) social-related anxiety (3 items; e.g., Conflict between family members), d) activity-related anxiety subscale (4 items; e.g., Restrict my social meetings with my friends) and f) financial-related anxiety (2 items; e.g., Family members lost their job). Higher values indicated higher levels of COVID-19- related stress and anxiety.

Loneliness

We adapted the UCLA 3-item loneliness scale developed by Hughes et al. (2004) to measure individuals' levels of loneliness during the COVID-19 pandemic. Participants rated their responses on a 3-point scale, ranging from "hardly ever" (1) to "too often" (3). Specifically, participants were asked: a) about how often they feel that they lack companionship, b) how often they feel left out, and c) how often they feel isolated from others after the COVID-19 outbreak. Higher values indicated greater feelings of loneliness.

Psychological well-being

We employed the 8-item well-being subscale from the IDAS-II to evaluate participants' psychological well-being over the preceding 2 weeks. Participants used a 5-point scale, ranging from "not at all" (1) to "extremely" (5), to rate their experiences. Higher values on this scale indicated greater levels of psychological well-being.

Covariates

We included the 2-item neuroticism subscale (e.g., Anxious) from the Big Five Personality Scale (McCrae & Costa, 1987) and the 3-item physical health subscale (e.g., In general, how would you rate your physical health?) adapted from the PROMIS Global Health scale as covariates.

Data analytical Plan

Our first aim was to employ a person-centered approach to examine individual ER profiles based on eight different ER strategies (i.e., positive reframing, problem solving, seeking support, acceptance, denial, using substances, venting, and rumination) using latent profile analysis (LPA) in Mplus 7.3. We conducted LPA models with one to six classes. The optimal solution was selected following the guidelines provided by Nylund and colleagues (Nylund, Asparouhov, & Muthén, 2007). Specifically,

smaller values of the Akaike information criterion (AIC), Bayesian information criteria (BIC), and adjusted Bayesian information criteria (ABIC) indicate a better fitting model. Significant Vuong-Lo-Mendell-Rubin Likelihood Ratio Test (VLMR) and Bootstrap Likelihood Ratio Test (BLRT) results indicate that the k-class solution is superior to the k-1-class solution. Each profile in the best solution should also be substantively (greater than 2%; Muthen & Muthen) and conceptually meaningful.

Our second aim was to examine whether individuals with different ER profiles are associated with distinct mental health outcomes. Class membership identified in Aim 1 was extracted from Mplus, and a series of Class membership X Gender ANCOVAs with Tukey adjustment for post hoc pairwise t-tests (robust to violations of homogeneity of variance and differences in sample size) were conducted to compare participants' mental health outcomes, including anxiety, depression, somatization, general depression, loneliness, COVID-19 related anxiety and stress, and psychological well-being. Neuroticism and physical health were included as covariates.

Results

Missing data and Preliminary analysis

Missing values of all variables range from 0 to 34%. Little's missing completely at random (MCAR; 1988) test was not significant, $\chi^2(39) = 32.49$, $p = .76$, which suggests that data were MCAR and that conditions were sufficient to use full information maximum likelihood (FIML) to approximate missing data for Aim 1. Mean, standard deviation (SD) and intercorrelation of all study variables are presented in Table 1.

Solutions for one to six classes of the LPA models are presented in Table 2. Results indicated that the 5-class model has overall better fit indexes (lower AIC, BIC, SSABIC, higher entropy values, and VLMR and BLRT p-values < .05, Table 2).

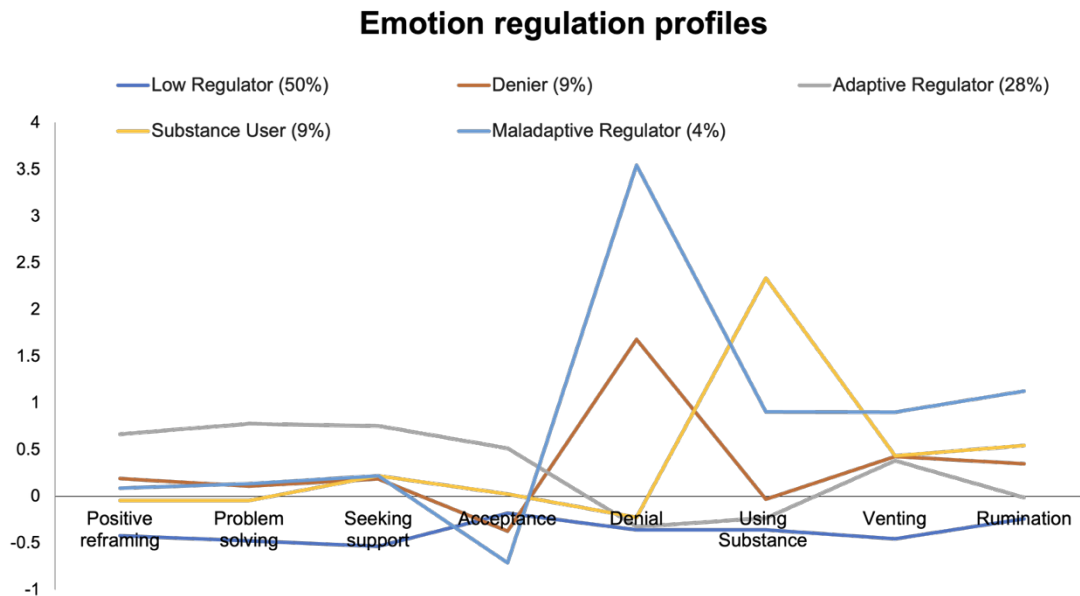
Figure 1 depicts the emotion regulation profiles identified from the 5-class solution model. The *Low Regulator* (encompassed 50% of the sample) was characterized by low endorsement of different emotion regulation strategies. The second largest class (28%) was the *Adaptive Regulator* characterized by higher usage of "adaptive" ER strategies including positive reframing, problem solving, seeking support, acceptance, and lower usage of "maladaptive" strategies including denial, substance use, venting, and rumination. Next, there were the classes of *Denier* and *Substance User* (both of which encompassed 9% of the sample) characterized by high usage of denial and substance use as coping strategies respectively, both with low usage of other strategies. Finally, there was a class of *Maladaptive Regulator* (4%) characterized by the lower usage of "adaptive" strategies including positive reframing, problem solving, seeking support, acceptance, and high endorsement of denial and rumination, along with moderate levels of other "maladaptive" strategies including substance use and venting.

Table 1. Descriptive statistics and Pearson correlation of all study variables (N = 1,302)

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
Community-related													
1 Anxiety	4.01	.74	1										
2 Health-related Anxiety	3.12	.78	.585***	1									
3 Social-related Anxiety	2.06	.99	.281***	.300***	1								
4 Activity-related Anxiety	3.41	.86	.436***	.278***	.280***	1							
5 Financial-related Anxiety	2.88	1.29	.283***	.262***	.322***	.267***	1						
6 BSI Anxiety	1.99	.94	.369***	.366***	.358***	.320***	.281***	1					
7 BSI Depression	2.15	.93	.312***	.251***	.350***	.353***	.275***	.773***	1				
8 BSI Somatization	1.53	.71	.230***	.290***	.320***	.193***	.258***	.699***	.564***	1			
9 Well-being	2.34	.73	-.104***	-.077**	-.086**	-.112***	-.120***	-.240***	-.419***	-.175***	1		
10 General Depression	2.18	.73	.342***	.300***	.338***	.318***	.282***	.741***	.795***	.618***	-.372***	1	
11 Loneliness	1.99	.62	.149***	.098***	.237***	.284***	.078**	.309***	.496***	.242***	-.320***	.447***	1

Table 2. Fit statistics of latent Profile from one to six classes

Class	Log likelihood	Df	AIC	BIC	SSABIC	VLMR	BLRT	Entropy	Sm LC
1	-14661	16	29353	29436	29385	NA	NA	NA	NA
2	-14127	25	28305	28435	28355	0	0	0.971	0.13
3	-13749	34	27565	27741	27633	0.0598	0	0.783	0.11
4	-13494	43	27074	27296	27159	0	0	0.841	0.03
5	-13278	52	26660	26929	26764	0.0569	0	0.866	0.04
6	-13210	61	26541	26856	26662	0.5086	0	0.809	0.04

Figure 1. Latent profile analysis identified five emotion regulation profiles**Aim 2. ER profiles and mental health outcomes**

Class membership X Gender ANCOVA indicated that, overall, individuals in the Maladaptive Regulator class had the poorest mental health outcomes, followed by those in the Denier and Substance User classes. Conversely, individuals in the Low Regulator class had the best mental health outcomes, followed by those in the Adaptive Regulator class (Tables 3-4; Figures 2-3). Specifically, individuals in the Maladaptive Regulator class exhibited higher levels of anxiety, depression, and loneliness than those in other ER profiles (Table 3; Figure 2), as well as higher levels of COVID-related anxieties (Table 4; Figure 3). In contrast, individuals in the Adaptive Regulator profile exhibited the highest levels of psychological well-being (Table 3; Figure 2). Substance Users and Deniers exhibited the second-highest levels of depressive symptoms (Table 3; Figure 2). No significant differences were found between the ER profiles when examining gender differences.

Table 3. Mental health outcomes ANCOVA

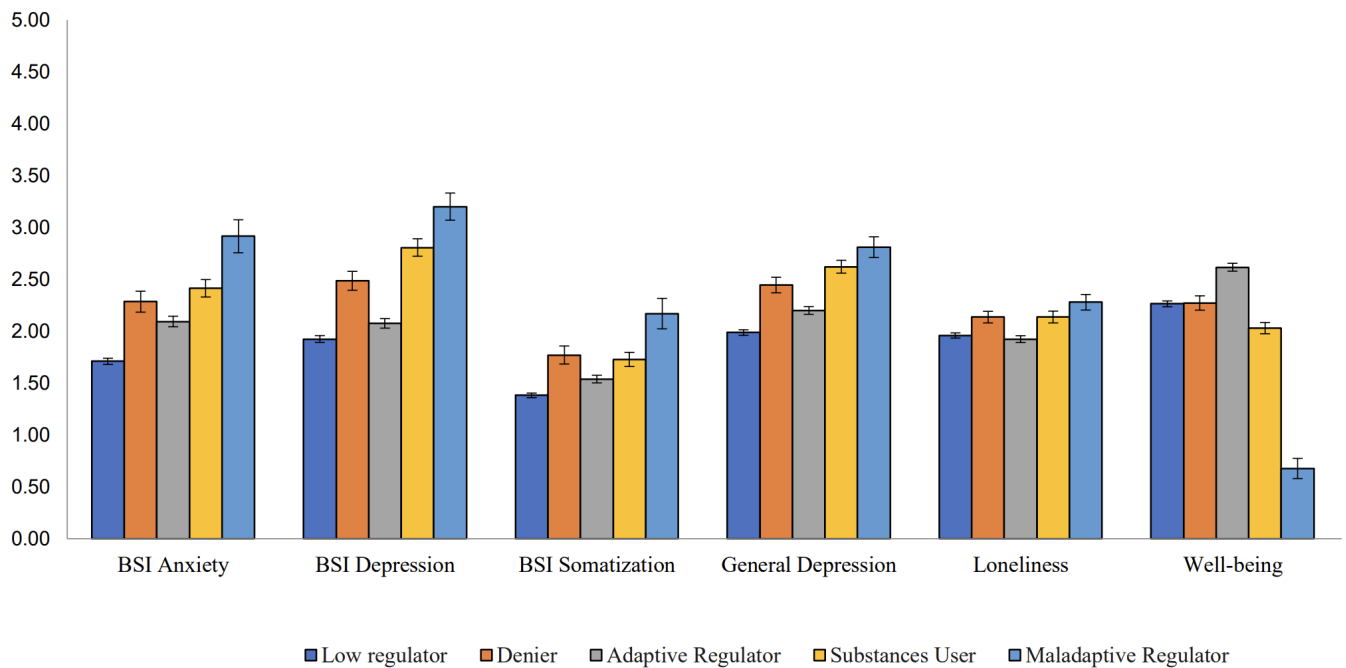
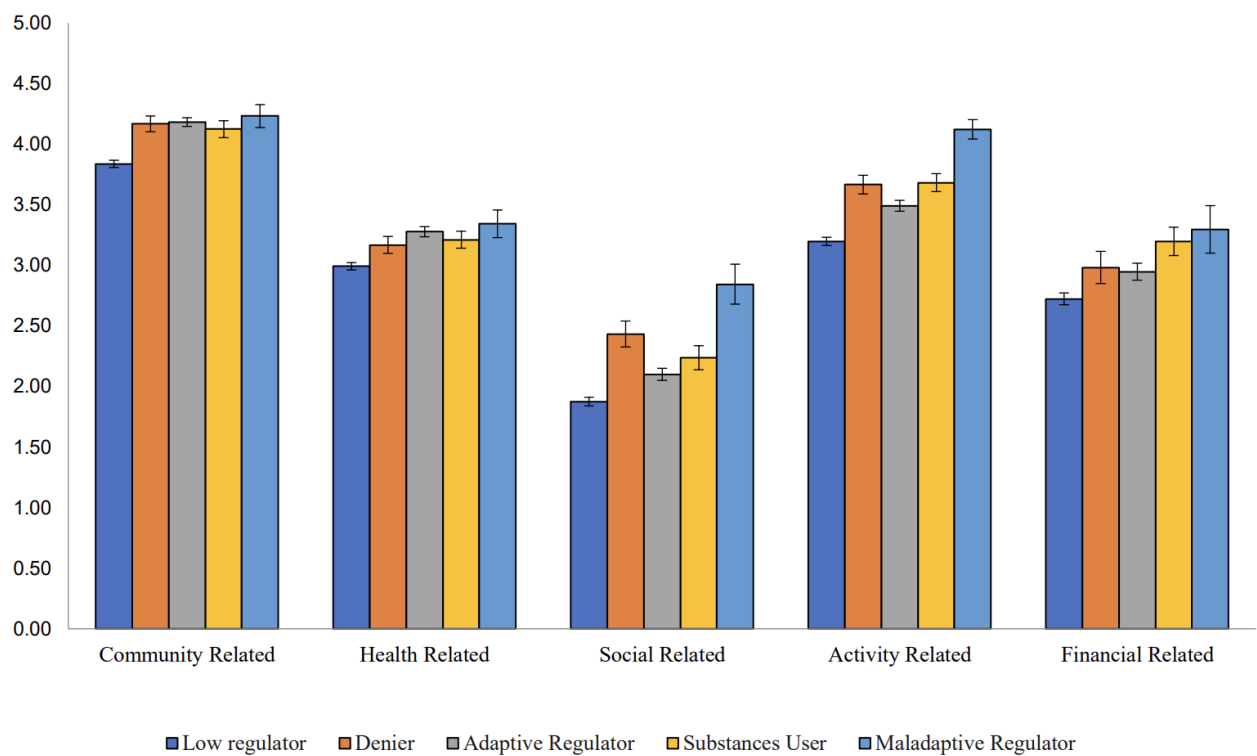
Variables	Low regulator (LR)		Denier (D)		Adaptive Regulator (AR)		Substances User (SU)		Maladaptive Regulator (MR)		F Value	P-value	Partial Eta Squared	Pairwise Comparison
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE				
BSI Anxiety	1.71	0.03	2.29	0.10	2.09	0.05	2.41	0.08	2.92	0.16	36.02	***	0.103	MR, D, SU, AR > LR; MR > AR, SU, D
BSI Depression	1.93	0.03	2.49	0.09	2.08	0.05	2.81	0.08	3.20	0.13	43.45	***	0.122	MR, SU, D, AR > LR; D, SU > AR; MR > AR, D, SU
BSI Somatization	1.38	0.02	1.77	0.09	1.54	0.04	1.73	0.07	2.17	0.15	20.00	***	0.06	MR, D, AR > LR; MR > SU
General Depression	1.99	0.03	2.45	0.08	2.20	0.04	2.62	0.06	2.81	0.10	35.03	***	0.101	MR, SU, D, AR > LR; MR > AR, D
Loneliness	1.96	0.03	2.14	0.06	1.92	0.03	2.14	0.06	2.28	0.08	3.26	***	0.01	MR > LR
Well-being	2.26	0.03	2.27	0.07	2.62	0.04	2.03	0.05	0.68	0.10	16.00	***	0.049	AR > LR, D; SU > AR

Note: control for emotional stability and general health; Gender was included in the main effect and moderator but there is no difference of gender by group

Table 4. COVID-Related anxiety ANCOVA

Variables	Low regulator (LR)		Denier (D)		Adaptive Regulator (AR)		Substances User (SU)		Maladaptive Regulator (MR)		F Value	P-value	Partial Eta Squared	Pairwise Comparison
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE				
COVID-19 related anxiety and stress														
Community-related	3.84	0.03	4.17	0.07	4.18	0.04	4.12	0.07	4.23	0.10	13.13	***	0.04	AR, D, SU > LR
Health-related	2.99	0.03	3.17	0.07	3.28	0.04	3.21	0.07	3.34	0.11	8.35	***	0.026	AR > LR
Social-related	1.88	0.04	2.43	0.11	2.10	0.05	2.24	0.10	2.84	0.17	16.27	***	0.049	MR, D, AR > LR; MR > SU, AR
Activity-related	3.20	0.03	3.67	0.08	3.49	0.05	3.68	0.07	4.12	0.08	22.72	***	0.068	MR, D, SU, AR > LR; MR > AR
Financial-related	2.72	0.05	2.98	0.13	2.95	0.07	3.20	0.12	3.30	0.20	4.39	***	0.014	AR > LR

Note: control for emotional stability and general health; Gender was included in the main effect and moderator but there is no difference of gender by group

Figure 2. COVID-related anxiety outcomes by emotion regulation profiles**Figure 3. COVID-related anxiety outcomes by emotion regulation profiles**

Discussion

The primary goal of this study was to identify classes of ER profiles across eight different strategies and examine how different ER profile classes are associated with mental health outcomes during the COVID-19 pandemic, when individuals faced unexpected changes and stresses in their daily lives. This study provides evidence supporting the existence of five distinct classes of ER strategy patterns in the pandemic situation and their associations with several mental health outcomes, including anxiety, depression, loneliness, psychological well-being, as well as COVID-19-related anxieties. Taken together, these findings emphasize the importance of adopting a person-centered approach to understand ER strategies and provide valuable information on ER patterns and mental health outcomes during a global pandemic.

Profiles of ER strategies

Consistent with the findings of Dixon-Gordon and colleagues (2015), we identified five different profiles of ER strategies, although the specific patterns differed slightly. This underscores the importance of applying a person-centered approach to ER research, as it provides evidence that individuals may employ various combinations of coping strategies to manage their emotions in different situational contexts. Specifically, we first identified "adaptive regulators" characterized by frequent use of adaptive strategies and lower use of maladaptive strategies, as well as "maladaptive regulators" with higher use of maladaptive strategies and lower use of adaptive strategies. Additionally, our results revealed two additional patterns of ER characterized by using denial and substance abuse as coping strategies. Finally, we identified a class called "low regulators," comprising individuals who generally endorsed low use of any emotion regulation strategies.

While deniers (avoiders), low regulators, high/maladaptive regulators, and adaptive regulators were identified in Dixon-Gordon and colleagues' (2015) sample, we found a new group of substance users in our sample. This discrepancy may arise from differences in measurement, as we included substance use as one of the coping strategies in our measure, considering its prevalence among college students. Alternatively, this difference may be partially attributed to the context of the COVID-19 pandemic, during which individuals were restricted from engaging in in-person interactive coping strategies and encouraged to stay home. Indeed, empirical studies conducted during the early phase of the COVID-19 pandemic have documented increased alcohol use (Charles et al., 2021). The emergence of this new group of substance users in our study underscores the significance of considering contextual and broader environmental factors in understanding the regulatory strategies individuals employ.

Associations of different ER profiles with mental health outcomes

Supporting the idea of individual differences in adjustment during stressful circumstances depending on their patterns of ER, the results of this study indicated that an individual's mental health outcomes, such as depression, loneliness, and COVID-19-related anxieties, varied across the patterns of ER strategy use. In general, "low regulators" exhibited the lowest levels of psychological problems, followed by "adaptive regulators." This suggests that "low regulators" may not employ specific ER strategies simply because they do not experience significant levels of negative emotions that require regulation. "Adaptive regulators" showed the second-best mental health outcomes among the five groups, providing additional evidence that a combination of using adaptive strategies (e.g., positive reframing, acceptance) and avoiding maladaptive strategies (e.g., rumination, denial) may lead to the most optimal mental health outcomes.

Although "low regulators" generally manifested lower levels of mental health problems, it is notable that "adaptive regulators" experienced higher levels of psychological well-being than "low regulators." This may suggest that individuals experiencing higher levels of negative emotions and stress can feel happier and more comfortable than individuals with lower negative emotions, as long as they cope with their stresses using appropriate ER strategies. This pattern of results implies that the ability to employ adaptive ER strategies may be a key factor in well-being, even in situations where individuals

experience emotional distress in uncertain and stressful circumstances, such as a pandemic. On the other hand, the group of individuals characterized by using multiple maladaptive ER strategies, but not adaptive ones, exhibited the most elevated levels of mental health problems, including the highest levels of depression, anxiety, and loneliness among the five groups. It is particularly intriguing that this class of individuals showed significantly higher levels of mental health problems than the classes of people characterized by mainly using a specific maladaptive ER strategy (i.e., denier, substance user). These findings provide evidence that the combination of using multiple maladaptive strategies and not employing adaptive strategies adds unique challenges to individuals' mental health. This emphasizes the importance of applying a person-centered approach to investigate patterns of using several ER strategies. It may also suggest the need to target multiple ER strategies in intervention settings.

Associations of different ER profiles with COVID-related multidimensional anxiety

Another interesting finding includes the differential relationship between the patterns of ER and various domains of COVID-19 anxiety. In general, low regulators showed the lowest levels of COVID-related anxiety across the five domains, indicating that low regulators may generally experience less anxiety during the early phases of a pandemic than individuals with other ER strategy patterns. Adaptive regulators showed the second-lowest levels of anxiety in some domains of COVID-19 anxiety (social-, activity-, and financial-related anxiety), suggesting a strong relationship between the ability to employ adaptive coping strategies and the levels of anxiety.

For community- and health-related anxieties, adaptive regulators exhibited the second-highest levels of anxiety, followed by maladaptive regulators. This result may be attributable to the unique characteristics of the community- and health-related anxiety subscales. For example, community-related anxiety includes concerns related to the impact of COVID-19 on the broader community, such as government management, difficulties in treatment and prevention, and safety issues with healthcare workers. Therefore, community-related anxiety may reflect more adaptive and healthier aspects of anxiety, reflecting an individual's concerns about community settings. Indeed, prior studies using the same measure of COVID-19 specific anxiety showed a significant relationship between the community-level anxiety subscale and positive behavioral adjustment, such as more frequent use of preventive strategies towards COVID-19 (under review). Similarly, health-related anxiety also includes concerns about the physical health of oneself and other people (e.g., friends and family). Therefore, it is possible that individuals who use more adaptive emotion regulation strategies, including seeking social support, might have endorsed higher levels of anxiety concerning how COVID-19 would negatively impact the health of their friends and family members. This pattern of results highlights the importance of delineating different types of anxieties pertaining to COVID-19, or other stressful circumstances, to identify the targets of intervention.

Meanwhile, maladaptive regulators showed the highest levels of anxiety in various aspects of COVID-19 situations. Consistent with the findings on general mental health outcomes, the levels of anxiety among maladaptive regulators were significantly higher than those among deniers and substance users. This suggests that individuals using several maladaptive ER strategies may be particularly vulnerable when dealing with anxieties arising from different aspects of the COVID-19 pandemic, such as financial difficulties, restricted social activities, and health-related concerns.

Limitations and future directions

Despite several important findings, some caveats should be noted for this study. First, our participants were primarily undergraduate students and young professionals from a university in the US without significant health issues. Therefore, the findings may not be generalizable to populations with more diverse sociodemographic and ethnic backgrounds or individuals with health-related problems. Second, since our findings are based on cross-sectional data, determining causality between ER patterns and mental health outcomes during a pandemic is not possible. More research using longitudinal data would help identify temporal relationships between ER strategies and mental health outcomes during a pandemic. Relatedly, it is challenging to ascertain the impact of ER patterns on COVID-19 anxiety

since we did not assess anxiety levels prior to the COVID-19 outbreak. Despite controlling for general health status and individuals' emotional stability, the relationship between ER strategies and COVID-19 anxieties may simply reflect an individual's anxiety levels prior to COVID-19. Lastly, the venting subscale (Brief COPE) has a low Cronbach alpha ($\alpha = .53$).

Conclusion and clinical implication

Our study represents an initial attempt to investigate the patterns of ER strategies and mental health outcomes during a real-life global pandemic setting by applying a person-centered approach. Pending replication, our findings emphasize the importance of considering multiple adaptive and maladaptive ER strategies in individuals. This study also provides valuable knowledge on interventions for emotion regulation. For example, individuals using several maladaptive ER strategies appear to be a vulnerable population who suffer more from mental health problems and therefore need more intervention, especially during an uncertain and stressful situation like pandemic settings. Additionally, our results highlight the importance of a detailed assessment of ER strategies in clinical settings, focusing on the various strategies patients use in different settings to capture the multifaceted and multi-contextual nature of the ER process. Similarly, in treatment settings, it is essential not only to target decreasing the use of undesirable ER strategies but also to provide more psychoeducation and continued practice in applying more adaptive ER strategies in patients' daily lives, given that individuals who use fewer maladaptive and more adaptive ER strategies endorsed better mental health outcomes.

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Conflict of Interest

No potential conflict of interest was reported by the author(s).

Ethical approval

Ethical approval for this study was obtained from the University of Michigan Institutional Review Board

Data Availability

The data that support the findings of this study are available from the first and corresponding author KI, upon reasonable request.

Author Credit Statement

Ka I Ip: Conceptualization; Methodology; Formal analysis; Data curation; Writing – original draft; Writing – review & editing; Visualization; Supervision; Project administration; Funding acquisition.

Janice Lin: Data curation; Formal analysis; Visualization; Writing – review & editing.

Sharon E. Shaw: Data curation; Formal analysis; Writing – review & editing.

Sujin Lee: Conceptualization; Methodology; Data curation; Formal analysis; Writing – original draft; Writing – review & editing.

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Appendix A

COVID-19 Stress and Anxiety Scale

Measured on a 5-point Likert scale: 1 = not at all; 2 = slightly 3 = moderately; 4 = quite a lot 5 = extremely

	<i>Not at all</i>	<i>Slightly</i>	<i>Moderately</i>	<i>Quite a lot</i>	<i>Extremely</i>
<i>Question</i>	☐	☐	☐	☐	☐

We will ask you to complete questions in regard to how you cope with different emotions, your psychological well-being, as well as your behavioral and emotional adjustment. Completing these questionnaires will require approximately 20 - 30 minutes of your time.

In the past 7 days, including today, what has been your level of concern regarding the impact of COVID-19 outbreak about the following:

1. If you were to develop COVID-19 symptoms tomorrow
2. Worried about catching COVID-19
3. Worried about someone in the household or extended family might become sick
4. Friends possibly getting sick
5. Persist in the community for a long time
6. Easy to spread and difficult to prevent
7. Difficulty to treat COVID-19
8. Conflict between family members
9. Poor relationship with friends or romantic partner
10. Government failing to provide enough, adequate and true information
11. Restricted social meetings with friends
12. Restricted outdoor activities
13. Healthcare workers at high risk
14. Family members losing their job
15. Financial difficulties
16. Missing personally important events
17. Changes and disruptions on existing plans

Note: Community related anxiety: #5, #6, #7, #10, #13; Activity related: #11, #12, #16, #17; Health Related- #1, #2, #3, #4; Social Related- #8, #9; Financial Related- #15, #14