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RESEARCH ARTICLE

Coping to What End?: Core Belief Disruption and Posttraumatic Growth During COVID-19

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Abstract

The pandemic caused by the 2019 Novel Coronavirus disrupted life globally, leading to a disruption of core beliefs, the need for coping strategies, and the possibility of posttraumatic growth, the positive psychological change that may occur after a stressful or traumatic event. This study followed 201 participants from the United States (M_{age}: 35.39, *SD*: 14.60) at four time points over the first year of the pandemic. Core belief disruption, the use of coping strategies, and posttraumatic growth were assessed in March 2020 (T1), April 2020 (T2), September 2020 (T3), and April 2021 (T4). From T1 to T4, core belief disruption significantly increased, and the use of most coping strategies decreased, but overall posttraumatic growth did not change. However, posttraumatic growth at all four time points was predicted by higher levels of core belief disruption, although which coping strategies predicted core belief disruption and posttraumatic growth varied based on the time of assessment and whether analyses were cross-sectional or longitudinal. Overall, the avoidant coping strategy of substance use was most frequently associated with core belief disruption, followed by the emotion-focused strategies of acceptance, self-blame, and religion. Interestingly, each problem-focused coping strategy was predictive of core belief disruption at one time point cross-sectionally, but no problem-focused coping strategy predicted core belief disruption longitudinally. Alternatively, the problem-focused coping strategies of active coping and positive reframing were the most frequent predictors of posttraumatic growth, while 50% of avoidant and emotion-focused coping strategies, such as self-distraction, denial, emotional support, and venting, were not associated with posttraumatic growth at any time point. These results indicate that participants were flexible with the use of coping strategies based on the circumstances at the time. Additionally, the coping strategies that primarily predict core belief disruption differ from the coping strategies that primarily predict posttraumatic growth. These findings highlight the coping strategies that should be avoided since they may contribute primarily to core belief disruption and encourage the use of coping strategies that may promote psychological growth following traumatic events.

Keywords: core belief disruption, coping, posttraumatic growth, COVID-19

Coping to What End?: Core Belief Disruption and Posttraumatic Growth During COVID-19

Many people experience a traumatic event at some point throughout the course of their life. Events such as a natural disaster, being in an accident, or suffering from an injury or illness, can all be extremely stressful. The 2019 Novel Coronavirus (COVID-19) affected people all over the world, proving to be a highly stressful experience as well as an unprecedented traumatic event that resulted in shaken core beliefs for many individuals[1]. The implementation of policies such as social distancing and quarantine resulted in both a large disruption in the global economy and a redefinition of people's daily routines. Many people underwent highly stressful experiences during– or as a result of– the pandemic, such as deaths of loved ones, threats to one's health and life, financial problems, etc.[2]. This global health crisis has called for researchers to examine its effects on mental health and well-being worldwide.

Coping Strategies

How people learn to handle or grapple with adverse events, such as the COVID-19 pandemic, is known as coping. As a construct, coping describes the way in which people use cognitive and behavioral tactics to help them manage circumstances that cause distress[3]. The use of coping strategies, which include either a series of actions or thought processes, can play a vital role in the recovery process following traumatic events by allowing one to effectively adapt during adversity[4,5]. Literature has identified three primary forms of coping: problem-focused, emotion-focused, and avoidant coping[3] that contain 14 facets of strategies: self-distraction, denial, substance use, behavioral disengagement, emotional support, venting, humor, acceptance, self-blame, religion, active coping, use of instrumental support, positive reframing, and planning.

Problem-focused coping strategies include active coping (e.g., putting efforts toward doing something about the current situation), the use of instrumental support (e.g., getting help from other people), planning (e.g., coming up with a strategy about what to do), and positive reframing (e.g., trying to see it more positively). On the other hand, emotion-focused coping strategies include venting (e.g., expressing negative feelings), the use of emotional support (e.g., getting comfort and understanding from someone), humor (e.g., making jokes about it), acceptance (e.g., learning to live with it), self-blame (e.g., criticizing oneself), and religion (e.g., praying or meditating). Avoidant coping involves self-distraction (e.g., turning to work and activities to take one's mind off of things), denial (e.g., refusing to believe that it has happened), substance use (e.g., using alcohol or drugs to help get through it), and behavioral disengagement (e.g., giving up trying to deal with it)[3].

All of these coping strategies can be either adaptive or maladaptive, meaning that they can be of benefit to someone by helping them to effectively adapt to their current circumstances or they can prevent effective adjustment and instead, negatively impact one's already distressful situation[6-8]. In

general, problem-focused coping is considered an adaptive coping style, while avoidance coping is considered as a maladaptive coping style because each are associated with positive and negative mental-health outcomes, respectively, while emotion-focused coping can be considered as either adaptive or maladaptive depending on the situation[3]. An adaptive coping style has been perceived as engaging in active coping, planning, acceptance, religion, humor, emotional support, and the use of instrumental support. Whereas, a maladaptive coping style is considered to be engaging in self-distraction, denial, substance use, behavioral disengagement, venting, positive reframing, and self-blame. Yet, recent research findings suggest that identifying which specific coping strategies can be considered adaptive or maladaptive is dependent upon the type of adversity that one experiences[9].

Core Belief Disruption and Posttraumatic Growth

Adverse events can cause a disruption in one's core beliefs that prompts them to ruminate and reflect upon the experience which can lead to a reshaping in the way in which they perceive themselves, others, and the world[10]. With the help of social support, reflection, meaning-making, and time, one may be able to rebuild their core beliefs and experience growth[11]. Posttraumatic growth (PTG) explains the positive psychological changes someone can experience as a result of a struggle with a major life crisis or traumatic event[12]. These positive changes are shown by gaining a better appreciation for life, feeling stronger than before, realizing new possibilities, making a spiritual or existential change, and relating to others more[12]. During the COVID-19 pandemic, core belief disruption was found to have a strong impact on PTG[13] such that many people reported experiencing PTG as a result of it[14-16].

Coping and PTG

Previous studies have demonstrated that certain cognitive processes following a traumatic experience can provoke coping styles that promote PTG[17]. More specifically, problem-focused coping, emotion-focused coping, avoidant coping, and religious coping have all been found to facilitate growth following adversity[18,19]. A concept coined as "positive active coping" has been found to contribute to PTG, which includes spiritual and religious development, positive coping strategies, acceptance coping, and especially, active cancer rumination[6,20-24]. The association between active coping and acceptance with PTG has also been replicated by previous studies[25-27]. Prati and Pietrantoni[27] state that positive reappraisal coping is likely to have a large impact on increasing PTG following a traumatic event, but social support coping only provides a moderate impact, and acceptance coping is likely to provoke very minimal growth. Additionally, avoidance-oriented coping styles such as denial, self-distraction, and behavioral disengagement have been associated with PTG[22,29]. However, those who use avoidance coping less after experiencing multiple types of traumas or a childhood trauma are more likely to experience PTG[30]. Additionally, the current use of substances[31] or self-blame to cope[32,33]

has been associated with less PTG. Yet previous studies have found no differences between adaptive and maladaptive styles of coping in that they both contribute to PTG[34,35]. Since findings have repeatedly shown that PTG can occur for those who use approach coping strategies (i.e., problem-focused and emotion-focused) and for those who use avoidance coping strategies, a concept known as "flexible coping" has been created to explain this phenomenon[36,37], suggesting that the two styles work together to facilitate growth.

Due to the equivocal findings in research regarding the association between overarching coping strategies and PTG, one of the researchers recently conducted a study to analyze the two. The findings suggested that coping strategies are, in fact, predictive of PTG[13]. Participants who engaged in higher levels of problem-focused coping and lower levels of avoidance coping were more likely to experience PTG, but they appeared to have decreased their use of coping strategies in general over the course of the first year of the COVID-19 pandemic. Emotion-focused coping was positively associated with PTG, but it was not a significant predictor when considered in tandem with problem-focused and avoidance coping strategies. Perhaps, that may have been due to the lower reliability seen for the emotion-focused coping subscale within that sample or due to less of an association between PTG and specific emotion-focused coping strategies. Since emotion-focused coping can be perceived as either adaptive or maladaptive, the results from this study replicate the prior research which has found that both adaptive (problem-focused) and maladaptive (avoidance) coping were linked to PTG[13,34,35].

The Current Study

Although the previous study analyzed the forms of coping strategies, research has yet to describe the relationships between the facets of coping strategies with core belief disruption and PTG during the COVID-19 pandemic. The primary objective of this study is to assess the coping strategies that people used throughout the first year of the COVID-19 pandemic, from March 2020 to April 2021. Specifically, analyzing which forms as well as facets of coping strategies were used during the pandemic and their associations with one's core belief disruption and prospective perceived PTG over time. Given that the relationship between coping strategies and PTG remains unclear, it would be of benefit to extend current research by examining subtypes within the three coping styles. Additionally, exploring the relationships between coping strategies, core belief disruption, and PTG during the pandemic will provide novel insight into adaptative and maladaptive behaviors during public health crises.

Method

Participants

There were 201 participants who completed four surveys over the course of the first year of the pandemic. Participants ranged in age from 18 to 81, with a mean age of 35.39 (*SD* = 14.60). Participants who did not complete all four time points (*n* = 797) were excluded from the analyses. See Table 1 for complete demographics.

Table 1

Participant Demographics

Variable	Participants ($N = 201$)	Variable	Participants ($N = 201$)
Age	35.39 (14.56)	Essential worker	35.3% Essential workers
			31.5% Live with essential worker
Sex	77.6% Female	High risk	28.9% High risk
			33.9% Live with high risk individual
Pets	71.0% Own pets	Living status	17.4% Live alone
			54.7% Live with romantic partner
			13.9% Live with parents
			13.9% Live with roommates
Race	83.6% White	Relationship status	37.7% Married
	4.5% Mixed		31.2% Dating/in relationship
	4.0% Asian		26.6% Single
	2.5% Latinx/Hispanic		3.0% Divorced
	2.0% Middle Eastern		
	1.5% Black		
State	25.4% Michigan	Employment	75.2% Employed
	12.4% Colorado		8.0% Unemployed/unable to work
	9.5% California		6.0% Students
	4.5% Virginia		6.0% Retired
	4.0% Texas		2.5% Out of work & looking for work
	4.0% Utah		2.5% Employed but not working
	4.0% New York		
Religion	47.5% Agnostic/Atheist	Had COVID	11.6% Yes
	36.5% Christianity		
	6% Unsure		
	2.5% Judaism		
	2.0% Buddhism		
Vaccination status	92.9% Vaccinated or plan to get vaccinated	Knew someone hospitalized	54.8% Yes
	6.5% Not vaccinated & no plan for vaccination		
		Knew someone who died	42.7% Yes

Procedure

Participants were recruited through a midwestern university's undergraduate subject pool as well as through snowball sampling that was advertised on social media sites such as Instagram and Reddit. A total of 1,000 participants were issued the T1 online survey starting March 31st, 2020, and were sent follow-up surveys on April 30th, 2020 (T2), September 30th, 2020 (T3), and March 31st, 2021 (T4). Participants who enrolled through the subject pool earned research credit for completing the initial survey. To encourage retention of participants each participant was sent up to three reminder emails every seven days after the initial follow-up survey invitation. In addition, participants were entered into raffles for a $50, $75, and $150 e-gift card for the T2, T3, and T4 surveys, respectively. Demographics and COVID-19

exposure were assessed first. Questionnaires regarding coping strategies, core beliefs, and PTG, were presented in a randomized order following the demographic section. Subsequently, T2, T3, and T4 targeted changes in participants' responses between surveys. All questionnaires that were included in T1 were also included in the subsequent surveys, with modifications made to the instructions to reflect changes in timing. Vaccinations for COVID-19 became available to the public in early 2021, so questions regarding vaccination status were also added to the T4 survey. Ethical approval for this study was granted by the university's internal review board.

Measures

Coping Strategies. Coping strategies were assessed with the brief version of the COPE scale[3]. This measure consists of 28 items (α = 0.801) rated on a scale from 1 (*not at all*) to 4 (*a lot*) and included items such as "I've been taking action to try to make the situation better." A separate score was calculated for each of the three subscales: avoidant coping (α = 0.685), emotion-focused coping (α = 0.548), and problem-focused coping (α = 0.816). The brief COPE includes 14 facets of coping strategies with 2 items each: self-distraction, denial, substance use, behavioral disengagement, emotional support, venting, humor, acceptance, self-blame, religion, active coping, use of instrumental support, positive reframing, and planning.

Core Belief Disruption. The Core Beliefs Inventory (CBI)[38] consisted of 9 items (α = 0.886) used to measure the degree to which the COVID-19 pandemic had caused participants to seriously examine their beliefs (e.g., "Because of COVID-19, I seriously examined the degree to which I believe things that happen to people are fair"). Participants rated the items on a 6-point scale ranging from 0 (*not at all*) to 5 (*very great degree*). Scores were averaged for a total core-belief disruption score.

Posttraumatic Growth. An expanded version of the PTG Inventory (PTGI-X)[39] consisted of 25 items (α = 0.956) that measure the degree to which the participants have experienced personal growth as a result of the COVID-19 pandemic or most stressful experience during the time of the study (e.g., "I changed my priorities about what is important in life"). The participants used a 6-point scale ranging from 0 (*did not experience this change*) to 5 (*very great degree*). Scores were averaged for a total PTG score.

Data Analysis

Data were analyzed using SPSS 26. Preliminary correlations between T4 variables were assessed using Pearson's Correlation coefficient. Experiences with COVID-19, comparisons based on demographic information, and comparisons between those who completed all four time points and those who completed three or fewer time points were assessed using Independent Sample *T*-tests. Changes over time were assessed with repeated measure ANOVAs using a repeated contrast. The Greenhouse-Geisser correction was used for any variables that violated Mauchly's Test of Sphericity. Hierarchical

regression analyses were run with each time point of core belief disruption as the dependent variable, with demographics in step one and the corresponding coping strategies from each time point entered in step two. A separate hierarchical regression analysis was run using T1 coping strategies to predict T4 core belief disruption. Hierarchical regression analyses were also used to assess whether coping strategies predicted PTG. For all PTG models, demographics and core belief disruption were entered in the first step and coping strategies were entered in the second step. Separate analyses were run with PTG at each time point as the dependent variable, along with a longitudinal analysis examining T1 coping strategies and T4 PTG.

Results

Time 4 core belief disruption was positively correlated with total PTG at T4, substance use, positive reframing, planning, acceptance, and self-blame. Total PTG at Time 4 was also positively correlated with self-distraction, active coping, emotional support, instrumental support, positive reframing, planning, acceptance, and religion. Strategies that fall under problem-focused coping were positively correlated, but there were no consistent correlations between strategies considered either emotion-focused or avoidant coping. Please see Table 2 for a complete correlation matrix.

Table 2

Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.PTG	-	.652**	.115	.310**	-.018	.164*	.066	.148*	.004	.048	.269**	.290**	-.065	.206**	.148*	.135
2. CBI		-	.137	.130	-.049	.224**	.096	.117	.050	.123	.155*	.221**	.139	.230**	.144	.287**
3. SD			-	.077	.129	.122	.251**	.311**	.095	.342**	.239**	.051	.017	.050	.081	.178*
4. AC				-	-.040	-.060	.184*	.284**	-.182**	.182**	.355**	.559**	.056	.200**	.200**	.055
5. Den					-	.186**	-.014	-.056	.300**	.181*	-.011	-.046	.104	-.266**	-.042	.108
6. S.U.						-	.036	.017	.175*	.247**	-.084	.059	.035	-.052	-.115	.196**
7. E.S							-	.566**	-.084	.222**	.163*	.207**	.037	.161*	.100	.068
8. I.S								-	-.062	.362**	-.271**	.296**	-.052	.042	.111	.159*
9. BD									-	.326**	-.249**	-.079	.028	-.284**	-.142*	.196**
10. V										-	.053	.169*	.079	.044	.094	.424**
11. PR											-	.286**	.020	.152*	.281**	.078
12. Plan												-	.099	.269**	.110	.205**
13. Hum													-	.107	-.088	.061
14. Acc														-	.091	.027
15. Rel															-	.112
16. S.BL.																-

Note. PTG = Posttraumatic Growth, CBI = Core belief intrusion, SB = self-distraction, AC = active coping, Den = Denial, SU = substance use, ES = emotional support, IS = instrumental support, BD = behavioral disengagement, Vent= venting, PR = positive reframing, Plan= planning, Hum = Humor, Acc = acceptance, Rel = Religion, SBL = self-blame. * = p<.01. **= p<.001.

From April 2020 until April 2021, core belief disruption significantly increased [F(2.87, 499.38) = 15.96, p < 0.001; η 2 = 0.08], while total PTG remained fairly consistent [F(2.63, 451.81) = 1.39, p = .247]. Participants reported a decrease in the use of the majority of coping strategies over the first year; self-distraction [F(3, 546) = 13.782, p <.001, η^2 = .070], denial [F(3, 546) = 5.497, p <.001, η2 = .029], substance use [F(2.66, 490.10) = 10.220, p<.001, η2 = .053], behavioral disengagement [F(2.82, 515.34) = 4.79, p =.003, η2 = .026], positive reframing [F(3, 552) = 3.157, p = .024, η2 = .017], planning [F(2.78, 507.99) = 9.514, p<.001, η2 = .049], humor [F(2.76, 494.61) = 5.885, p<.001, η2 =.032], and acceptance [F(2.87, 525.61) = 4.467, p = .005, η2 = .024]. The use of self-blame increased over the first year [F(3, 537) = 6.400, p<.001, η2 = .035]. There was no significant change in active coping, emotional support, instrumental support, venting, or religion. Please see Table 3 for mean scores across time.

Table 3

Changes Over Time

Variable	Range	Time 1	Time 2	Time 3	Time 4
Instrumental Support	1 - 4	2.24 (0.80)	2.07 (0.80)	2.17 (0.74)	2.10 (0.74)
Active coping	1 - 4	2.45 (0.76)	2.33 (0.85)	2.49 (0.82)	2.45 (0.82)
Planning	**1 - 4**	**2.69 (0.84)**	**2.44 (0.90)**	**2.43 (0.86)**	**2.39 (0.91)**
Positive Reframing	**1 - 4**	**2.23 (0.86)**	**2.23 (0.82)**	**2.08 (0.77)**	**2.16 (0.80)**
Emotional Support	1 - 4	2.70 (0.82)	2.61 (0.88)	2.65 (0.80)	2.58 (0.84)
Venting	1 - 4	2.09 (0.77)	2.10 (0.80)	2.18 (0.76)	2.03 (0.75)
Humor	**1 - 4**	**2.23 (0.92)**	**2.23 (0.95)**	**2.34 (0.97)**	**2.07 (0.93)**
Acceptance	**1 - 4**	**3.28 (0.68)**	**3.25 (0.62)**	**3.15 (0.70)**	**3.13 (0.76)**
Self-blame	**1 - 4**	**1.65 (0.69)**	**1.62 (0.63)**	**1.76 (0.72)**	**1.83 (0.80)**
Religion	1 - 4	1.64 (0.86)	1.59 (0.84)	1.59 (0.81)	1.58 (0.78)
Behavioral Disengagement	**1 - 4**	**1.45 (0.67)**	**1.57 (0.72)**	**1.56 (0.75)**	**1.38 (0.62)**
Substance Use	**1 - 4**	**1.74 (0.95)**	**1.69 (0.93)**	**1.60 (0.83)**	**1.47 (0.74)**
Self-distraction	**1 - 4**	**3.02 (0.75)**	**2.92 (0.74)**	**2.78 (0.82)**	**2.68 (0.78)**
Denial	**1 - 4**	**1.26 (0.50)**	**1.16 (0.41)**	**1.21 (0.45)**	**1.13 (0.36)**

Note. Bold variables indicate significant changes over time. ( ) indicates standard deviation. Black variables indicate problem-focused coping strategies, green variables indicate emotion-focused coping strategies, red variables indicate avoidant coping strategies.

Examining core belief disruption using hierarchical regression analyses indicated that demographics did not play a significant role in predicting core belief disruption either longitudinally or cross-sectionally. T1 core belief disruption was predicted by active coping, self-blame, and substance use. At T2, disruptions to core beliefs were predicted by planning, positive reframing, and self-distraction. At T3, core belief disruptions were positively predicted by instrumental support, acceptance, religion, and substance use, and negatively predicted by emotional support. At T4, disruptions to core beliefs were predicted by behavioral disengagement. Longitudinal analysis indicated that T1 coping strategies of acceptance, self-blame, religion, and substance use predicted T4 core belief disruption, with the final model accounting for 13.3% of the variance in disruption to core beliefs. Cross-sectional analyses accounted for between 21.1% and 29.9% of the variance in core belief disruption. Please see Table 4 for complete regression results.

Table 4

Core Belief Disruption Hierarchical Regression Results

	T4 CBI, T1 Cope (n=178)	T1 CBI, T1 Cope (n = 201)	T2 CBI, T2 Cope (n = 183)	T3 CBI, T3 Cope (n = 183)	T4 CBI, T4 Cope (n = 183)
Age	β = -.067, p = .414 [-.019, .008]	β = -.040, p = .592 [-.015, .008]	β = -.010, p = .883 [-.012, .010]	β = .028, p = .691 [-.019, .006]	β = -.021, p = .783 [-.014, .010]
Sex	β = .032, p = .668 [-.281, .438]	β = .127, p = .068 [-.021, .611]	β = -.023 p = .726 [-.360, .251]	β = .060, p = .376 [-.181, .478]	β = .023, p = .739 [-.287, .403]
Race	β = -.027, p = .723 [-.557, .388]	β = .100, p = .157 [-.117, .718]	β = .055, p = .418 [-.245, .588]	β = -.012, p = .856 [-.445, .370]	β = -.029, p = .676 [-.530, .345]
Instrumental Support	β = .025, p = .797 [-.250, .325]	β = .152, p = .094 [-.036, .451]	β = .006, p = .954 [-.279, .296]	**β = .289, p <.001 [.194, .736]**	β = .113, p = .208 [-.102, .466]
Active Coping	β = .017, p = .851 [-.252, .305]	**β = .169, p = .046 [.005, .484]**	β = .045, p = .615 [-.172, .291]	β = -.091, p = .302 [-.381, .119]	β = .159, p = .059 [-.009, .473]
Planning	β = .088, p = .340 [-.131, .378]	β = .046, p = .585 [-.158, .279]	**β = .233, p = .013 [.063, .523]**	β = .123, p = .172 [-.075, .416]	β = .085, p = .348 [-.122, .344]
Positive reframing	β = .032, p = .714 [-.190, .277]	β = .079, p = .321 [-.103, .311]	**β = .209, p = .009 [.074, .507]**	β = .017, p = .820 [-.203, .256]	β = .128, p = .108 [-.042, .418]
Emotional Support	β = .034, p = .705 [-.203, .300]	β = -.071, p = .391 [-.312, .123]	β = -.083, p = .378 [-.347, .132]	**β = -.303, p <.001 [-.673, -.216]**	β = -.007, p = .940 [-.262, .243]
Venting	β = -.141, p = .142 [-.492, .071]	β = .032, p = .710 [-.202, .295]	β = .134, p = .087 [-.028, .412]	β = .065, p = .424 [-.146, .345]	β = -.055, p = .447 [-.312, .138]
Humor	β = .092, p = .214 [-.068, .302]	β = -.022, p = .749 [-.187, .135]	β = -.046, p = .503 [-.217, .107]	β = .041, p = .574 [-.124, .224]	β = .018, p = .807 [-.161, .207]
Acceptance	**β = .199, p = .013 [.073, .624]**	β = .027, p = .714 [-.196, .286]	β = .025, p = .730 [-.216, .307]	**β = .196, p = .009 [.086, .590]**	β = .121, p = .089 [-.029, .406]
Self-blame	**β = .174, p = .035 [.021, .563]**	**β = .172, p = .025 [.035, .510]**	β = .067, p = .402 [-.161, .399]	β = .075, p = .304 [-.112, .357]	β = .073, p = .361 [-.126, .344]
Religion	**β = .157, p = .043 [.007, .418]**	β = .102, p = .147 [-.048, .317]	β = .015, p = .833 [-.161, .200]	**β = .203, p = .004 [.097, .491]**	β = .085, p = .235 [-.084, .339]
Behavioral disengagement	β = .121, p = .172 [-.099, .552]	β = .040, p = .620 [-.201, .336]	β = -.036, p = .659 [-.312, .198]	β = .077, p = .312 [-.117, .364]	β = .158, p = .048 [.003, .612]
Substance Use	**β = .238, p = .002 [.107, .479]**	**β = .164, p = .020 [.030, .348]**	β = .106, p = .145 [-.046, .306]	**β = .244, p <.001 [.153, .540]**	β = .114, p = .109 [-.042, .416]
Self-distraction	β = .029, p = .731 [-.211, .300]	β = .028, p = .717 [-.181, .263]	**β = .182, p = .018 [.049, .511]**	β = .129, p = .085 [-.026, .392]	β = .149, p = .060 [-.010, .461]
Denial	β = -.079, p = .331 [-.531, .180]	β = .071, p = .334 [-.158, .463]	β = .083, p = .248 [-.162, .620]	β = .084, p = .258 [-.161, .595]	β = -.044, p = .534 [-.613, .319]
Model 1	F(3, 175) = 0.56, p = .641	**F(3, 187) = 3.57, p< .015**	F (3, 185) = .43 p = .735	F(3, 182) = 0.827, p = .481	F(3, 181) = 1.15, p = .332
Model 2	**F(17, 161) = 2.61, p <.001**	**F(17, 173) = 3.99 p<.001**	**F(17, 171) = 4.77, p< .001**	**F (17, 168) = 5.64, p <.001**	**F(17, 167) = 4.56, p<.001**
Change R^2 (ΔR^2, *p*)	20.6%, p <.001	**22.8%, p < .001**	**31.5%, p<.001**	**35.0%, p<.001**	**29.8%, p<.001**
% Variance	13.3%	21.1%	25.4%	29.9%	24.7%

Note. [ ] indicate 95% confidence intervals. Bold indicates significant values. Black coping strategies indicate problem-focused coping strategies, green variables indicate emotion-focused coping strategies, red variables indicate avoidant coping strategies.

Hierarchical regression analyses indicated that core belief disruption was a driver for PTG longitudinally and cross-sectionally at each time point, resulting in each model reaching significance. For each regression analysis, higher core belief disruption significantly predicted higher PTG. Along with core belief disruption, at T1 PTG was positively predicted by active coping, positive reframing, and religion, and negatively predicted by behavioral disengagement and self-blame. At T2, PTG was predicted by younger age and the coping strategies of positive reframing and religion. At T3, PTG was positively predicted by active coping and negatively predicted by behavioral disengagement. At T4, PTG was predicted by positive reframing and negatively predicted by self-blame. The longitudinal analysis indicated that T1 active coping, acceptance, and substance use predicted T4 PTG, accounting for 28.4% of the variance in PTG scores. The cross-sectional analyses accounted for between 48.1% and 63.9% of the variance in PTG. Please see Table 5 for the complete regression results.

Table 5

PTG Hierarchical Regression Results

	T4 PTG, T1 Cope (n=178)	T1 PTG, T1 Cope (n = 201)	T2 PTG, T2 Cope (n = 183)	T3 PTG, T3 Cope (n = 183)	T4 PTG, T4 Cope (n = 183)
Age	β = -.021, p = .774 [-.013, .010]	β = .005, p = .933 [-.008, .008]	**β = -.109, p = .029 [-.015, -.001]**	β = -.005, p = .937 [-.009, .009]	β = -.087, p =.161 [-.016, .003]
Sex	β = .027, p = .699 [-.250, .327]	β = .065, p = .257 [-.097, .359]	β = .054, p = .254 [-.082, .308]	β = .004, p = .946 [-.243, .260]	β = .045, p=.441 [-.163, .372]
Race	β = -.015, p = .828 [-.450, .361]	β = -.061, p = .287 [-.457, .136]	β = -.078, p = .106 [-.484, .047]	β = -.005, p = .928 [-.324, .296]	β = .018, p = .761 [-.286, .390]
Core Beliefs	**β = .397, p <.001 [.243, .542]**	**β = .430, p <.001 [.277, .464]**	**β = .574, p<.001 [.427, .624]**	**β = .584, p <.001 [.432, .664]**	**β = .594, p<.001 [.430, .665]**
Instrumental Support	β = -.007, p = .935 [-.258, .237]	β = -.022, p = .767 [-.201, .148]	β = .014, p = .847 [-.169, .206]	β = .109, p = .128 [-.048, .378]	β = .099, p = .193 [-.075, .367]
Active Coping	**β = .178, p = .033 [.021, .498]**	**β = .137, p = .047 [.003, .347]**	β = .082, p = .193 [-.050, .245]	**β = .216, p = .003 [.102, .483]**	β = .090, p = .205 [-.067, .310]
Planning	β = .040, p = .634 [-.166, .272]	β = -.009, p = .890 [-.165, .143]	β = -.024, p = .717 [-.178, .123]	β = -.092, p = .210 [-.307, .068]	β = -.048, p = .530 [-.237, .123]
Positive reframing	β = .112, p = .158 [-.057, .350]	**β = .273, p <.001 [.167, .460]**	**β = .242, p <.001 [.164, .448]**	β = .113, p = .071 [-.014, .335]	**β = .230, p <.001 [.131, .488]**
Emotional Support	β = -.042, p = .605 [-.275, .161]	β = .073, p = .279 [-.070, .240]	β = .019, p = .782 [-.133, .176]	β = .004, p = .954 [-.176, .187]	β = -.028, p = .716 [-.235, .162]
Venting	β = -.128, p = .151 [-.431, .067]	β = .039, p = .582 [-.126, .224]	β = -.047, p = .397 [-.204, .081]	β = -.067, p = .310 [-.283, .091]	β = -.016, p = .792 [-.197, .151]
Humor	β = .081, p = .064 [-.310, .009]	β = -.092, p = .098 [-.212, .018]	β = -.028, p = .568 [-.133, .073]	β = -.058, p = .329 [-.198, .067]	β = -.003, p = .958 [-.148, .140]
Acceptance	**β = .175, p = .017 [.052, .519]**	β = .050, p = .414 [-.101, .244]	β = .038, p = .457 [-.104, .229]	β = .036, p= .558 [-.137, .254]	β = -.008, p = .893 [-.182, .158]
Self-blame	β = -.067, p = .402 [-.361, .145]	**β = -.132, p = .036 [-.352, -.012]**	β = -.080, p = .156 [-.311, .050]	β = -.016, p = .783 [-.204, .154]	**β = -.139, p = .041 [-.382, -.008]**
Religion	β = .059, p = .404 [-.103, .254]	**β = .125, p = .030 [.014, .273]**	**β = .182, p <.001 [.104, .333]**	β = .108, p = .061 [-.007, .301]	β = .023, p= .697 [-.131, .196]
Behavioral disengagement	β = .063, p = .434 [-.168, .388]	**β = -.195, p = .004 [-.504, -.100]**	β = -.103, p = .079 [-.310, .017]	**β = -.128, p = .039 [-.376, -.009]**	β = -.070, p= .301 [-.364, .113]
Substance Use	**β = .182, p = .012 [.047, .366]**	β = .090, p = .124 [-.025, .206]	β = -.011, p = .838 [-.126, .102]	β = -.028, p = .631 [-.190, .115]	β = .020, p = .737 [-.149, .211]
Self-distraction	β = .006, p = .942 [-.211, .228]	β = .011, p = .862 [-.145, .173]	β = .080, p = .142 [-.038, .261]	β = .022, p = .718 [-.131, .190]	β = -.032, p = .636 [-.227, .139]
Denial	β = -.015, p = .841 [-.338, .276]	β = .084, p = .166 [-.066, .378]	β = -.032, p = .532 [-.329, .170]	β = .092, p = .130 [-.066, .510]	β = -.027, p = .647 [-.452, .282]
Model 1	**F(4,172) = 12.40, p <.001**	**F(4,182) = 18.23, p <.001**	**F(4,180) = 44.54, p < .001**	**F(4, 181) = 33.31, p<.001**	**F(4,176) = 33.54, p <.001**
Model 2	**F(18,158) = 4.880, p <.001**	**F(18, 168) = 10.95, p<.001**	**F(18,166) = 19.07, p<.001**	**F(18, 167) = 13.08, p< .001**	**F(18, 162) = 10.25, p<.001**
Change R^2 (ΔR^2, *p*)	**13.3%, p = .006**	**25.4%, p<.001**	**17.7%, p<.001**	**16.1%, p <.001**	**10.0%, p = .003**
% Variance	28.4%	49.1%	63.9%	54.0%	48.1%

Note. [ ] indicate 95% confidence intervals. Bold indicates significant values. Black coping strategies indicate problem-focused coping strategies, green variables indicate emotion-focused coping strategies, red variables indicate avoidant coping strategies.

Discussion

The impact of the COVID-19 pandemic provoked a need to partake in various coping strategies. This study examined the use of coping strategies over time and how those strategies contributed to both core belief disruption and posttraumatic growth cross-sectionally and longitudinally.

Changes Over Time

Disruptions to core beliefs significantly increased and the use of most of the coping strategies decreased while PTG remained consistent over the first year of COVID-19. For example, self-distraction, denial, substance use, behavioral disengagement, positive reframing, planning, humor, and acceptance coping all significantly decreased over the first year of the pandemic. The use of self-blame, interestingly, is the only coping strategy that significantly increased. Participants remained stable in the use of active coping, emotional support, instrumental support, venting, and religion as coping strategies. Given this pattern of results, it appears as if participants grew more disillusioned with the world over the first year of the pandemic, while simultaneously altering the coping strategies used to cope with it.

The use of all four avoidant coping strategies decreased from March 2020 until March 2021, indicating that participants may have recognized the maladaptive nature of these coping strategies as time progressed. However, there was not a corresponding increase in adaptive coping strategies over the same time period. Of the four problem-focused coping strategies that are generally considered adaptive, instrumental support and active coping remained stable, while the use of planning and positive reframing decreased. While emotion-focused coping strategies can be considered either adaptive or maladaptive depending on the situation[3], the pattern of results found in this study appear to primarily indicate maladaptive coping. Specifically, the strategy of self-blame increased over time while strategies such as acceptance and humor, which may have counteracted the effect of increased self-blame, decreased. There were no major changes in the use of emotional support, venting, or religion as coping strategies.

Taken together, it can be concluded that the use of coping strategies in general, including the use of maladaptive coping, decreased. Previous studies regarding coping strategies over a prolonged period reflect similar changes. A ten year comparison of coping strategies used by parents of children with autism indicated a decline in the total number of coping strategies used, as well as a general shift from problem-focused coping to emotion-focused coping[40], and patients suffering from a traumatic brain injury reported frequent use of avoidance coping and reduced problem-focused coping over a five-year time frame, although they also reported an increase in seeking social and emotional support as a coping strategy[41]. Breast cancer patients similarly reported a decrease in planning, denial, religious coping, and self-distraction coping strategies over their first year post-surgery, although there were no significant differences over time for the other coping strategies[42]. Overall, it may

be assumed that exposure to prolonged distress reduces the number of coping strategies used and may prompt a shift toward emotion-focused rather than problem-focused coping strategies.

Coping Strategies and Core Belief Disruption

Although increased core belief disruption predicted increased PTG in every analysis, which coping strategies predicted core belief disruption varied based on the time and whether the analysis was concurrent or longitudinal. Emotion-focused and avoidant coping appeared to contribute the most to a violation of world assumptions. At the beginning of the pandemic, increased use of substances and self-blame, along with increased active coping, predicted core belief disruption. Those who numbed and blamed themselves felt a stronger disruption of core assumptions about the world, both at the beginning of the pandemic and when assessed longitudinally. However, one month into the pandemic it was those that attempted planning, positive reframing, and self-distraction that experienced higher core belief violations. Perhaps the attempt to actively cope this early in the pandemic backfired, and those who tried, ended up questioning their beliefs about the world more than those who did not.

The situation in the United States had changed drastically six months later, with a widespread racial justice movement and a highly polarizing ongoing presidential election occurring simultaneously with the pandemic. At this point, different types of support contributed to core belief disruption. Specifically, those who used more instrumental support (assistance meeting tangible needs, perhaps including the PPE program) and less emotional support to cope reported higher core belief disruption, along with those using the strategies of substance use, acceptance, and religion. Participants who needed more tangible support may have felt less independent than they had previously, while the use of emotion-focused coping strategies, which don't *solve* problems, felt less successful and resulted in more questioning of the world and their place in it.

Interestingly, when looking at how coping strategies predict core belief disruption one year into the pandemic, very different results were found when assessing current strategies and prior strategies. One year in, only current behavioral disengagement predicted core belief disruption – those who disengaged from the situation experienced more assumption violation. However, those who used acceptance, self-blame, religion, or substances to cope at the beginning of the pandemic experienced more violation of assumptions one year into the pandemic, appearing as if using emotion-focused and avoidant coping strategies were unsuccessful, contributing to participants questioning their core assumptions.

Coping Strategies and PTG

Similar to the pattern of results seen with core belief disruption, coping strategies predicted PTG differently based on the time

of assessment and whether concurrent or longitudinal analyses were run. However, unlike with core belief disruption, the problem-focused coping strategies of active coping and positive reframing were the most frequent strategies predicting PTG. When the pandemic first started, participants with higher core belief disruption and who used more active coping, positive reframing, and religion, with less self-blame and behavioral disengagement were most likely to experience PTG. During this time not much was known about the virus, and there was a high level of uncertainty. Correspondingly, those who took action to cope and engaged in fewer avoidant coping strategies were the most likely to express a positive psychological outcome at this point. The combination of strategies used initially are similar to the positive active coping found previously[6,20-24], although at this point in time acceptance was not related to PTG and reductions in avoidance coping strategies were.

The pattern of positive active coping was similar one month into the pandemic, as participants who used positive reframing and religion to cope expressed the most growth while avoidant coping did not impact perceptions of growth, although acceptance coping was again unrelated to PTG. As found in previous studies, those who actively searched for meaning in the pandemic, either through reframing of the situation or reliance on a higher power, were most able to experience PTG[6,20-24]. Intriguingly, younger participants were also more likely to experience growth, at this time only. One month in, a bit more was known about the virus, although there was still a high level of uncertainty about the stay-at-home orders and the economy. Younger participants may have felt more able to adapt to the "stay at home" orders and requisite technology as well being less vulnerable to the virus than older participants, contributing to their higher growth.

Six months into the pandemic, when there were even more stressors to cope with, the coping strategy related to PTG changed. Participants who expressed higher levels of growth engaged in more active coping and less behavioral engagement, yet positive reframing, religion, nor acceptance coping strategies contributed to growth. With all the possible concurrent stressors at this time, it appeared that action and focus on coping and problem-solving was needed to experience growth, and those who tried to avoid engaging with the situation were less able to recognize any benefit. These findings mirror those of Brooks and fellow colleagues[30], who also found lower levels of avoidance coping related to higher PTG, but counter those who have found a slight positive association between the avoidance coping strategy of denial and PTG[22,29]. Perhaps the relationship between avoidance coping and PTG depends on the specific strategy used and the population assessed, as denial coping was not associated with PTG in our sample.

One year after the pandemic started, when more was known about the virus, vaccines were available, the stay-at-home orders were mostly lifted, and the political landscape had mellowed slightly, it was those who purposefully tried to think of things in a

positive light and those who blamed themselves less for the situation that expressed the most growth. The beneficial impact of positive reappraisal coping on PTG has been found consistently[28,29], as has the negative association between self-blame and PTG[32,33]. Interestingly, the most effective coping strategies for promoting growth one year later were different than the strategies used to promote concurrent PTG. When examining how initial coping strategies contributed to T4 PTG, it was found that while active coping was still important, the strategies of acceptance and substance use also contributed to PTG. Participants who tried to accept the situation or used substances to cope with the situation were more likely to report growth one year later yet did not express higher levels of growth at that time. While this does not replicate the positive active coping seen when examining concurrent growth, it does correspond with prior findings of a longitudinal association between active coping, acceptance, and PTG[25,27]. Substance use has been associated with PTG previously[31], although the directionality in this case was switched. The combination of approach and avoidance coping contributing to PTG lends support to the concept of flexible coping that has been found to work together to facilitate growth previously[36,37]. Perhaps, cross-sectionally the use of positive active coping is the most predictive of experiencing PTG, whereas longitudinally, flexible coping is needed.

There was some overlap of strategies in which the use of a specific coping strategy appeared to contribute to both core belief disruption and PTG. This is likely due to the relationship between core belief disruption and PTG – higher core belief disruption drives the experience of PTG. Thus, some coping strategies may provoke a questioning of core beliefs which in turn contributes to a perception of growth. Substance use at the start of the pandemic appeared to be one of those strategies. When used initially, substances contributed to immediate core belief disruption, yet over time, contributed to PTG as well. However, examining the results all together reveals a distinct pattern. The use of emotion-focused and avoidant coping contributes primarily to core belief disruption, while the use of problem-focused coping and lower levels of avoidant coping contribute to perceptions of PTG.

Implications

The COVID-19 pandemic caused many individuals to utilize strategies that assisted in dealing with its negative effects. People partook in activities considered to be either problem-focused, emotion-focused, or avoidant coping that could have led to a disruption in their core beliefs, potentially facilitating posttraumatic growth. The results of this study indicate that emotion-focused and avoidant coping tend to lead to a higher disruption of core beliefs and that people may use active positive coping to experience growth currently, but flexible coping in order to recognize growth longitudinally. These findings provide novel insight into how core belief disruption and PTG can occur for people during a worldwide health crisis. Due to the variability within each coping style, this

study has provided a closer look into the coping facets and what specific behaviors people may engage in during the pandemic. Previous longitudinal studies on PTG have primarily focused on injury and illness trauma which are specific to certain populations[22,43], whereas this study shows how core beliefs and PTG may be impacted over time for an event that everyone was subjected to.

The way in which coping strategies may lead to or buffer against a disruption in core beliefs or growth after trauma, can be better understood based on this longitudinal design. Coping strategies that were associated with core belief disruption at a single time point never reoccurred for any of the following time points; such that eleven out of the fourteen facets of coping positively predicted core belief disruption at some point during the first year of the pandemic, along with one facet that negatively predicted a disruption. This suggests that the way in which someone chooses to cope can contribute to the disruption and reshaping of their core beliefs once, to where they may either move on to different coping strategies that impact core belief disruption or grow because of them. Yet, on the other hand, the same coping strategies that positively or negatively predicted PTG remained fairly consistent, such that if the strategy contributed to growth or inhibited it at a single time point, it did so at a following time point as well. Therefore, only four of the fourteen facets positively predicted PTG and two, negatively predicted PTG. These findings suggest that any of the coping strategies can cause someone to think about their current worldviews and assumptions, but that does not mean they will all lead to growth. Since not much is known regarding coping strategies and core belief disruption, this study helps to provide a foundation for understanding how these constructs are associated with one another, allowing for future studies to build upon these findings. This study also supports previous suggestions of there being distinct coping strategies that help to facilitate PTG[9,17], and that identifying which strategies lead to a disruption in core beliefs which then promote growth can benefit therapeutic and clinical interventions to help those who have experienced trauma.

Although positive reframing decreased over the span of the year, the use of this problem-focused coping strategy that encourages the development of a more positive outlook, consistently predicted greater growth throughout the pandemic. Perhaps, engaging in positive reappraisal coping is similar to engaging in meaning-making and deliberate rumination, factors that are important for the development of PTG according to the PTG theoretical model[44]. It is also possible that coping methods such as positive reappraisal, findings things to be grateful for, and recognizing new opportunities and new people, closely resembles the new possibilities PTG domain that consists of making an effort to do better things and establish a new path in life, in spite of trauma. During adverse experiences, intervention programs should consider implementing practices that can promote a positive change in attitude about the event and current situation in order to facilitate

growth. This study highlights the constructive aspect of PTG in that behavioral disengagement was negatively predictive of growth, meaning that an individual has to want to confront and face their traumatic experience in order grow from it. Due to these findings and given that religion was a positive predictor of PTG as well, interventions should encourage the use of practices that cause people to ruminate and think about their experience, instead of disengaging and steering away from it, in order to experience positive psychological outcomes.

Along with contributing to the coping, core belief, and PTG literature, learning more about the COVID-19 pandemic allows for a better understanding of how everyone chose to handle it at the time. Given that the spread of the virus occurred rapidly and caused many people to reorganize their lives, learning how coping strategies were utilized during a worldwide health crisis allows researchers to examine human behavior in order to promote positive- and hinder negative- ones in the future.

Limitations

Despite these findings, there are limitations. It was a self-report study that was conducted online, however, the sample was large enough to buffer against some of the potential inaccuracies. As far as the sample demographics, the participants skewed toward White, young, females. Additionally, this study had a high attrition rate, with only 30% of the original sample responding to the survey one year later and different demographics for the 20% of participants who completed all 4 surveys. While this study started near the beginning of many shelter-in-place policies, states differed in their response to the pandemic. Therefore, it is possible that some participants had been isolated longer than others which may have impacted the type of coping strategies that some participants used. Continuing to evaluate the types of coping strategies utilized, along with examining perceived PTG throughout a traumatic experience, would better help to understand the way in which the transformative, growth process occurs during adverse experiences that are more chronic in nature. Yet, even with these limitations, this study contributed significant novel information regarding coping strategies, core belief disruption and insight into prospective posttraumatic growth over the course of the first year of the COVID-19 pandemic.

Future Directions

Future studies should continue to examine the differences between concurrent and longitudinal coping strategies to determine which specific strategies are more likely to result in consistent growth, and which need more time to translate to psychological growth. Future research should also consider analyzing which coping strategies may lead to specific domains of PTG. Additionally, the relationship between coping strategies and core belief disruption needs replication. As there is not much data on this relationship at this point, it is possible that our results are specific to this study, or due to confounding factors such as time or the nature of our participants. Different relationships between

coping and core belief disruption may be found in different age groups or after experiencing more acute trauma than was seen in this sample.

Conclusion

In conclusion, these findings lend insight into how a variety of coping strategies were used to deal with, or cope, during an extended, unprecedented, health crisis. This study suggests that any way in which an individual chooses to cope can lead to a disruption in their core beliefs but does not necessarily improve their chances of experiencing positive psychological growth after the traumatic event. However, positive reframing and active coping appear to contribute most to PTG, perhaps due to the new possibilities and personal strength domains of the construct and perhaps reflecting the active process involved in transforming negative experiences into meaningful events. Future interventions should encourage individuals to ruminate and restructure the way they view the adversity they've experienced, alongside problem-focused coping strategies, in order to experience PTG.

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The authors declare no conflicts of interest.

Author Contributions

Conception and design of the study: W.D. Acquisition of data: W.D. Analysis of data: W.D. Drafting the manuscript and tables: W.D. and T.E. Both authors have reviewed and edited the manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

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