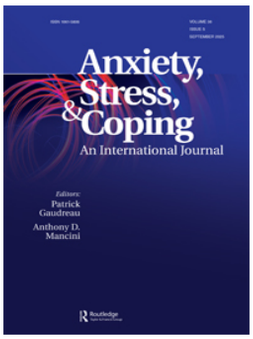

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A longitudinal model of emotion pathways to growth, depreciation, and health outcomes after life stress

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ABSTRACT

Background and Objectives: The emotion belief and emotion regulation pathways that shape negative (posttraumatic depreciation; PTD) and positive adaptation (posttraumatic growth; PTG) following daily life stressors are poorly understood. This longitudinal study examined how emotion beliefs and emotion regulation strategies influence PTD and PTG, and subsequent mental (depression, anxiety, stress) and physical health (headaches, gastrointestinal problems, respiratory infections, sleep disturbances) symptoms.

Design and Method: A longitudinal panel design was used. British participants ($N = 627$) completed an online survey measuring life stressors, emotion beliefs, emotion regulation, PTD and PTG, and mental and physical health at two time points six months apart (October 2021 and April 2022).

Results: The path model explained 18-21% of the variance in mental and physical health outcomes. Cognitive mediation and emotion beliefs were negatively and positively related to PTD. Maladaptive emotion regulation was positively associated with PTD, and worse mental and physical health. Adaptive emotion regulation was positively related to PTG, and less depressive and stress symptoms. PTG was negatively related to depression, and PTD was negatively associated with mental and physical health.

Conclusions: Distinct pathways to PTD and PTG operate through superordinate emotion beliefs and emotion regulation. Interventions targeting emotion beliefs and emotion regulation may improve mental and physical health following adversity.

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Emotion regulation; emotion beliefs; mental health; posttraumatic growth; posttraumatic depreciation

Following adversity, people can report both negative and positive psychosocial changes, known as posttraumatic depreciation (PTD) and posttraumatic growth (PTG), respectively. These changes may arise in response to any adverse event that is associated with a psychological struggle. The extent to which these changes transpire depends on cognitive-emotional processing following adversity exposure, in which people attempt to make sense of their experiences (Tedeschi et al., 2018).

PTD and PTG are characterized by changes in five life domains, specifically, appreciation for life, relationships with others, spirituality, new opportunities, and personal strength. More specifically, PTD refers to negative psychological changes in these domains, whereas PTG refers to the corresponding positive changes in these same life domains (Taku et al., 2021). As such, PTD and PTG

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are both possible outcomes from adversity, but are not mutually exclusive and can co-occur (Cann et al., 2010), such that a person may learn to value life experiences but are equally aware of their own mortality. Importantly, although the PTD and PTG constructs are intended to reflect negative and positive adaptation post-adversity, respectively, they may not encompass all possible changes.

Both PTD and PTG have been documented in response to adverse life events including sexual victimization and collective violence such as war and terrorism (Brooks et al., 2025; Steidl et al., 2024), that often meet the strict "criterion A" definition outlined in the DSM-5 (American Psychiatric Association, 2013), specifically, "death, threatened death, actual or threatened serious injury, or actual or threatened sexual violence" (p. 271). Although these events can have serious psychosocial repercussions, they are relatively uncommon in an individual's lifespan compared to normative daily life stressors such as serious illness, vehicle accidents, and relationship difficulties (Benjet et al., 2016). Few studies have explored PTD and PTG in the context of everyday negative life events, but research that has included these experiences alongside criterion A events has reported PTG following family bereavement, financial difficulties, or separation from a partner (Jayawickreme et al., 2022). Meanwhile, PTD has been reported after serious illness and injury, and relationship problems (Zięba et al., 2022).

Posttraumatic depreciation, posttraumatic growth, mental and physical health

Both PTD and PTG have been linked to physical and mental health. PTD is positively related to depression, anxiety, and stress (Barrington & Shakespeare-Finch, 2013), and increased PTD and PTG are also associated with more psychological distress and posttraumatic stress symptoms (Michélsen et al., 2017). PTD is generally associated with worse physical health, including increased pain intensity and poorer physical functioning, with PTG demonstrating weaker associations with these outcomes (Kunz et al., 2017). In this study we conceptualize *physical health* as referring to the presence or absence of sleep disturbances, headaches, gastro-intestinal problems, and respiratory infections, in line with the General Health Questionnaire (Schat et al., 2005). We use the term *mental health* to describe changes measured using the Depression, Anxiety, and Stress (DASS) scales, that measure the presence or absence of common mental health complaints, specifically anxiety, depression, and/or stress symptoms (Lovibond & Lovibond, 1995). The experience of negative life events that do not meet criterion A are just as, if not more, likely to lead to mental and physical health concerns (Georgescu et al., 2024; Gold et al., 2005), and responses can be highly heterogeneous (Etilé et al., 2021). Therefore, it is important to examine the pathways that steer individuals toward PTD and/or PTG, which could influence mental and physical health.

Superordinate emotion beliefs and emotion regulation

One pathway that may contribute to PTD and PTG is emotion regulation. Broadly, emotion regulation refers to attempts to influence which emotions one has, when one has them, and how one experiences and expresses them (Gross, 2015). Emotion regulation is important for well-being, social functioning, coping with stressors, job success (Salovey et al., 2010), psychological health (Kobylińska & Kusev, 2019; Tsujimoto et al., 2024), and physical health (Sapolsky, 2007; Tsujimoto et al., 2024). Emotion regulation and distress management are thought to be critical in determining PTD and PTG (Tedeschi et al., 2018), although the emotion pathways to PTD and PTG are poorly understood. Gross (2014) has perhaps offered the most prominent and well-tested model of emotion regulation, in which five emotion regulation strategies are articulated: situation selection, situation modification, attentional deployment, cognitive change, and response modulation. Of these strategies, ample evidence indicates that cognitive reappraisal of a situation to alter its emotional impact (Gross, 2015) is one of the most effective emotion regulation strategies (Boehme et al., 2019) linked to adaptive psychophysiological outcomes (Ray et al., 2010).

More recently, researchers have developed superordinate concepts to emotion regulation in the form of emotion beliefs (i.e., beliefs about emotion; Ford & Gross, 2019), which are proposed to

precede and inform emotion regulation (Gross & Feldman Barrett, 2011). Emotion beliefs appear to be important for acute outcomes (e.g., emotional experiences), chronic cumulative outcomes (e.g., well-being; Ford & Gross, 2019), and consequent emotion regulation tendencies (Turner et al., 2022). In the extant literature, four emotion beliefs have emerged as potentially important concepts for emotion regulation, namely whether emotions are useful or not ("usefulness"), controllable or uncontrollable ("controllability"), generated by external stimuli ("stimulus response"), and whether changes in cognition lead to emotion change ("cognitive mediation").

Of these emotion beliefs, it is postulated that believing emotions are useful, controllable, and cognitively mediated rather than dictated by external events, is more adaptive for emotion regulation, emotional reactivity, and mental health, with some evidence in support of these hypotheses (Becerra et al., 2020; Tamir et al., 2007; Turner et al., -2022; 2024). Of note are Tamir et al.'s (2007) findings that college students with lower controllability beliefs experienced fewer positive and more negative emotions, received less social support from college friends, reported more loneliness, and poorer social adjustment. Thus, emotion beliefs seem to have psychosocial implications, and could play a role in how people react to and move on from negative life events. To date, researchers have not investigated the influence of emotion beliefs on PTD and PTG, with limited work on emotion regulation, PTD, and PTG. Extant literature has shown that adaptive regulation strategies, such as processing, meaning making (Larsen & Berenbaum, 2015), and reappraisal (Orejuela-Dávila et al., 2019) are positively related to PTG. Conversely, increased use of maladaptive strategies, such as suppression, are associated with more stress (García et al., 2023; Larsen & Berenbaum, 2015), and greater emotion regulation difficulties associated with less PTG (Carter et al., 2021).

Proposed model

Informed by existing research, we propose a model (see Figure 1) that outlines pathways from the experience of life stressors to subsequent mental and physical health outcomes via PTD and PTG. In literature and our model, PTD and PTG are both described as a process (Joseph, 2021) and an outcome of adversity (O'Connor et al., 2021). As processes, PTD and PTG reflect ongoing psychological responses to adversity, shaped by individual differences in emotional beliefs and emotion regulation strategies. For instance, adaptive regulation could facilitate meaning-making processes conducive of PTG. As outcomes, PTD and PTG represent some of the negative and positive psychological changes arising from this process, which in turn could influence mental health (anxiety, depression, stress) and physical health (headaches, gastrointestinal problems, respiratory infections, sleep disturbances). Our model also views PTD and PTG as co-occurring but distinct constructs (Cann et al., 2010). In this manner, PTD may act as a risk factor for mental and physical health outcomes, whereas PTG may serve as a protective factor.

Rationale and aims of study

Life stressors are widely experienced, yet receive less attention in PTD and PTG research compared to criterion A events, despite PTG theory (Tedeschi et al., 2018) and cognitive reappraisal literature arguing that it is not the external event *alone*, but the way in which it is appraised and evaluated, that shapes subsequent adaptation (Boals, 2018). Research is lacking as to the emotion belief and emotion regulation pathways that contribute to PTG and PTD, which in turn could influence mental and physical health symptoms. Furthermore, existing work in this area relies on cross-sectional designs. Limited longitudinal PTD and PTG research has identified trajectories of PTD and PTG (e.g., Pięta-Lendzion et al., 2024), rather than examining how PTD and PTG shape subsequent mental and physical health outcomes, and/or used unvalidated measures (Marshall et al., 2015). Addressing the research gaps in this area could help inform interventions for people who struggle to navigate daily life stressors.

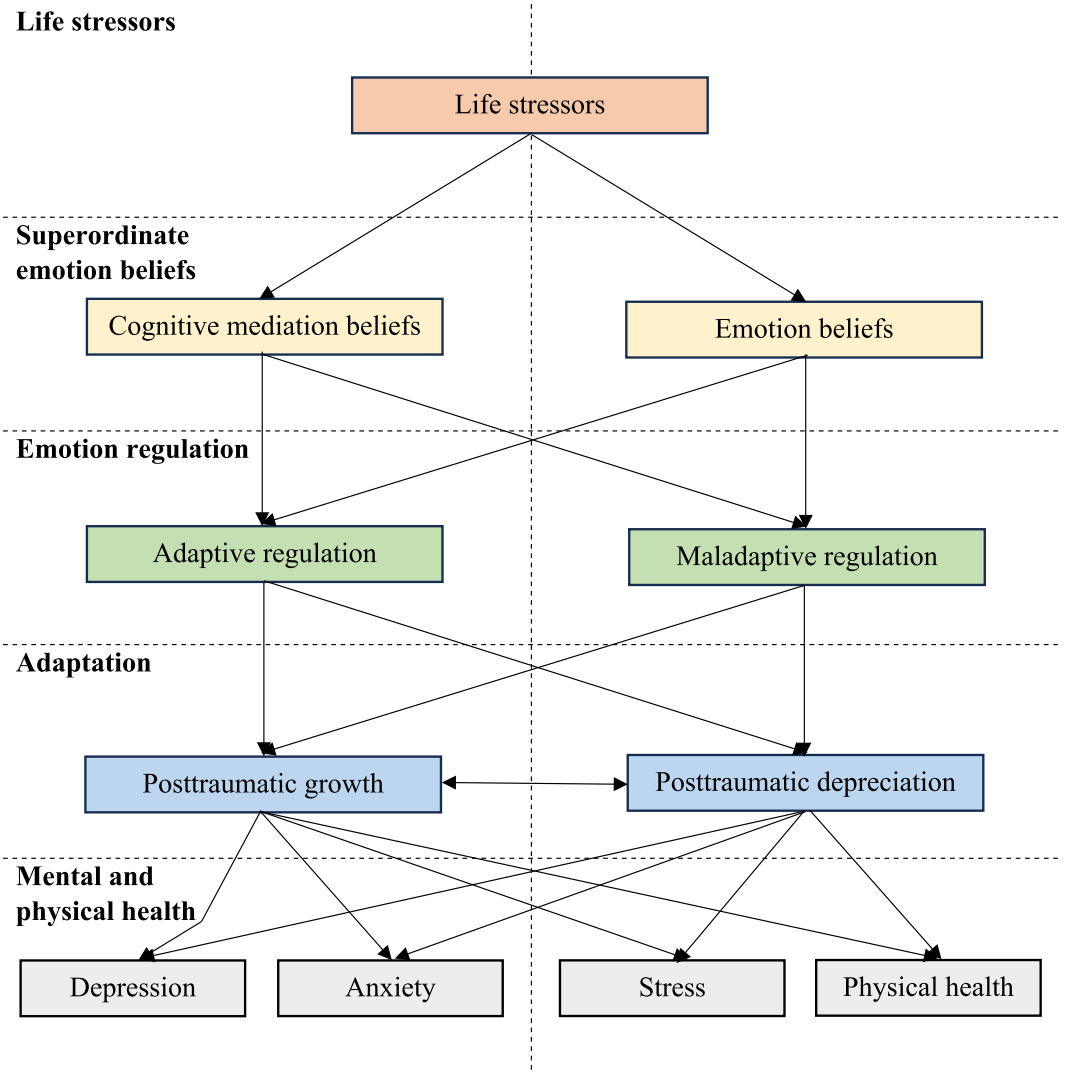

Figure 1. Hypothesized pathways from life stressors to mental and physical health.

The current study aimed to clarify the psychological mechanisms that shape PTD and PTG following everyday life stressors, and how these constructs relate to mental and physical health outcomes over time. Specifically, we examined the role of cognitive mediation beliefs, emotion beliefs, and emotion regulation strategies on PTD and PTG, and the subsequent effects on common mental and physical health complaints. The first objective was to examine whether emotion beliefs were associated with emotion regulation tendencies. We hypothesized that fewer negative emotion beliefs and cognitively mediated beliefs (i.e., beliefs that emotions occur through cognition rather than events themselves) would be associated with greater adaptive emotion regulation (H1) and reduced maladaptive emotion regulation (H2). The second objective was to investigate whether emotion regulation strategies were associated with PTD and PTG. We suggest that adaptive emotion regulation will be negatively associated with PTD (H3) and positively associated with PTG (H4). The third objective was to assess whether PTD and PTG are related to mental and physical health outcomes. We expected that greater PTD would be positively associated with worse mental and physical health (H5), while higher levels of PTG would be related to reductions in mental and physical health symptoms (H6).

Method

Participants

Participants were a general population sample recruited via the online research participation platform Prolific. Individuals were eligible to participate if they were aged over 18, based in the United Kingdom, with at least one self-reported stressful experience in the past six months. The study was only available to those without self-reported ongoing mental health difficulties using a predefined filter in the Prolific platform. At the baseline measurement (T1), 800 participants completed the online survey, after the removal of 31 incomplete responses and two further responses that failed data quality checks. Six months later (T2), 627 complete responses were obtained from the original T1 sample, after the removal of 22 incomplete responses and one straight-lining participant. The completion rate was 78.4%. Sample characteristics at both time points is presented in Table 1. Dropout analyses revealed that participants who completed T2 were significantly older than at T1 [$t(798) = 6.21$, $p < .001$, $d = .53$], but did not differ in terms of gender [$\chi^2(2) = 1.56$, $p = .458$, $\phi = .04$], ethnicity [$\chi^2(4) = 2.07$, $p = .723$, $\phi = .05$], educational level [$\chi^2(6) = 2.03$, $p = .917$, $\phi = .05$], or employment status [$\chi^2(3) = .57$, $p = .905$, $\phi = .03$]. Sample size was determined for a regression-type model with seven predictors using G*Power (v.3.1.9.7), with an alpha error probability of .05 and statistical power of .80. We selected the recommended minimum effect size representing a practically significant effect in social science research of $R^2 = .04$ (Ferguson, 2009). The power analysis suggested a minimum sample size of $N = 341$.

Procedure

The study received ethics approval from the Faculty of Health & Education Ethics Committee (ETHOS ID: 40473) and complied with the Declaration of Helsinki. At T1 (April 2022), Prolific participants who met the inclusion criteria were offered an opportunity on their user area to complete an online survey hosted on Qualtrics. Upon clicking the link, participants were invited to read an information sheet and provide informed consent before completing the study measures. At the end of the

Table 1. Participant demographic characteristics.

Characteristic	T1 Sample ($N = 800$) *M* (*SD*)	T2 Sample ($N = 627$) *M* (*SD*)
Age	40.60 (11.27)	42.38 (11.28)
	***N* (%)**	***N* (%)**
Gender		
Female	419 (52.4)	334 (53.3)
Male	379 (47.4)	289 (46.1)
Other/Prefer not to say	2 (0.2)	4 (0.6)
Ethnicity		
Asian	48 (6.0)	39 (6.2)
Black	23 (2.9)	17 (2.7)
Mixed	26 (3.3)	20 (3.2)
White	701 (87.6)	549 (87.6)
Other/Prefer not to say	2 (0.2)	2 (0.3)
Education		
No qualifications	2 (0.3)	1 (0.2)
GCSE or equivalent	84 (10.5)	68 (10.8)
A-level or equivalent	164 (20.5)	125 (19.9)
Bachelor's degree or equivalent	363 (45.4)	285 (45.5)
Master's degree or equivalent	152 (19.0)	119 (19.0)
Doctoral degree or equivalent	23 (2.9)	21 (3.3)
Other	12 (1.5	8 (1.3)
Employment status		
Part-time	7 (0.9)	14 (2.2)
Full-time	786 (98.3)	604 (96.3)
Other	7 (0.8)	9 (1.5)

survey, participants were presented with debriefing information and asked if they would like to be recontacted to complete the same survey again in six months' time. Six months' later (T2, October 2022), the participants who provided consent to be recontacted were invited to complete the survey again. The SRRS instructions were altered so the referent period was the past six months' from when the survey was last completed. At both time points, participants were paid the equivalent of £7.11 per hour for their time. The study was preregistered (https://osf.io/8345 g) and the study data are available on the Open Science Framework at https://osf.io/tjzuw/. All data exclusions, manipulations, and measures are reported in the study.

Materials

Demographics

Data were collected for age, gender, ethnicity, educational, and employment status.

Life stressors

The Social Readjustment Rating Scale (SRRS; Holmes & Rahe, 1967) lists 43 life events that may be experienced as stressful, such as bereavement, divorce, financial pressures, and changes in educational and social domains. Each event is assigned a weight from 11 (least stressful) to 100 (most stressful). Participants are asked to indicate whether an event has happened to them in the past six months. A cumulative stress score is calculated from summing the events which participants have experienced, with higher scores indicating greater stress.

Superordinate emotion beliefs

Cognitive mediation beliefs. The Cognitive Mediation Beliefs Questionnaire (CMBQ; Turner et al., 2021) is a 15-item measure of emotion beliefs (e.g., "To change how I feel, I need to change what I think about things around me"). The CMBQ contains two subscales which measure the extent to whether participants attribute emotion beliefs to changes in cognition (cognitive mediation beliefs) or specific events (stimulus-response beliefs), on a scale from 1 (strongly disagree) to 5 (strongly agree). The CMBQ is a valid measure with acceptable test-retest reliability, and internal consistency (cognitive mediation beliefs $\alpha = .88$, stimulus response beliefs $\alpha = .89$; Turner et al., 2021). In the current study, the CMBQ demonstrated respectable Cronbach's alphas for cognitive mediation (T1: $\alpha = .87$; T2: $\alpha = .90$) and stimulus response beliefs (T1: $\alpha = .91$; T2: $\alpha = .91$). For the analyses, and following the work of the CMBQ developers (Turner et al., 2022), we created a cognitive mediation-stimulus response index by subtracting stimulus-response beliefs from cognitive meditation beliefs. As cognitive mediation beliefs and stimulus response beliefs can be considered to be on opposing sides of a dichotomy in the CMBQ, the index provides a single score that indicates the extent to which cognitive mediation beliefs predominate over and above stimulus-response beliefs, with higher index scores reflecting higher cognitive mediation scores and lower stimulus response scores.

Emotion beliefs. The Emotion Beliefs Questionnaire (EBQ; Becerra et al., 2020) is a measure of emotion beliefs (e.g., "There is very little use for negative emotions"). On a scale from 1 (strongly disagree) to 7 (strongly agree), participants respond to 16 statements about general beliefs about emotions. In this study, a total score which reflected overall maladaptive beliefs about emotions was used, with higher scores representing greater maladaptive beliefs. The EBQ has good psychometric properties ($\alpha = .88$; Becerra et al., 2020), which was reflected at T1 ($\alpha = .87$) and T2 ($\alpha = .88$).

Emotion regulation

Adaptive and maladaptive emotion regulation. Composite adaptive and maladaptive emotion scores were created by averaging subscales across two common measures of emotion regulation for the purposes of meaningful analysis. The Regulation of Emotion Systems Survey (RESS; De

France & Hollenstein, 2017) is a 38-item measure of six common emotion regulation strategies (rumination, engagement, suppression, relaxation, distraction, and reappraisal). Participants rate the extent to which they use a given strategy (e.g., "Letting my emotions show"), on a scale from 1 (never) to 5 (always). The RESS is a valid and reliable measure (original $\alpha \geq .84$ to .94 for all subscales, De France & Hollenstein, 2017), with all six subscales demonstrating similar reliability at both time points (all $\alpha \geq .89$ to .95). The Cognitive Emotion Regulation Questionnaire (CERQ; Garnefski & Kraaij, 2007) measures three additional emotion regulation strategies (acceptance, putting into perspective, catastrophizing) using 12 items (e.g., "I think that I have to accept the situation") rated from 1 (almost never) to 5 (almost always). The CERQ has good psychometric properties (Garnefski & Kraaij, 2007), and appropriate internal consistency for all three subscales (all $\alpha \geq .79$ to .89), similar to those reported in the original validation study (all $\alpha \geq .75$ to .87; Garnefski & Kraaij, 2007)). For both measures, higher scores indicate greater endorsement of emotion regulation strategies. To reduce the number of emotion regulation variables for inferential analyses, "adaptive emotion regulation" and "maladaptive emotion regulation" composite variables were created (Aldao et al., 2014). "Adaptive emotion regulation" (T1 $\alpha = .88$, T2 $\alpha = .90$) was created by summing and averaging the engagement, relaxation, reappraisal, acceptance, and perspective subscale scores. "Maladaptive emotion regulation" (T1 $\alpha = .90$, T2 $\alpha = .91$) was created by summing and averaging the rumination, suppression, distraction and catastrophizing subscale scores.

Posttraumatic growth and depreciation

The Posttraumatic Growth and Depreciation Inventory – Expanded Version (PTGDI-X; Taku et al., 2021) is a 50-item measure of psychological change following stressful life events, rated on a scale from 0 (no change) to 5 (very great degree). Two subscales capture positive (PTG; e.g., "I have established a new path for my life") and negative psychological change (PTD; e.g., "I am less certain that I can handle difficulties"), with higher scores indicating more growth or depreciation. Participants were asked to respond to the items in relation to the most stressful situation identified on the SRSS. The PTGDI-X has demonstrated acceptable psychometric properties (PTG and PTD subscales exceeding $\alpha = .93$; Taku et al., 2021), reflected in this study for the PTG (T1 $\alpha = .96$; T2 $\alpha = .96$) and PTD (T1 $\alpha = .95$; T2 $\alpha = .96$) subscales.

Mental health symptoms

The Depression Anxiety Stress Scale-21 (DASS-21; Lovibond & Lovibond, 1995) is a 21-item measure of common mental health difficulties (e.g., "I felt I was close to panic"). Three subscales (depression, anxiety, stress) assess the extent to which participants endorse symptoms in those domains over the past two weeks, on a scale of 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). Higher scores indicate greater presence of mental health difficulties. The DASS-21 has demonstrated acceptable psychometric properties, including convergent and discriminant validity (Lovibond & Lovibond, 1995). Depression (T1 $\alpha = .94$; T2 $\alpha = .94$), anxiety (T1 $\alpha = .88$; T2 $\alpha = .87$) and stress (T1 $\alpha = .91$; T2 $\alpha = .91$) displayed high reliability at both time points, exceeding those reported in the development of the measure (depression $\alpha = .91$, anxiety $\alpha = .84$, stress $\alpha = .90$; Lovibond & Lovibond, 1995).

Physical health symptoms

The Physical Health Questionnaire (PHQ; Schat et al., 2005) is a 14-item measure of physical health complaints experienced over the past two weeks (e.g., "How often have you experienced headaches?"). On a scale ranging from 1 (not at all) to 7 (all of the time), participants indicate the extent to which they have experienced physical health difficulties. A total score was used in this study, with higher scores referring to greater physical health problems. The PHQ has acceptable psychometric properties, including construct validity (Schat et al., 2005). In this study, internal consistency at both time points (T1 $\alpha = .90$; T2 $\alpha = .89$), exceeded that reported in the original development study ($\alpha = .70$; Schat et al., 2005).

Data analysis

Data analysis was conducted using SPSS (v.29) and AMOS (v.28). Following data cleaning, assumption checks, and descriptive analyses, hypothesized longitudinal effects between variables were estimated using cross-lagged panel analysis. Then, path analysis with maximum likelihood estimation was used to assess the hypothesized relationships between variables. For the path analysis, residualized change scores were computed by regressing T2 observed variables on T1 observed variables, saving the unstandardized residual values. The residualized change scores were then used as observed variables in the path analysis. No change score was calculated for the T2 life stressors variable, which was used to represent cumulative stress exposure over the previous six months. To evaluate the model fit to the observed data, we used the Comparative Fit Index (CFI), Standardized Root Mean Square Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA). CFI values exceeding .90, and SRMR and RMSEA values ≤ 0.06 demonstrate an acceptable model (Kline, 2016).

Results

Preliminary analyses

On average, participants reported 5.73 different types of life stressors at T1 in the preceding six months, and 3.39 types of events in the following six months at T2. Analysis of differences between T1 and T2 measures (shown in Table 2) with an adjusted alpha level of .005 for multiple comparisons revealed that T2 life stressor scores were significantly lower than at T1 ($p < .001$, $d = .44$). Maladaptive emotion regulation scores were significantly lower at T2 than at T1 ($p = .002$, $d = .10$). T2 PTG scores also significantly decreased compared to T1 ($p < .001$, $d = .20$). All other variables remained similar across both time points. Analyses also indicated that T2 dropouts did not significantly differ on any of the primary measures.

Bivariate correlation analyses using change scores between key study variables are shown in Table 3. Specifically, emotion belief and regulation variables, PTG, and PTD were largely positively related to mental and physical health outcomes. Cognitive mediation beliefs were negatively associated with anxiety, stress, and physical health. Adaptive emotion regulation was positively associated with physical health scores. PTG was positively correlated with changes in anxiety and physical health.

Path model

The final path model depicting significant relationships between the study variable change scores is shown in Figure 2. The model demonstrated acceptable fit according to most indices [$\chi^2(1) = 21.91$,

Table 2. Descriptive statistics for T1 and T2 study variables ($N = 627$).

	Time 1			Time 2		
	M	*SD*	Range	*M*	*SD*	Range
Life Stressors	153.00	135.85	0–897	95.11	98.71	0–615
Emotion Beliefs	42.20	11.83	16–84	42.10	11.27	16–81
Cognitive Mediation Beliefs Index	1.80	7.43	−20–27	2.26	7.45	−18–27
Adaptive Emotion Regulation	2.88	.44	1.77–4.58	2.84	.47	1.54–4.42
Maladaptive Emotion Regulation	2.88	.59	1.25–4.71	2.81	.58	1.27–4.48
Posttraumatic Growth	52.69	26.09	0–123	47.88	27.82	0–120
Posttraumatic Depreciation	23.23	21.78	0–111	22.05	22.50	0–122
Anxiety Symptoms	3.27	4.08	0–21	2.94	3.78	0–21
Depressive Symptoms	5.19	5.28	0–21	4.95	5.29	0–21
Stress Symptoms	6.17	5.06	0–21	5.95	5.02	0–21
Physical Health Symptoms	36.94	14.49	14–89	36.10	13.47	15–91

Notes. *M* = mean; *SD* = standard deviation.

Table 3. Correlations between residualized change scores for study variables ($N = 627$).

	1	2	3	4	5	6	7	8	9	10	11
1. Life Stressors	-										
2. Emotion Beliefs	−.06	-									
3. Cognitive Mediation	.08*	−.32***	-								
4. Adaptive Emotion Regulation	.12**	−.01	.05	-							
5. Maladaptive Emotion Regulation	.15***	.09*	−.11**	.19***	-						
6. Posttraumatic Growth	.12**	−.08*	.06	.26***	.09*	-					
7. Posttraumatic Depreciation	.10*	.18***	−.14***	.08*	.15***	.24***	-				
8. Anxiety	.12*	.16***	−.10*	.05	.19***	.11**	.38***	-			
9. Depression	.11**	.14***	−.07	−.05	.18***	−.03	.40***	.59***	-		
10. Stress	.20***	.13***	−.08*	−.02	.22***	.07	.39***	.63***	.65***	-	
11. Physical Health	.18***	.10*	−.12**	.12**	.23***	.10**	.36***	.47***	.39***	.45***	-

Notes. Residualized change was not calculated for Life Stressors. *$p < .05$, **$p < .01$, ***$p < .001$.

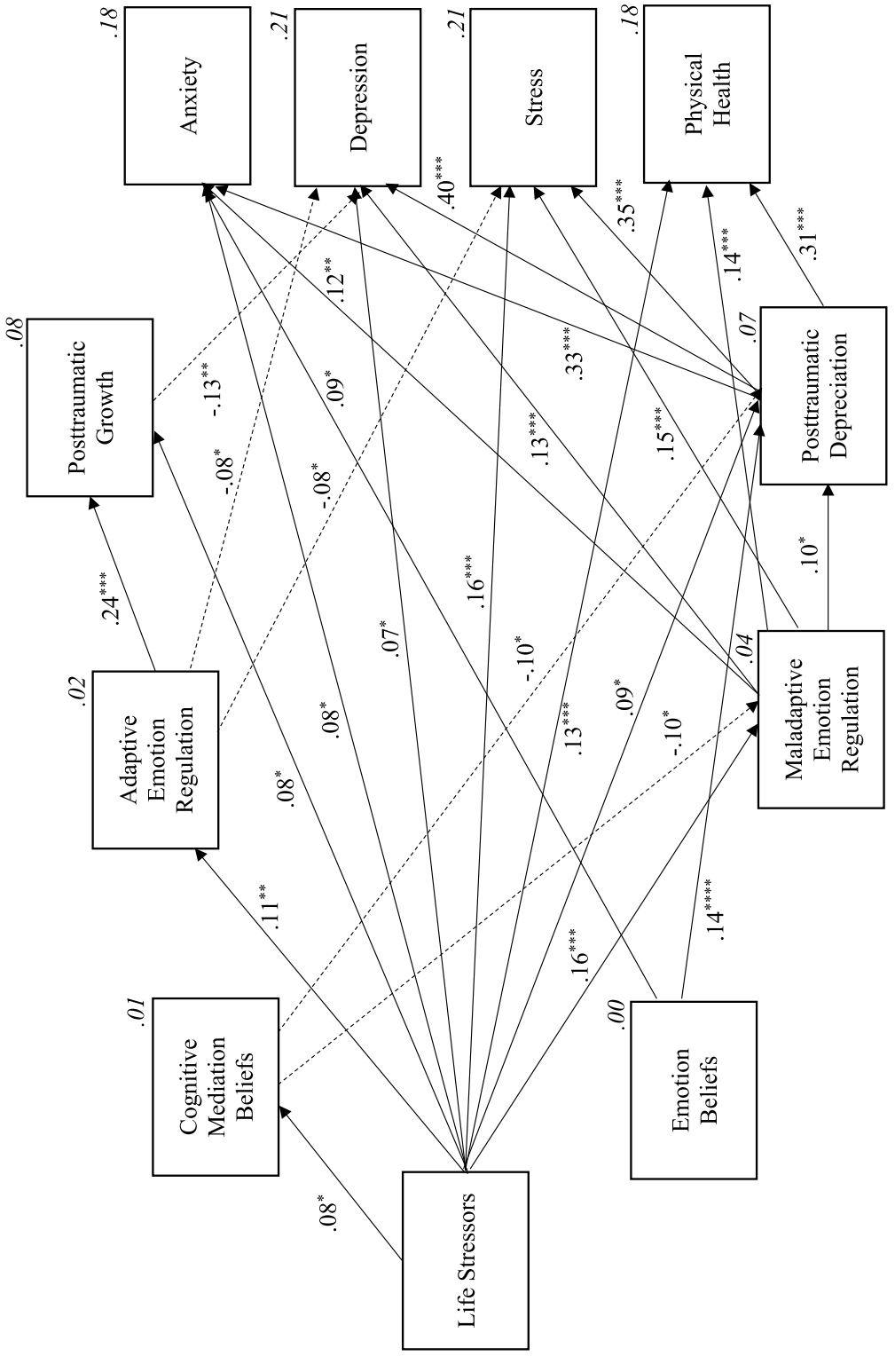

Figure 2. Final path model with residualized change scores. Notes. The model only depicts significant paths for simplicity. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

$p < .001$, CFI = .99, SRMR = .02], although the RMSEA value (.18) indicated problematic fit. The model explained between 18-21% of the variance in mental and physical health changes over the six-month study period.

T2 life stress scores were positively related to cognitive mediation beliefs ($p = .037$), adaptive emotion regulation ($p = .005$), maladaptive emotion regulation ($p < .001$), PTG ($p = .032$), PTD ($p = .020$), anxiety ($p = .038$), depression ($p = .049$), stress ($p < .001$), and physical health ($p < .001$). Cognitive mediation beliefs were negatively associated with maladaptive emotion regulation ($p = .019$) and PTD ($p = .017$). Emotion beliefs were positively related to PTD ($p < .001$) and anxiety ($p = .020$). Adaptive emotion regulation was positively related to PTG ($p < .001$) and negatively associated with depression ($p = .023$) and stress symptoms ($p = .017$). Maladaptive emotion regulation was positively related to PTD ($p = .010$), anxiety ($p = .002$), depression ($p < .001$), stress ($p < .001$), and physical health ($p < .001$). PTD was positively related to anxiety ($p < .001$), depression ($p < .001$), stress ($p < .001$), and physical health ($p < .001$). PTG was negatively associated with depression symptoms ($p = .001$).

Analysis of indirect effects revealed a significant indirect effect of T2 life stress on PTG [β = .04, *SE* = .01, 95% CI: .02, .06], stress [β = .04, *SE* = .01, 95% CI: .01, .07], anxiety [β = .04, *SE* = .02, 95% CI: .02, .08], and physical health [β = .05, *SE* = .02, 95% CI: .02, .08]. Cognitive mediation beliefs demonstrated significant indirect effects on all mental and physical health outcomes, specifically, depression [β = −.06, *SE* = .02, 95% CI: − .10, − .03], anxiety [β = −.05, *SE* = .02, 95% CI: − .08, − .02], stress [β = −.06, *SE* = .02, 95% CI: − .09, − .03], and physical health symptoms [β = −.04, *SE* = .02, 95% CI: − .07, − .02]. Emotion beliefs were indirectly related to depression [β = .08, *SE* = .02, 95% CI: .05, .11], anxiety [β = .06, *SE* = .02, 95% CI: .03, .09], stress [β = .06, *SE* = .02, 95% CI: .04, .10], and physical health [β = .06, *SE* = .02, 95% CI: .03, .09]. Significant indirect effects were also observed for maladaptive emotion regulation on depression [β = .04, *SE* = .02, 95% CI: .01, .07], anxiety [β = .04, *SE* = .02, 95% CI: .01, .06], stress [β = .04, *SE* = .02, 95% CI: .01, .06], and physical health [β = .03, *SE* = .02, 95% CI: .01, .06].

Discussion

This study aimed to investigate: (1) whether and how superordinate emotion beliefs relate to emotion regulation strategies; (2) assess relationships between emotion regulation strategies, PTD and PTG; and (3) examine the influence of PTD and PTG on physical and mental health symptoms following everyday life stressors. Using a longitudinal design, we tested a path model that integrated these variables to better understand psychological mechanisms and adaptation to life events. By modeling PTD and PTG simultaneously, this study contributes to a growing body of work that challenges the assumption of a single posttraumatic trajectory.

Superordinate emotion beliefs and emotion regulation

In partial support of H1 and H2, greater cognitive mediation beliefs (i.e., attributing emotions to cognitions rather than events themselves) were related to lower maladaptive emotion regulation, but not to greater adaptive emotion regulation. Negative emotion beliefs were also unrelated to emotion regulation strategies. These findings are broadly consistent with the view that perceiving emotions as useless, uncontrollable, and dictated by events rather than cognition is associated with worse functioning (Becerra et al., 2020; Turner et al., 2024).

The inverse relationship between cognitive mediation beliefs and maladaptive regulation strategies may reflect a shift in how individuals interpret and respond to emotional experiences. When emotions are seen as being shaped by thoughts rather than external events, then strategies such as rumination, suppression, or distraction may seem less useful (Arbulu et al., 2024). Rather than dwelling on or avoiding the event, individuals may be more inclined to engage in cognitive change. However, this belief alone may not translate into the use of adaptive strategies, because

although attitudes can shape intentions, intentions do not always lead to action (Ajzen, 1991). Believing that emotions can be changed through cognition may be an important but not necessary or sufficient condition for emotion regulation, particularly if individuals lack the skills or knowledge to implement adaptive strategies.

The lack of association between negative emotion beliefs and emotion regulation strategies may similarly reflect a disconnect between general attitudes toward emotion and specific regulatory behaviors. The EBQ (Becerra et al., 2020) captures broad beliefs about the usefulness and controllability of emotions, but these beliefs may not directly influence the choice or frequency of regulatory strategies. For instance, individuals who believe emotions are uncontrollable may disengage from regulation altogether, while others may persist with habitual strategies regardless of their beliefs. These mixed findings add to calls for more research on the relationship between emotion beliefs and regulation (Ford & Gross, 2019), although further research is needed into how emotion beliefs inform regulatory strategies, and under what conditions these beliefs translate into behavior.

Emotion regulation, posttraumatic depreciation and posttraumatic growth

In support of H3 and H4, adaptive emotion regulation strategies (e.g., reappraisal, perspective taking) were positively related to PTG, whereas maladaptive emotion regulation strategies (e.g., suppression, catastrophizing) were positively associated with PTD. PTG is thought to arise from proactive meaning-making processes that extend beyond immediate emotional coping, although emotion regulation strategies lack attention in theoretical models of PTG (e.g., Tedeschi et al., 2018) compared to other (primarily cognitive) factors. Our study further adds to this limited knowledge, in that regulation strategies such as reappraisal can facilitate PTG. Conversely, PTD may more directly influenced by maladaptive regulation strategies that exacerbate distress and hinder recovery. Together these results further support views that PTD and PTG are not simply opposite ends of a continuum, but are distinct outcomes with different antecedents (Cann et al., 2010).

The modest paths observed between emotion regulation variables and PTD and PTG are consistent with prior longitudinal work that finds emotion regulation processes exert a weak influence on PTD and PTG (Pięta-Lendzion et al., 2024), and as such are likely only one part of a broader psychological process. However, emotion regulation choice is important in determining the likelihood of PTG; the decision to use adaptive or maladaptive strategies can depend on the emotional intensity of the stressor/s, with adaptive strategies more likely to be used in the context of lower intensity stressors and maladaptive strategies like distraction increasingly employed as intensity increases (Orejuela-Dávila et al., 2019). We found that subjective life stress scores were generally at the lower end of the distribution, and so this may explain why the relationship between adaptive emotion regulation and PTG was stronger.

The associations observed may reflect the complexity of PTD and PTG as multifaceted constructs. For instance, PTG is thought to arise from deliberate, effortful meaning-making processes that extend beyond immediate emotional coping (Larsen & Berenbaum, 2015; Tedeschi et al., 2018). These processes may be more cognitively demanding compared to reducing distress via adaptive emotion regulation strategies such as acceptance (Troy et al., 2018).

Posttraumatic depreciation, posttraumatic growth, and mental and physical health

We found that greater PTD was positively and moderately related to worse mental and physical health, in line with our hypotheses (H5). There was mixed support for H6, as PTG perceptions were unrelated to mental and physical health outcomes over the six-month period, except for depression. Previous work has consistently demonstrated associations between negative responses to adversity and worse mental and physical health (Garfin et al., 2018; O'Connor et al., 2021), and

between PTD and anxiety, depression, and stress, whereas PTG was unrelated to these outcomes (Barrington & Shakespeare-Finch, 2013).

Our findings raise potential questions about the temporal nature of growth. PTG theorists (Tedeschi et al., 2018) argue that growth is a dynamic construct that can fluctuate over time, and is non-linear. Cross-sectional (Weber & Schulenberg, 2023) and longitudinal (Martin et al., 2017) findings suggest that PTG is more likely to be reported when depression, anxiety, and stress symptoms are moderate. Average scores on mental health symptoms in this non-clinical sample were at the lower end, and the estimation of linear relationships in the analysis did not capture the possibility of curvilinear associations. Furthermore, at T2 we asked participants to respond to the psychological measures when thinking about their life stressors in the past six months. It may be that this time was not sufficient for growth to enact changes to mental and physical health. In the short-term following exposure to adversity, PTG may serve to consolidate and mitigate negative consequences associated with life stress, and more transformative changes to wellbeing, purpose, meaning and other related constructs may take more time to emerge.

However, our findings may also suggest that PTG could have an illusory quality that reflects coping tendencies to manage distress (Boals, 2023), or *perceived* rather than *actual* changes in wellbeing (Jayawickreme et al., 2021). For instance, in line with other longitudinal work (Dekel et al., 2012), we found that PTG did not facilitate reductions in anxiety. It is therefore possible that the PTG measure employed in this study captured perceived rather than actual changes, leading to discrepancies between perceived growth and associated mental and physical health outcomes.

Existing evidence on the relationship between PTG and physical health outcomes is mixed (Barskova & Oesterreich, 2009), and so it is possible that changes in PTG may not clearly map onto symptom-based measures of mental and physical health. PTG is typically characterized by broader existential changes (e.g., greater appreciation for life, changes in life priorities, Tedeschi et al., 2018), as opposed to the domains within the DASS and PHQ measures. Given that PTD and PTG refer to changes in specific life domains and do not reflect all possible changes post-adversity, this highlights a limitation with current measurement approaches and suggests the need for more holistic tools that capture a wider range of psycho-physical adaptation.

Strengths and limitations

This study has several strengths. It is the first to integrate emotion beliefs, emotion regulation, PTD, PTG, and mental and physical health outcomes into a single longitudinal model, and addresses calls for longitudinal research into PTD and PTG (Jayawickreme et al., 2021). We also retained a high completion rate, enhancing the validity, reliability, and generalisability of the findings, and reducing attrition bias. Several limitations should be acknowledged. Despite data quality checks to remove careless responders (Agley et al., 2024), the data were self-report, and participants were compensated for their time, which could increase socially desirable responding. Although the longitudinal data provides temporal order within the model, causal inferences are limited due to potential bidirectional influences. Model fit indices were generally acceptable, although RMSEA indicated poorer fit, likely due to its sensitivity to model complexity (Lai & Green, 2016). The model explained a small proportion of variance explained in PTD and PTG (7-8%), suggesting other variables may better contribute to these constructs. Theories (Tedeschi et al., 2018) emphasize cognitive (e.g., core belief disruption, event-related rumination) and social processes (e.g., disclosure), and future research should integrate these elements into expanded models. We recruited a large, gender-balanced non-clinical British sample using Prolific, a platform that can produce more representative samples than traditional convenience-based methods (Wright, 2023). However, White and educated individuals were overrepresented when compared to the national demographic characteristics of the United Kingdom (Office for National Statistics, 2024), and so the data may not be fully representative of clinical and diverse populations. For instance, cultural differences have been observed to influence emotion regulation strategies used (Ford et al., 2015) and the nature of PTG reported

(Kashyap & Hussain, 2018). Future studies should seek to validate the findings among broader samples.

Practical implications

The findings have potential practical relevance for supporting individuals navigating daily stressors. Self-help interventions that target maladaptive emotion beliefs and emotion regulation strategies could guide individuals toward more adaptive processing, which in turn could reduce the likelihood of common mental and physical health complaints (Kobylińska & Kusev, 2019; Sapolsky, 2007). For example, cognitive behavioral interventions such as rational emotive behavior therapy (REBT; Ellis, 1957) teach cognitive mediation emotion beliefs, and help recipients regulate emotion chiefly via cognitive change of deeply held beliefs (Turner, 2022). Evidence indicates wide support for REBT in ameliorating a range of pathological outcomes (King et al., 2024).

The findings also suggest that interventions aiming to promote PTG should not assume downstream improvements in mental and physical health symptoms. Indeed, PTG is multifaceted and not simply the absence of distress (Tedeschi et al., 2018). Instead, such interventions may need to target other existential domains such as meaning making or sense of purpose, that demonstrate more robust relationships with PTG.

Conclusion

This study illuminates the emotional, cognitive, and psychological mechanisms that shape how individuals adapt to everyday adversity, providing more insight into the factors that contribute to PTD and PTG and how these in turn relate to physical and mental health. Although PTD was more consistently linked to poor health outcomes, PTG showed more selective associations, raising questions about its functional role in supporting wellbeing. Emotion beliefs and emotion regulation appeared to be important, modifiable factors that may steer individuals toward PTD and/or PTG. Future research should continue to explore these pathways with a view to informing interventions that foster more adaptive responses to life stress.

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Author contributions

MB – Conception and Design, Analysis and Interpretation of Data, Drafting and Revising the Paper.
MJT – Conception and Design, Analysis and Interpretation of Data, Drafting and Revising the Paper.

Data availability statement

The data that support the findings of this study are openly available on the Open Science Framework at https://osf.io/tjzuw/.

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