



Original Article

Coping and rumination as predictors of posttraumatic growth and depreciation

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ABSTRACT

Purpose: The present study examined the joint impact of coping and rumination after trauma on posttraumatic growth (PTG) and posttraumatic depreciation (PTD) based on the PTG model.

Methods: A cross-sectional study was conducted between October 2017 and May 2018. A sample of 253 individuals who had experienced a traumatic event in the last two years, was included. Participants completed an online self-reported survey, including demographic variables, trauma characteristics, the German Posttraumatic Growth and Depreciation Inventory – Expanded, the Brief COPE Inventory, and the Event Related Rumination Inventory. An analysis of correlation, a principal component analysis and hierarchical regression analyses were conducted. Statistical analyses were undertaken on SPSS (version 25.0; IBM, New York, USA).

Results: After controlling for the effects of personal and trauma characteristics, self-sufficient coping and socially supported coping were found to favor the emergence of PTG. Event-related and recent deliberate rumination were positively related to PTG. Avoidant-focused coping and recent intrusive rumination were positively associated with PTD. Overall, the final models accounted for 46% and 58% of the variance in PTG and PTD.

Conclusion: Our findings confirm the PTG model and support the central role of deliberate rumination, self-sufficient coping and socially supported coping in the development of PTG. Our results indicate that a similar model of PTD with comparable influencing factors can be assumed: if the individual is stuck in ongoing intrusive rumination and uses more avoidance-focused coping, it might lead to more reports of PTD.

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Introduction

A trauma can be defined as an event that a person “experienced, witnessed, or was confronted with [...] that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others” and that the person responded to with “intense fear, helplessness, or horror”.¹ Experiencing traumatic or highly stressful events can lead to various psychological, emotional, and behavioral reactions. Another approach to defining trauma is a focus on how such events disrupt one’s core beliefs about the world and the self, and thus may pave the way for developing a posttraumatic stress disorder.² However, people usually find ways to

effectively deal with the adverse experience, and many people seem to recover on their own.³

In some cases, individuals make a wide range of efforts to diminish psychological distress by showing a variety of strategies for dealing with the traumatic event. Such reactions to stressors are referred to as *coping* — the “efforts to prevent or diminish threat, harm, and loss, or to reduce associated distress”.⁴ Therefore, successful coping may be one determining factor that can lead to positive changes in the aftermath of trauma, such as improvements of relationships with others, more personal strength, new possibilities in life, greater appreciation of their life or shifts in spiritual or existential concerns.⁵ In other cases, the posttraumatic stress can persist for long periods, which can lead to persistent distress and thus to negative changes, such as deterioration of relationships, personal weakness, stagnation in life, disapproval of their life and spiritual-existential anomaly.

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One approach to capturing these reported positive and negative changes after stressful events is the concept of posttraumatic growth (PTG) and posttraumatic depreciation (PTD). PTG is defined as the experience of positive change resulting from struggle with major life crises.⁶ PTD reflects the opposite side of PTG⁷ and is defined as the experience of negative change resulting from struggle with major life crises. PTG and PTD have been shown to be relatively unrelated^{7–10} and may therefore co-occur on the same five postulated domains: personal strength, new possibilities, relating to others, appreciation of life, and spiritual-existential change.⁹ Furthermore, different attempts of coping with trauma can then lead to more or less PTG⁵ and PTD.¹¹

Extensive psychological research from recent decades has given rise to various definitions of coping and various classifications of individual coping strategies.⁴ One common measure to assess coping strategies is the Brief COPE Inventory,¹² whose superordinate structure has been analyzed in several studies. These investigations have generally resulted in three-factor solutions, such as socially supported/help-seeking, self-sufficient/active, and avoidant coping;^{13–16} active, emotional, and avoidant coping,¹⁷ or problem-focused, positive emotion-focused, and negative emotion-focused and avoidant-coping.¹¹ In the current study, we investigated whether the former well-recognized three-factor structure of coping, that is, socially supported, self-sufficient, and avoidant coping, could be represented in our data.

There is a conceptual overlap between the coping efforts and styles discussed so far and the construct of posttraumatic cognitive engagement, also referred to as *posttraumatic rumination*, which has been described as a crucial determinant of PTG.¹⁸ PTG theory assumes that a stressful event may disrupt a person's previous assumptions, goals, and beliefs, what can cause distress and initiate cognitive rumination processes.¹⁸ Processes that initially run automatically (e.g., nightmares about the event or unwanted images or thoughts about the experience) instigate coping processes and are replaced by increasingly conscious attempts to find meaning in the stressful experiences and integrate the experiences into the life narrative.⁵ According to this revised theory of PTG,⁵ coping is embedded between intrusive and deliberate rumination. The emerging sense of comprehensibility allows the individual to figure out ways to re-evaluate the changed circumstances and then may lead to PTG.⁵ This cognitive engagement process may be comparable to what is called “meaning-focused coping”,¹⁹ or the rearrangement of beliefs, values, and priorities to find a positive *meaning* in stressful events.⁴ It should be noted that deliberate rumination is distinct from coping appraisals.⁵ Coping aims to reduce distress by evaluating the stressor's context and resource availability,²⁰ whereas deliberate rumination focuses on the meaning of the traumatic event and takes place after initial coping attempts, which may be comparable to “meaning-focused coping”.^{4,19}

Effect of rumination on PTG and PTD

Empirical evidence suggests that posttraumatic cognitive engagement plays a central role in PTG^{21,22} and PTD^{8,10} in the aftermath of trauma. Previous studies have not only shown a connection between cognitive activity and PTG²³ but also highlighted the important role of different types of rumination (intrusive vs. deliberate) in PTG and PTD. However, results appear to be ambiguous. PTG seems to be associated with the extent of deliberate rumination.^{7,24} In contrast, PTG does not seem to be associated with intrusive rumination^{7,24,25} or might be negatively associated with especially recent intrusive rumination.^{9,10} Stockton and colleagues²⁶ found that deliberate rumination is only

associated with PTG when controlling for intrusive rumination. Regarding PTD, a positive influence of intrusive rumination on the emergence of PTD was found in initial studies,⁷ especially of prolonged intrusive rumination.^{9,10} Additionally, there are contrary findings indicating that deliberate rumination also predicts PTD.²⁵

Effect of coping strategies on PTG and PTD

Empirical research has demonstrated that cognitive and behavioral coping strategies influence the emergence of positive changes after stressful events. According to the organismic valuing theory of growth through adversity,²¹ avoidant coping reduces the initial distressing emotions after the trauma to allow engagement of cognitive processing of trauma-related information. Denial and avoidance strategies, especially during the early stage after traumatic events, may allow more control of the psychological adaptation process by influencing the rate at which the individual faces the traumatic contents.²⁷ However, there are little evidence and mixed results for avoidant coping and PTG.²⁸ In a sample of cancer patients, a positive association of PTG and avoidant coping (e.g., self-distraction) was found when used during their medical examination or chemotherapy — this association could not be found six months later.²⁹ Kroemeke and colleagues¹¹ found no predictive role of avoidance-focused coping on PTG. More coping by behavioral disengagement²⁷ and current substance use was found to be related to less PTG,³⁰ whereas denial was positively related to PTG³¹ (using an alternative measure) and benefit finding.³²

Furthermore, seeking social support leads to higher reported PTG.³³ The significant role of self-disclosure and social support is also emphasized in the PTG model.⁵ The greater availability of social support may help people successfully cope with trauma and thus affect PTG.⁵ Studies have found a positive relationship between perceived social support and PTG.³⁴ A strong social network may also facilitate the use self-disclosure as a successful coping strategy. According to the PTG model, self-disclosure after a traumatic event can help alleviate distress and therefore affect the PTG process⁵: self-disclosure can foster qualitative changes in cognitive processing by shifting the intrusive characteristics of rumination into a more reflective and deliberate rumination.⁵

For the styles of emotion-focused coping^{11,31} and problem-focused coping,³¹ there is empirical evidence of a positive influence on the emergence of PTG. Furthermore, positive reappraisal was found to be associated with more reported PTG.³³ A meta-analysis found a strong association of positive reappraisal as well as a moderate association of acceptance with benefit finding.³² Many studies across various cultures and types of trauma confirmed that the use of specific coping strategies led to more perceived PTG, with the most evidence for positive reinterpretation.^{27,35,36} Other coping strategies seem to be positively associated with PTG, such as acceptance,^{27,35} instrumental support,^{35,36} humor,³⁶ religious coping,³⁷ active coping,^{27,35,38} venting,³¹ planning,^{27,35} and emotional support.³⁹

Little is known about the association of coping strategies with PTD, especially while simultaneously assessing PTG¹¹ or even rumination. In our review of the literature, there was only one study investigating the effects of coping strategies on PTD and PTG simultaneously¹¹: for PTD, there was a positive association with negative emotion-focused and avoidant coping strategies (including venting, denial, substance use, behavioral disengagement, self-distraction, and self-blame). Furthermore, Schroevers and colleagues²⁸ found that a greater use of coping by self-distraction/mental disengagement led to more negative psychological changes.

Objectives

The present study examined the simultaneous impact of coping styles and types of rumination on both PTG and PTSD. Although the influences of coping styles and rumination on PTG have been extensively studied, the common associations of coping and rumination with PTSD have not been explored in the literature. Using the Brief COPE Inventory,¹² we explored the dimensional structure, hypothesizing a three-dimensional factorial structure—socially supported, self-sufficient, and avoidant coping—as documented in previous literature.^{14,15} We tested the following two hypotheses, controlling for person and trauma characteristics, respectively, which we derived from PTG and PTSD theory:

- 1) PTG is predicted by self-sufficient coping, socially supported coping, and recent and event-related deliberate rumination. Avoidant-focused coping, and recent and event-related intrusive rumination are unrelated to PTG.
- 2) PTSD is predicted by recent and event-related intrusive rumination, and avoidant coping. Self-sufficient coping, socially supported coping, and recent and event-related deliberate rumination are unrelated to PTSD.

Methods

Participants and procedure

Data in the current study were collected as part of the global validation of the PTG-PTD theoretical model⁷ and the examination of the psychometric properties of the German Posttraumatic Growth and Depreciation Inventory – Expanded (PTGDI-X).^{7,10} The inclusion criteria were as follows: (1) sufficient knowledge of German, (2) residing in Germany, and (3) age ≥ 18 years. After providing informed consent, individuals reported one potentially traumatic experience. Of 421 adults who participated, the experiences of 253 individuals met the A-level trauma criteria according to the definition of the *Diagnostic and Statistical Manual of Mental Disorders 4th edition (DSM-IV)*¹ and happened within a range of more than 14 days and less than two years.

These 253 individuals, of whom 186 were women and 67 men, with a mean age of 34.58 years (range 18–78 years, SD = 11.20), were included in the present study. All participants had completed formal German education (7.9% lowest formal, 30.4% intermediary secondary, 34.8% higher secondary, and 26.9% university degree). Reported traumas varied in the sample, with 38.7% indicating a very serious medical condition or life-threatening illness ($n = 98$), 13.0% a traffic or train accident ($n = 33$), 12.6% a sudden serious medical incident ($n = 32$), 7.9% suicide or a suicide attempt ($n = 20$), 5.5% non-life-threatening serious illness ($n = 14$), 4.7% other serious accident (e.g., fall, fire, and drowning) ($n = 12$), 4.7% physical assault ($n = 12$), 4.3% sexual assault ($n = 11$), 4.7% another traumatic event ($n = 12$), and 3.6% an unknown traumatic event ($n = 9$). With multiple classifications possible, in 64 cases it was indicated that the traumatic event happened to the person themselves; in 139 cases, participants witnessed the event happening to someone else; and in 15 cases, participants learned about the event happening to someone else. Additionally, 95 individuals (23.3%) experienced the specified trauma as part of their professional activity (e.g., firefighters, civil protection). When evaluating the event associated with the most significant current distress, 149 participants experienced the traumatic event themselves, whereas in 61 cases, the traumatic event happened to someone else (30 participants witnessed the event, and 31 learned about it happening to a close family member or close friend). On average, the reported traumatic event had happened 12.95 months ago (SD = 7.91). The

stressfulness of the reported experience at the time of the event was mean 2.78 (SD = 1.28), and during the past month before the survey point, the mean was 2.26 (SD = 1.22) on a 5-point scale from 0 (not distressed at all) to 4 (extremely distressed).⁷ Participants subjectively rated their experience in terms of severity as mean 2.89 (SD = 0.97) on a 5-point scale from 0 (mild) to 4 (extremely severe).

The study was conducted as an online survey between October 2017 and May 2018 with approval from the Ethical Committee of the University Medicine Greifswald, Germany (Internal registration number: BB 139/17). All participants provided informed consent before completing demographic data and questionnaires provided in German. Individuals were recruited by posts on social media (e.g., Facebook), on the project website, or via online portals for first responders (e.g., firefighters, civil protection). Following the online survey, participants had the opportunity to participate in a voluntary raffle to win one of 20 €15 Amazon vouchers. Additionally, our contact details were provided to ensure the possibility of sharing distressing thoughts or feelings that might occur due to the survey.

Measures

Traumatic event

Participants completed the Posttraumatic Stress Disorder Checklist for DSM-5 to indicate their experience out of a list comprising 12 traumatic events (PTSD Checklist for DSM-5 [PCL-5]),^{40,41} which were clustered into broader categories based on content criteria. Participants also had the opportunity to describe the event in their own words (“Please provide a brief description of the traumatic experience you have had. If you have endured more than one traumatic event, please describe the one that has had the greatest impact on you and note that it was not the only event. If you have suffered a loss [e.g., death of a loved one], please clarify how the loss occurred.”). The qualitative responses were coded according to qualitative content analysis.⁴² Additionally, participants had to decide if the DSM-IV trauma definition applied to their reported experience: “A trauma can be defined as an event that a person experienced, witnessed, or was confronted with that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others and that the person responded to with intense fear, helplessness, or horror”.¹

PTG and PTSD

The PTGDI-50^{7,10} was used to measure PTG and PTSD. The PTGDI-X consists of the PTGI-X²⁴ and PTDI-X.⁷ It measures PTG and PTSD with 25 items each, designed in parallel by corresponding negative and positive wording. Responses were provided on a 6-point scale, ranging from 0 (I did not experience this change) to 5 (I experienced this change to a very great degree). Higher scores reflect more PTG or PTSD. The overall PTG and PTSD scores were used (range, 0–125). Internal consistencies were very good for PTG ($\alpha = 0.93$) and PTSD ($\alpha = 0.94$).

Coping

Coping was assessed with the Brief COPE Inventory, which asked participants about the extent to which they used each of 14 distinct coping strategies described by two items each: emotional support, positive reframing, acceptance, religion, humor, active coping, planning, use of instrumental support, venting, denial, substance use, behavioral disengagement, self-distraction, and self-blame.^{12,43} Answers were recorded on a 4-point scale ranging from 1 (I have not been doing this at all) to 4 (I have been doing this a lot), with higher scores reflecting greater use of coping strategies. Since the Brief COPE has shown minimally acceptable internal reliability for the subscales,¹² we followed a common conceptualization of

previous literature, which suggested three higher-order factors, often referred to as self-sufficient coping, socially supported coping and avoidant coping, for the COPE^{44,45} and Brief COPE.^{13–16,46} Following an approach suggested by Carver and colleagues, we performed a principal component analysis prior to statistical analyses.⁴⁷ For further analyses, the mean value of each coping strategy was used, consisting of two associated items.

Rumination

Intrusive and deliberate rumination were assessed using the Event Related Rumination Inventory.⁴⁸ Both types of rumination were assessed by 10 items, each on a 5-point scale from 1 (not at all) to 5 (extremely). In addition, participants had to state the extent of both types of intrusive rumination (e.g., I could not keep images or thoughts about the event from entering my mind) and deliberate rumination (e.g., I deliberately thought about how the event had affected me) regarding the event-related processes (during the weeks immediately after the event) as well as the extent at the current time (during the past two weeks). Internal consistencies were excellent for all four scales: $\alpha = 0.92$ to 0.97 . Intercorrelations ranged from $r(\text{DRrecent, IRevent-related}) = 0.48$ to $r(\text{DRrecent, IRrecent}) = 0.79$.

Data analyses

Analyses were conducted using SPSS 25. Owing to the programming design of the online survey, there were no missing data. Pearson's correlations were considered as weak ($|0.10| < r < |0.30|$), moderate ($|0.30| < r < |0.50|$), or strong ($|0.50| < r$) effects.⁴⁹ After that, two separate hierarchical regression analyses were conducted with PTG or PTD as the dependent variable to examine the predictive role of coping styles and types of rumination in PTG and PTD. Demographic variables (age, gender, and education) and trauma characteristics (time since trauma and type of experience) were entered at the first stage to control for their effect. Regarding the ways of experience, two indicator variables were created by effect coding. In this context, the expression “job” was coded as -1 on both indicator variables. Therefore, the regression weights of the design variables “Self experience” and “Someone else” reflect the deviations (mean differences) of the respondents from the overall mean. Both types of intrusive rumination (event-related and recent) were entered at the second stage as predictors. The third model additionally included the three higher-order coping factors. Finally, both types of deliberate rumination were also included in the fourth model (event related and recent).

Results

Preliminary analyses and descriptive statistics

Following Carver and colleagues approach to the Brief COPE,⁴⁷ a principal component analysis using oblique (promax) rotation was performed prior to statistical analyses with three factors preset. The Kaiser–Meyer–Olkin measure was sufficient with 0.756 ,⁵⁰ and Bartlett’s test of sphericity was significant ($p < 0.001$). Anti-image correlation (measure of sampling adequacy value) was sufficient (>0.5) for all items. The default factor solution accounted for 51.9% of the variance in coping strategies.

We then constructed a sum score based on dominant factor loadings and calculated its internal consistency. The first factor was self-sufficient coping (positive reinterpretation, active coping, planning, humor, self-distraction, religion, acceptance; $\alpha = 0.77$); the second was avoidant coping (denial, self-blame, substance use, behavioral disengagement; $\alpha = 0.80$); the third was socially supported coping (emotional support, venting, instrumental support;

$\alpha = 0.82$). With respect to interrelations between coping styles (sumscores), only self-sufficient coping and socially supported coping were significantly associated, $r = 0.35$, $p < 0.001$. The averaged sum scores of each coping style together with rumination types, PTG and PTD are presented in [Table 1](#).

Predictive role of coping styles and types of rumination in PTG and PTD

[Table 2](#) shows the results of two stepwise hierarchical regressions of coping styles and rumination on PTG and PTD. With respect to PTG, the full model was highly significant, $F(13, 239) = 15.70$, $p < 0.001$, which accounted for 46% of the variance. Person and trauma characteristics in the first step accounted for a significant part of the variance, $F(6, 246) = 2.59$, $p < 0.05$, $R^2 = 0.06$. We found age to be the only significant predictor. Although entering rumination variables in the second step did not account for additional variance, entering the three coping variables in the third step increased the variance accounted for by 31%. The most important significant predictors were self-sufficient coping, socially supported coping, and time since trauma. Finally, in Model 4, we entered deliberate rumination, which accounted for an additional 9% of variance. We found the same predictors as in Model 3 (self-sufficient coping, socially supported coping, and time since trauma) to be significant, along with event-related and recent deliberate rumination. In contrast to Model 3, we also found avoidant-focused coping and recent intrusive rumination to significantly predict a decrease in PTG. The full model predicting PTD was highly significant $F(13, 239) = 25.09$, $p < 0.001$, $R^2 = 0.58$. Our control variables in the first step accounted for a significant part of the variance, $F(6, 246) = 5.66$, $p < 0.001$, $R^2 = 0.12$. The significant predictors were gender and self-sufficient coping. Entering intrusive rumination variables in the second step accounted for an additional 28% of the variance, $F(8, 239) = 20.06$, $p < 0.001$, $R^2 = 0.40$. Recent intrusive rumination was the most important significant predictor, along with low age, whereas the significant control variables in the first step became nonsignificant. Entering the coping style variables in the third step accounted for an additional 17% of the variance, $F(11, 239) = 29.18$, $p < 0.001$, $R^2 = 0.57$. Two predictors were significant: avoidant coping and recent intrusive rumination. Entering deliberate rumination variables in the last step of the hierarchical regression had no additional predictive value.

Discussion

A convenience sample of 253 traumatized individuals was examined in this online survey, with participants providing self-reports about how they reacted to a traumatic event in terms of

Table 1
Descriptive statistics and internal consistencies of the main study measures.

Variables	Mean	SD	α	Range	Number of items
Coping					
Self-sufficient	2.10	0.49	0.77	1–4	14
Avoidant	1.77	0.64	0.80	1–4	8
Socially supported	2.52	0.72	0.82	1–4	6
Rumination					
IR-past	3.71	1.00	0.95	1–5	10
IR-recent	2.71	1.28	0.97	1–5	10
DR-past	3.22	1.10	0.92	1–5	10
DR-recent	2.61	1.28	0.96	1–5	10
PTG	2.31	1.02	0.93	0–5	25
PTD	1.28	1.05	0.94	0–5	25

IR: intrusive rumination; DR: deliberate rumination; PTD: posttraumatic depreciation; PTG: posttraumatic growth; SD: standard deviation.

Table 2
Hierarchical multiple regression analyses predicting PTG and PTD, respectively.

Variables	PTG				PTD			
	Model 1 β	Model 2 β	Model 3 β	Model 4 β	Model 1 β	Model 2 β	Model 3 β	Model 4 β
Person characteristics								
Gender ^a	x.0.03	0.01	0.03	0.03	0.21*	0.07	0.09	0.08
Age	x.0.13*	0.13	0.01	0.02	-0.05	-0.12*	-0.05	-0.05
Education ^b	x.0.03	0.04	-0.07	-0.06	-0.04	0.06	0.07	0.07
Trauma characteristics								
Time since trauma	0.11	0.11	0.12*	0.16**	-0.07	0.04	0.04	0.06
Self experience ^c	0.12	0.11	-0.00	-0.06	0.17*	0.02	0.00	-0.02
Someone else ^d	0.07	0.07	0.02	-0.01	0.04	0.03	0.08	0.07
Experience in job (-1) ^e								
Intrusive rumination								
IR _{event-related}		0.05	0.05	0.02		0.13	-0.00	-0.01
IR _{recent}		0.03	0.06	-0.19*		0.52***	0.35***	0.27***
Coping								
Self-sufficient			0.42***	0.33***			-0.02	-0.04
Avoidant			-0.09	-0.20**			0.49***	0.46***
Socially supported			0.28***	0.22***			-0.08	-0.09
Deliberate rumination								
DR _{event-related}				0.24**				0.04
DR _{recent}				0.31**				0.11
R ^b	0.06	0.06	0.37	0.46	0.12	0.40	0.57	0.58
F	2.59*	2.06*	13.09***	15.70***	5.66***	20.06***	29.18***	25.09***
ΔR^b	0.06	0.00	0.31	0.09	0.12	0.28	0.17	0.01
ΔF	2.59*	0.50	39.89***	19.18***	5.66***	55.71***	32.68***	1.69

Note: n = 252; *p < 0.05, **p < 0.01, ***p < 0.001.

DR: deliberate rumination; IR: intrusive rumination; PTD: posttraumatic depreciation; PTG: posttraumatic growth.

^a Male gender was used as baseline.

^b Variable was dichotomized, low education was used as baseline (low education included lowest formal, intermediary secondary and pupils, high education included higher secondary and university degree).

^c Variable was classified: “Self experience” included: “It happened to me directly”.

^d Variable was classified: “Someone else” included: “I witnessed it” and “I learned about it happening to a close family member or close friend”.

^e Variable was classified: “Experience in job” included cases when trauma occurred in job and cannot be further specified if happened to self or someone else. For further information see statistical analysis.

rumination and coping and the resulting consequences in terms of PTG and PTD. Our sample consisted mostly of young adults (mean age 35 years) of female gender (73.52% women). The individuals experienced traumatic events, with illness/suffering abundant, in most cases, the event had happened to themselves (58.89%). On average, participants had experienced the incident 13 months ago, which meant that the reported consequences of the event may already have manifested, and our findings can be interpreted as medium-term effects of traumatic experiences on average. The perceived stressfulness of the reported trauma for the time of the event and in the month before the survey tended to be slightly lower than most reported findings of other countries.⁷ The reported severity of the experience in our study was comparable to previous findings.⁷ The means of reported PTG and PTD in the current study were within the range of previous findings for the PTGDI-X and the Posttraumatic Growth Inventory 42 (PTGI-42).^{7,51} Our results support the idea that after a traumatic experience, a higher extent of PTG than PTD is reported.^{7,8,51}

Dimensionality of Brief COPE scales

A factor analysis with promax rotation allowed the identification of three coping styles assessed by the Brief COPE. Three total scores with very convincing internal consistencies for each coping style could be obtained, avoiding the occasional reliability problems of single Brief COPE scales.^{11,36}

Self-sufficient coping was empirically defined in our factor solution by active coping, planning, religion, humor, positive reinterpretation, acceptance, and self-distraction. This meant that the individual actively used both problem- and emotion-focused strategies to deal with the stressor on their own. A high overlap and

covariation of problem- and emotion-focused strategies in the literature support our finding that both together might form a self-sufficient coping style.⁵² In accordance with the evolutionary perspective of coping, successful problem-focused coping also needs emotion-focused strategies to reduce the feeling of stress and physical arousal.⁴⁴ Furthermore, most coping strategies from this category support problem solving but also have an impact on handling the emotional situation.

Socially supported coping was empirically defined in our factor solution by instrumental support, emotional support and venting. This constellation implies that socially supported coping seems to manifest not only in instrumental or emotional support from others, in terms of help and advice as well as comfort and understanding, but also in the availability of a counterpart for venting to reduce negative feelings.¹⁴

Finally, our definition of an avoidant coping style implied denial, substance use, self-blame and behavioral disengagement. This means that the individual uses disengaging strategies to escape from the stressor and avoid direct confrontation. This coping style might be the most agreed-upon one in literature¹⁴ and is often referred to as maladaptive.⁴⁴ Overall, our three-factor solution exactly replicated previous findings and was largely comparable to previous factor solutions reported in coping research.^{13–16,46}

Joint impact of rumination and coping styles on PTG and PTD

For the first time, we examined the joint influence of rumination and coping on both PTG and PTD using the PTGDI-X.⁷ We tested our two hypotheses in a hierarchical regression analysis framework, holding person and trauma characteristics constant. According to

the revised theory of PTG,⁵ we entered stepwise intrusive rumination variables, coping styles, and deliberate rumination variables.

Our results suggested that intrusive rumination did not account for additional variance in PTG while controlling trauma- and person-characteristics. Additionally, coping styles increased the explained variance by 31%. In the last step, deliberate rumination contributed to additional 9% of the variance. The full model explained 46% of the variance in PTG, validating the PTG theoretical model.

We found support for our first hypothesis. As expected, intrusive rumination variables did not explain PTG in Model 2, self-sufficient and socially supported coping styles were significant predictors in Model 3, and both recent and event-related deliberate rumination accounted for additional variance in Model 4. This pattern supports the notion of Tedeschi and colleagues that deliberate rumination is a key element for the emergence of PTG.⁵ This key role of deliberate rumination in PTG was supported by a strong association with PTG and a high amount of additional variance (7%) in PTG in our regression analysis, even after controlling for trauma and person characteristics, intrusive rumination, and coping styles. Thus, our findings support the PTG model,⁵ which postulates deliberate rumination to be a crucial factor for the emergence of PTG by enabling the individual to draw meaning from the experience and to consider the personal consequences of the event. Our findings are also consistent with previous studies.^{24,48,53} As predicted, intrusive rumination showed no effect on PTG. More precisely, our four-step regression analysis of PTG revealed that intrusive rumination (entered in the second step) did not explain any additional variance.

Along with recent deliberate rumination, self-sufficient coping was the strongest predictor, supporting the findings of Kroemeke and colleagues who observed a positive influence of an equivalent coping factor on PTG.¹¹ The active use of self-sufficient coping strategies — such as positive reinterpretation, active coping and planning — seems to be a promising way to foster PTG in the aftermath of trauma.^{27,35} Socially supported coping styles — such as emotional support, venting, and instrumental support — also significantly predicted higher levels of PTG, supporting previous findings and PTG theory.^{5,33} Although our results do not allow for any statements about the relation of perceived or even actual social support and PTG, our findings support the important role of coping via social support and self-disclosure in the emergence of PTG. In this context, self-disclosure seems to act long-term, since no rise in PTG levels could be found immediately after self-disclosure.⁵⁴ Overall, our results highly support the PTG model.⁵

For the full model for PTG we found that both recent intrusive rumination and avoidant coping, which were not significant in Model 3, became significant and were negatively associated with PTG. Such negative associations of PTG with recent intrusive rumination⁹ and some individual avoidance-focused coping strategies^{27,30} have rarely been reported in the literature. However, it must be noted that the bivariate correlations of PTG with avoidant coping and recent intrusive rumination were $r = -0.02$ and $r = 0.09$, respectively. This pattern of an unexpected negative sign of the standardized beta weight for recent intrusive rumination and avoidance-focused coping in the final model may indicate a suppression effect, i.e., the significant effect in the last step of the regression must be interpreted with caution. Therefore, it is more likely that intrusive rumination²⁴ and avoidance-focused coping strategies have no predictive influence on PTG.^{36,55} It appears that avoidance strategies during the early stage after traumatic events may reduce the initial distressing emotions and allow more control of the adaptation process.^{21,27} Furthermore, the influence of rumination on PTG may vary over time.⁵⁶ Further research should

investigate these associations of intrusive rumination, avoidance-focused coping, and PTG and possible moderating variables.

Regarding PTD, intrusive rumination explained 28% variance while controlling trauma- and person-characteristics. Additionally, coping styles increased the explained variance by 17%. In the last step, deliberate rumination only contributed to additional 1% of the variance. The full model explained 55% of the variance in PTD. Therefore, we also found support for our second hypothesis. As expected, recent intrusive rumination (Model 2/3) and avoidant coping style (Model 3) were significant predictors of PTD, whereas deliberate rumination did not predict PTD. Avoidant-focused coping was the strongest predictor of PTD, while self-sufficient coping and socially supported coping remained non-significant in Models 3 and 4. Positive bivariate correlations of all assigned coping strategies of the avoidant-focused coping style support this finding. Thus, our study supports the idea that reliance on avoidance coping is maladaptive and leads to increased reports of negative changes.^{11,57} Although avoidant strategies may reduce initial distressing emotions²¹ and help control the psychological adaptation process²⁷ after a traumatic event, they generally seem more likely to lead to perceived negative changes as a result of the trauma in the long term.

Furthermore, recent intrusive rumination was positively associated with higher levels of PTD, as also found in previous literature.^{7,9} The importance of this predictor becomes clear when one considers the large contribution of intrusive rumination to PTD in the hierarchical regression analysis by accounting for 28% of the variance (entered in the second step). Our results support the previous finding that the phenomenon of ongoing intrusive thoughts is associated with continued stress and may indicate a failure to cope effectively with the traumatic event.⁵⁸

Our data suggested that intrusive rumination and avoidant coping predict PTD. We suppose that individuals high in PTD are still stuck in a state of posttraumatic stress, as intrusions (e.g., nightmares, flashbacks) and avoidance are two symptom clusters of posttraumatic stress disorder. For these reasons, we suppose that the PTD inventory gauges the aftermath of depressive information processing, such as deterioration of relationships, personal weakness, stagnation in life, disapproval of one's life, and spiritual–existential anomy. Therefore, individuals might not be able to distance themselves emotionally from the trauma and could not process event-related information, i.e., cannot consciously integrate their traumatic experiences into their life story. In this context, it is remarkable that deliberate rumination was unrelated to PTD but related to PTG. It could be conceivable that through deliberate rumination, individuals might be able to process the traumatic experience, free themselves from being emotionally stuck in the trauma, and integrate the event into their life story. Instead of fighting for mere survival, individuals might recognize new possibilities for their life narrative. Through deliberate rumination the situation becomes more comprehensible and manageable, and individuals become able to act toward their revised goals again and finally give meaning to the experience, which is a key element for PTG to occur.

Regarding clinical implications, our results support the clinical mobilization of the aforementioned beneficial coping strategies as well as deliberate rumination processes, even when intrusive rumination might already be reduced. Deliberate rumination is probably favored by clinical interventions like mindfulness meditation, which has been proved to be an effective way of treatment for PTSD.⁵⁹ Mindfulness meditation can presumably be viewed as an active coping strategy. Some types of meditation might encourage letting go of intrusive thoughts, some types of meditation even might encourage deliberate reflection on what has happened. Since PTD and PTSD are positively associated,⁷

mindfulness meditation could be associated with less PTSD and possibly more PTG. The influence of meditation on the emergence of PTG and PTSD should therefore be investigated in future research. In this regard, the question may arise of how the findings of our study can be reconciled with the potentially harmful effects of interventions such as psychological debriefing. We would not consider debriefing right after the trauma as optimally fostering deliberate rumination processes, because those pertain to long-term meaning-making. Even if debriefing would be considered as an intervention to encourage deliberate rumination, it would not necessarily be the ideal amount or timing to promote PTG, especially when used directly after the traumatic experience. Nevertheless, we encourage clinical efforts to encourage deliberate rumination processes in terms of helping the individual to find meaning in the experience.

Limitations

Our results need to be treated with caution, due to factors such as the retrospective nature of the survey, self-selection, and the cross-sectional design. Furthermore, the current sample of our online survey consisted of comparatively young adults who probably have a higher affinity for and easier access to the Internet, which may lower the generalizability of the findings. Future research should replicate the findings within different populations using longitudinal designs and another type of recruitment, such as a standardized telephone survey or face-to-face survey. Other limitations include the wide range of traumatic events that may not be comparable to each other. Future research might therefore investigate the relationships of coping and rumination with PTSD and PTG by focusing on a homogeneous class of events. Additionally, owing to the programming of the online survey, the uniqueness of respondents could not be guaranteed, and a loss of data of participants who started but did not complete the survey was possible.

Since the current work examined the contributing factors to PTG and PTSD, the potential cause and effects among the predictors were not evaluated. Therefore, future research should investigate the indirect and direct effects of coping and rumination on PTSD and among each other in detail. Furthermore, the DSM-IV definition of trauma was used because PTG theory focuses on both the subjective and objective qualities of a stressful life event. Because a traumatic event is defined as a highly stressful and challenging life-altering event,⁵ the definition of trauma in PTG research is commonly defined more broadly than in the DSM-5 trauma criteria.^{60,61} Our sample therefore might also include events that would not be considered traumatic according to the DSM-5. Further research should also consider using the DSM-5 criteria to identify the potential impact of the type of traumatic event using a different classification system.

Conclusion

In recent decades, there has been growing interest in the field of posttraumatic outcomes and their influencing factors. Our results contribute to a deeper understanding of the processes leading to the experience of PTG and PTSD after a trauma and provide evidence that coping styles play a role in people's perceptions of their positive and negative posttraumatic outcomes. Our findings strongly confirm the PTG model by Tedeschi and colleagues and also expand it to further assumptions about predictive relationships with PTSD. We found PTG to be predicted by the use of more self-sufficient and socially supported coping as well as deliberate rumination processes. Meanwhile, PTSD was predicted by the use of avoidant coping and current intrusive rumination.

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Ethics statement

The study got approved by the Ethical Committee of the University Medicine Greifswald, Germany (Internal registration number: BB 139/17).

Declaration of competing interest

The authors declare no competing interest.

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Author contributions

All the four authors participate in the conceptualization, methodology, and writing/review/editing of the manuscript; while Selina Platte and Doris Kehl did additional data curation and Selina Platte did formal analysis.

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