RESEARCH PAPER

50 Years After Political Protest Violence, Posttraumatic Growth is Associated with PTSD and Anxiety but not Depression or Sleep Difficulties

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Abstract

Rates of, and relationships between, posttraumatic stress disorder (PTSD), depression, anxiety, and posttraumatic growth (PTG) decades after a single-incident trauma remain unclear. During a two-month period surrounding the 50th anniversary of the political protest violence at Kent State University on May 4, 1970, 132 individuals completed measures of PTG, PTSD, depression, anxiety, and sleep difficulties. Participants were, on average, 19 years old (SD=3.01) on May 4, 1970, and 44% were present at the protests. 17% met cutoff scores consistent with PTG, 6% for PTSD, 8% for anxiety, 11% for depression and 20% for sleep difficulties. PTG was significantly and positively correlated with PTSD (r=.32, 95% CI: 0.17-0.44) and anxiety (r=.23, 95% CI: 0.08-0.38) but not depression or sleep difficulties after controlling for additional trauma exposure since May 4, 1970. All relationships were best explained by linear rather than curvilinear relationships and were not moderated by proximity to the events of May 4, 1970. Results indicate that clinicians working with survivors of trauma decades later may be able to capitalize on the adaptive functions of PTG to foster positive treatment outcomes.

Keywords Posttraumatic Growth · PTSD · Depression · Anxiety · Protest violence · Coping

Posttraumatic growth (PTG) is defined as positive changes in self-perception, relationships with others, and philosophy on life after a traumatic experience (Tedeschi & Calhoun, 1996). Considered a distinct phenomenon from post-traumatic stress, approximately 53% of individuals who experience a traumatic event develop moderate to high PTG (Wu et al., 2019; Zoellner & Maercker, 2006). The relationship between Posttraumatic Stress Disorder (PTSD) symptoms and PTG is complex, with

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studies finding positive, negative, curvilinear, and no relationships between PTG and PTSD symptoms (Liu et al., 2017; Shakespeare-Finch & Lurie-Beck, 2014; Zoellner & Maercker, 2006). While anxiety, depression, and sleep difficulties also occur after trauma (Ikin et al., 2007; Socci et al., 2020), research exploring the relationship between these pathologies and PTG is limited and equivocal (Bianchini et al., 2017; Eisma et al., 2019; Güzel Ozdemir et al., 2021; Lurie-Beck et al., 2008). Further, most studies evaluating the relationship between PTG and psychopathology occur within the first year after a trauma (Wu et al., 2019), with little data informing longer-term relationships between symptoms. The present study evaluated the relationship between PTG, PTSD, depression, anxiety, and sleep difficulties in survivors of political protest violence 50 years after the events of May 4th, 1970.

1 The Events of May 4, 1970

On May 1, 1970, Kent State University students held a protest of the United States' invasion of Cambodia and prolongation of the Vietnam War. The campus protests extended for three days, culminating in a gathering of 3,000 protesters met by about 100 Ohio National Guardsman on May 4th. At around noon that day, guardsman opened fire on the crowd, firing over 60 shots, resulting in nine injuries and four Kent State University students' deaths (Lewis & Hensley, 1998). In response to traumatic events like those of May 4th, individuals may develop post-traumatic symptomatology and PTG but the relationship between psychopathology and PTG is unclear, especially decades after the index trauma.

1.1 Post-Traumatic Growth and Psychopathology Decades After Trauma

Some theorists argue that PTG is an adaptive process that relies on a certain level of distress or "struggle" for growth to emerge (Tedeschi & Calhoun, 2004). Others posit that, in addition to the adaptive (also called constructive) component of PTG, there is an illusory component, considering PTG as a "positive illusion" of the trauma, leading to "denial, avoidance, wishful thinking, self-consolidation, or palliation," rather than acceptance and integration of the trauma (Maercker & Zoellner, 2004, p. 43). This two-component theory supports a possible curvilinear or U-shaped relationship between psychopathology and PTG such that, if PTG were functioning as an illusory component, it would be related to increased symptoms. Alternatively, if it were constructive, it would be related to lower symptoms (Maercker & Zoellner, 2004). The function of PTG may change over time; the illusory component may serve as an adaptive coping strategy in the short term but it may become maladaptive in the long term if used to deny or avoid thinking about the trauma (Zoellner & Maercker, 2006). Therefore, examining the relationship between PTG and psychopathology more distally after a trauma is critical.

Two meta-analyses have documented a positive linear relationship between PTG and PTSD symptoms with combined correlation coefficients between $r=.22$ and $r=.32$ (Liu et al., 2017; Shakespeare-Finch & Lurie-Beck, 2014). When the quadratic term for PTSD was assessed cross-sectionally, it explained slightly more variance and

represented an inverted U-shaped relationship (Shakespeare-Finch & Lurie-Beck, 2014). This curvilinear relationship was particularly strong for traumas involving war and natural disasters while the relationship between PTSD and PTG was lower, or in some cases non-existent, in health professionals and survivors of serious illness (Shakespeare-Finch & Lurie-Beck, 2014). An inverted U-shape was also found when looking at the PTG-PTSD relationship longitudinally (Liu et al., 2017). In contrast, in research on events similar to that of May 4, 1970 a study of community members affected by political protest violence in Ferguson, Missouri found a positive linear relationship between PTSD and PTG assessed three to four months later (Strasshofer et al., 2018). Longer-term longitudinal research has also found that higher initial levels of PTSD predicted higher PTG in ex-prisoners of war 30 years later (Dekel et al., 2012); however, the relationship between PTSD and PTG decades after a single-incident trauma remains unclear.

With respect to other post-traumatic symptomatology, a meta-analysis of 121 studies found a very weak and likely nonsignificant relationship between PTG and depression (mean ES=0.04 and a 95% CI: -0.07:-0.001; Long et al., 2021). For anxiety, an analysis of 55 studies found a very small nonsignificant association between anxiety symptoms and PTG scores; individual studies' correlation coefficients ranged from $r=-.54$ to $r=.54$ (Long et al., 2021). However, a large percentage of studies on PTG have examined cancer survivors, and, to our knowledge, no studies of political protest violence have reported correlations between depression, anxiety, and PTG (Long et al., 2021). Further, while there was a negative correlation between PTG and depression in adolescent survivors six years after an earthquake, evidence from bereaved individuals within three years of a relative's passing found both a negative linear correlation and a curvilinear (inverted U-shape) relationship between PTG and both depression and anxiety (Eisma et al., 2019; Xie et al., 2020). Despite being a common post-traumatic symptom, no studies have directly examined the relationship between PTG and sleep difficulties (Socci et al., 2020). One study of Syrian refugees found no relationship between sleep difficulties and PTG in a path analysis but the relationship between sleep and PTG has yet to be directly examined (Güzel Ozdemir et al., 2021).

The trauma literature suffers from a lack of long-term follow-up assessments, and little is known regarding the relationship between post-traumatic symptomatology decades after trauma exposure. However, this research is complicated by the fact that studies with such distal follow-ups allow more time for a participant to experience additional potentially traumatic events that can both hinder recovery from prior traumas and lead to additional symptoms. Because cumulative trauma exposure has been found to relate to PTG, we examined relationships between PTG and symptoms both with and without controlling for cumulative lifetime trauma exposure (Kira et al., 2019). We hypothesized significant linear relationships between PTG and PTSD, depression, anxiety, and sleep difficulties; however, we did not hypothesize a specific direction to this relationship because of the prior mixed findings showing both positive and negative associations. As an exploratory hypothesis, we evaluated if these relationships would be better explained by a curvilinear versus linear relationship.

2 Method

2.1 Participants

Eligibility was limited to individuals who were thirteen years or older in 1970 (born prior to 1958) to ensure that participants had a relative capacity for remembering the events of May 4, 1970. Surveys were distributed, and data were obtained via Qualtrics. Of the 359 individuals who clicked on ads and reached the online consent form, 78 (21.73%) did not continue past the initial consent page, and 76 (21.17%) did not continue past the second page where contact information was collected. Six participants were removed before analysis because they were younger than 13 in 1970. Of the 199 participants remaining, 67 were excluded due to missing data, resulting in a sample size of 132 participants. Most excluded participants skipped multiple outcome measures; for example, 27 did not complete all 5 of the outcome measures. Larger proportions of participants were missing the instruments at the end of the survey (e.g., Pittsburgh Sleep Quality Inventory and the Traumatic Stress Schedule, and demographics survey), indicating that participants likely dropped out due to fatigue. There were no differences between participants who dropped out and those who remained in the survey on demographic variables or initial reported distress and fear due to the events May 4th, 1970.

2.2 Procedures

The following methods are part of a larger study on the anniversary of May 4, 1970, that was approved by the Kent State University IRB (ID: 20–092). Detailed methods have been previously described (Rabinowitz et al, 2021). Briefly, participants were recruited via survey links posted on social media related to the anniversary of May 4th, 1970. Participants followed the link to participate in a study about their "thoughts, feelings and reactions concerning the events of May 4th, 1970." The study link was active from April 6, 2020 to May 31, 2020. Due to the COVID-19 pandemic, all 50th anniversary commemoration and memorial events were either cancelled or moved online. Thus, we adjusted our original in-person study design to a virtual format and added questions to assess the experience of the COVID-19 pandemic.

2.3 Measures

Participants completed standard demographics questions and information about their location during the events of May 4, 1970. They also endorsed whether or not they had been exposed to, or witnessed on TV, potentially traumatic experiences during the events of May 4, 1970, such as gunfire, tear gas, or people running in a panic. In addition, one item asked participants to report any other experience from the events of May 4th that they thought was traumatic. On a scale of 0 "not at all" to 7 "extremely," participants also rated the extent to which they were distressed by the events of May 4th, 1970, whether they feared for their life and whether they feared for the life of someone else.

The Posttraumatic Growth Inventory (PTGI) is a 21-item questionnaire that assesses positive changes in an individual following a traumatic event. The scale consists of 5 subscales that relate to dimensions of growth: relating to others, new possibilities, personal strength, spiritual change, and appreciation of life. The questions were anchored to the events of May 4, 1970. The PTGI has established internal consistency and test-retest reliability (Tedeschi & Calhoun, 1996) and demonstrated high internal consistency in the present sample (Cronbach's alpha=0.97). The PTGI does not have established cutoff criteria; however, consistent with a recent systematic review, the present study used the criterion of 60% of the highest score possible (60% of 105 for a cut off score of 63) to indicate the presence of post-traumatic growth (Wu et al., 2019).

The PTSD Checklist for DSM 5 (PCL-5), a 20-item self-report scale, was used to assess PTSD symptoms experienced in the last month. In addition to a total score, the PCL-5 produces four subscale scores that map onto the PTSD symptom clusters of intrusions, avoidance, negative alterations in cognitions or mood, and arousal. The scale has been established as internally consistent, reliable and valid (Blevins et al., 2015). In this study, the PCL-5 demonstrated high internal consistency (Cronbach's alpha=0.92). In accordance with previous studies individuals who reported moderate levels (defined as a score of 2) on at least one symptom within a subscale were classified as meeting criteria for that symptom cluster, and a total score above 30 was regarded as meeting diagnostic criteria for probable PTSD (Cukor et al., 2011).

The Depression Anxiety and Stress Scale (DASS-21), a 21-item self-report measure, was used to assess depression and anxiety symptoms and stress levels over the past week. In both clinical and non-clinical populations, the DASS-21 is a reliable and valid measure of depression and anxiety (Antony et al., 1998; Sinclair et al., 2012). Internal consistency of the total DASS-21 was high in the current study (Cronbach's alpha=0.92). Subscale scores of moderate or above were considered indicative of meeting criteria for probable depression (score≥14) and probable anxiety (score≥10; Lovibond & Lovibond 1995).

The Pittsburgh Sleep Quality Inventory-Addendum (PSQI-A) for PTSD is a 10-item survey measuring disruptive nocturnal behaviors that may be related to a PTSD diagnosis (Germain et al., 2005). The scale includes seven items assessing sleep-related symptoms on a scale of 0=not in the past month to 3=three or more times a week; the scale has a total range of 0–21. In the present sample, the PSQI-A had a lower internal consistency (Cronbach's alpha=0.67) than previously reported in trauma-exposed samples (Germain et al., 2005). While our low alpha is a limitation, our alpha is consistent with prior studies of a 16-year follow-up from avalanche survivors (alpha=0.74) and a veterans sample (alpha=0.72; Insana et al., 2013; Thordardottir et al., 2015).

The Traumatic Stress Schedule (TSS) is a 10-item self-report measure quantifying the number of times a respondent experienced one of nine different types of traumatic events (e.g., natural disaster or sexual assault; respondents could also add an event that they felt was traumatic but not covered by the other nine types) (Norris, 1990). Participants were instructed to report all experiences other than those related to the events of May 4th, 1970. The total number of trauma types experienced was used as a measure of lifetime trauma history (Irish et al., 2013).

Participants also responded to two statements regarding how the pandemic intersected with the anniversary of May 4th, 1970: "The timing of coronavirus (COVID-19) and the May 4th. anniversary was difficult for me", and "Thinking about the coronavirus (COVID-19) pandemic makes my feelings about May 4th, 1970 worse." These questions were scored on a five-point scale ranging from strongly disagree to strongly agree.

2.4 Data Analysis

Statistical analyses were conducted using Stata (Version 16.1). Our hypotheses were tested with pairwise linear correlations. To reduce the likelihood of type one error, we used the bias corrected and accelerated (BCa) bootstrapped methodology for 1000 iterations to estimate effect sizes and confidence intervals (Banjanovic & Osborne, 2016). We conducted follow up analyses to determine if proximity to the May 4 shootings moderated the relationship between symptomatology and PTG and if the relationships remained when controlling for cumulative lifetime trauma exposure. To test for possible curvilinear effects, a regression predicting PTG from the symptom measures was conducted with a quadratic term for the symptom measure added in the second step. A significant R^2 change was used to determine if effects were better explained by a curvilinear versus linear relationship.

3 Results

Standard demographics and responses to the COVID-19 items are presented in Table 1. Participants reported participating in or witnessing a variety of potentially traumatic experiences during May 4, 1970. For example, 65 people participated in or witnessed protests, 46 experienced or witnessed people running in a panic, 37 witnessed or experienced tear gas being deployed, 28 experienced gun fire, 23 people reported seeing someone get injured, and 15 people reported witnessing a person being killed. Examples of events mentioned in response to the request to provide other traumatic events included "blood flowing down the concrete drive" and "having friends arrested." A large proportion of participants also reported seeing traumatic scenes on television in the days around May 4, 1970. For example, over 90 people reported watching coverage of protests and crowds, 73 people saw coverage of tear gas being deployed, 70 saw coverage of a person being killed, and 60 saw coverage of gunfire. On a scale of 0 "not at all" to 7 "extremely," participants reported high levels of distress from the events of May 4, 1970 (M=6.28 SD=1.10), relatively low levels of fear for their own lives (M=3.08 SD=2.08), and moderate fear for the life of someone else (M=4.84 SD=2.12).

17% (n=22) of individuals scored above the cut-offs for PTG. Approximately 6% (n=8) met the cut-off for likely PTSD, 8% (n=10) for anxiety, 11% (n=15) for depression, and 20% (n=26) for sleep difficulties. There were no significant differences in PTG or levels of psychopathology between participants who were in, versus not in, Kent, OH during the events of May 4th (Table 2). Participants who were in Kent reported being slightly more distressed by the events of May 4th and fearing

Table 1 *Demographics*

	n	%
Gender		
Male	56	42.42
Female	75	56.82
Non-binary	1	.76
Race		
White	128	96.97
Black	2	1.51
Latino	1	.76
Black & White	1	.76
Occupation Status		
Full time	25	18.94
Part Time	11	8.33
Retired	87	65.91
Unemployed	4	3.03
Other	5	3.79
Education		
High school	1	0.76
Some college	13	9.85
Bachelor's degree	43	32.58
Professional training (trade school)	2	1.52
Graduate Degree	72	54.55
Other	1	0.76
Proximity to the events of May 4th, 1970		
In Kent, OH	58	43.94
Outside of Kent, OH	68	51.52
Missing	6	4.55
	M	SD
Age in 1970	18.57	3.01
Distressed by events of May 4th (N=132)	6.28	1.10
Fear for your life (N=115).	3.08	2.08
Fear for the life of someone else (N=121)	4.84	2.12
"The timing of coronavirus (COVID-19) and the May 4th anniversary was difficult for me"	3.34	1.43
Thinking about the coronavirus (COVID-19) pandemic makes my feelings about May 4th, 1970 worse."	2.75	1.46
Cumulative Trauma Exposure	2.66	1.94

Note. N=132

more for their lives and the lives of others during the events of May 4th 1970 than participants who were not in Kent, OH (Table 2).

PTG was significantly and positively correlated with PTSD ($r=.32$, 95% CI: 0.17-0.44), anxiety ($r=.23$, 95% CI: 0.08-0.38), and sleep difficulties ($r=.19$, 95% CI: 0.03-0.34) but not with depression ($r=.16$, 95% CI: 0.00-0.32; Table 3). PTSD and anxiety were related to all 5 subscales of PTG, but depression was not (Table 3). Sleep difficulties were weakly associated with the "relating to others" ($r=.14$, CI: 0.01-0.28), "personal strength," ($r=.26$, CI:0.10-0.43) and "appreciation of life" ($r=.26$, CI:0.09-0.42) subscales.

Proximity to the events of May 4th did not moderate any of the significant relationships (Table 4). When controlling for cumulative trauma exposure, PTSD (B=0.74,

Table 2 Mean Differences According to Proximity

	In Kent			Outside of Kent			t(124)	p	Cohen's d
	N	M	SD	N	M	SD			
PTG	58	30.90	25.24	68	34.82	28.28	0.8160	0.42	0.15
PTSD	58	8.66	9.96	68	9.60	10.12	0.5277	0.60	0.09
Depression	58	4.48	5.82	68	6.38	7.36	1.5876	0.11	0.28
Anxiety	58	2.28	4.44	68	2.12	4.12	-0.2074	0.84	−0.04
Sleep Difficulties	58	1.84	2.64	68	2.16	2.32	0.7168	0.47	0.13
Distressed by the events of May 4th	58	6.5	0.86	68	6.15	1.16	-1.95	0.05	−0.34
Fear life	55	4.24	2.03	54	2.02	1.54	-6.45	0.000	-1.23
Fear for others'	54	5.37	1.83	61	4.44	2.18	-2.46	0.02	−0.46

SE=0.23 CI: 0.28- 1.18) and anxiety (B=1.14, SE=0.52, CI: 0.12- 2.16), but not sleep difficulties, remained significantly related to PTG (Table 5). There were no significant curvilinear relationships between PTG and psychopathology after controlling for prior trauma exposure (Table 5).

4 Discussion

This study was the first to examine the relationship between PTG and psychopathology 50 years after a single incident trauma. We found a significant positive correlation between PTG and PTSD after controlling for additional trauma exposure. Further, the relationship between PTG and PTSD ($r=.32$, $p<.001$) was similar in magnitude to that documented in prior meta analyses (Liu et al., 2017; Shakespeare-Finch & Lurie-Beck, 2014). Additional analyses found that PTSD was also positively associated with all five subscales of PTG suggesting that the relationship was not due to any specific PTG component. Therefore, the present results suggest that long-term PTG may be related to persistent PTSD symptoms decades after the initial trauma occurred.

Anxiety, but not depression, was positively associated with PTG when controlling for additional trauma exposure. In prior research both anxiety and depression were previously associated with PTG in survivors of torture decades after trauma, but another study of survivors of the Holocaust 60 years later found no associations between PTG and depression or anxiety (Dekel et al., 2012; Lurie-Beck et al., 2008). Both depression and anxiety were associated with the "relating to others" and "spiritual change" subscales of PTG while depression was not associated, and anxiety was weakly associated with the "personal strength" subscale. Given the strength of these relationships, these findings should be interpreted with caution; however, it is possible that some domains of PTG may be more associated with anxiety and depression than others (Kira et al., 2019; LaRocca & Avery, 2020). Our study also found a small positive correlation between sleep difficulties and PTG, but this relationship did not hold when controlling for cumulative lifetime trauma exposure. It is also possible that the observed nonsignificant relationship may be due to range restriction and small sample size. PSQI-A scores in our sample did not encompass the upper range of sleep difficulties, thus limiting the ability to find an effect. Further, the present study

Table 3 *Correlations between study variables*

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. PTG	32.42	27.00	---										
2. Relating to others	9.68	9.49	0.94*** [0.91-0.96]	--									
3. New Possibilities	8.33	7.25	0.93*** [0.90-0.95]	0.82*** [0.75-0.89]	--								
4. Personal Strength	6.04	5.81	0.93*** [0.90-0.96]	0.83*** [0.77-0.90]	0.82*** [0.76-0.88]	--							
5 Spiritual Change	1.95	2.81	0.74*** [0.67-0.82]	0.63*** [0.51-0.74]	0.63*** [0.53-0.72]	0.74*** [0.67-0.82]	--						
6. Appreciation of life	6.40	4.41	0.87 [0.84-0.91]	0.77*** [0.70-0.83]	0.80*** [0.74-0.86]	0.77*** [0.71-0.84]	0.56*** [0.46-0.67]	--					
7. PTSD	8.98	9.91	0.32*** [0.17-0.44]	0.25*** [0.11-0.39]	0.34*** [0.18-0.49]	0.27*** [0.12-0.43]	0.27** [0.09-45]	0.31*** [0.17-0.46]	--				
8. Depression	5.52	6.70	0.16 [-0.00-0.32]	0.12 [-0.04-0.28]	0.17* [0.01–32]	0.13 [-0.04-0.29]	0.21* [0.02-0.41]	0.13 [-0.04-0.31]	0.72*** [0.60-0.84]	--			
9. Anxiety	2.27	4.26	0.23** [0.08-0.38]	0.19* [0.03-0.34]	0.24*** [0.10-0.39]	0.16* [0.0-0.32]	0.23* [0.05-0.41]	0.26*** [0.12-0.41]	0.65*** [0.50-0.81]	0.61*** [0.43-0.78]	--		
10. Sleep Difficulties	2.02	2.49	0.19** [0.03-0.34]	0.14* [0.01-0.28]	0.26** [0.10-0.43]	0.11 [-0.07-0.28]	0.08 [-0.10-0.26]	0.26** [0.09-0.42]	0.68*** [0.55-0.81]	0.46*** [0.28-0.63]	0.67*** [0.51-0.83]	--	
11. Thinking about covid	2.75	1.46	0.34***	0.33***	0.30***	0.31***	0.28***	0.31***	0.40***	0.41***	0.36***	0.28**	--

Table 3 (continued)

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11
			[0.19-0.50]	[0.19-0.47]	[0.14-0.45]	[0.15-0.48]	[0.11-0.44]	[0.15-0.47]	[0.26-0.54]	[0.27-0.56]	[0.22-0.50]	[0.10-0.46]	0.74***
12. Timing of covid	3.34	1.43	0.33***	0.29***	0.29***	0.34***	0.23**	0.30***	0.41***	0.38***	0.29***	0.23**	[0.65-0.83]
			[0.17-0.48]	[0.15-0.43]	[0.14-0.44]	[0.18-0.50]	[0.07-0.39]	[0.15-0.46]	[0.31-0.51]	[0.27-0.50]	[0.17-0.40]	[0.06-0.39]	

Note N = 132 Pairwise correlations and bias corrected and accelerated (BCa) bootstrapped confidence intervals

* p≤.05, p≤.01**, p≤.001***

Table 4 *Interaction between Symptoms and Proximity to Predict PTG*

	Variable	β	B	SE	95% CI	p
PTSD	Constant		27.37	4.40	18.75, 35.99	0.000
	PTSD	0.29	0.78	0.36	0.07, 1.49	0.03
	Proximity	−0.08	-4.07	6.22	-16.26, 8.11	0.51
	Interaction	0.03	0.10	0.44	−0.76, 0.96	0.82
	R^2		0.10			
Anxiety	Constant		32.46	3.98	24.66, 40.26	0.00
	Anxiety	0.18	1.11	0.96	−0.78, 3.01	0.248
	Proximity	−0.10	-5.56	5.52	-16.37, 5.26	0.314
	Interaction	0.08	0.64	1.14	-1.60, 2.87	0.58
	R^2					
Sleep Difficulties	Constant		33.00	4.80	23.59, 42.41	0.000
	Sleep Difficulties	0.08	0.84	1.53	-2.15, -3.83	0.55
	Proximity	−0.14	-7.41	6.33	-19.83, 5.00	0.24
	Interaction	0.15	2.04	1.97	-1.82, 5.89	0.30
	R^2	0.04				

Note N = 126 Interactions between symptoms and proximity. Proximity was defined as 0 = Not located in Kent, OH and 1 = located in Kent, OH during the events of May 4, 1970

assessed sleep disturbances specific to PTSD and did not include a comprehensive measure of sleep quality; future research should assess the relationship between general sleep quality and PTG (Germain et al., 2005; Insana et al., 2013). Importantly, we found that proximity to the events of May 4th, as measured by whether participants were in Kent, OH or not, did not moderate the associations between PTG and PTSD, depression, anxiety, or sleep difficulties, suggesting that these findings are consistent across different levels of exposure to the events of May 4th .

Contrary to prior studies, we found no evidence of curvilinear relationships between PTG and psychopathology (Eisma et al., 2019; Liu et al., 2017; Shakespeare-Finch & Lurie-Beck, 2014). However, because of range restriction in posttraumatic symptomatology in the present sample, we cannot rule out a curvilinear relationship. For example, the current sample had few participants that met criteria for a probable PTSD diagnosis (i.e., scores beyond 30), thus limiting the ability to detect a relationship between PTG and PTSD at more extreme scores. If a curvilinear relationship is present, it may decrease or remove the linear correlation between PTG and posttraumatic symptomatology, potentially explaining conflicting results regarding the direction of the relationship between PTG and PTSD, depression, and anxiety (Goodwin & Leech, 2006). Larger samples are needed to detect such a relationship in survivors of trauma decades after exposure considering that extreme levels of posttraumatic symptomatology decades after index trauma are relatively rare (Joffe et al., 2003; Koenen et al., 2008).

This study is not without limitations. The status of the COVID-19 pandemic during data collection may have increased levels of psychopathology symptoms at the time of assessment. Further, while the experience of the May 4th anniversary may have impacted levels of symptoms reported in our study, prior analyses found that

Table 5 *Regression Coefficients and Examination of Quadratic terms*

	Variable	Model 1					Model 2				
		β	B	SE	95% CI	p	β	B	SE	95% CI	p
PTSD	Constant		19.63	3.53	13.54, 27.85	0.00		16.52	3.77	9.13, 23.90	0.000
	PTSD	0.27	0.74	0.23	0.28, 1.18	0.002	0.60	1.63	0.61	0.43, 2.83	0.01
	Trauma Exposure	0.17	2.30	1.15	0.16, 4.52	0.06	0.16	2.21	1.18	−0.1, 4.52	0.06
	Squared PTSD						-0.34	−0.03	0.02	−0.06, 0.01	0.142
	R^2	0.13						0.14			
	ΔR^2							0.01			0.14
Depression	Constant		22.65	3.65	15.49, 29.80	0.000		20.98	4.15	12.84, 29.12	0.000
	Depression	0.09	0.37	0.38	−0.38, 1.12	0.33	0.33	1.34	1.05	−0.71, 3.39	0.20
	Trauma Exposure	0.21	2.90	1.30	0.35, 5.45	0.026	0.20	2.73	1.31	0.16, 5.31	0.04
	Squared Depression						-0.25	−0.04	0.05	−0.13, 0.05	0.347
	R^2	0.06						0.07			
	ΔR^2							0.01			0.31
Anxiety	Constant		22.90	3.68	15.69, 30.12	0.000		22.33	3.48	15.51, 29.14	0.000
	Anxiety	0.18	1.14	0.52	0.12, 2.16	0.03	0.36	2.27	1.35	−0.38, 5.91	0.093
	Trauma Exposure	0.19	2.60	1.21	0.23, 4.97	0.03	0.18	2.48	1.22	0.09, 4.88	0.042
	Squared Anxiety						-0.19	−0.07	0.08	−0.23, 0.09	0.39
	R^2	0.09						0.09			
	ΔR^2							0.006			0.37
Sleep Difficulties	Constant		21.91	3.77	13.52, 29.30	0.000		21.73	3.94	14.00, 29.46	0.000
	Sleep Difficulties	0.14	1.54	0.89	−0.21, 3.29	0.09	0.17	1.84	2.37	-2.81, 6.49	0.44
	Trauma Exposure	0.20	2.79	1.18	0.47, 5.10	0.02	0.20	2.76	1.18	0.44, 5.08	0.02
	Squared Sleep Difficulties						-0.03	−0.04	0.26	−0.55, 0.48	0.89
	R^2	0.08						0.08			
	ΔR^2							0.00			0.88

Note N = 132 Model 1: Linear relationship between PTG and psychopathology controlling for additional trauma exposure. Model 2: Curvilinear relationship between PTG and psychopathology controlling for additional trauma exposure

there was no difference in levels of depression, anxiety, or PTSD during the anniversary compared to three months later (Rabinowitz et al, 2021). Additionally, our sample included participants already engaging in online commemorative events and/ or social media related to May 4th, 1970, potentially limiting generalizability to individuals who avoid May 4th content or individuals without access to online platforms. It is also possible that unobserved clinical or demographic differences between those participants that completed the study surveys and those that dropped out may limit the generalizability of our results. Future research should consider offering incentives to encourage survey completion. Finally, our sample was primarily white, highly educated, and older adults. While perhaps representative of survivors of May 4th, this sample may not represent survivors of trauma more broadly, and future research should continue to evaluate the long-term effects of trauma in diverse populations.

Future studies would benefit from longitudinally assessing the relationship between PTG and psychopathology over time with larger samples. Although time-intensive, tracking individuals over time may allow for collecting data from more symptomatic individuals who may not have participated in a one-time survey due to avoidance symptoms. Further, research should continue to examine the associations between PTG and coping styles to further distinguish between the illusory and constructive components of PTG, and determine whether the constructive components of PTG can be optimized in patient treatment (Zoellner & Maercker, 2006). The present study suggests that even decades after exposure to single incident trauma, individuals experiencing more severe symptoms of PTSD and anxiety report higher levels of PTG. Clinicians working with survivors of trauma decades later may be able to capitalize on the adaptive functions of PTG to foster positive treatment outcomes such as helping clients to develop coherent life stories and encouraging the client to engage in service to the greater community (Tedeschi & Moore, 2021). Focusing on these components may increase development of PTG and help clients to manage long-term post-traumatic stress symptoms.

Declarations

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