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Discrete memories of adverse experiences differ according to post-traumatic growth

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ABSTRACT

People organize their experience into discrete memories, which are used to remember, comprehend, and predict. Retrospective evaluations of complex experiences seem to be influenced by memories of negative "peak affects" and positive "end affects". However, it is not known if these discrete memories vary depending on people's post-traumatic growth (PTG). Two cross-sectional studies aimed to examine the extent to which participants classified according to the 33rd and 66th percentile scores on PTG differed in their discrete memories, reported current strengths, and perceived changes. A total of 345 people with at least one adverse experience were selected from two convenience samples. While a higher proportion of memories of negative "peak affects" was found in whole samples, comparisons between the PTG groups confirmed a higher proportion of positive "end affects" (turning points) in the medium and high groups compared to the low groups. Significant differences between the two extreme groups (low and high) in both current strengths and perceived changes were found when using univariate analyses of variance and post-hoc comparisons. Medium and high groups differed only in their current strengths. Interventions to promote PTG would benefit from favoring the identification of positive "end affects".

1. Introduction

People tend to organize their experience into discrete events, which are used to remember, comprehend, and predict (Franklin et al., 2020). Among the demonstrated benefits of a better ability to segment events is, for instance, a superior performance in memory tests (Sargent et al., 2013). At the other end, post-traumatic stress disorder (PTSD) symptoms (which are grouped into re-experimentation, avoidance, cognition and mood changes, and hyperarousal) have been linked to difficulties in encoding, consolidation, and retrieval of both negative and positive experiences (Contractor et al., 2018).

Memories for highly stressful experiences are mostly well remembered, especially if the adverse experiences occupy a central place in personal identity or the sense of who one is over time (Berntsen & Rubin, 2006). Even if the details of experiences have faded, people with or without PTSD symptoms tend to keep fragmented memories of them (Engelhard et al., 2019). These memories not only contribute to the maintenance of psychological discomfort. They may also boost post-traumatic growth (PTG), which is defined as a positive change arising from the struggle to deal with a traumatizing situation (Tedeschi & Calhoun, 1996, 2004). In this regard, active deliberate rumination, which is aimed at understanding and problem-solving (Cann et al., 2011), has proven to facilitate PTG (Kramer et al., 2020). In addition, narrative coherence about adverse experiences has been associated with less psychological distress and psychopathology (Mitchell et al., 2020; Reese et al., 2011). Specifically, narrative coherence can be recognized when people remember aspects such as the context in which the experience occurred, the order in which the events occurred, and key points such as the resolution of the experience (Reese et al., 2011).

From qualitative research, terms such as "turning points" are used to refer to events that mark a positive change in the course of adverse circumstances or in their understanding. Some of the identified turning points seem to be quite common (e.g., influence of significant others or recognition of positive consequences), whereas others seem to be more specific (e.g., disclosure or search for justice) (e.g., Easton et al., 2015; King et al., 2003). Research on turning points provides insight into the events that people who have overcome difficult experiences tend to remember. However, it would benefit from relying on the contributions of memory research on how the endings of adverse experiences are remembered.

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Ganzach and Yaor (2019) have found that retrospective evaluations of complex experiences tend to be influenced by "peak affect" memories when the affects involved are negative, and by "end affect" memories when they are positive. The negative "peak affect" memories would be those that reflect the moments that are remembered as the most intensely negative, while the positive "end affect" memories would reflect the moments remembered as positive turning points after adverse experiences. Drawing on these results, one would expect that most people would be able to identify the worst moment of an adverse experience (a negative "peak affect"), but only those who have solved a harmful situation or reported thriving can signal a turning point (a positive "end affect"). However, it has not been examined whether individuals who score highest on PTG differ in their discrete memories from those who show other responses to adversity.

Responses to adversity range from maladaptive to thriving (Ijntema et al., 2021), and those that allow an effective adaptation to disturbing experiences are considered resilient outcomes (Denckla et al., 2020; Fletcher & Sarkar, 2013). Within that range of responses, there is a growing interest in exploring the potential for positive outcomes associated with traumatic experiences, and PTG is one of the most used measures for this purpose.

PTG correlates with resilience, but the two terms refer to different psychological constructs (Vloet et al., 2017). Resilience is considered by most as a broader process that is not necessarily associated with traumatic experiences and that does not always involve changes (Feeney & Collins, 2015). By contrast, PTG is defined as an enduring positive psychological change that is experienced after trauma or challenging life events (Tedeschi & Calhoun, 1996, 2004). PTG is deemed to involve struggle with traumatic events that challenge core beliefs and force the use of problem-focused coping (Calhoun & Tedeschi, 2013; Southwick et al., 2014). As a consequence of this, PTG should be associated with perceived changes in strengths.

Despite some doubts raised about whether PTG implies a real change of functioning, evidence supports that it reflects a growth phenomenon (Boehm-Tabib & Gelkopf, 2020). Longitudinal studies have provided proof that adverse events may have an impact on PTG (Mangelsdorf et al., 2019), although the mechanisms that explain this are not yet clear. For instance, the association between PTG and distress is inconsistent across studies (Volgin & Bates, 2016), although there is evidence pointing to both significant linear and curvilinear relationships between the two (Shakespeare-Finch & Lurie-Beck, 2014). In this regard, highly stressful events that are assessed as central to one's identity may lead to increased distress and the deliberate rumination that makes PTG more likely (Kramer et al., 2020). This is why the centrality of the event has been highlighted as a relevant factor in predicting PTG (Berntsen & Rubin, 2006; Johnson & Boals, 2015).

1.1. The current studies

Since PTG is defined as an enduring positive psychological change, we expected not only to find differences in the participants' discrete memories, but also to verify that those who indicated the highest PTG would report more strengths and perceived changes in their strengths. Hence, we compared the discrete memories of participants with different levels of PTG, their reported current strengths, and the perceived changes in those strengths after their most adverse experience. The generalizability of the findings was tested using two samples.

To examine both current strengths and perceived changes in their strengths, we used emotional awareness, psychological endurance, social support, and purpose measures, which have been consistently associated with PTG (Hamby et al., 2018; Sörensen et al., 2021). These strengths contribute to recognizing and managing difficult emotions, persevering in the face of setbacks, strengthening sources of social support, and giving meaning to life. In line with previous research (Berntsen & Rubin, 2006; Johnson & Boals, 2015), we also assessed event centrality to validate the relevance of the adverse events for the students' identity.

In short, the aim of these two studies was to examine the extent to which participants classified according to their 33rd and 66th percentile scores on PTG differed in the discrete memories of their most adverse experiences, their reported strengths, and the perceived changes in those strengths. Compared to the low and medium groups, we expected that participants high in PTG would report more memories of positive "end affects", a higher level of strengths, and greater changes in those strengths after adverse events. By contrast, we expected no significant differences between the groups in their memories of negative "peak affects".

2. Method

2.1. Participants

Using two larger convenience samples, we selected 345 participants who had reported having been through at least one major adverse experience in their lives.

In the first study, participants were 175 college students (85.7% women), with ages between 18 and 29 years ($M = 19.0$, $SD = 1.9$). The problems mentioned were illness (70.9%) and death (69.7%) of a close relative, family conflicts (63.4%), financial difficulties (38.9%), dating violence (30.3%), and having suffered school bullying (21.7%). The mode of adverse events reported by the students (i.e., the number of events that was repeated the greatest number of times) was six. The time elapsed since the adverse event ranged from 1 month to 14 years ($M = 3.8$, $SD = 3.4$ years).

In the second study, participants were 170 workers (85.2% women), recruited from various work settings (department stores, healthcare, and restaurant services). Their ages ranged from 21 to 60 years ($M = 35.7$, $SD = 8.9$). At that time, 144 were working, 18 were unemployed, and eight had been temporarily laid off. They reported illness (79.4%) and death of a relative (20%), family conflicts (79.4%), financial difficulties (46.5%), serious conflicts with their partners, (53.5%), and having suffered school bullying (17.1%). The mode of adverse events was three. The time elapsed since the adverse event ranged from 1 month to 44 years ($M = 5.6$, $SD = 6.7$ years).

2.2. Measures

2.2.1. Discrete memories of the most adverse events

In both studies, participants were first asked to remember their most adverse experiences. Then, they were to focus on the most negative one to indicate:

(a) the time elapsed since that experience;
(b) the most negative moment that they remembered (negative "peak affect"); and
(c) the specific moment, if any, in which their way of understanding or coping with the situation would have changed favorably (positive "end affect").

2.2.2. Current strengths and perceived change in strengths

We used different shortened scales from the Resilience Portfolio Measurement Packet (Hamby et al., 2015) to assess both the participants' strengths and the perceived changes in those strengths. The selected scales have demonstrated their association with PTG (Hamby et al., 2018). After answering each item (e.g., "I think that what doesn't kill you makes you stronger"), the participants were asked if the adverse experience had contributed to changing their view about that specific statement ("since that negative experience, I think that what doesn't kill you makes you stronger"). Response options of all the scales used ranged from 1 (*not true*) to 4 (*mostly true*). Specifically, we assessed the following strengths:

2.2.2.1. Psychological endurance. This scale consists of seven items (e.g., "I am quick to pick myself back up again when I get 'knocked down'"). McDonald's omegas for the current strength were 0.94 for students and 0.93 for workers. The internal consistency of the change in this strength (e.g., "since that negative experience, I am quick to pick myself back up again when I get 'knocked down'") was 0.94 for students and 0.94 for workers.

2.2.2.2. Emotional awareness. Two items assessed the ability to recognize one's own feelings (e.g., "I am aware of my feelings"). McDonald's omegas were 0.82 for students and 0.88 for workers. Regarding the change in that strength (e.g., "since that negative experience, I am more aware of my feelings"), McDonald's omegas were 0.90 for students and 0.94 for workers.

2.2.2.3. Purpose. Three items assessed purpose (e.g., "I have a good sense of what makes my life meaningful"), whose internal consistency was 0.82 and 0.86 for students and workers, respectively. For the perceived change, the omega values were 0.88 for students and 0.91 for workers (e.g., "since that negative experience, I have a good sense of what makes my life meaningful").

2.2.2.4. Social support. Six items evaluated social support from friends and other people (e.g., "I can rely on my family and/or friends when I have difficulties"), with McDonald's omegas being 0.93 (students) and 0.94 (workers). For the perceived change (e.g., "since that negative experience, I can rely on my family and/or friends when I have difficulties"), omega values were 0.96 (students) and 0.95 (workers).

2.2.3. Post-traumatic growth

Post-traumatic growth was assessed using a shortened 9-item scale from the Resilience Portfolio Measurement Packet (Hamby et al., 2015) (e.g., "I changed my priorities about what is important in life"). This short scale has been previously adapted to the Spanish language, showing adequate psychometric properties and predictive capacity (Gonzalez-Mendez et al., 2021). McDonald's omegas were 0.90 (students) and 0.93 (workers).

2.2.4. Event centrality in the student sample

The Centrality of Event Scale (Berntsen & Rubin, 2006) was only used in the first study to assess the centrality of the students' memories for their identity. Participants indicated their degree of agreement with seven statements (e.g., "I feel that this event has become part of my identity", "this event was a turning point in my life"). Response options ranged from 1 (*totally disagree*) to 4 (*totally agree*) (McDonald's omega was 0.91).

2.3. Procedure

The studies were conducted in compliance with the ethical standards of the Institutional Review Board of the authors' university and approved by the Academic Committee of the Doctoral Program in Psychology. In the first study, students of different degree programs were contacted in their classrooms and asked to participate after being informed of the objectives and characteristics of the study. They received the link to the online survey. For the second study, the link to the survey was spread through shared networks of various work settings.

The two almost identical studies were performed to obtain a greater generalization of the results, as well as to control more demographic variables. Despite both samples had different ages, elapsed time was not restricted to avoid that some childhood experiences (e.g., bullying) were only reflected in the student sample, but not in the worker sample. In this regard, the participants' task was not to coherently narrate their experiences, but rather briefly describe if they recalled each of two types of discrete memories analyzed (negative "peak affects" and positive "end affects").

All participants received the same instructions and were informed of the objective of the research. They were asked to actively confirm their consent to collaborate in the research. Their participation was voluntary, and we guaranteed the anonymity of their responses and the confidentiality of the results. Only those participants who had had at least one highly stressful experience were selected for this study.

2.4. Data analysis

Similar analyses were conducted in the two independent studies to obtain a greater generalization of the findings. After verifying the memories of negative "peak affects" and positive "end affects" of each participant, we first used McNemar's test to detect significant differences in the percentage of these paired memories. Thus, we were able to identify the most frequent type of discrete memory in participants of each sample as a whole, without considering their level of PTG. Cohen's *g* test was used as an indicator of the effect size. A Cohen's *g* around 0.05 is generally considered a small effect, a *g* around 0.15 indicates a medium effect, and a *g* greater than 0.25 is a large effect.

Subsequently, we converted all scale scores to z scores. Then, we calculated the 33rd and 66th percentile scores on post-traumatic growth for each sample. This allowed us to classify the participants as being "low" (those who scored below the 33rd percentile), "medium" (between the 33rd and the 66th percentile), or "high" (higher than the 66th percentile) in PTG. Setting two cutoffs, at the 33rd and 66th percentiles, guarantees a better classification of participants with intermediate scores. This statistical strategy has successfully been used in previous studies to the identification of the characteristics of the most extreme groups in PTG (Gonzalez-Mendez & Díaz, 2021; Gonzalez-Mendez et al., 2020). In each sample, the participants were distributed as follows: Students ($n_{\text{Low group}} = 69$, $n_{\text{Medium group}} = 61$, and $n_{\text{High group}} = 45$); Workers ($n_{\text{Low group}} = 53$, $n_{\text{Medium group}} = 72$, and $n_{\text{High group}} = 45$).

Once the participants of each sample were classified into "low", "medium", or "high" groups of PTG, data were to be treated as ordinals. Hence, the Kruskal-Wallis test was used to detect significant differences between these three groups in the proportion of each type of discrete memory. Dunne's ε^2 test was used as an indicator of the effect size. An ε^2 around 0.04 is generally considered a small effect, an ε^2 around 0.06 indicates a medium effect, and an ε^2 greater than 0.14 is a large effect. Post hoc comparisons between each pair of levels of PTG were also computed using Mann-Whitney's Test. This allowed verifying whether the proportion of memories of negative "peak affects" and positive "end affects" differed between the participants who had been classified into different groups of PTG. Rosenthal's r test was used as an indicator of the effect size. An r around 0.10 is generally considered a small effect, an r around 0.30 indicates a medium effect, an r greater than 0.50 is a large effect and an r greater than 0.70 is a very large effect.

To compare the strengths and the perceived changes of each group of PTG, univariate analyses of variance (ANOVAs) and Bonferroni post-hoc comparisons were carried out separately. When variances were not homogeneous (Levene's test), we used Welch's test to determine whether there were significant differences between the groups and the Games-Howell correction for post-hoc comparisons. Generalized η^2 was used as an indicator of the effect size. An η^2 around 0.01 is generally considered a small effect, an η^2 around 0.06 indicates a medium effect, and an η^2 greater than 0.14 is a large effect.

Finally, we carried out an ANOVA and post-hoc comparisons to test whether event centrality was significantly different between the three student groups, thus examining the relevance of experiences described to participants' identity. This analysis was only computed with the student sample.

3. Results

3.1. Discrete memories

In each sample, McNemar's test was computed with the participants as a whole, without distinguishing between levels of PTG. This analysis showed significant differences in the percentage of students (49.2, $p \leq .001$, $g = 0.42$) and workers (45.8, $p \leq .001$, $g = 0.45$) who identified each type of discrete memory. In both samples, the percentage of those who indicated memories of negative "peak affects" was significantly higher than those who identified positive "end affects" ones. Thus, while 157 students (89.7) identified negative "peak affects", only 99 (56.6%) were able to identify positive "end affects". Regarding the sample of workers, 159 (93.5%) participants identified negative "peak affects" and 106 (62.4%) identified positive "end affects".

By contrast, the results of the Kruskal-Wallis and Mann-Whitney tests did confirm the expected pattern in both samples (Table 1). These analyses were used to compare the proportion of each type of memory between PTG levels. While those groups did not differ in the proportion of memories of negative "peak affects", they did differ significantly in the proportion of positive "end affect" memories. As expected, the high groups, and also the medium groups, indicated a higher proportion of positive "end affects" than the low groups.

3.2. Current strengths and perceived change in strengths

3.2.1. Zero-order correlations

Zero-order correlations are shown in Table 2. In both samples, post-traumatic growth correlated positively with all the measures, except with the adversity index. Event centrality (measured only in the student sample) was positively related to PTG ($r = 0.205$, $p \leq .01$) and all measures of change in strengths (ranged from $r = 0.151$, $p \leq .05$ to $r = 0.400$, $p \leq .01$). Moreover, the time elapsed since the adverse experience was significantly associated with PTG ($r = -0.160$, $p < .05$) and purpose ($r = -0.182$, $p < .05$) in students, but not in workers.

3.2.2. Event centrality

ANOVAs comparing event centrality in students with different levels of PTG showed significant differences ($F(2,172) = 3.7$, $p < .05$, $\eta 2 = 0.04$). Post-hoc analyses confirmed that the low ($M = -0.25$, $SD = 1.01$) and high groups ($M = 0.28$, $SD = 0.99$) differed significantly in line with what was expected, i.e., the centrality of the event was greater among students high in PTG than among those in the low group.

3.2.3. Comparison of strengths according to the level of PTG

ANOVAs comparing the participants' strengths (Table 3) revealed similar results in both samples, i.e., the strengths increased linearly as the level of PTG rose. With the exception of emotional awareness, post-hoc comparisons confirmed significant differences between the low group and the other two groups.

3.2.4. Comparison of perceived change in strengths according to the level of PTG

The results of ANOVAs comparing the perceived changes in the studied strengths are also shown in Table 3. They indicate a similar pattern in both samples, with higher change scores as PTG increased. Post-hoc comparisons confirmed this similarity between samples, with the notable finding that the medium and high groups did not differ in the perceived change.

4. Discussion

Two studies were aimed at examining whether people with different levels of PTG (i.e., low, medium, or high) differed in their discrete memories of their most adverse experiences, as well as their reported current strengths and perceived changes. According to Ganzach and Yaor's findings (2019), retrospective evaluations of adverse events are mainly linked to negative "peak affect" memories, whereas positive evaluations are associated with "end affect" memories. Consistently with this, most participants of both samples identified the worst moment of their adverse experiences or negative "peak affect", whereas a significantly lower proportion of them indicated a positive "end affect". However, the results also corroborated that those high and medium in PTG identified a greater proportion of positive "end affects" than the low group. As far as we are aware, these are the first studies to find that people with higher PTG scores are also those who report a greater proportion of positive "end affects" memories. In addition, these results have been found in two different samples, suggesting that this type of discrete memories could be common in the PTG process.

Ganzach and Yaor (2019) have also suggested that the substitution of faded memories for positive "end affects" could be affected by people's global optimistic-pessimistic attitude. Our findings support this interpretation by confirming that negative experiences are organized around memories of positive "end affects" in people who report positive changes after trauma.

Event centrality was measured in the student sample to verify that their memories of highly stressful experiences were relevant to their identity, since it is precisely the central memories that are best remembered (Berntsen & Rubin, 2006). Compared to the low group, those who scored high in PTG stood out for keeping in memory both the distressing episode central to their identity and a positive "end affect". Active deliberate rumination has proven to facilitate PTG (Kramer et al., 2020), whereas intrusive rumination has been most often associated with poorer mental health (Fritz et al., 2018). This suggests that

Table 1
Kruskal-Wallis's test for comparison of several independent samples for each level of PTG.

Discrete memories	Kruskal-Wallis's test			[a]Mann-Whitney *U* test for pairwise comparisons					
	H_{kw}	p	ε^2	L-M		L-H		M-H	
				z	r	z	r	z	r
Students									
Negative Peak affects	5.6	0.063	0.032	–		–		–	
Positive End affects	14.1	0.001	0.081	2.1*	0.16	3.2***	0.24	**0.12**	0.09
Workers									
Negative Peak affects	3.3	0.192	0.020	–		–		–	
Positive End affects	12.4	0.002	0.073	3.4***	0.26	2.9**	0.22	0.13	0.01

Note. *L* = Low Group. *M* = Medium Group. *H* = High Group.
[a] Significance values have been adjusted using the Bonferroni correction for various tests.
* $p \leq .05$.
** $p \leq .01$.
*** $p \leq .001$.

Table 2
Zero-order correlation coefficients between study variables for each sample.

	PTG	EA	ChEA	End	ChEnd	SS	ChSS	Purp	ChPurp	AI
PTG		0.379**	0.417**	0.626**	0.380**	0.495**	0.172*	595**	0.500**	−0.106
EA	0.333**		0.368**	0.464**	0.118	0.380**	−0.051	0.451**	0.287**	−0.075
ChEA	0.245**	0.262**		0.295**	0.469**	0.190*	0.280**	0.229**	0.616**	0.041
End	0.582**	0.308**	0.161*		0.363**	0.462**	0.031	0.582**	0.465**	−0.050
ChEnd	0.280**	−0.067	0.408**	0.349**		0.133	0.638**	0.179*	0.607**	−0.011
SS	0.520**	0.184*	0.106	0.381**	0.002		0.185*	0.396**	0.282**	−0.146
ChSS	0.255**	−0.009	0.364**	0.128	0.562**	0.131		0.008	0.324**	−0.014
Purp	0.585**	0.295**	0.100	0.670**	0.233**	0.446**	0.197*		0.472**	−0.105
ChPurp	0.376**	0.037	0.486**	0.333**	0.684**	0.171*	0.568**	0.476**		−0.079
AI	−0.061	0.081	0.061	−0.152*	−0.021	−0.079	−0.042	−0.145	0.020	

Note. The correlations shown below the diagonal correspond to students, whereas those above the diagonal correspond to workers.
EA = Emotional awareness. ChEA = Change in Emotional awareness. End = Psychological Endurance. ChEnd = Change in Psychological Endurance. SS = Social support. ChSS = Change in Social support. Purp = Purpose. ChPurp = Change in Purpose. AI = Adversity index.
* $p < .05$.
** $p < .01$.

Table 3
ANOVA and post-hoc analyses comparing strengths and their changes with different levels of PTG.

	Descriptives			ANOVA				
	L	M	H	*F* (2,172)	η^2	Post-hoc		
	M(*SD*)	*M*(*SD*)	*M*(*SD*)			L-M	L-H	M-H
Students								
EA	−0.36(1.10)	0.02(0.93)	0.46(0.82)	W9.4***	0.10	G−0.38	G−0.81***	G−0.44
End	−0.72(0.89)	0.20(0.89)	0.55(0.80)	30.5***	0.26	−0.92***	−1.27***	−0.35
SS	−0.57(1.10)	0.11(0.92)	0.50(0.84)	W19.0***	0.17	G−0.68***	G−1.01***	G−0.39*
Purp	−0.71(0.93)	0.16(0.86)	0.62(0.80)	31.7***	0.27	−0.87***	−1.32***	−0.45*
ChEA	−0.39(0.92)	0.11(0.84)	0.34(1.19)	7.9***	0.08	−0.50*	−0.73***	−0.24
ChEnd	−0.40(0,75)	0.04(1.00)	0.39(1.09)	W9.8***	0.09	G−0.44*	G−0.79***	G−0.35
ChSS	−0.26(0.80)	−0.07(1.01)	0.41(1.09)	W5.9**	0.07	G−0.20	G−0.67**	G−0.47
ChPurp	−0.52(0.80)	0.18(0.92)	0.37(1.11)	13.7***	0.14	−0.70***	−0.89***	−0.20
Workers								
EA	−0.42(1.02)	0.02(1.01)	0.48(0.70)	W15.5***	0.14	G−0.40	G−0.91***	G−0.50*
End	−0.74(0.96)	0.02(0.75)	0.73(0.50)	47.6***	0.36	−0.75***	−1.46***	−0.71***
SS	−0.61(1.12)	0.03(0.91)	0.51(0.63)	W21.4***	0.20	G−0.64**	G−1.11***	G−0.48**
Purp	−0.61(1.03)	0.08(0.76)	0.63(0.60)	W31.6***	0.28	G−0.69***	G−1.25***	G−0.55***
ChEA	−0.52(0.94)	0.13(0.84)	0.37(1.03)	13.1***	0.14	−0.66***	−0.90***	−0.24
ChEnd	−0.50(0.76)	0.14(0.86)	0.34(1.15)	W14.2***	0.13	G−0.65***	G−0.84***	G−0.20
ChSS	−0.28(0.86)	0.16(0.93)	0.11(1.11)	W4.4*	0.04	G−0.45***	G−0.39	G−0.05
ChPurp	−0.62(0.85)	0.19(0.73)	0.46(1.03)	W26.5***	0.21	G−0.81***	G−1.09***	G−0.28

Note. *L* = Low Group. *M* = Medium Group. *H* = High Group.
EA = Emotional Awareness. End = Psychological Endurance. SS = Social Support. Purp = Purpose. ChEA = Change in Emotional awareness. ChEnd = Change in Psychological Endurance. ChSS = Change in Social support. ChPurp = Change in Purpose.
W Welch's F.
G Games-Howell test.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

deliberate rumination could lead to thriving when it contributes to identify a positive "end affect" or turning point central to identity. By contrast, the low PTG group reported lower centrality, despite vividly remembering the worst moments of their experiences. This is coherent with their low emotional awareness, as well as with an unsuccessful fit with prior identity (Crespo & Fernandez-Lansac, 2016).

The memory patterns found were also coherent with the measures of strengths and perceived change. In both samples, the low groups showed greater vulnerability by scoring lower on strengths and perceived change, as well as by giving fewer positive evaluations of their experiences. By contrast, the other two groups indicated higher strengths and perceived changes, as well as a more balanced evaluation of what happened. These results suggest that discrete memories are organized into coherent frameworks that enable articulate narrative construction (Ijntema et al., 2021; Reese et al., 2011). These narratives may contribute either to overcoming the adverse experience or to reinforcing vulnerability when people assume unhealthy interpretations. In this regard, the purpose of psychological therapies is to help build healthy narratives, which can benefit from identifying positive end affects or turning points. In fact, therapies may be taken as turning points themselves.

Participants high and medium in PTG also differed in their reported strengths, with those classified as high showing the highest scores in all strengths. However, the students high and medium in PTG did not differ in emotional awareness and psychological endurance, which could be due to the participants' average age. In fact, some facets of emotional awareness, such as the ability to identify one's own emotions and their source, have been found to increase with age (Mankus et al., 2016). In addition, evidence indicates that strengths associated with resilience may change with life events linked to age (Henning, 2011). Psychological endurance could require certain experience coping successfully with adversity, thus explaining the differences found in the two samples.

This strength was the only one that significantly and negatively correlated with the adversity index.

Altogether, the participants higher in PTG seem better prepared to cope with future events. They have been able to draw positive conclusions from their experience, reinforcing their identity in strengths that may be useful in the face of future adversities. They also draw on end positive memories to comprehend what occurs in the present and predict what will happen in the future (Franklin et al., 2020). Moreover, the medium group of PTG only differed from the high group in their reported lower strengths, but not in the other measures, which suggests that they may be immersed in the struggle to thrive.

4.1. Limitations

Although the findings of both studies support the hypotheses, it is necessary to consider some limitations. Sample sizes and the type of analyses required to examine the proportion of discrete memories do not guarantee the generalizability of the findings. In addition, the samples did not have balanced gender representation, which was due both to a greater representation of women in the populations analyzed and to their greater willingness to participate in surveys (Curtin et al., 2000). Hence, it is necessary to replicate the studies using a larger and more diverse sample.

Memories do not accurately reflect the lived experience and fragmentation affects even recent events and people with and without symptoms (Engelhard et al., 2019). However, participants were only asked to indicate whether they remembered two types of discrete memories. In any case, the time elapsed since the event should be controlled in future studies, especially if the aim is to go beyond identifying the proportion of positive "end affect" memories. Cross-sectional designs are also a limitation, since they do not allow confirmation that the changes reported really occurred after the adverse experiences. Therefore, elucidating this would require a longitudinal design. A mixed approach could also be used to deepen the knowledge of these types of memories and their role in PTG process.

To prevent the instrument used from being excessively long, event centrality was only used in the first study. Therefore, it cannot be stated that the same results were observed among workers. Finally, future studies should include other additional indicators of psychological functioning.

4.2. Implications and future directions

The findings confirm the relevance of those strengths that reflect an agentic disposition to facing adversity, as well as a greater emotional awareness and social support (Hamby et al., 2018; Sörensen et al., 2021). Even though flexibility may contribute more to resilience than a fixed set of strategies (Chen & Bonanno, 2020), agency is crucial for positive functioning and well-being (Cavazzoni et al., 2020). People who score higher in PTG show an attentional bias toward resilience-related words that are conceptually associated with proactivity (Gonzalez-Mendez et al., 2020). Therefore, interventions could benefit enhancing strengths such as psychological endurance or sense of purpose. Expressive writing, for instance, has proved to be useful in improving health (Pennebaker & Chung, 2011), and may also be used to reinforce the strengths that contribute to resilience (Hamby et al., 2018). Interventions could also help individuals to focus attention on resilience-related clues, as resilient people do. In a similar vein, interventions may help people to identify end marks in the course of their experiences, and social support is an important resource to explore, since it is often identified as a turning point (Easton et al., 2015).

The results also support qualitative research on "turning points", which would benefit from understanding the processes that lead to building them. For instance, it could be useful to examine some forms of counterfactual thinking (Kray et al., 2010), as well as recent findings about people's ability to update negative-to-positive outcome associations (Haim-Nachum et al., 2021).

4.3. Conclusion

Significant differences were confirmed between those who scored higher on PTG compared to the more vulnerable group. These differences refer to how they organized their experience into discrete memories, their current strengths, and their perceived changes in those strengths. As far as we know, these are the first studies to show that the high and medium PTG groups describe a greater proportion of positive "end affects" than the low group. Moreover, the high and medium groups only differed in their reported strengths, which suggest that the latter group could benefit from interventions to enhance them. The results have been found in two different samples, suggesting that this type of discrete memories could be common in the PTG process. The link between discrete memories and turning points opens up a non-qualitative way to analyze critical advances in the PTG process.

Clinical impact statement

The findings support PTG interventions to build "end affect" memories, which rest on the perception of a change in dimensions that are central to the individual's identity. This perception of change is a first step that needs to be reinforced by increasing the sense of agency and social support. Expressive writing or attention to resilience-related stimuli are some of the strategies that may be used for this goal.

CRediT authorship contribution statement

Rosaura Gonzalez-Mendez: Conceptualization, Funding acquisition, Project administration, Supervision, Writing – original draft, Writing – review & editing. **Itziar Canino:** Investigation, Resources, Visualization. **Gustavo Ramírez-Santana:** Data curation, Formal analysis, Methodology, Software, Validation, Visualization, Writing – review & editing.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/10.1016/j.paid.2022.111677.

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