



Post-Traumatic Growth in Children and Adolescents

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Abstract

Introduction: Children and adolescents often suffer from adverse or even traumatic events. While clinicians and researchers so far have focused predominantly on their negative consequences more recently it has been postulated that traumatic events may exert positive effects in some individuals. In this context the concept of post-traumatic growth (PTG) has been investigated increasingly in adults. However, so far data in children and adolescents is rare.

Method: We performed a narrative review of the current literature regarding PTG especially in children and adolescents as well as the pertinent literature on the PTG framework in general.

Results: Data indicates that PTG in youth is quite similar to that observed among adults and can be assessed reliably in childhood and adolescents. However, mechanisms underlying the origination of PTG are still not sufficiently understood and further factors influencing its development have to be identified. Furthermore, there seems to be an overlap between PTG and concepts of resilience.

Conclusion: PTG should be considered in the aftermath of trauma and may be useful in therapeutic contexts. There is a considerable dearth of objective measures of PTG causing an intensive debate whether PTG is a real positive identity change or rather a kind of safety mechanism that may be interpreted as a subconscious strategy. Neurobiological data may help to further investigate the "real" character of PTG in the future.

Keywords

Children; Adolescent; Trauma; Post-traumatic stress disorder; Post-traumatic growth

Introduction

Many children and adolescents experience traumatic events and prevalence rates of trauma exposure can reach up to 65% [1]. Some of the exposed children and adolescents develop psychiatric disorders, the most common sequela being post-traumatic stress disorder (PTSD) [2]. Cross-sectional prevalence rates of child and adolescent PTSD vary from 11% to 20% [3]. The likelihood of developing PTSD depends on both genetic and environmental factors [4]. Several risk factors have been identified: Sexual abuse for example increases the risk of PTSD more than five-fold compared to natural disasters and adolescent females are twice more likely than males to develop PTSD following a significant trauma [5,6].

However, in children there is a great variety within the course of psychiatric symptomatology after a traumatic event. While some of the affected youth continue to suffer from psychiatric symptoms as adults [7], in others symptomatology seems to decrease more sharply [8-10]. In the context of the large variability in the psycho-emotional reaction to trauma, the possibility has been discussed that changes after trauma might not be universally negative. Not only that some trauma victims do not develop PTSD, some of them may even realize psychological benefits. Based on the growing interest in the positive effects of past adverse events, different terms have been used to describe this aspect and it has been referred to as "stress-related growth" [11], "thriving" [12] or "adversarial growth" [13].

The current narrative review focuses on post-traumatic growth (PTG) as conceptualized by Tedeschi and Calhoun who defined PTG as a positive psychological change resulting from a struggle through a life-altering experience. During the last years PTG has become most widely used to describe these higher levels of psychosocial functioning especially in adults [14,15]. However, there is still an intensive discussion about whether PTG is real or rather a hypothetical construct.

While there is a small but significant body of literature on PTG in adults, more recently the focus has shifted towards PTG in children and adolescents. Several studies so far have addressed the question about the underlying construct, the mechanisms of its genesis and the possibilities to assess PTG also in childhood and adolescence. The current review provides an overview of the current literature regarding PTG in youth and summarizes the pertinent literature on the PTG framework in general.

The Concept of Post-traumatic Growth

The concept of PTG as defined by Tedeschi and Calhoun [16] describes positive personality and life changes that enhance functioning and result from the emotional and cognitive processing of trauma exposure. The authors emphasize that it is not the event itself that is believed to lead to PTG but rather the struggle in the wake of trauma. PTG so far has been studied intensely in adults and these studies have repeatedly demonstrated that post-traumatic symptoms in affected individuals can be accompanied by PTG [17,18].

With regard to the developmental process, Tedeschi and co-workers proposed that traumatic events may serve as "seismic challenges" to individuals' pre-trauma schema regarding themselves, others, their relationships, and the world, by shattering their assumptions about the world and forcing a reconfiguration of an individual's goals, beliefs, and, more broadly, worldview [19]. PTG differs from other strength-based concepts like resilience by emphasizing the process of transformation as a result of struggling with a trauma [20]. It has furthermore been underlined that "growth" may perhaps be the most appropriate word to define this special phenomenon. It is assumed that the affected individual reaches a stage in the personal development that extends beyond the previous functional level. Finally, the use of the term "post-traumatic" indicates that this growth occurs after an extreme event and hence it is not caused by any minor stressors, nor is it part of a natural process of personal development [21].

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Several studies [22,23] indicate that PTSD does not exclude the development or existence of PTG. It rather emphasizes that distress may to some extent be essential in order to initiate the change process and, possibly, maintain growth [24]. Levine, Laufer [25] found an inverted-U curvilinear relationship between post-traumatic stress and growth and assumed that PTG might be maximum at moderate post-traumatic stress levels. In contrast, Zhou and Wu [26] recently emphasized the independency of PTG and PTSD after investigating the role of emotion regulation within 315 adolescents after an earthquake. The authors used structural equation models within a longitudinal study to examine the effects of intrusive rumination at different time points on PTSD and PTG. They found that PTSD and PTG are influenced by different mechanisms and concluded that PTG and PTSD should be regarded as separate, independent dimensions of psychological experiences in the aftermath of an adverse or respectively traumatic event.

PTG has been subdivided into five main domains or categories [27]: 1) *New possibilities*, 2) *Relating to others*, 3) *Personal strength*, 4) *Spiritual change* and 5) *Appreciation of life*. In more detail, the perceived changes include e.g. a greater sense of one's personal strength and/or a feeling to be more able to face future challenges. Changes in interpersonal relationships comprise a better sense of one's 'real friends' and an increased need to share and express one's feelings. Changes in philosophy of life relate to e. g. a greater appreciation of the available resources and the ability of the individual to discriminate more effectively between important and irrelevant [28,29]. Although these positive effects may resemble to some extent

the idea of *resilience*, many authors have emphasized that both (while sharing some conceptual aspects) are yet to some extent distinct constructs (please see also below).

Assessment of PTG

There are several measures assessing PTG in adults. Two of the best acknowledged quantitative measures are the Post-Traumatic Growth-Inventory (PTGI) [16] and the Benefit Finding Scale (BFS) [30]. Both differ slightly depending on the captured growth domains and the priority at the focal point in the assessment procedure [31].

More recently, there have been some initial attempts to assess PTG in children. Some authors only used parent's descriptions to measure PTG in children [32] or at least semi-structured interviews that were adopted from adult instruments like the Perceptions of Changes in Self Scale (PCS) from the Impact of Traumatic Stressors Interview Schedule (ITSIS) [33,34]. Salter and Stallard [35] used qualitative, (indirect) measures by re-analysing PTSD interviews and coding for elements of PTG. More recently, some authors tried to develop a self-report PTG-scale suitable for children and adolescents. They mostly adapted their inventories from Tedeschi and Kilmer [36] PTGI by rewording and modifying the items covering the same subscales as in the adult scale (detailed in Table 1; adopted from [14]).

Kilmer, Gil-Rivas [23] revised the PTGI for children (Revised Post-Traumatic Growth-Inventory for Children; PTGI-C-R [20]). This questionnaire consists of only 10 items but may assess PTG in all five domains. It has been shown that PTG can be assessed reliably with

Table 1: Measures of post-traumatic growth in children, adolescents and young people.

Authors	Sample	Amendments	Scoring	Reliability and validity
Milam et al. (2004)	435 adolescents; Hispanic ($n = 373$), Multiethnic ($n = 27$), White ($n = 12$), other ($n = 23$). Mean Age 15.8 years ($SD = 1.52$), 55% female.	16 items developed by authors and modified from PTGI 5 subscales	5-point Likert scale ranging from highly negative change to highly positive change	Cronbach's alpha for overall scale, = .93 (not reported for subscales). No association found with depression ($r = -.01$, ns).
Ickovics et al. (2006)	328 female adolescent girls; aged 14–19 years ($M = 17.24$, $SD = 1.49$) 43% African American; 35% Hispanic/Latina; 10% Caucasian; 2% Other	Modified version of Pilot study ($n = 20$); rewording for increased comprehension; changes to scoring key, 2 spiritual items dropped, resulting in 19 items measuring four subscales: (1) appreciation of life, (2) relating to others, (3) personal strength, (4) new possibilities	3-point Likert scale: 0 = no change, 1 = a little change, 2 = a lot of change	Cronbach's alpha ranged from .72 to .80 for subscales. Cronbach's alpha for overall fit scale = .90
Cryder et al. (2006)	28 females and 18 males. Age range 6–15 years ($M = 9.54$, $SD = 2.64$). 65% African Americans	21 item adaption of PTGI assign the five domains including 'spiritual change'. Some rewording	4-point scale; Detail not reported	Cronbach's alpha for overall scale = .89. (not reported for subscales). No association with rumination.
Yaskowich (2002 in Kilmer, 2006)	Children and adolescents Details not reported	21 item adaptation of the PTGI. reworded to be more suitable for children as young as 8 years	Not reported	Cronbach's alpha .68 to .86 for the five subscales (for overall scale = .94). No difference found between parents' and children's ratings.
Levine et al. (2008)	two, pooled samples: 1) $n=2999$; 35.5% 13 years; 36.5% 14 years; 26.9% 15 years; 1% 16 years); 42.2% boys 2) $n=1745$; all 16 years old; 52% girls)	21 item adaption of PGI with, items were re-ordered and back translated into Hebrew	reduced response options from 6 to 4 in order to ease respond understanding	Cronbach's alpha for two growth components were .90 and .80 respectively
Kilmer et al. (2009)	68 children, 54.4% girls; Age range 7–10 years ($M=8.3$; $SD=1.1$) 78% African Americans, 14.7% White, 7.3% other	Adaption of PTGI-C-R (Cryder et al. 2006) reduced number of items; some rewording for young children, new metric: degree of change, new introduction, two open-ended items inquiring about changes	4-point scale, : 0 = no change, 1 = a little change, 2 = some change, 3 = a lot of change	Cronbach's alpha for overall scale at T1 = .77; at T2 = .81, stability coefficient over 10-month interval was .44; no differences found between T1 and T2
Wu et al. (2015)	376 adolescents; age range 13–19 years ($M=15.98$; $SD=1.64$); 52.7% girls	22 item adaption of PTGI assign three domains: perceived changes in self, relationship with others, changed philosophy of life.	6-point scale ranging from 0 (no change to 5 (very great degree of change)	Cronbach's alpha for overall scale = .90. Cronbach's alpha not reported for subscales.

Abbreviations: M: Mean; SD: Standard Deviation; R: Correlation Coefficient; Ns: Not Significant; PTGI: Post-Traumatic Growth Inventory

the PTGI-C-R [1,20,23,37]. More recently, the inventory has been translated e.g. in Hebrew [38], in Chinese [26,39] and German [40].

Psychosocial Factors Affecting PTG

So far several psychosocial factors in adult samples have been identified that seem to influence PTG [41,42]. Less is known about factors that contribute to PTG in children and adolescents and existing data are to some extent inconsistent. There is also a mixed picture for variables that reflect one's self-schema or internal beliefs, religiosity and perceptions about oneself [20,37,43]. Some authors pointed to the possible role of future expectations, influencing perception and response to an event as well as the degree to which children and adolescents sustain effort in grappling with a traumatic event, its aftermath and its potential meaning [44].

Age is one key psychosocial factor that has repeatedly been found to influence PTG in youth. For example, Milam and co-workers investigated 435 adolescents having experienced negative life events within the previous three years and found positive correlations between PTG and age. This was confirmed in another study with 150 adolescent cancer survivors [45] and more recently by Glad, Jensen [46] in another clinical sample. Nevertheless, other studies failed to find a positive association between PTG and age [20,23]. However, these studies investigated younger adolescents and predominately children. Hence, it has been argued that PTG might depend on cognitive maturity and capabilities that may influence the understanding and appraisal of traumatic events [47].

Within the process of developing PTG, social support (e. g. in forms of treatment intensity) seems to be another important factor [26,28,29,43]. However, results indicate that the impact of social support on PTG depends on the source of that support [19,39,45,48].

There are also studies indicating factors that might impede PTG. For example it has been found that PTG might be lower in males [43,49], children and adolescents with substance abuse and other external factors, for example when needed treatment has been delayed [43,45]. More recently, Kilmer and co-workers concluded that important aspects that seem to influence PTG in children and adolescents may be environmental (e.g. severity of the event, time since trauma, and exposure to other stressful experiences) as well as social factors (e.g. involvement in religious organizations) that may provide comfort as well as frameworks for making sense of the traumatic experience.

Demographic variables such as gender, ethnicity, and socioeconomic status may also moderate the associations between trauma and growth [41,50]. However, most data so far were derived from adult samples and results from studies in children and adolescents are rare.

The Role of Rumination within PTG

Another core element within the genesis of PTG seems to be rumination. The model of PTG according to Calhoun and Tedeschi [28] emphasizes cognitive activities typically beginning in the aftermath of a traumatic event that challenge the individual's beliefs about their framework for understanding the world (e. g. how the world works and what is the individual's place in the world). The authors postulate that the repeated reflection about the beliefs before and after the traumatic event helps the individuals to rebuild an understanding of the post-traumatic world [51]. In other words, this cognitive process seeks to reconstruct the basic schemas altered by

the trauma and has been described as "rumination" [52]. While some previous studies found that some components of the rumination process are risk factors for distress [52,53], others found aspects of rumination to be crucial for post-traumatic growth [13].

In this context, Cann, Calhoun [54] proposed a distinction between two different types of rumination: *deliberate* and *intrusive*. The former is characterized by deliberate re-examining of -and contemplation about- the event. This is thought to be productive and to involve a narrative development. Deliberate rumination is assumed to reconcile the trauma with one's representational world and/or to create meaning from the event [19,28]. Intrusive rumination, on the other hand, describes thoughts that invade one's cognitive world. This generally involves a negative focus on the trauma and maintains distress (for details please see also Wu et al.).

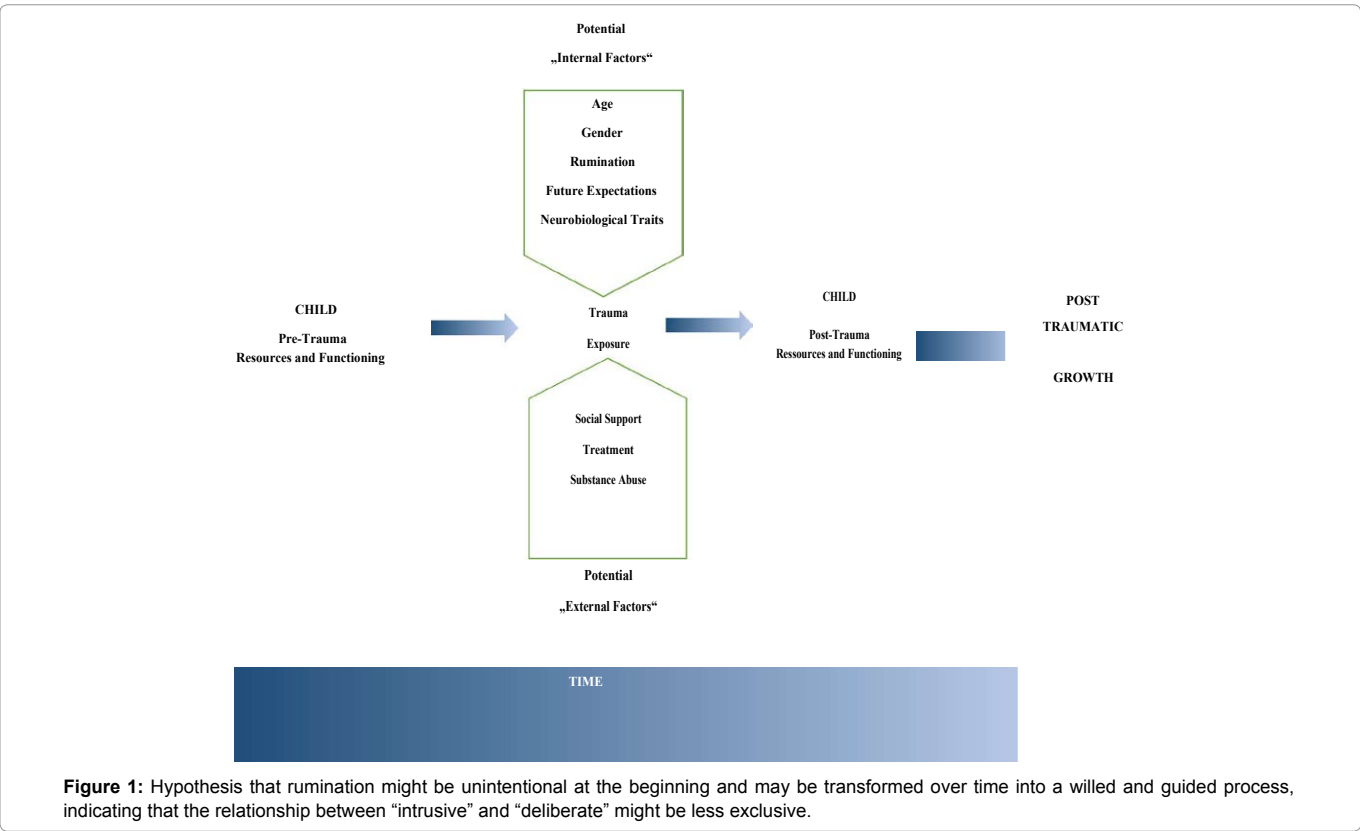
However, the impact of so called "intrusive" and "deliberate" rumination on PTG is still not clear. According to the hypothesis of Cann and co-workers, deliberate rumination was the only significant factor predicting PTG one year after Hurricane Katrina in a study of 66 children [37]. Accordingly, it has recently been found that within a large sample of adolescents investigated at different times within an 18-month period after an earthquake, intrusive rumination was more likely to lead to PTSD, whereas deliberate rumination correlated with PTG [26]. However, Kilmer, Gil-Rivas [44] re-analysed the traumatised children after Hurricane Katrina nearly two years after the disaster. In contrast to Kilmer and Gil-Rivas [37] they found baseline intrusive rumination as the lone significant predictor of PTG in the same sample.

In sum, rumination might be an essential part of the genesis of PTG. However, current findings comparing the distinction of "intrusive" and "deliberate" are to some extent contradictory. These inconsistencies might be caused by the somewhat diffuse distinction of "intrusive" and "deliberate" rumination. In clinical practice both forms of rumination may co-occur and sometimes merge with each other, which makes a clear sorting difficult. Moreover, Sumalla, Ochoa [55] already hypothesised that rumination might be unintentional at the beginning and may be transformed over time into a willed and guided process, indicating that the relationship between "intrusive" and "deliberate" might be less exclusive (Figure 1).

PTG – Accommodation or Assimilation

Since the initial proposal of PTG as a concept, there has been discussion whether PTG is true positive identities change or rather a safety mechanism compromising subconscious strategies to maintain the integration of the individual's identity [55]. Those who consider PTG as a real cognitive phenomenon in forms of *accommodation* argue that the positive changes occur at the level of basic beliefs and nuclear assumptions, which affect one's personal beliefs, self-concept and social views [56,57]. Based on this point of view, the traumatic event is not only integrated as a part of the subject's identity, but becomes a central part of it [58].

On the other hand, it may be that PTG is only illusory since distress produced by an extreme event is just reduced by a form of *assimilation* and thereby helping to maintain or defend aspects of one's own identity (e. g. perceived control) [55]. This means that information regarding the trauma is assimilated within the pre-existing cognitive and socio-emotional schemas; the significance of the trauma in this conceptualization is rather 'built around' the individual's concepts. In contrast, real cognitive processes would



indicate that schemas have to change and therefore are transformed by accommodating the new information regarding the traumatic event. This may lead to the development of new structures of coherent beliefs. Sumalla and co-workers emphasize that this process also bears the possibility to fail and this may cause an affective symptomatology or generate pessimism and despair.

While active cognitive processes are essential within the concept of “real” PTG, models emphasizing the illusory nature of the process state that individuals who face periods of crisis or sudden, intense life-changing experiences even resist change, since change may be experienced as a form of threat [59]. People need to maintain a certain continuity and internal consistency with regard to their attributes and constructs, which are important for their identity. Therefore processes are initiated to verify any possible discrepancies between the current identity and the identity before the crisis. The past is perceived as being more negative than it actually was and hence is distorted in order to reduce this discrepancy and produce a more valuable current identity. In other words, the individual seeks to see him- or herself as someone who has improved overtime [60,61].

Sumalla and co-workers note in their review that both ways to understand PTG, illusory and real, might be time related. The illusory side could be assumed as a cognitive avoidance that may serve as a short-term palliative coping strategy decreasing over time. In case of successful coping with trauma, the constructive component in forms of “real” PTG may become more important and grow over time. However, the question persists, whether PTG can be measured objectively, for example by neurobiological markers.

PTG and Neurobiology

Neurobiological studies in psychotraumatology so far have

almost entirely focused on the neural basis of the negative post-traumatic outcome (i.e. PTSD) [62]. However, there are a few studies that investigated neurobiological correlates of PTG in adult-samples: For example, a former study from Rabe, Zöllner [63] using electroencephalography found an evident association between left frontal brain activity and PTG in 82 survivors of severe motor vehicle accidents. More recently, within a neuropsychological study Eren-Koçak and Kiliç [64] found that PTG was predicted by executive functions but neither by memory functions nor processing speed in 53 individuals after an earthquake trauma.

Neuroimaging data indicated that a greater perception of growth was associated with increased insular volume in a structural MRI-study [65]. However, the authors did not assess PTG but used the concept of “eudaimonic well-being”, which limits the comparability of the results. The concept of Eudaimonia differs from the concept of PTG and originally derives from Aristotle who thought that true happiness is found by leading a virtuous life [66].

The first study using functional MRI to investigate neurobiological correlates of PTG found a stronger functional connectivity between memory functions within the central executive network and social functioning in the supramarginal gyrus [67]. The authors concluded that individuals with higher levels of psychological growth following adverse experiences may have stronger activation in regions related to prospective or working memory within the executive function network as well as a stronger connectivity in areas associated with mentalizing processes. This is in line with the finding of an association between PTG and executive functioning [64]. However, limitations of the study are the small sample size and the inclusion of healthy adults who did not experience severe traumatic events.

To the best of our knowledge no study has investigated neurobiological markers of PTG in childhood or adolescence. Although the neurobiological effects of trauma and maltreatment have been investigated in children and adolescents [68,69], significantly less is known about these effects in children compared with adults. Even less is known about how associated mechanisms underlie the short- and long-term medical and mental health consequences of trauma [70].

Over the last few years, plenty data have been accumulated to demonstrate that exposure to stressors can change e. g. epigenetic markers which have impact on the regulation of stress vulnerability in human as well as animal models [71]. In this context many neurobiological studies have also focused on “resilience” [72] which is a widely used term and subsumes different dimensions as no single definition fully captures this construct. Generally, it has been conventionalized as an endpoint of stress and coping processes, possibly involving dynamic interactions between risk and protective factors. In contrast to PTG, resilience describes a decrease or absence of psychopathology in response to adverse circumstances [73]. Though the definition as a dynamic developmental process’ is somehow similar to that of PTG, PTG in contrast to resilience increases the level of functioning beyond the state before adversity (please see also Kilmer et al.). Current data indicates that resilience and PTG seem to be distinct psychological constructs, although they may be empirically related [44,74]. One could argue that a main difference between PTG and resilience is the outcome of individuals facing an adverse/traumatic event. While those who exhibit a social functioning comparable to pre-trauma conditions showed “resilience”, those with increased social functioning experienced “PTG”. In fact, many interventions aim to enhance resilience during development since this is a time of increased plasticity and thus may increase responsiveness to preventive interventions [72]. Nevertheless, again the question arises whether neurobiological association may also help to clarify the relationship between PTG and resilience.

Conclusion and Outlook

Considering the dramatic numbers of children, adolescents and adults experiencing psychiatric disorders in the course of traumatization internationally, the negative impact and implications of trauma and trauma recovery has long dominated research in psychotraumatology. The emerging concept of PTG has already broadened the clinical perspective and raised various questions on the variability of cognitive, emotional and behavioural response to trauma [75]. The existing data from adult samples support the notion that PTG is a valid concept for further investigation and research efforts in the fields of disaster mental health [76]. However, while data on PTG in children and adolescents is still scarce, it nevertheless suggests that PTG in youth may be quite similar to that observed among adults [46]. However, the existing conceptual psychological ideas of PTG in youth [44] are quite complex but still predominately hypothetical. A theoretical background integrating neurobiological disposition, environmental modification and neuropsychological development is lacking, while corresponding data with regard to negative outcomes in the aftermath of traumatic events (e.g. PTSD) already exists [77]. In this context some crucial problems remain to be solved.

A main question is whether PTG is “real” or a form of compensatory strategy. Neurobiological data might help to assess PTG more objectively and back up or test the already existing

psychological hypotheses. Moreover, data on neurobiological aspects may help to further delineate PTG from resilience (where significantly more neurobiological findings already exist). Longitudinal studies could help to clarify which factors can predict PTG, increase the change of developing PTG and find out whether PTG is temporally stable. These data would be very useful not only for therapeutic needs but also prevention programs. Generally, it appears to be essential to further identify factors that influence PTG development, which is likely to increase the relevance of PTG for therapeutic approaches. It has been argued that adult patients should be provided with the opportunity to talk through the meaning of their trauma and thereby may explore how their lives have changed and what might improve in their future life [14]. Although psychotherapy of adult PTSD resembles those of affected children in many ways [78], so far it is not clear to what extent adolescents and especially children might benefit from such strategies, especially in respect to PTG.

The existing data already indicates that the living environment of children and adolescents in forms of social and contextual factors seems to be very important for their prognosis after traumatic life-events [44]. The opportunity to assess reliable and valid psychometric aspects of PTG in traumatised children and adolescents offers the chance to identify factors that increase the likelihood of PTG and thereby may improve their post-trauma adjustment.

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