ORIGINAL CONTRIBUTION

CrossMark

Emotion regulation difficulties in traumatized youth: a meta-analysis and conceptual review

L. Villalta[1] · P. Smith[2] · N. Hickin[2] · A. Stringaris[3]

Abstract
This article provides a quantitative and conceptual review of emotion regulation difficulties in trauma-exposed young people, and informs future directions in the field. Despite long-standing interest in the influence of emotion regulation difficulties on different internalizing and externalizing psychiatric disorders in childhood, several questions remain unresolved with respect to children and adolescents with PTSD (post-traumatic stress disorder). Meta-analytic data from adult victims suggest that emotion regulation problems are associated with PTSD, but this has never been studied in children and young people. We therefore provide a conceptual review of features related to the phenomenology, assessment, severity and treatment of emotion regulation difficulties in trauma-exposed children and young people. We combine this with a meta-analysis of published literature. We searched studies in Medline, PsychINFO, and Embase databases based on pre-selected criteria. Eight hundred and eighty-six papers were identified and 41 were included. We found that children and adolescents with a diagnosis of PTSD reported more emotion regulation difficulties than those who did not develop PTSD, and that the overall association between the two symptom dimensions was moderately strong. We identify a number of research priorities: the development of instruments to assess emotion regulation difficulties in children, the design of studies that describe its prevalence in young epidemiological traumatized samples, its predictive role in the onset, severity and persistence of post-traumatic symptoms, and its relevance as a moderator, outcome or treatment target for young survivors.

Keywords Emotion regulation · Anger · Post-traumatic stress disorder · Meta-analysis · Review · Childhood

Introduction

Potentially traumatic events are fairly common in the lives of children and adolescents. More than two-thirds of community youth have been exposed to at least one potentially traumatic event in their lifetime. The lifetime prevalence

✉ L. Villalta
lvillalta@sjdhospitalbarcelona.org

1 Child and Adolescent Psychiatry Department, Hospital Sant Joan de Deu, Passeig de Sant Joan de Déu, 2, Esplugues de Llobrega, 08950 Barcelona, Spain

2 Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, UK

3 Mood Brain & Development Unit, Emotion and Development Branch, National Institute of Mental Health, Bethesda MD, USA

of post-traumatic stress disorder (PTSD) in community samples of youth is around 5% [1, 2]. In the aftermath of a traumatic experience, young people can experience intense emotional responses. Difficulties in emotion regulation can be a factor underlying the development, severity and persistence of post-traumatic stress symptoms over time in adult survivors [3–6], but data on young people are lacking. In young populations, emotion dysregulation has been consistently associated with a wide range of internalizing and externalizing disorders [7] and with maltreatment [8], but its association with PTSD has not yet been studied. This is surprising as developmental theories frame the acquisition of regulation capacities within the close relational context of the child, which would be disrupted when children experience traumatic relationships with core adult figures. Thus, traumatic experiences in young people can elicit both, post-traumatic symptoms and disrupt the acquisition of emotional regulation processes. Also, whether or not emotionally dysregulated patients who are receiving treatment would benefit from an emotion-stabilization work prior to trauma-focused

treatment has recently been reviewed in adult samples [9]. However, clinicians who treat young traumatized patients with prominent emotion regulation problems face a lack of guidance in these regards.

We review issues associated with the phenomenology, assessment, severity and treatment of emotion regulation difficulties in child and adolescent survivors of traumatic experiences. We also provide a meta-analysis of the association between emotion regulation difficulties and post-traumatic stress symptoms, and give suggestions for future research and clinical practice.

Definition of emotion regulation difficulties

Emotion regulation difficulties in the form of anger or other intense negative emotional reactions are common in children and adolescents [7, 10]. Researchers and clinicians use the term *emotion regulation difficulties* interchangeably with affect dysregulation, mood swings, affective and mood instability or lability. The boundaries of these key concepts are not firmly grounded in empirical data [11], showing considerable overlap and being defined by largely similar attributes. It is also of note that no overall 'gold standard' for measuring emotion regulation exists so far. After a systematic assessment of the tools used in adult clinical samples, no single instrument was found to comprehensively cover most of the core components of emotion regulation difficulties. Indeed, around 25 distinct definitions and measures for general emotional regulation or its specific facets (e.g., oscillation, intensity, ability to regulate) were found [12]. Surprisingly, no systematic study has been conducted to refine those definitions or constrain their parameters [13]. It is, however, recognized that in pre-school years, regulation skills are consolidated, resulting in typically brief and contextualized misbehaviors such as angry outbursts, non-compliance and temper tantrums [8]. While these behaviors are typical of development, if they become persistent, frequent and qualitatively distinct from normative misbehaviors, they can acquire clinical significance. Similarly, during the transition from middle childhood into adolescence, there appears to be a developmental increase in stress responsivity which may be linked with the emergence of psychological disorders in vulnerable youth [14]. Thus, the lack of developmental sensitivity and specificity in the definition of emotion regulation is a considerable limitation in the field, probably reflecting the complexity of the construct and the pending need to bind together its measurement and understanding.

As a working definition, we conceptualize emotion regulation difficulties broadly, including oscillations in affect, mood or emotion that are noteworthy because of their rapidity, intensity, frequency or difficulty in being controlled. This definition focuses on negative valences, while periods of elevated or expansive mood that typically qualify for manic states are not considered here. This definition would enable much of the lexicon in this field to be absorbed into a dimensional single term, while not being reliant on a specific theoretical framework. It should also be noted that we do not consider emotion regulation difficulties to be specific to PTSD. Indeed, it is clear that emotion regulation problems are present across psychopathology [15, 16]. Whether emotion regulation across disorders represents a shared liability or a disease-specific phenomenon is currently debated [15], yet substantial evidence has accumulated linking the emotion regulation difficulties with impairment over and above that of each specific disorder [7, 15]. Moreover, as indicated below, some authorities view the presence of emotion regulation difficulties in PTSD as meriting a distinct nosological description in the form of complex PTSD.

Emotion regulation difficulties and conceptualization of PTSD

Reactions to traumatic events can vary widely, and how to best conceptualize PTSD has proven to be challenging since the earliest observations of post-traumatic reactions. As early as World War I, physicians highlighted the relevance of emotion regulation difficulties in the clinical profile of war survivors (e.g., "In a word, these disturbances are characterized by instability and exaggeration of emotion" [17]). However, how emotion regulation difficulties should be considered in relation to PTSD is still an unresolved issue in current diagnostic classifications [18, 19]. The DSM (Diagnostic and Statistical Manual of Mental Disorders) and the ICD (International Classification of Diseases) have taken different approaches when conceptualizing the broad array of negative emotions that survivors can present alongside PTSD. The threatening nature of many traumatic events typically elicits trauma-specific negative emotions such as intense fear and anxiety, which are intrinsically related to the re-experiencing, avoidance and hyper-arousal post-traumatic stress symptoms. Alongside trauma-related fear, other emotions such as sadness, hopelessness, disgust or anger may also be present [20].

The recognition of broader PTSD emotional profiles was modest in the first DSM definitions, where only irritability was listed within the hyper-arousal symptoms, and was always seen concomitant to fear reactions. However, the new DSM-5 defines PTSD more widely, not requiring a fear response at the time of the exposure to the traumatic event (Criteria A), and including trauma-related negative mood and cognitions which comprise a new symptom cluster (e.g., shame, horror, guilt). However, more general difficulties in regulating emotions, which might not be directly tied to

trauma triggers, are still defined as associated features and not as core PTSD symptoms.

A different approach has been taken by the ICD Working Group. Stemming from WHO's (World Health Organization) emphasis on clinical usefulness, the new ICD-11 [21] directs clinicians' attention to a simplified PTSD diagnosis, refocusing on the three fear-based elements tied to trauma triggers (e.g., re-experiencing, avoidance and physiological over-arousal). This definition removes symptoms that are less specific, which may overlap with comorbidities or persist beyond specific trauma triggers, such as irritability. Alongside this narrow definition of PTSD proposed for the ICD-11 and consistent with the WHO's approach, the ISTSS Expert Consensus Complex Trauma Task Force (2012) also recommends that more extensive post-traumatic reactions should be classified in a new diagnostic category named Complex PTSD (CPTSD). This subgroup of severely traumatized patients would typically be exposed to early repeated interpersonal trauma and present persistent and debilitating problems in emotion regulation, self-perception and interpersonal relationships, in addition to core PTSD symptoms [22–24]. It has been suggested that this construct has its origin before adulthood, and that it might be associated with more impairment and psychiatric comorbidities in both adults and adolescents [25, 26].

This debate has significant implications for clinicians who encounter trauma-exposed young people with difficulties in emotion regulation in their daily practice. The separation of two distinct constructs (e.g., PTSD and CPTSD) could imply taking into consideration different risk factors when assessing cases, expecting a different symptom course, prognosis and, ultimately, planning different treatment approaches accordingly.

Association between emotion regulation difficulties and post-traumatic stress symptoms

Regardless of where emotion regulation difficulties might sit within the PTSD nosologic structure, meta-analytic data in traumatized adults show that post-traumatic stress symptoms are largely correlated with general emotion regulation difficulties [27] as well as with more concrete aspects of it, such as irritability [28, 29]. The high co-occurrence of emotion regulation difficulties and post-traumatic symptoms does not seem to be artificially inflated by the fact that anger is one of the symptoms of PTSD [30, 31]. Instead, several aspects such as the victim's age, gender, the type of traumatic experience (e.g., interpersonal vs non-interpersonal) and sample type (clinical vs community) seem to influence the relationship between emotion regulation difficulties and post-traumatic stress symptoms. However, in a meta-analysis

conducted in adults, the type of trauma and sample did not moderate the relationship between general emotion regulation difficulties and post-traumatic stress symptoms [27]. There is not such meta-analysis available for trauma-exposed children and adolescents, despite the finding that emotion regulation difficulties occur in up to 60% of community youth exposed to interpersonal trauma [25].

Thus, the first question that needs to be answered is whether trauma-exposed young people frequently report difficulties in emotion regulation, and how strongly these are associated with their post-traumatic stress symptoms. To address this gap in the literature, we first aimed to find any epidemiological or clinical research that described the rates of emotion regulation difficulties in children or adolescents with PTSD. Secondly, we wanted to determine whether emotion regulation problems were associated with post-traumatic stress symptoms among trauma-exposed youth, both dimensionally and when meeting threshold for a PTSD diagnosis. Finally, we aimed to explore which individual or trauma factors could affect the co-occurrence of the two symptom dimensions.

We hypothesized that levels of emotion regulation difficulties would be high in survivors who presented with a PTSD diagnosis, and that there would be a significant positive correlation between emotion regulation difficulties and PTSD symptoms. We set the following questions: (1) What are the rates of emotion regulation difficulties in children and adolescents with PTSD? (2) What is the strength of the association between emotion regulation difficulties and post-traumatic stress symptoms in children and adolescents? (3) Which are the main factors that affect the association between emotion regulation difficulties and post-traumatic stress symptoms? Answering these questions systematically and employing a quantitative approach will serve as an empirical basis from which to set specific directions for future research.

Emotion regulation difficulties and PTSD treatment

The treatment of emotion regulation difficulties across psychopathology can present a major clinical challenge [16]. Moreover, clinicians differ in the best way to approach these symptoms in children treated for PTSD. Some experts have argued that the efficacy of and engagement in trauma-focused treatment can be impaired in those adults with PTSD who also present emotion regulation difficulties (e.g., CPTSD). In this context, the consensus treatment guideline elaborated by the *International Society for Traumatic Stress Studies Complex Trauma Task Force* (ISTSS) supports the implementation of special emotion stabilization procedures prior to trauma-focused treatment when treating

these patients. They suggest as the optimal strategy a phase-oriented or sequential treatment model [32], where emotion regulation skills would be strengthened before focusing on the trauma, ensuring that the patient can safely use the ability to regulate strong emotions before exposure [33]. A recent review argued that the evidence to support this approach is still lacking and that it risks delaying delivery of trauma-focused treatments from which patients might profit [9].

Recent reviews about the effectiveness of PTSD therapies for children and adolescents include research projects that did not usually take into account emotion regulation difficulties [34–36]. Despite some interventions incorporating emotion regulation skills in the therapies tested, the papers reviewed do not measure it as a treatment target or moderator [37–39]. Thus, it remains unclear whether an initial stabilization phase to improve emotion regulation difficulties is needed before applying trauma-focused interventions in youth that report high levels of these difficulties.

While the state of the literature does not allow for a meta-analysis of effects, we provide a narrative review of treatment studies that tackle the issue of emotion regulation problems in the context of trauma.
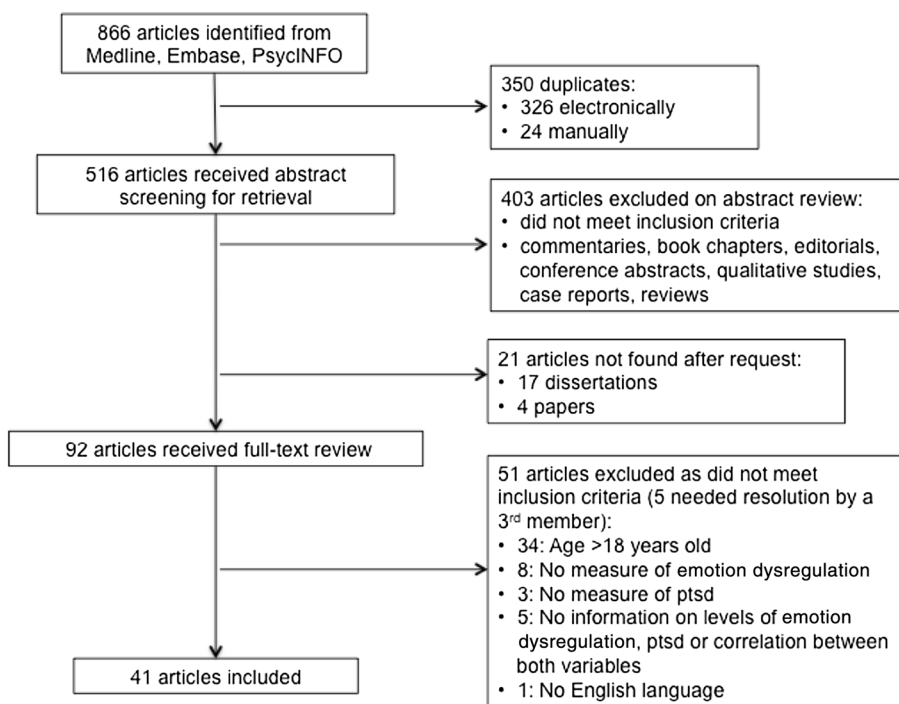
Method

In Online Resource 1, we describe in more detail the methods employed for the systematic review including search terms, inclusion criteria, study selection, data extraction and the analytic strategy of the meta-analysis. Here, we provide an overview of the main characteristics of the methodology used.

Systematic review

Two independent reviewers systematically searched in Medline, PsychINFO and Embase databases. The search strategy was defined by any combination of terms representing emotion regulation difficulties, post-traumatic symptoms and young age. We included studies that measured levels of emotion regulation difficulties and post-traumatic stress symptoms (e.g., mean scores, %) or the relationship between the two variables (e.g., r values, regression coefficients) in samples of children and adolescents below the age of 18 years. All study designs were accepted except for qualitative or non-original research. Both reviewers did the selection process independently (Fig. 1), and all efforts to contact authors and librarians were made. Given the broad range of study designs, a standard and empirically grounded quality assessment tool was not available. Thus, both reviewers applied a 14-item checklist that provides an overall quality score covering the study internal validity and risk of bias [40]. There is not a validated threshold for the overall score to be selected for study inclusion, ranging from a relatively conservative cutoff point (e.g., 75%) to a more liberal one (e.g., 55%). Almost all (19/21) studies included in the meta-analysis received an overall score above 75%, only two were rated between 55 and 75%, and none below 55%, so no study was deemed to be excluded from analysis (Table 2).

Fig. 1 Review and selection of articles

866 articles identified from Medline, Embase, PsycINFO

350 duplicates:
- 326 electronically
- 24 manually

516 articles received abstract screening for retrieval

403 articles excluded on abstract review:
- did not meet inclusion criteria
- commentaries, book chapters, editorials, conference abstracts, qualitative studies, case reports, reviews

21 articles not found after request:
- 17 dissertations
- 4 papers

92 articles received full-text review

51 articles excluded as did not meet inclusion criteria (5 needed resolution by a 3rd member):
- 34: Age >18 years old
- 8: No measure of emotion dysregulation
- 3: No measure of ptsd
- 5: No information on levels of emotion dysregulation, ptsd or correlation between both variables
- 1: No English language

41 articles included

Meta-analysis

To calculate the strength of association between emotion regulation difficulties and post-traumatic stress symptoms (question 2), we selected from the systematic search all studies that reported mean scores for both symptom dimensions and conducted a meta-analysis of the pooled correlation coefficients. A total of 21 effect sizes of the *r* type were obtained. One study [41] provided data for two unique community samples and was therefore counted as two separate studies for the purposes of the analyses. All studies provided cross-sectional data except one [42], which provided longitudinal correlation coefficients (*r*) at 3 and 6 months after the trauma. Both *r* coefficients were of the same magnitude, and only one was included in the analyses. Fisher's *Z* transformations were used to correct for the standard error formula of *r*-type effect sizes. Given that the studies varied in methodology and design, a random-effects model was estimated using Stata 13. Random-effects models account for within-study and between-study error, resulting in broader confidence intervals and a more conservative estimate of the true effect, reducing the probability of making a Type I error [43]. To test for between-study heterogeneity, we used the I^2 statistic, which is the percentage of variation attributable to heterogeneity. The values of I^2 lie between 0 and 100%, with larger values showing increasing heterogeneity. I^2 values between 25 and 50% are considered low, between 50 and 75% moderate and $\geq$ 75% high [44].

Another complementary way of testing the co-occurrence of emotion regulation and post-traumatic difficulties would be to use a categorical approach, to determine if trauma-exposed children and adolescents who develop PTSD report more emotion regulation difficulties than those who do not develop the disorder. This would be of clinical relevance, as it is common in clinical practice to use diagnostic thresholds when assessing patients and elaborating treatment plans. To do that, we meta-analyzed all case–control studies found [e.g., studies reporting emotion regulation levels in the case group (with PTSD) and in the control group (without PTSD)]. We used a random-effects model, appropriate when analyzing studies with different designs, to pool the standardized mean difference (SMD). This model reflects the difference between the distributions in the two groups even if they do not measure exactly the same outcome [45]. After the systematic search, we only found four case–control studies, and one of them did not provide complete data for analyses (Online Resource 2). It is of note that, unlike a fixed-effect model which can be used to perform a meta-analysis with only two studies [46], the random-effects model may provide a false sense of assurance if the number of studies is very small, as the estimate of the between-studies variance will have poor precision.

Descriptive analysis

Given the small number of case–control studies available from the systematic search, we also decided to use a descriptive approach to observe if those trauma-exposed children and adolescents with higher difficulties in emotion regulation also endorsed a PTSD diagnosis more commonly. To do that, we needed to standardize the mean scores of emotion regulation difficulties reported in the studies, as we were to compare data collected with different measurement tools. The calculation was done based on the minimum and maximum possible scores of each study measure, representing all standardized means on a scale ranging from 0 to 100. For one study [47], the standardized mean score could not be calculated as the minimum and maximum tool scores were not available.

Finally, we also used a descriptive approach to do a general review of those studies that focused on treatment, which were not part of our systematic search strategy or meta-analysis, but were of clear clinical relevance.

Results

The systematic search returned a total of 866 articles and 41 studies met inclusion criteria for the review; 4 were case–control studies, 4 were cross-sectional studies of trauma-exposed and non-exposed samples, 4 were longitudinal cohort studies and 1 a retrospective cohort of clinical records, 12 were treatment trials from which we selected pre-treatment data only, 15 were cross-sectional observational studies and 1 was a within-scale meta-analysis (e.g., data collected only from studies that used the same questionnaire, which measured post-traumatic and anger symptoms, disregarding other differentiated symptom checklists or structured interviews) [48]. To prevent duplicate data from being used, the meta-analysis found was not included within any analytical strategy or in the interpretation of the review.

Question 1: What are the rates of emotion regulation difficulties in trauma-exposed children and adolescents with PTSD?

We first wanted to select all studies that reported the percentage of trauma-exposed children and adolescents with emotion regulation difficulties and with PTSD to answer this question. Out of the 41 studies included in the review, we could not find any epidemiological study providing this prevalence data in a representative community sample. Only two cohort studies reported both the PTSD percentage and the rates of emotion regulation difficulties in exposed youth [49, 50]. However, none of them specified the percentage of youth reporting emotion regulation difficulties within those

that presented PTSD. Thus, there were no primary studies that allowed us to do a meta-analysis to determine the prevalence of emotion dysregulation in young people with PTSD.

Alternatively, other 35 studies provided mean score levels of emotion regulation difficulties in youth with varying levels of post-traumatic stress symptoms or PTSD diagnosis and were appropriate for descriptive analyses (Table 1).

Question 2: What is the strength of association between emotion regulation difficulties and post-traumatic stress symptoms in children and adolescents?

Most common psychiatric problems, including emotion dysregulation, seem to vary along a continuum and their underlying etiology seems to conform to a dimensional model [51, 52]. Thus, to answer our question, we used a dimensional approach, meta-analyzing the strength of the association between emotion regulation difficulties and post-traumatic stress symptoms.

Out of the 41 studies included in the review, we used the 21 studies (Table 2) that reported data on the association of both symptom dimensions to conduct a meta-analysis of the pooled correlation coefficients (Fig. 2). The studies comprised 5818 unique participants. The overall effect size found between emotion regulation difficulties and post-traumatic stress symptoms was large according to Cohen's standards ($r = 0.372$; $k = 21$; 95% CI 0.244–0.501), with a high degree of heterogeneity ($I^2 = 95\%$). This high heterogeneity means that the varied designs of the included studies could affect the validity of the results. This is not surprising given that a limitation in this research field is the lack of consistency in emotion regulation measures, and that we decided to use a wide working definition for this review. A total of 12 different self-reported tools were used in the 21 studies included in the meta-analysis. Almost two-thirds of the studies ($k = 13$, 61.9%) used a definition which encompassed several dimensions on which emotion regulation difficulties can occur (e.g., lack of emotional awareness or clarity, difficulty engaging in goal-directed behaviors, limited access to emotion regulation strategies, non-acceptance of emotional responses), while the remaining eight studies (38.1%) measured emotion regulation difficulties more narrowly, focusing specifically on problems with anger.

To address this concern, we conducted the same analyses but limited to the studies that operationalized and measured emotion regulation with the same tool. The DERS (Difficulties in Emotion Regulation Scale) was the most commonly used ($k = 6$, 28.6%). When pooling the data of these six studies, we still found a large effect ($r = 0.447$; $k = 6$; 95% CI 0.359–0.535) and the percentage of variation attributable to heterogeneity decreased to 30.6%. We repeated the same strategy selecting the six studies that measured PTSD

symptoms with the same tool (PTSD-RI: Post-traumatic Stress Disorder-Reaction Index), but in this case the heterogeneity was still very high (I^2 97%; $r = 0.368$; $k = 6$; 95% CI 0.078–0.657).

These results suggest that the overall cross-sectional association between emotion regulation difficulties and post-traumatic stress symptoms is strong in children and adolescents, and the consistency of these results increases when using the same measurement tool for emotion regulation.

Following a categorical approach, we wondered if besides the dimensional association with post-traumatic symptoms, emotion regulation was also more common in trauma-exposed youth who meet the threshold for a PTSD diagnosis in contrast to those who do not develop the disorder. For this, we selected the three case–control studies that reported levels of emotion regulation difficulties in young survivors with and without a PTSD diagnosis. The pooled sample size of the three studies analyzed was $N = 157$ for the PTSD group and $N = 162$ for the non-PTSD group. Compared with young people without a PTSD diagnosis, those with PTSD did not present significantly higher mean scores of emotion regulation difficulties (pooled SMD = 0.316, 95% CI = -0.206 to 0.838, $I^2 = 79.2\%$).

Given that the interpretation of this result could be limited by the small number of studies analyzed, we took a descriptive approach to observe if those trauma-exposed young samples that report higher difficulties in emotion regulation tend to present a PTSD diagnosis more often. We selected 19 studies out of the 41 included in the review, which provided information on the proportion of the sample meeting PTSD threshold for diagnosis, with percentages ranging from 11.7 to 77.8% depending on the sample. In four of the studies, PTSD rates were of 100% as survivors were only included if they presented a full-blown PTSD, and we did not include them in the description. The proportions of PTSD diagnosis as a function of emotion regulation difficulties mean scores are represented in Online Resource 2 (see studies included in Table 1 in bold). A positive association was observed, in that higher emotion regulation difficulties were associated with higher proportion of PTSD diagnosis in the samples. The strength of this correlation was $r = 0.61$. These results support the association between PTSD diagnosis and emotion regulation difficulties also in children and adolescents.

Question 3: Which are the main factors that modify the association between emotion regulation difficulties and post-traumatic stress symptoms in youth?

Based on prior literature in adult samples, we hypothesized that the overall effect size of the association between emotion regulation difficulties and post-traumatic symptoms would vary depending on the young people's age, gender,

Table 1 Characteristics of studies with mean scores of emotion regulation difficulties, post-traumatic symptoms and PTSD diagnostic rates

Study	N	Sample type	Trauma type	Age (sd)	Sex (% females)	Emotion regulation difficulties			PTSD		Quality score (%)
						Tool	Mean score (sd)	Mean score normalized	Tool mean score(sd)	Tool diagnosis (%)	
Bender et al. [76]	16	Children in specialized anxiety clinics (clinical)	Various	10.38 years (1.54)	50	DERS	2.04** (0.55)	2.6	SCARED-R 0.44 (0.51)	–	86
Bennett et al. [77]	205	Juvenile detention center (community)	Various	16.23 years (1.19)	36.8	DERS	92.41 (20.4)	3.9	PTSD-RI 37.77 (9.68)	–	95
Bennett et al. [77]	20	Juvenile detention center (community)	Various	16.23 years (1.19)	36.8	DERS	104.1 (16.4)	4.7	PTSD-RI 46 (9.9)	–	95
Betancourt et al. [61]	436	Children in war-affected zone (community)	War (interpersonal)	17.8 years (2.3)	44.6	DERS	3.41 (0.29)	–	PTSD-RI 0.73 (0.41)	–	89
Bicanic et al. [57]	41	Adolescents in sexual assault specialized center (clinical)	Sexual abuse (interpersonal)	16 years (1.4)	100	TSCC[b]	44* (7.3)	2.1	TSCC[a] 59.9 (6.6)	ADIS-C❖ 20%	100
Dauber et al. [59]	31	Children in PTSD treatment center (clinical)	Neglect, domestic violence, physical or sexual abuse (interpersonal)	12.15 years (2.85)	61	TSCC[b]	9.23 (7.09)	3.4	TSCC[a] 10.65 (7.23)	TSCC[a] 23%	82
Espil et al. [78]	50	Adolescents in acute psychiatric hospital (clinical)	Various	15.1 years (1.4)	52	DERS	92.3 (27.5)	3.9	CPSS 13.7(11.8)	–	100
Ford et al. [63]	20	Various clinics and community centers (community)	Various	14.7 years (1.2)	100	TSCC[b] NMR	8.8 (7.1) 105.2 (12)	3.3 6.3	CAPS-CA 58.9 (20.7)	CAPS-CA❖ 64%	82
Ford et al. [63]	26	Various clinics and community centers (community)	Various	14.7 years (1.2)	100	TSCC[b] NMR	8.3 (6) 108.8 (16)	3.1 6.6	CAPS-CA 47.5 (10.6)	CAPS-CA❖ 61%	82

Table 1 (continued)

Study	N	Sample type	Trauma type	Age (sd)	Sex (% females)	Emotion regulation difficulties			PTSD		Quality score (%)
						Tool	Mean score (sd)	Mean score normalized	Tool mean score(sd)	Tool diagnosis (%)	
Hodges et al. [79]	318	Children in PTSD treatment center (clinical)	Sexual or physical abuse, neglect (interpersonal)	9.8 years (1.5)	67.6	TSCC[b]	6.73 (5.23)	2.5	TSCYC[c] 10.21 (6.14)	TSCC[b] 17.10%	91
Kaczkurkin et al. [75]	31	Adolescents in sexual assault crisis center (clinical)	Sexual abuse or assault (interpersonal)	15.3 years (1.52)	100	NMR STAXI	93.36 (11.94) 47 (11.7)	5.3 4.9	CPSS 27.29 (7.36)	CPSS❖ 100%	92
Kaczkurkin et al. [75]	30	Adolescents in sexual assault crisis center (clinical)	Sexual abuse or assault (interpersonal)	15.3 years (1.52)	100	NMR STAXI	93.44 (18.18) 46.97 (11.48)	5.3 4.9	CPSS 29.23 (7.31)	CPSS❖ 100%	92
Kagan et al. [60]	26	Family service programs (clinical)	Various	–	50	TSCC[b]	54.4* (–)	4.5	TSCC[a] 50.9*	–	96
Kerig et al. [80]	221	Youth from juvenile justice facilities (community)	Various	15.98 years (1.25)	30.7	ENRS	22.93 (7.34)	3.2	PTSD-RI 37.39 (20.43)	PTSD-RI❖ 51.10%	91
Kimonis et al. [81]	373	Juvenile detention center (community)	Various	16.43 years (0.8)	0	NAS	89.25 (16.59)	2.4	K-SADS-PL 3.24 (4.25)	K-SADS-PL❖ 11.70%	95
Lanktree et al. [82]	151	Children in PTSD treatment center (clinical)	Various	11.43 years (2.69)	65	TSCC[b]	8.96 (6.71)	3.3	TSCC[a] 11.74 (6.76)	–	91
Laor et al. [47]	63	Displaced homeless children (community)	Earthquake (non-interpersonal)	8.2 years (1.3)	56	TDGS	1.88 (0.48)	–	CPTSD-RI–	CPTSD-RI 30.88%	77
Ma et al. [83]	82	64% school (community)	Physical, sexual abuse (interpersonal)	12 years (1.5)	53.7	CEMS	12.28 (2.24)	5.2	CRIES–	–	91
Ma et al. [83]	83	92% school (community)	Nonabuse-related trauma (non-interpersonal)	12.04 years (1.37)	50.6	CEMS	10.75 (2.48)	4.0	CRIES–	–	91

Table 1 (continued)

Study	N	Sample type	Trauma type	Age (sd)	Sex (% females)	Emotion regulation difficulties			PTSD		Quality score (%)
						Tool	Mean score (sd)	Mean score normalized	Tool mean score(sd)	Tool diagnosis (%)	
March et al. [62]	17	Elementary and high school students (community)	Various	12 years (1.6)	58.8	STAXI	15.06 (8.67)	1.6	CAPS-CA 71.47 (19.6)	–	96
Marsee et al. [84]	166	High school students (community)	Hurricane (non-interpersonal)	14.97 years (1.1)	61	ADI-ED	10.11 (7.17)	3.4	RI 16.43 (11.82)	RI 18%	82
Martinez et al. [48]	135*** (195)	US studies and international studies	Various	12.47 years (2.56) ***	61.9	TSCC[b]	8.3*** (0.37) 7.32*** (0.51)	3.1 2.7	TSCC[a] 9.2*** 11.1***	–	100
Mazloom et al. [85]	678	High school students (community)	Earthquake (non-interpersonal)	15.81 years	54.1	DERS	92.36 (18.87)	3.9	PSS-SR 16.03 (11.59)	–	91
Ovaert et al. [86]	28	Juvenile offender center (community)	Sexual, physical abuse (interpersonal)	15.4 years (1.1)	0	STAXI	33.75 (10.47)	3.5	PTSD-RI 37.04	CPTSD-I❖ 100%	71
Ovaert et al. [86]	35	Juvenile offender center (community)	Various	15.4 years (1.1)	0	STAXI	40.47 (13.03)	4.2	PTSD-RI 44.63	CPTSD-I❖ 100%	71
Olafson et al. [58]	69	Youth from juvenile justice facilities (community)	Various	16.5 years	15.9	TSCC[b]	54.4* (11.8)	4.4	TSCC[a] 56.1* (11.8)	PTSD-RI❖ 55%	86
Runyon et al. [87]	100	School-based PTSD clinic (clinical)	Sexual abuse	13.8 years (1.72)	80	BYI-G	57 (14.47)	9.5	K-SADS 8.1 (4.34)	K-SADS❖ 49%	95
Sandler et al. [88]	28	Children in PTSD treatment center (clinical)	War (interpersonal)	10.51 years (2.99)	67	NMR	111.39 (7.35)	6.8	K-SADS 5.25 (2.67)	–	64
Sandler et al. [88]	14	Children in PTSD treatment center (clinical)	War (interpersonal)	10.51 years (2.99)	67	NMR	100.79 (22.93)	5.9	K-SADS 7.18 (2.22)	–	64

Table 1 (continued)

Study	N	Sample type	Trauma type	Age (sd)	Sex (% females)	Emotion regulation difficulties			PTSD		Quality score (%)
						Tool	Mean score (sd)	Mean score normalized	Tool mean score(sd)	Tool diagnosis (%)	
Sharma-Patel et al. [74]	118	Youth in PTSD treatment center (clinical)	Sexual abuse or assault, physical abuse, domestic violence (interpersonal)	11.02 years	75	BASC-PRS	58.56 (13.52)	3.9	CPSS 17.21 (10.17)	CPSS 62%	86
Wechsler-Zimring et al. [89]	31	Residential facility for maltreated youth (community)	Various	14.1 years (1.5)	50.8	STAXI	49.08 (22.45)	5.1	CPTSD-I 5.35 (1.18)	CPTSD-I✤ 77.80%	82
Wechsler-Zimring et al. [89]	192	Residential facility for maltreated youth (community)	Various	14.1 years (1.5)	50.8	STAXI	59 (23.97)	6.1	CPTSD-I 5.39 (0.88)	CPTSD-I✤ 56.30%	82
Wechsler-Zimring et al. [89]	27	Residential facility for maltreated youth (community)	Various	14.1 years (1.5)	50.8	STAXI	41.9 (22.19)	4.4	CPTSD-I 3.90 (1.48)	CPTSD-I✤ 33%	82
Whalen et al. [90]	109	Adolescents residential psychiatric unit (clinical)	Various	14.28 years (1.38)	46.7	DERS	91.16 (22.43)	3.8	CPSS 15.7 (11.35)	–	91
Zajac et al. [91]	118	Child advocacy center (community)	Sexual abuse (interpersonal)	11.57 years (2.69)	85.6	TSCC[b]	7.72 (6.08)	2.9	TSCC[a] 10.43 (6.27)	–	90

Studies included in Fig. 1 of Online Resource 2 in bold

PTSD post-traumatic stress disorder, *sd* standard deviation, *DERS* Difficulties in Emotion Regulation Scale, *SCARED-R* Screen for Child Anxiety-Related Emotional Disorders-Revised (PTSD subscale), *PTSD-RI* Post-Traumatic Stress Disorder Reaction Index, *TSCC[c]* Trauma Symptom Checklist for Children (PTDS subscale), *TSCC[b]* Trauma Symptom Checklist for Children (anger subscale), *CPSS* Child PTSD Symptoms Scale, *NMR* Negative Mood Regulation Scale, *CAPS-CA* Clinician Administered PTSD Scale-child and adolescent version, *TSCYC[c]* Trauma Symptom Checklist for Young Children (caretaker-reported PTSD subscale), *STAXI* State–Trait Anger Expression Inventory (anger expression subscale), *ENRS* Emotional Numbing And Reactivity Scale (numbing of anger subscale), *NAS* Novaco Anger Scale, *K-SADS-PL* Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime version, *TDGS* Traumatic Dissociation and Grief Scale, *CPTSD-RI* Child PTSD-Reaction Index, *CEMS* Children Emotion Management Scale, *CRIES* Children's Revised Impact of Event Scale, *ADI-ED* Abbreviated Dysregulation Inventory-Affective Dysregulation Subscale, *RI* Reaction Index for children, *PSS-SR* PTSD Symptom Scale-Self Report, *BYI-G* Beck Anger Inventory for Youth, *K-SADS* Schedule for Affective Disorders and Schizophrenia for School-Age Children, *BASC-PRS* Behavior Assessment System for Children–Parent Report Scale, *CPTSD-I* Children's PTSD Inventory, *ADIS-C* Anxiety Disorders Interview Schedule-Children's version, *CAPS-CA* Clinician Administered PTSD Scale for Children and Adolescents

✤Diagnostic measure based on DSM criteria (Diagnostic And Statistical Manual of Mental Disorders)

type of trauma experienced or whether they were survivors from the general population or youth who seek help from medical services. Out of the 21 studies that we meta-analyzed, 7 (33.3%) were of non-interpersonal trauma survivors, 5 (23.8%) were of interpersonal trauma survivors and 9 (42.9%) were of survivors exposed to a variety of trauma types. The mean survivors' age was 13.8 years (2.76). Two of the studies recruited only females and one study only males, and for the remaining studies the percentage of females ranged from 27.36 to 75%. We included gender, age, type of trauma and source of recruitment as predictors in a meta-regression to see if the inclusion of these covariates affected the pooled effect size between emotion regulation difficulties and post-traumatic stress symptoms. The results were non-significant, $F(4,15) = 1.08$, $p = 0.403$, $I^2 = 94.72\%$, indicating that the relationship between emotion regulation difficulties and post-traumatic stress symptoms in traumatized youth does not seem to depend on the age, gender, type of trauma or source of recruitment of the survivors. However, the high heterogeneity of the pooled studies limits the interpretation of these results.

Finally, as we could only find 21 studies that reported an effect size appropriate for meta-analysis, we tested for publication bias (e.g., significant findings are more likely to be published). We examined whether there was asymmetry in funnel plots and calculated the Egger's coefficient, and we could not find evidence of publication bias (bias = 0.12, $p = 0.904$). A more detailed description of examination of publication bias and funnel plots are provided in Online Resource 1. Also, as most of the individual effect estimates of the meta-analysis were above zero, any effect of publication bias would be to inflate the estimate rather than to lead to an incorrect conclusion about the existence of an effect. It is important to note that the results of these tests should be taken carefully, as publication bias is only one of the many sources of asymmetry found in funnel plots [53, 54].

Emotion regulation difficulties and PTSD treatment

We found 12 studies evaluating changes in emotion regulation in relation to different PTSD treatment modalities. Most studies (7 out of 12) were uncontrolled pre–post-treatment trials. Some were based on trauma-focused CBT [55–57], while others applied sequenced-based therapies that also included enhancement of specific emotion regulation strategies [58–60]. Studies from both approaches demonstrated improvements in emotion regulation and PTSD symptoms, but the absence of a control group in the studies limited interpretation of their results and the comparison between the effect sizes of the interventions.

We only found three studies with more robust methodological designs, a randomized control trial [61], a single case across time and setting experimental design [62] and

Table 2 Characteristics of studies correlating post-traumatic and emotion regulation difficulties symptoms included in the meta-analysis
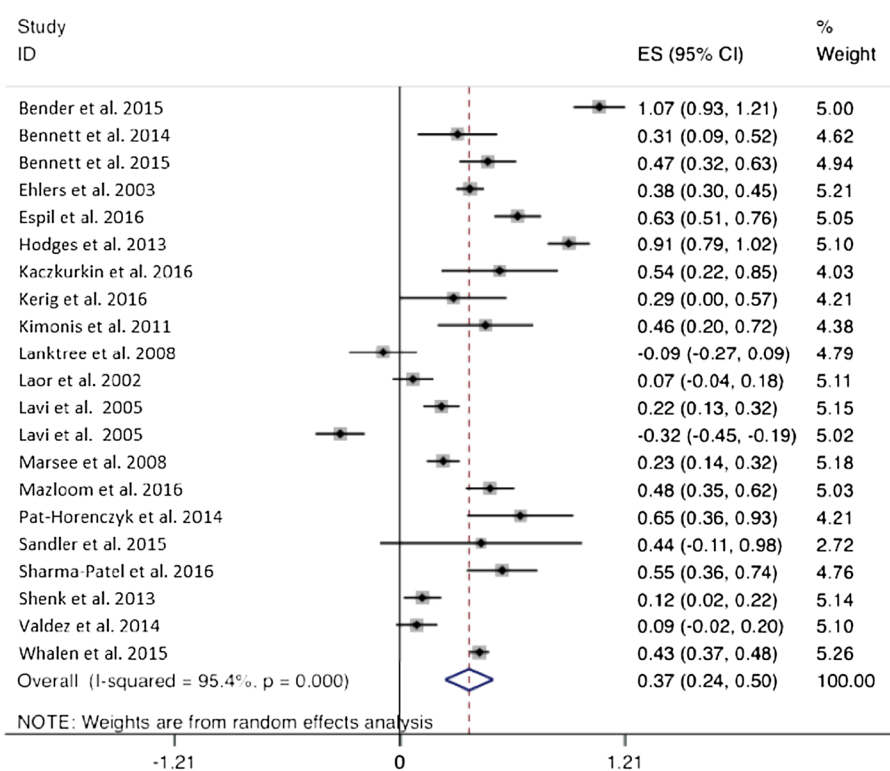
Study	N	Sample type	Trauma type	Age years (sd)	Sex (% females)	PTSD symptoms tool	Emotion regulation difficulties tool	Effect size (r)	Quality score rater1–rater2 (%)
Bender et al. [76]	16	Children in specialized anxiety clinic (clinical)	Various	10.38 years (1.54)	50	SCARED-R	DERS	0.41	70–86
Bennett et al. [92]	1363	Juvenile justice-involved adolescents (community)	Various	15.56 years (1.41)	27.36	PTSD-RI	MAYSI-2	0.403	91–91
Bennett et al. [77]	225	Juvenile detention center (community)	Various	16.23 years (1.19)	36.88	PTSD-RI	DERS	0.45	91–95
Ehlers et al. [42]	86	Children in emergency department (clinical)	Road traffic accident (non-interpersonal)	12.3 years (2.86)	45	IES PTSD-RI	Single question	0.3	95–91
Espil et al. [78]	50	Adolescents in acute psychiatric hospital (clinical)	Various	15.1 years (1.4)	52	CPSS	DERS	0.57	91–82
Hodges et al. [79]	318	Children in specialized trauma treatment centers (clinical)	Sexual abuse, physical abuse, neglect (interpersonal)	9.8 years (1.5)	67.61	TSCC[a] TSCYC[c]	TSCC[b]	0.07	86–91
Kaczkurkin et al. [75]	61	Adolescents in a sexual assault crisis center for PTSD treatment (clinical)	Sexual abuse or assault (interpersonal)	15.3 years (1.52)	100	CPSS-I	NMR	0.43	92–92
Kerig et al. [80]	221	Juvenile detention center (community)	Various	15.98 years (1.25)	30.77	PTSD-RI	ENRS	− 0.31	95–91
Kimonis et al. [81]	373	Juvenile detention center (community)	Various	16.43 years (0.8)	0	K-SADS	NAS	0.12	95–95
Lanktree et al. [93]	310	Children in specialized trauma treatment centers (clinical)	Various	9.7 years (1.5)	67.1	TSCC[a]	TSCYC[d]	0.09	95–100
Laor et al. [47]	202	Displaced homeless children (community)	Earthquake (non-interpersonal)	8.2 years (1.3)	56	PTSD-RI	TDGS	0.79	59–77
Lavi et al. [41]	245	High school adolescents (community)	Terror-related traumatic events (non-interpersonal)	13.52 years (0.73)	54	TSCC[a]	TSCC[b]	0.56	77–73

Table 2 (continued)

Study	N	Sample type	Trauma type	Age years (sd)	Sex (% females)	PTSD symptoms tool	Emotion regulation difficulties tool	Effect size (r)	Quality score rater1–rater2 (%)
Lavi et al. [41]	300	High school students (community)	Terror-related traumatic events (non-interpersonal)	14.75 years (0.42)	56	TSCC[a]	TSCC[b]	0.72	77–73
Marsee et al. [84]	166	High school students (community)	Hurricane (non-interpersonal)	14.97 years (1.1)	61	RI	ADI-ED	0.44	86–82
Mazloom et al. [85]	678	High school students (community)	Earthquake (non-interpersonal)	15.81 years	54.1	PSS-SR	DERS	0.36	91–91
Pat-Horenczyk et al. [94]	482	431 mother–child dyads (community)	Various	16.29 years (0.7)	47.7	PTSD-RI	CERQ-S	0.229	82–77
Sandler et al. [88]	42	Children in specialized PTSD treatment center (clinical)	War (interpersonal)	10.51 years (2.99)	67	K-SADS	NMR	0.49	59–64
Sharma-Patel et al. [74]	118	Youth in PTSD treatment center (clinical)	Child sexual abuse, peer sexual assault, physical abuse, domestic violence (interpersonal)	11.02 years	75	CPSS	BASC-PRS	− 0.09	82–86
Shenk et al. [95]	50	Maltreated adolescents (unknown)	Sexual abuse, physical abuse, neglect (interpersonal)	16.75 years (1.11)	100	CTI	DERS	0.28	100–100
Valdez et al. [96]	403	Foster youth (community)	Child maltreatment (interpersonal)	17 years (0.15)	57	DIS-IV	IASC-AD	0.22	100–95
Whalen et al. [90]	109	Adolescents in a residential psychiatric treatment facility (clinical)	Various	14.28 years (1.38)	46.7	CPSS	DERS	0.5	91–91

PTSD post-traumatic stress disorder, *sd* standard deviation, *PTSD-RI* Post-Traumatic Stress Disorder Reaction Index, *TDGS* Traumatic Dissociation and Grief Scale, *IES* Impact of Event Scale, *RI* Reaction Index exposure, *ADI-ED* Abbreviated Dysregulation Inventory-Affective Dysregulation Subscale, *PSS-SR* PTSD Symptom Scale-Self Report, *DERS* Difficulties in Emotion Regulation Scale, *TSCC^a* trauma Symptom Checklist for Children (PTDS subscale), *TSCC^b* Trauma Symptom Checklist for Children (anger subscale), *K-SADS* Schedule for Affective Disorders and Schizophrenia for School-Age Children, *NMR* Negative Mood Regulation Scale, *CTI* the Comprehensive Trauma Interview, *CPSS-I* the Child PTSD Symptom Scale-Interview, *CPSS* Child PTSD Symptoms Scale, *BASC-PRS* Behavior Assessment System for Children–Parent Report Scale, *TSCYC^c* Trauma Symptom Checklist for Young Children (caretaker-reported PTSD subscale), *DIS-IV* Diagnostic Interview Schedule-version IV, *IASC-AD* Inventory of Altered Self-Capacities-Affect Dysregulation Subscale, *ENRS* Emotional Numbing and Reactivity Scale (numbing of anger subscale), *CERQ-S* Cognitive-Emotion Regulation Questionnaire (short), *SCARED-R* Screen for Child Anxiety-Related Emotional Disorders-Revised (PTSD subscale), *NAS* Novaco Anger Scale, *TSCYC^d* Trauma Symptom Checklist for Young Children (caretaker-reported anger/aggression subscale), *MAYSI-2* the Massachusetts Youth Screening Instrument—Second Version (anger-irritability subscale)

Fig. 2 Forest plot of the 21 studies included in the meta-analysis of the association between emotion regulation difficulties and post-traumatic stress symptoms

Study ID	ES (95% CI)	% Weight
Bender et al. 2015	1.07 (0.93, 1.21)	5.00
Bennett et al. 2014	0.31 (0.09, 0.52)	4.62
Bennett et al. 2015	0.47 (0.32, 0.63)	4.94
Ehlers et al. 2003	0.38 (0.30, 0.45)	5.21
Espil et al. 2016	0.63 (0.51, 0.76)	5.05
Hodges et al. 2013	0.91 (0.79, 1.02)	5.10
Kaczkurkin et al. 2016	0.54 (0.22, 0.85)	4.03
Kerig et al. 2016	0.29 (0.00, 0.57)	4.21
Kimonis et al. 2011	0.46 (0.20, 0.72)	4.38
Lanktree et al. 2008	-0.09 (-0.27, 0.09)	4.79
Laor et al. 2002	0.07 (-0.04, 0.18)	5.11
Lavi et al. 2005	0.22 (0.13, 0.32)	5.15
Lavi et al. 2005	-0.32 (-0.45, -0.19)	5.02
Marsee et al. 2008	0.23 (0.14, 0.32)	5.18
Mazloom et al. 2016	0.48 (0.35, 0.62)	5.03
Pat-Horenczyk et al. 2014	0.65 (0.36, 0.93)	4.21
Sandler et al. 2015	0.44 (-0.11, 0.98)	2.72
Sharma-Patel et al. 2016	0.55 (0.36, 0.74)	4.76
Shenk et al. 2013	0.12 (0.02, 0.22)	5.14
Valdez et al. 2014	0.09 (-0.02, 0.20)	5.10
Whalen et al. 2015	0.43 (0.37, 0.48)	5.26
Overall (I-squared = 95.4%, p = 0.000)	0.37 (0.24, 0.50)	100.00

NOTE: Weights are from random effects analysis

a randomized trial using enhanced treatment as usual as a control group [63]. The first two studies showed that anger and emotion regulation improved with treatments that were based on trauma-focused CBT. These interventions included some elements of anger and emotion regulation, but these were not the focus of the treatment and were not sequentially designed within an initial stabilization phase. However, Ford et al. [63] did not find significant changes in emotion regulation in adolescents that were treated with a CBT intervention based on a sequential skill set designed to enhance emotion regulation without trauma memory processing (TARGET: Trauma Emotion regulation Guide for Education and Therapy).

Therefore whether improving emotion regulation skills in the early stages of PTSD therapy is necessary is still unclear, not only in adult patients but also in children and adolescents.

Discussion

Given the wide variety of emotion regulation definitions and measurement tools found in our study of trauma-exposed youth, clinicians and researchers might firstly be interested in knowing how to measure emotion regulation difficulties to assess and track changes in patients' symptom levels and design their research projects. In view of the lack of a gold standard to assess emotion regulation problems, one relevant

focus for future research would be to create developmentally adapted instruments and procedures that validly and reliably assess emotion regulation broadly. This could be done by combining the scales that have shown the strongest psychometric properties using factor analyses and validating the new tool against external criteria. This approach would still be limited by recall bias, which could be avoided by focusing research on measuring real-time experiences of affect change (e.g., Ecological Momentary Assessment). As childhood and adolescence are considered key developmental periods for emotion regulation, developing a gold standard measure developmentally adapted to young populations would be of paramount usefulness.

Once a reliable and valid measure to assess emotion regulation in young populations is available, an important initial step would be to describe the prevalence of emotion regulation difficulties in a representative community sample of traumatized children and adolescents. There are no epidemiological studies addressing this issue so far.

Our meta-analysis showed a strong positive association between emotion regulation difficulties and post-traumatic stress symptoms in children and adolescents ($r = 0.447$; $k = 6$; 95% CI 0.359–0.535). The effect size is in the medium range and slightly smaller than that found for children's negative appraisals of trauma and post-traumatic symptoms ($r = 0.63$; 95% CI 0.58–0.68) [64]. Yet, when interpreting such effects, the size of the effect is only part of the consideration. The nature of the problem (e.g., in medicine

effect sizes for death as an outcome as opposed to days off work) must also be taken into account [65]. Given that the consequences of emotion dysregulation can be dire [7, 15, 16], ranging from increased burden of illness to aggression toward self and others, it is important that its effect sizes are interpreted accordingly.

Our results also provided preliminary evidence that youth who develop PTSD are more likely to report emotion regulation difficulties than those trauma-exposed youth who do not develop the disorder. However, there is a paucity of studies with the appropriate case–control design to answer this question. Thus, future research projects should be designed as case–control studies comparing the rates of emotion regulation difficulties between trauma-exposed youth with and without PTSD. Answering this question would expand our results that suggested a large association between post-traumatic stress symptoms and emotion regulation difficulties. As emotion regulation difficulties are also known to be associated with a wide range of internalizing and external-izing disorders in youth, it would be interesting to control for the presence of comorbidity to clarify how much of this association would be specific to PTSD. Future studies will need to examine whether emotion dysregulation arises as a consequence of core traumatic symptoms (e.g., reliving of trauma) or whether it is a generalized feature.

What is still under debate is whether the co-occurrence of these symptom domains could help clinicians in classifying victims in different groups, either by their level of PTSD severity or as a function of PTSD and CPTSD diagnostic categories. Our review did not seek to directly address this question. Our finding that emotion dysregulation is relatively common in young people with (vs without) PTSD symptoms is in principle consistent with both a severity account (emotion dysregulation occurs in more severe forms of PTSD) and a categorical account (emotional dysregulation occurs in CPTSD). However, we did not find that trauma type modi-fied the relationship between PTSD and emotional dysregu-lation, and many of our reviewed studies included young people who had been exposed to single-event trauma. This implies that emotion dysregulation does not occur only in CPTSD.

Direct tests of whether emotion regulation difficulties are a function of PTSD severity or part of a distinct nosological entity would require a different approach to study design and analysis. A recent review of such approaches with adults [66], concludes that there is general support for the distinc-tion between PTSD and CPTSD, but also notes that data about children and young people are lacking. A recent latent class analysis among clinically referred children [67] found that PTSD and CPTSD were empirically distinguishable. Further work is needed.

Our results did not suggest that age, gender, type of trauma or source of recruitment significantly changed the strength of the relationship between emotion regulation problems and post-traumatic symptoms. However, the high variability between studies did not allow us to draw robust conclusions. Given that these factors have shown to be of importance in studies with adult samples, future research projects should take them into account when studying emo-tion regulation difficulties in traumatized youth, to clarify which risk factors predict the development of emotion regu-lation difficulties in youth exposed to trauma.

With regard to the limitations of this study, even if our search strategy were broad, it did not include the PILOTS (Published International Literature on Traumatic Stress), potentially overlooking other relevant studies. Also, due to the lack of longitudinal primary studies, the analysis was correlational, limiting our ability to draw casual inferences.

Finally, beyond their cross-sectional association with PTSD symptoms, emotion regulation difficulties have been shown to be both a predisposing factor and a consequence of post-traumatic stress symptoms, increasing the risk of symptom persistence over time [68]. They have also been found to be a factor associated with sexual revictimization [69] and risky behaviors such as self-harm [70] or drug use [71]. These longitudinal studies have only been applied to adult clinical or university samples, and after our sys-tematic search we could only find one study in youth that measured emotion regulation difficulties and post-traumatic symptoms over time. Therefore, longitudinal studies in traumatized young clinical samples looking at how emo-tion regulation difficulties predict the onset, severity, persis-tence of post-traumatic symptoms and risky behaviors after a traumatic event are needed. The lack of such data limits causal inferences. To determine a causal relationship, all variables should be collected before and after the traumatic event. Due to the unpredictability of traumatic events, one way to look at this would be to follow cohorts of children throughout their childhood and adolescence screening for emotion regulation difficulties and exposure to trauma in each follow-up time point. Few longitudinal cohort stud-ies following young survivors after a traumatic event have been conducted, and they usually focus on the development of post-traumatic, anxiety or depressive symptoms [72, 73] but not on emotion regulation. Shedding light on this would allow us to get a better understanding of the possible role of emotion regulation difficulties as a predisposing factor for future revictimization, as sequelae of trauma or both.

Finally, future research should focus on increasing the evidence on how to best treat children and adolescents that seek help in clinics for their post-traumatic stress symptoms, and also report significant difficulties in regulating their emotions. To guide clinicians toward the best treatments for their patients, and to effectively help children and ado-lescents, randomized controlled trials that include emotion regulation as study outcome are needed. It should also be

studied if difficulties in emotion regulation are a moderator of PTSD improvement, as high baseline levels of anger or emotion dysregulation did not seem to modify the efficacy of conventional PTSD trauma-exposure treatments for youth, but this has not been tested in controlled studies [74, 75]. Improving the evidence in all the above-mentioned aspects would definitely have an impact on improving the quality and effectiveness of the services provided in clinics for such vulnerable young traumatized survivors.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

References

1. McLaughlin KA, Koenen KC, Hill ED, Petukhova M, Sampson NA, Zaslavsky AM, Kessler RC (2013) Trauma exposure and posttraumatic stress disorder in a national sample of adolescents. J Am Acad Child Adolesc Psychiatry 52(8):815–830. https://doi.org/10.1016/j.jaac.2013.05.011

2. Copeland WE, Keeler G, Angold A, Costello EJ (2007) Traumatic events and posttraumatic stress in childhood. Arch Gen Psychiatry 64(5):577–584. https://doi.org/10.1001/archpsyc.64.5.577

3. Stevens NR, Gerhart J, Goldsmith RE, Heath NM, Chesney SA, Hobfoll SE (2013) Emotion regulation difficulties, low social support, and interpersonal violence mediate the link between childhood abuse and posttraumatic stress symptoms. Behav Ther 44(1):152–161

4. Badour CL, Feldner MT (2013) Trauma-related reactivity and regulation of emotion: associations with posttraumatic stress symptoms. J Behav Ther Exp Psychiatry 44(1):69–76. https://doi.org/10.1016/j.jbtep.2012.07.007

5. Tull MT, Barrett HM, McMillan ES, Roemer L (2007) A preliminary investigation of the relationship between emotion regulation difficulties and posttraumatic stress symptoms. Behav Ther 38(3):303–313

6. Lilly MM, London MJ, Bridgett DJ (2014) Using SEM to examine emotion regulation and revictimization in predicting PTSD symptoms among childhood abuse survivors. Psychol Trauma 6(6):644–651

7. Stringaris A, Goodman R (2009) Mood lability and psychopathology in youth. Psychol Med 39(8):1237–1245. https://doi.org/10.1017/S0033291708004662

8. Wakschlag LS, Briggs-Gowan MJ, Carter AS, Hill C, Danis B, Keenan K, McCarthy KJ, Leventhal BL (2007) A developmental framework for distinguishing disruptive behavior from normative misbehavior in preschool children. J Child Psychol Psychiatry 48(10):976–987. https://doi.org/10.1111/j.1469-7610.2007.01786.x

9. De Jongh A, Resick PA, Zoellner LA, van Minnen A, Lee CW, Monson CM, Foa EB, Wheeler K, Broeke ET, Feeny N, Rauch SA, Chard KM, Mueser KT, Sloan DM, van der Gaag M, Rothbaum BO, Neuner F, de Roos C, Hehenkamp LM, Rosner R, Bicanic IA (2016) Critical analysis of the current treatment guidelines for complex PTSD in adults. Depress Anxiety 33(5):359–369. https://doi.org/10.1002/da.22469

10. Mikita N, Stringaris A (2013) Mood dysregulation. Eur Child Adolesc Psychiatry 22(Suppl 1):S11–S16. https://doi.org/10.1007/s00787-012-0355-9

11. Vidal-Ribas P, Brotman MA, Valdivieso I, Leibenluft E, Stringaris A (2016) The status of irritability in psychiatry: a conceptual and quantitative review. J Am Acad Child Adolesc Psychiatry 55(7):556–570. https://doi.org/10.1016/j.jaac.2016.04.014

12. Marwaha S, He Z, Broome M, Singh SP, Scott J, Eyden J, Wolke D (2014) How is affective instability defined and measured? A systematic review. Psychol Med 44(9):1793–1808. https://doi.org/10.1017/S0033291713002407

13. Kochanska G, Coy KC, Murray KT (2001) The development of self-regulation in the first four years of life. Child Dev 72(4):1091–1111

14. Spear LP (2009) Heightened stress responsivity and emotional reactivity during pubertal maturation: implications for psychopathology. Dev Psychopathol 21(1):87–97. https://doi.org/10.1017/S0954579409000066

15. Shaw P, Stringaris A, Nigg J, Leibenluft E (2014) Emotion dysregulation in attention deficit hyperactivity disorder. Am J Psychiatry 171(3):276–293. https://doi.org/10.1176/appi.ajp.2013.13070966

16. Stringaris A, Taylor E (2015) Disruptive mood. Oxford University Press, Oxford

17. Smith GE (1918) Shell Shock and its lessons. Longmans, Green & co., Harlow

18. Friedman MJ (2013) Finalizing PTSD in DSM-5: getting here from there and where to go next. J Trauma Stress 26(5):548–556. https://doi.org/10.1002/jts.21840

19. Maercker A, Brewin CR, Bryant RA, Cloitre M, Reed GM, van Ommeren M, Humayun A, Jones LM, Kagee A, Llosa AE, Rousseau C, Somasundaram DJ, Souza R, Suzuki Y, Weissbecker I, Wessely SC, First MB, Saxena S (2013) Proposals for mental disorders specifically associated with stress in the international classification of diseases-11. Lancet 381(9878):1683–1685. https://doi.org/10.1016/S0140-6736(12)62191-6

20. Dalgleish T, Power MJ (2004) Emotion-specific and emotion-non-specific components of posttraumatic stress disorder (PTSD): implications for a taxonomy of related psychopathology. Behav Res Ther 42(9):1069–1088. https://doi.org/10.1016/j.brat.2004.05.001

21. Hyland P, Shevlin M, Brewin CR, Cloitre M, Downes AJ, Jumbe S, Karatzias T, Bisson JI, Roberts NP (2017) Validation of posttraumatic stress disorder (PTSD) and complex PTSD using the international trauma questionnaire. Acta Psychiatr Scand. https://doi.org/10.1111/acps.12771

22. Van der Kolk BA, Perry J, Herman JL (1991) Childhood origins of self-destructive behavior. Am J Psychiatry 148(12):1665–1671

23. Cook A, Spinazzola J, Ford J, Lanktree C, Blaustein M, Cloitre M, DeRosa R, Hubbard R, Kagan R, Liautaud J, Mallah K, Olafson E, van der Kolk B (2005) Complex trauma in children and adolescents. Psychiatr Ann 35(5):390–398

24. Cloitre M, Garvert DW, Brewin CR, Bryant RA, Maercker A (2013) Evidence for proposed ICD-11 PTSD and complex PTSD: a latent profile analysis. Eur J Psychotraumatol. https://doi.org/10.3402/ejpt.v4i0.20706

25. Perkonigg A, Hoefler M, Cloitre M, Wittchen H-U, Trautmann S, Maercker A (2016) Evidence for two different ICD-11 posttraumatic stress disorders in a community sample of adolescents and young adults. Eur Arch Psychiatry Clin Neurosci 266(4):317–328. https://doi.org/10.1007/s00406-015-0639-4

26. Elklit A, Hyland P, Shevlin M (2014) Evidence of symptom profiles consistent with posttraumatic stress disorder and complex posttraumatic stress disorder in different trauma samples. Eur J Psychotraumatol. https://doi.org/10.3402/ejpt.v5.24221

27. Seligowski AV, Lee DJ, Bardeen JR, Orcutt HK (2015) Emotion regulation and posttraumatic stress symptoms: a meta-analysis. Cogn Behav Ther 44(2):87–102. https://doi.org/10.1080/16506073.2014.980753

28. Orth U, Wieland E (2006) Anger, hostility, and posttraumatic stress disorder in trauma-exposed adults: a meta-analysis. J Consult Clin Psychol 74(4):698–706. https://doi.org/10.1037/0022-006X.74.4.698

29. Olatunji BO, Ciesielski BG, Tolin DF (2010) Fear and loathing: a meta-analytic review of the specificity of anger in PTSD. Behav Ther 41(1):93–105. https://doi.org/10.1016/j.beth.2009.01.004

30. Novaco RW, Chemtob CM (2002) Anger and combat-related posttraumatic stress disorder. J Trauma Stress 15(2):123–132. https://doi.org/10.1023/A:1014855924072

31. Orth U, Cahill SP, Foa EB, Maercker A (2008) Anger and posttraumatic stress disorder symptoms in crime victims: a longitudinal analysis. J Consult Clin Psychol 76(2):208–218

32. Cloitre M, Courtois CA, Charuvastra A, Carapezza R, Stolbach BC, Green BL (2011) Treatment of complex PTSD: results of the ISTSS expert clinician survey on best practices. J Trauma Stress 24(6):615–627. https://doi.org/10.1002/jts.20697

33. Ford JD, Kidd P (1998) Early childhood trauma and disorders of extreme stress as predictors of treatment outcome with chronic posttraumatic stress disorder. J Trauma Stress 11(4):743–761. https://doi.org/10.1023/A:1024497400891

34. Gillies D, Maiocchi L, Bhandari AP, Taylor F, Gray C, O'Brien L (2016) Psychological therapies for children and adolescents exposed to trauma. Cochrane Database Syst Rev 10:012371. https://doi.org/10.1002/14651858.cd012371

35. Gutermann J, Schreiber F, Matulis S, Schwartzkopff L, Deppe J, Steil R (2016) Psychological treatments for symptoms of posttraumatic stress disorder in children, adolescents, and young adults: a meta-analysis. Clin Child Fam Psychol Rev 19(2):77–93. https://doi.org/10.1007/s10567-016-0202-5

36. Forman-Hoffman VL, Zolotor AJ, McKeeman JL, Blanco R, Knauer SR, Lloyd SW, Fraser JG, Viswanathan M (2013) Comparative effectiveness of interventions for children exposed to nonrelational traumatic events. Pediatrics 131(3):526–539. https://doi.org/10.1542/peds.2012-3846

37. Taussig HN, Culhane SE (2010) Impact of a mentoring and skills group program on mental health outcomes for maltreated children in foster care. Arch Pediatr Adolesc Med 164(8):739–746. https://doi.org/10.1001/archpediatrics.2010.124

38. Cohen JA, Mannarino AP, Knudsen K (2005) Treating sexually abused children: 1 year follow-up of a randomized controlled trial. Child Abuse Negl 29(2):135–145. https://doi.org/10.1016/j.chiabu.2004.12.005

39. Diehle J, Opmeer BC, Boer F, Mannarino AP, Lindauer RJ (2015) Trauma-focused cognitive behavioral therapy or eye movement desensitization and reprocessing: what works in children with posttraumatic stress symptoms? A randomized controlled trial. Eur Child Adolesc Psychiatry 24(2):227–236. https://doi.org/10.1007/s00787-014-0572-5

40. Kmet LM, Lee RC, Cook LS (2004). Standard quality assessment criteria for evaluating primary research papers from a variety of fields. https://www.biomedcentral.com/content/supplementary/1471-2393-14-52-s2.pdf. Accessed 3 Oct 2017

41. Lavi T, Solomon Z (2005) Palestinian youth of the intifada: PTSD and future orientation. J Am Acad Child Adolesc Psychiatry 44(11):1176–1183

42. Ehlers A, Mayou RA, Bryant B (2003) Cognitive predictors of posttraumatic stress disorder in children: results of a prospective longitudinal study. Behav Res Ther 41(1):1–10

43. Field A (2013) Discovering statistics using IBM SPSS statistics. Sage, Newcastle upon Tyne

44. Higgins JP, Thompson SG, Deeks JJ, Altman DG (2003) Measuring inconsistency in meta-analyses. BMJ 327(7414):557–560. https://doi.org/10.1136/bmj.327.7414.557

45. Grissom RJ, Kim J (2005) Effect sizes for research: a broad practical approach. Lawrence Erlbaum Associates Publishers, New Jersey

46. Cooper H (2009) The handbook of research synthesis and meta-analysis, 2nd edn. The Russell Sage Foundation, New York

47. Laor N, Wolmer L, Kora M, Yucel D, Spirman S, Yazgan Y (2002) Posttraumatic, dissociative and grief symptoms in Turkish children exposed to the 1999 earthquakes. J Nerv Mental Dis 190(12):824–832

48. Martinez W, Polo AJ, Zelic KJ (2014) Symptom variation on the trauma symptom checklist for children: a within-scale meta-analytic review. J Trauma Stress 27(6):655–663

49. Pelaprat M (2010) Complex trauma among court-involved youth. Dissertation, Massachusetts School of Professional Psychology

50. Stallard P, Velleman R, Langsford J, Baldwin S (2001) Coping and psychological distress in children involved in road traffic accidents. Br J Clin Psychol 40(2):197–208

51. Plomin R, Haworth CM, Davis OS (2009) Common disorders are quantitative traits. Nat Rev Genet 10(12):872–878. https://doi.org/10.1038/nrg2670

52. Stringaris A (2015) Emotion regulation and emotional disorders: conceptual issues for clinicians and neuroscientists. In: Thapar A et al (eds) Rutter's child and adolescent psychiatry, 6th edn. Wiley-Blackwell, New Jersey, pp 53–64

53. Egger M, Davey Smith G, Schneider M, Minder C (1997) Bias in meta-analysis detected by a simple, graphical test. BMJ 315(7109):629–634

54. Sterne JA, Sutton AJ, Ioannidis JP, Terrin N, Jones DR, Lau J, Carpenter J, Rücker G, Harbord RM, Schmid CH, Tetzlaff J, Deeks JJ, Peters J, Macaskill P, Schwarzer G, Duval S, Altman DG, Moher D, Higgins JP (2011) Recommendations for examining and interpreting funnel plot asymmetry in meta-analyses of randomised controlled trials. BMJ 343:d4002

55. Ovaert LB, Cashel ML, Sewell KW (2003) Structured group therapy for posttraumatic stress disorder in incarcerated male juveniles. Am J Orthopsychiatry 73(3):294–301

56. Ovaert LB (1998) Posttraumatic stress disorder in adolescents with conduct disorder: pre- and post-treatment comparison of trauma types. Dissertation, University of North Texas

57. Bicanic I, de Roos C, van Wesel F, Sinnema G, van de Putte E (2014) Rape-related symptoms in adolescents: short- and long-term outcome after cognitive behavior group therapy. Eur J Psychotraumatol 5(1):22969

58. Olafson E, Boat BW, Putnam KT, Thieken L, Marrow MT, Putnam FW (2016) Implementing trauma and grief component therapy for adolescents and think trauma for traumatized youth in secure juvenile justice settings. J Interpers Violence. https://doi.org/10.1177/0886260516628287

59. Dauber S, Lotsos K, Pulido ML (2015) Treatment of complex trauma on the front lines: a preliminary look at child outcomes in an agency sample. Child Adolesc Soc Work J 32(6):529–543

60. Kagan R, Spinazzola J (2013) Real Life Heroes in residential treatment: implementation of an integrated model of trauma and resiliency-focused treatment for children and adolescents with complex PTSD. J Fam Violence 28(7):705–715

61. Betancourt TS, McBain R, Newnham EA, Akinsulure-Smith AM, Brennan RT, Weisz JR, Hansen NB (2014) A behavioral intervention for war-affected youth in Sierra Leone: a randomized controlled trial. J Am Acad Child Adolesc Psychiatry 53(12):1288–1297

62. March JS, Amaya-Jackson L, Murray MC, Schulte A (1998) Cognitive-behavioral psychotherapy for children and adolescents

with posttraumatic stress disorder after a single-incident stressor. J Am Acad Child Adolesc Psychiatry 37(6):585–593

63. Ford JD, Steinberg KL, Hawke J, Levine J, Zhang W (2012) Randomized trial comparison of emotion regulation and relational psychotherapies for PTSD with girls involved in delinquency. J Clin Child Adolesc Psychol 41(1):27–37

64. Mitchell R, Brennan K, Curran D, Hanna D, Dyer KF (2017) A meta-analysis of the association between appraisals of trauma and posttraumatic stress in children and adolescents. J Trauma Stress 30(1):88–93. https://doi.org/10.1002/jts.22157

65. Leucht S, Hierl S, Kissling W, Dold M, Davis JM (2012) Putting the efficacy of psychiatric and general medicine medication into perspective: review of meta-analyses. Br J Psychiatry 200(2):97–106. https://doi.org/10.1192/bjp.bp.111.096594

66. Brewin CR, Cloitre M, Hyland P, Shevlin M, Maercker A, Bryant RA, Humayun A, Jones LM, Kagee A, Rousseau C, Somasundaram D, Suzuki Y, Wessely S, van Ommeren M, Reed GM (2017) A review of current evidence regarding the ICD-11 proposals for diagnosing PTSD and complex PTSD. Clin Psychol Rev 58:1–15. https://doi.org/10.1016/j.cpr.2017.09.001

67. Sachser C, Keller F, Goldbeck L (2017) Complex PTSD as proposed for ICD-11: validation of a new disorder in children and adolescents and their response to trauma-focused cognitive behavioral therapy. J Child Psychol Psychiatry 58(2):160–168. https://doi.org/10.1111/jcpp.12640

68. Bardeen JR, Kumpula MJ, Orcutt HK (2013) Emotion regulation difficulties as a prospective predictor of posttraumatic stress symptoms following a mass shooting. J Anxiety Disord 27(2):188–196

69. Messman-Moore TL, Walsh KL, DiLillo D (2010) Emotion dysregulation and risky sexual behavior in revictimization. Child Abuse Negl 34(12):967–976. https://doi.org/10.1016/j.chiabu.2010.06.004

70. Dixon-Gordon KL, Tull MT, Gratz KL (2014) Self-injurious behaviors in posttraumatic stress disorder: an examination of potential moderators. J Affect Disord 166:359–367

71. Tull MT, Bardeen JR, DiLillo D, Messman-Moore T, Gratz KL (2015) A prospective investigation of emotion dysregulation as a moderator of the relation between posttraumatic stress symptoms and substance use severity. J Anxiety Disord 29:52–60

72. Feiring C, Taska L, Lewis M (2002) Adjustment following sexual abuse discovery: the role of shame and attributional style. Dev Psychol 38(1):79–92

73. Mouilso ER, Calhoun KS, Gidycz CA (2011) Effects of participation in a sexual assault risk reduction program on psychological distress following revictimization. J Interpers Violence 26(4):769–788. https://doi.org/10.1177/0886260510365862

74. Sharma-Patel K, Brown EJ (2016) Emotion regulation and self blame as mediators and moderators of trauma-specific treatment. Psychol Violence 6(3):400–409

75. Kaczkurkin AN, Asnaani A, Zhong J, Foa EB (2016) The moderating effect of state anger on treatment outcome in female adolescents with PTSD. J Trauma Stress 29(4):325–331. https://doi.org/10.1002/jts.22116

76. Bender PK, Pons F, Harris PL, Esbjorn BH, Reinholdt-Dunne ML (2015) Emotion understanding in clinically anxious children: a preliminary investigation. Front Psychol 6:1916. https://doi.org/10.3389/fpsyg.2015.01916

77. Bennett DC, Modrowski CA, Kerig PK, Chaplo SD (2015) Investigating the dissociative subtype of posttraumatic stress disorder in a sample of traumatized detained youth. Psychol Trauma 7(5):465–472

78. Espil FM, Viana AG, Dixon LJ (2016) Post-traumatic stress disorder and depressive symptoms among inpatient adolescents: the underlying role of emotion regulation. Resid Treat Child Youth 33(1):51–68

79. Hodges M, Godbout N, Briere J, Lanktree C, Gilbert A, Kletzka NT (2013) Cumulative trauma and symptom complexity in children: a path analysis. Child Abuse Negl 37(11):891–898

80. Kerig PK, Bennett DC, Chaplo SD, Modrowski CA, McGee AB (2016) Numbing of positive, negative, and general emotions: associations with trauma exposure, posttraumatic stress, and depressive symptoms among justice-involved youth. J Trauma Stress 29(2):111–119

81. Kimonis ER, Ray JV, Branch JR, Cauffman E (2011) Anger mediates the relation between violence exposure and violence perpetration in incarcerated boys. Child Youth Care Forum 40(5):381–400

82. Lanktree CB, Briere J, Godbout N, Hodges M, Chen K, Trimm L, Adams B, Maida CA, Freed W (2012) Treating multitraumatized, socially marginalized children: results of a naturalistic treatment outcome study. J Aggress Maltreat Trauma 21(8):813–828

83. Ma EY, Li FW (2014) Developmental trauma and its correlates: a study of Chinese children with repeated familial physical and sexual abuse in Hong Kong. J Trauma Stress 27(4):454–460

84. Marsee MA (2008) Reactive aggression and posttraumatic stress in adolescents affected by Hurricane Katrina. J Clin Child Adolesc Psychol 37(3):519–529

85. Mazloom M, Yaghubi H, Mohammadkhani S (2016) Post-traumatic stress symptom, metacognition, emotional schema and emotion regulation: a structural equation model. Personal Individ Differ 88:94–98

86. Ovaert LB (1998) Posttraumatic stress disorder in adolescents with conduct disorder: pre- and post-treatment comparison of trauma types. Dissertation, University of North Texas

87. Runyon MK, Deblinger E, Schroeder CM (2009) Pilot evaluation of outcomes of combined parent–child cognitive-behavioral group therapy for families at risk for child physical abuse. Cogn Behav Pract 16(1):101–118

88. Sandler L, Sommerfeld E, Shoval G, Tsafrir S, Chemny A, Laor N, Zalsman G (2015) Effects of ethnicity on sub-clinical PTSD and depressive symptoms, following exposure to missile attacks in Israel—a pilot study. Int J Psychiatry Clin Pract 19(1):51–55

89. Wechsler-Zimring A, Kearney CA, Kaur H, Day T (2012) Posttraumatic stress disorder and removal from home as a primary, secondary, or disclaimed trauma in maltreated adolescents. J Fam Violence 27(8):813–818

90. Whalen DJ, Malkin ML, Freeman MJ, Young J, Gratz KL (2015) Brief report: borderline personality symptoms and perceived caregiver criticism in adolescents. J Adolesc 41:157–161

91. Zajac K, Ralston ME, Smith DW (2015) Maternal support following childhood sexual abuse: associations with children's adjustment post-disclosure and at 9-month follow-up. Child Abuse Negl 44:66–75

92. Bennett DC, Kerig PK, Chaplo SD, McGee AB, Baucom BR (2014) Validation of the five-factor model of PTSD symptom structure among delinquent youth. Psychol Trauma 6(4):438–447

93. Lanktree CB, Gilbert AM, Briere J, Taylor N, Chen K, Maida CA, Saltzman WR (2008) Multi-informant assessment of maltreated children: convergent and discriminant validity of the TSCC and TSCYC. Child Abuse Negl 32(6):621–625

94. Pat-Horenczyk R, Kenan AM, Achituv M, Bachar E (2014) Protective factors based model for screening for posttraumatic distress in adolescents. Child Youth Care Forum 43(3):339–351

95. Shenk CE, Putnam FW, Noll JG (2013) Predicting the accuracy of facial affect recognition: the interaction of child maltreatment and intellectual functioning. J Exp Child Psychol 114(2):229–242

96. Valdez CE, Bailey BE, Santuzzi AM, Lilly MM (2014) Trajectories of depressive symptoms in foster youth transitioning into adulthood: the roles of emotion dysregulation and PTSD. Child Maltreat 19(3–4):209–218