

Change in Post-Traumatic Cognitions Mediates Treatment Effects for Traumatized Youth—A Randomized Controlled Trial

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Posttraumatic stress symptoms (PTSS) are associated with serious impairments in psychological, social, and academic functioning in youth. The aim of this study was to investigate whether changes in posttraumatic cognitions mediate treatment effects. Participants were multitraumatized youth ($N = 156$, mean age = 15.1 years, range = 10–18; 79.5% girls) randomly assigned to receive trauma-focused cognitive-behavioral therapy (TF-CBT) or treatment-as-usual (TAU). Mixed-effects models were applied to investigate the impact of treatment conditions on posttraumatic cognitions. Mediation analyses were applied to examine whether changes in posttraumatic cognitions mediated the relationship between treatment conditions and outcome in posttraumatic stress symptoms, depressive symptoms, and general mental health. Participants receiving TF-CBT reported significantly lower levels of negative posttraumatic cognitions at the end of treatment compared to participants in TAU. Change in posttraumatic cognitions mediated the treatment effect difference found for PTSS. When the overall change in cognition was divided into early and late changes, it was only the late change that significantly mediated the PTSS treatment effect. A mediation effect of posttraumatic cognitions was also found for the treatment effect difference in depressive symptoms and in general mental health symptoms. Traumatized youth report having many negative posttraumatic cognitions and changes in negative cognitions plays a key role for treatment outcome.

Public Significance Statement

Many traumatized youth develop negative thoughts about the world and themselves that are associated with the development and maintenance of posttraumatic stress symptoms. This study shows that youth receiving trauma-focused cognitive-behavioral therapy report fewer negative thoughts at the end of treatment compared to youth receiving standard therapy and that this difference mediates the treatment outcome on posttraumatic stress symptoms and on symptoms of depression and general mental health problems as well. Addressing and altering these negative thoughts may be crucial to successful treatment.

Keywords: maladaptive appraisals, trauma-focused cognitive-behavioral therapy (TF-CBT), child trauma, posttraumatic stress, Children's Post-Traumatic Cognitions Inventory

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The psychotherapy development of the last years has generated several evidence-based therapies (EBTs) for youth, including treatments for youth exposed to potentially traumatizing events. Trauma-focused cognitive-behavioral therapy (TF-CBT) is currently one of the more studied trauma treatments for youth (Dorsey et al., 2017; Morina, Koerssen, & Pollet, 2016). There is, however, a lack of studies investigating potential treatment mechanisms in TF-CBT. Exposure to potentially traumatizing events is common in youth (Costello, Erkanli, Fairbank, & Angold, 2002; McLaughlin et al., 2013). Although many recover, a substantial number of youth will be at risk of developing posttraumatic stress symptoms (PTSS) that can severely impact emotional, academic, social, and later adult functioning (Alisic et al., 2014; Trickey, Siddaway, Meiser-Stedman, Serpell, & Field, 2012). Understanding how treatment may help these youth is therefore essential. No doubt understanding complex interpersonal processes and therapeutic change is never-ending. Research on therapy processes has nonetheless identified characteristics of the client, the therapist, and their relationship, as well as specific therapeutic interventions to predict outcome (see, e.g., Norcross & Lambert, 2011). The relative importance of these aspects, however, has been debated.

One concern in the psychotherapy research field has been that studies have not had comparable control groups, so that the role that specific interventions may play in treatment effects is not easily determined (Wampold et al., 1997). Many control conditions are not intended to be therapeutic (i.e., they are not bona fide treatments), making direct comparisons difficult and effects potentially overestimated. Furthermore, in some study designs the specific ingredients thought to be important to the active condition are purposely left out, at a disadvantage to the control condition (Wampold & Imel, 2015). One consequence is that one may be asking therapists to deliver a therapy they do not believe in, producing negative allegiance effects (Miller, Wampold, & Varhelyi, 2008; Wampold & Imel, 2015). It may be reasonable to assume that therapists who do not believe in the therapy they are asked to provide will be less invested in treatment delivery and may express less positive expectations for the outcome, thus inadvertently influencing the outcome negatively. Consequently, if one is going to study the relative importance of specific therapeutic ingredients over common ingredients, interventions compared should be bona fide treatments and allegiance factors should be taken into account.

In a meta-analysis on treatments for posttraumatic stress disorder (PTSD) in adults, Benish, Imel, and Wampold (2008) concluded that when trauma-focused therapies are compared to bona fide treatments, the efficacy of the trauma-focused treatments is diminished (see also Wampold et al., 2010, for a discussion). Although this claim has been challenged (Ehlers et al., 2010), Benish et al.'s (2008) meta-analysis lends support to the importance of the factors that are common across treatments, such as a strong therapeutic alliance. A comparable meta-analysis for youth trauma treatments is lacking. However, Spielmans, Gatlin, and McFall (2010) compared EBTs with bona fide usual care for youth suffering from a wide range of symptoms and concluded that when controlling for an array of confounding variables, the advantage of EBTs was small. In line with this, a current meta-analysis of youth studies showed that EBTs had the lowest effect sizes across studies when compared to usual care that included active treatment ingredients (Weisz et al., 2017). Also, Miller et al. (2008) found that

effect sizes in youth studies varied, providing evidence that some treatments may be more helpful than others, but this difference diminished when allegiance was controlled for. However, the number of studies comparing any two bona fide treatment approaches intended for children and adolescents have been few, making firm conclusions premature (Weisz et al., 2017).

Another concern in the psychotherapy field is related to the large number of studies showing that EBTs often do not outperform treatment-as-usual (TAU) when delivered in regular clinical practice. This has been demonstrated in several youth meta-analyses (see Kazdin, 2015; Spielmans et al., 2010; Weisz et al., 2013). In the prototypic randomized clinical trial, carefully selected therapists who receive extensive training and supervision deliver the treatment. They are often specialists in one treatment condition. The clients are often highly selected with low comorbidity, recruited through advertisements or from specialty clinics associated with a university or medical institution (Kazdin, 2015; Wampold & Imel, 2015; Weisz et al., 2013). To bring the field forward one must document that evidence based treatments also are useful when applied in regular clinical settings.

In this article, we aimed to understand more of what may lead to reductions in trauma-related symptoms in traumatized youth by comparing youth receiving trauma-focused cognitive-behavioral therapy (TF-CBT) with youth receiving bona fide treatment-as-usual (TAU) in regular mental health clinics. The analysis builds on results from a randomized controlled trial (RCT) showing that youth who received TF-CBT experienced significantly larger reductions on the primary outcome measure, PTSS, compared to the TAU group. Also, on the secondary outcome measures, depression and general mental health problems, participants in TF-CBT had larger symptom reductions than did participants in TAU, albeit both groups experienced improvements (Jensen et al., 2014). A strong alliance was predictive of reductions in PTSS for the TF-CBT group but not for the TAU group, although both groups reported similar alliance scores (Ormhaug, Jensen, Wentzel-Larsen, & Shirk, 2014). These results lend support to the claim that it may be the combination of a good alliance (i.e., a common factor) and specific interventions (i.e., specific factors) that leads to symptom reduction. Another study has documented that constructing a trauma narrative may be one important specific ingredient (Deblinger, Mannarino, Cohen, Runyon, & Steer, 2011). However, when analyzing the effect of narrative change in TF-CBT, we found that although youth in TF-CBT developed narratives that were more coherent and organized compared to baseline, these changes were not associated with changes in PTSS (Knutsen & Jensen, 2017).

In the current article we further untangle which factors may be important change mechanisms by studying whether changes in maladaptive cognitions mediate the effect of TF-CBT. We focus on changes in maladaptive cognitions because these are considered essential to the development and maintenance of posttraumatic stress in several information- and emotion-processing models (e.g., Ehlers & Clark, 2000; Foa & Kozak, 1986; Meiser-Stedman, 2002). According to these models, it is the person's appraisals of the trauma itself and its sequelae that maintain the PTSS. Misappraisals may be overgeneralizations of danger, exaggerated fear of recurrence of a new traumatic event, and/or mistaken thoughts about the causes of the trauma and the way the person reacted, often leading to feelings of guilt and shame. Regarding the se-

quelaes of trauma, misinterpretations of trauma symptoms can lead people to believe they are crazy, weak, helpless, or damaged. These negative cognitions may cause a range of unhelpful coping strategies such as avoidance and scanning the environment for possible danger, causing hypervigilance, rumination, and safety behaviors. In line with this, a recent study has shown that changes in trauma-related cognitions precedes changes in PTSS in an adult population, giving support to the claim that changes in cognitions may be the driving force in changing PTSS (Kleim et al., 2013).

Although the emotional and cognitive processing models are mostly tested in traumatized adults, there has been increasing evidence that unhelpful posttrauma coping strategies also contribute to the maintenance of PTSS in youth (Bryant, Salmon, Sinclair, & Davidson, 2007; Ehlers, Mayou, & Bryant, 2003; Hitchcock, Ellis, Williamson, & Nixon, 2015; McLean, Yeh, Rosenfield, & Foa, 2015; Meiser-Stedman, Dalgleish, Glucksman, Yule, & Smith, 2009; Stallard, 2003; Stallard & Smith, 2007; Udwin, Boyle, Yule, Bolton, & O’Ryan, 2000). A growing body of evidence has indicated that traumatized youth experience more negative cognitions compared to nontraumatized youth. This has been found in sexually abused (Mannarino & Cohen, 1996) and maltreated (Münzer, Ganser, & Goldbeck, 2017) youth, physically injured youth (Ehlers et al., 2003; Nixon et al., 2010), physically abused children (Kolko, Brown, & Berliner, 2002), youth injured from motor vehicle accidents (Meiser-Stedman, Dalgleish, et al., 2009), and youth subjected to psychological maltreatment (Leeson & Nixon, 2011). Thus, many trauma-focused interventions recommend addressing negative and maladaptive cognitions in their protocols.

Although studies have been limited in number, according to a meta-analysis, trauma-focused cognitive therapies do effectively reduce trauma-related cognitions—more so than do nontrauma-focused control conditions in adults (Diehle, Schmitt, Daams, Boer, & Lindauer, 2014). Because nearly all studies have been with adult populations, there is currently little knowledge about how trauma-related cognitions change in trauma therapy for youth and whether these changes are related to reductions in PTSS. To our knowledge, only two studies have examined whether changes in posttraumatic cognitions mediate treatment effects for youth with PTSS (McLean et al., 2015; Smith et al., 2007). Smith et al. (2007) showed that the effects of CBT were partially mediated by changes in posttraumatic cognitions in children who had experienced motor vehicle accidents, interpersonal violence, or witnessed violence, whereas McLean et al. (2015) found the same for a group of adolescent female sexual assault survivors receiving client-centered therapy or prolonged exposure therapy.

After several studies showed that exposure to traumatic events is associated with changes in cognitive appraisals and beliefs, the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013)* incorporated trauma-related cognitions as part of the PTSD diagnosis. Until recently, the diagnostic criteria for this diagnosis included three symptom clusters, namely reexperiencing the trauma, avoidance of trauma reminders, and hypervigilance. Negative changes in thoughts and mood are now included as a fourth symptom cluster. It has therefore become even more pertinent to know more about whether interventions may contribute to reducing posttraumatic cognitions.

So far, the literature has focused mainly on the relationship between cognitions and PTSS and less on other symptom groups. Because many traumatized youth develop not only PTSS but also severe symptoms of depression and a range of general mental health problems as well, examining whether changes in negative cognitions also mediates changes in these symptoms may be helpful to understand mechanisms of change. If changes in negative cognitions mediate changes in a range of mental health problems and not only PTSS, then this may indicate that changing negative cognitions is a general change mechanism for TF-CBT.

The aims of the current study were twofold. The first aim was to examine the impact of TF-CBT on posttraumatic cognitions relative to a bona fide control condition (i.e., TAU). Because TF-CBT specifically targets posttrauma cognitions, we hypothesized that TF-CBT would yield greater reductions in posttraumatic cognitions than would TAU. The second aim was to investigate whether posttraumatic cognitions mediate the relationship between treatment condition and PTSS, depressive symptoms, and symptoms of general mental health. For the primary outcome, PTSS, we also examined whether a potential mediator effect occurs early or late in treatment. Because studies have suggested that trauma-focused CBT interventions lead to larger reductions in trauma-related cognitions than do nontrauma-focused control conditions (Diehle et al., 2014; Smith et al., 2007), we hypothesized that the superior performance of TF-CBT compared to TAU would be mediated (i.e., explained) by differences in cognitive change.

Method

The difference in posttraumatic cognitions between TF-CBT and TAU over time were investigated with mixed-effects analyses. Mediation models (Preacher & Hayes, 2008) were tested to investigate the mediating effect of posttraumatic cognitions on changes in PTSS, depressive symptoms, and general mental health symptoms. In the mixed-effects analyses, we accounted for nesting of therapist level. Also, because the ability to form internal and stable cognitions has been found to increase with age (Salmon & Bryant, 2002), we controlled for youth age in all analytic models. All results in the study draw upon data from a randomized controlled trial conducted in community mental health clinics comparing TF-CBT with TAU. Previously published results showed TF-CBT to be more effective than TAU in reducing PTSS among youth with diverse traumatic experiences ($d = .51$), $t(154) = 3.30$, $p = .001$; (Jensen et al., 2014).

Participants

The sample comprised 156 youth between 10 and 18 years of age ($M = 15.1$ years, $SD = 2.2$; 79.5% girls), referred to one of eight community clinics. The majority of the children were ethnic Norwegian (73.7%; $n = 115$). Around half the sample lived most of the time or only with their mother (51.9%), and 22.4% lived with both parents. On average, participants reported having been exposed to 3.6 different types of traumatic events in their lifetime ($SD = 1.8$; range = 1–10). The most frequently reported traumatic events were sudden death or severe illness of a close person (60.9%), violence or threats of violence outside the family context (59.0%), physical abuse within the family (45.5%), witnessing

violence within the family (42.9%), witnessing violence outside the family (27.6%), and sexual abuse outside the family (27.6%). For a more detailed description of the sample, see Jensen et al. (2014).

Procedures

A total of 454 youth were screened for eligibility in the RCT using the Child Post-Traumatic Symptom Scale (CPSS; Foa, Johnson, Feeny, & Treadwell, 2001). To be eligible, the youth must have experienced at least one potentially traumatizing event that had occurred 4 or more weeks before study inclusion and have PTSS scores above cutoff (i.e., CPSS scores ≥ 15). The cutoff score of 15 was chosen because this has been suggested as an optimal indicator for clinically elevated PTSS (Kassam-Adams, Marsac, & Cirilli, 2010). Exclusion criteria were acute psychosis, acute suicidal behavior, or need of an interpreter. Two hundred youth scored above the established cutoff, and of those, 156 agreed to participate. Youth were randomly assigned to either TF-CBT or TAU (see Figure 1). At each clinic, a computer-generated randomization procedure allocated participants into random blocks of four or six in random order with an equal probability of four or six, with half (i.e., two or three) assigned to TF-CBT and half to the control group. The randomization was not stratified by any variables. Computer-assisted assessments were conducted by two clinicians naïve to treatment condition at pretreatment (T1), after six sessions (T2), and after 15 sessions (T3). The clinical diagnostic interviews

for PTSS (Clinician-Administered PTSD Scale for Children and Adolescents; CAPS-CA) and assessment of youth general mental health symptoms (Strengths and Difficulties Questionnaire; SDQ), were conducted only at T1 and T3. The study was approved by the Norwegian Regional Ethical Committee, and written informed consent was provided by youth and parents.

Treatment Conditions

The TF-CBT treatment model addresses possible problem domains such as cognitive, relationship, affective, family, traumatic behavior, and somatic problems, summarized by the acronym CRAFTS. The treatment comprises 12–15 sessions and involves individual child and caregiver sessions and conjoint sessions (see Cohen, Mannarino, & Deblinger, 2017).

The treatment consists of three phases. Phase 1 is stabilization and skill building, which encompass (a) teaching *psychoeducation* to normalize youth and caregiver reactions to the trauma and to support accurate cognition about what has happened, (b) improving *parenting skills* to maintain normal daily routines and expectations, (c) teaching *relaxation skills* to reduce physiological stress and arousal, (d) *identifying feelings* so that youth can learn to regulate these and not feel overwhelmed and vulnerable, and (e) teaching *cognitive coping skills* so that youth can explore and correct thoughts that are unhelpful. Phase 2 is trauma narration and processing, which includes (a) creating a *trauma narrative* to desensitize youth to trauma reminders and minimize avoidance

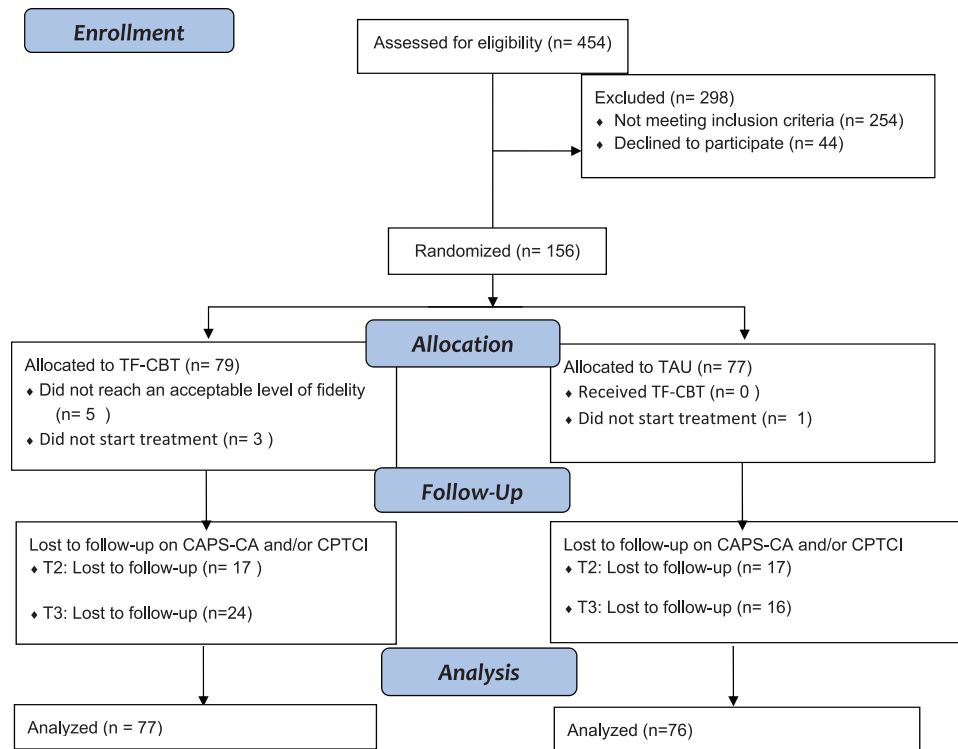


Figure 1. CONSORT Flowchart of the study. TF-CBT = trauma-focused cognitive-behavioral therapy; TAU = treatment-as-usual; CAPS-CA = Clinician-Administered PTSD Scale for Children and Adolescents; CPTCI = Post-Traumatic Cognitions Inventory—Child Version; T2/T3 = Time 2/Time 3. See the online article for the color version of this figure.

and hyperarousal and (b) identifying and modifying trauma-related cognitions to reduce possible self-blame, shame, and fear through *cognitive reprocessing*. Phase 3 is consolidation and closure, in which therapists may use in vivo exposure to help youth (a) *cope with generalized avoidant behavior* and *enhance feelings of mastery* and (b) work to *enhance future safety and development* so youth can recognize and respond to future threats.

All therapy sessions were audiorecorded to control for treatment fidelity using the TF-CBT Fidelity Checklist (Deblinger, Cohen, Mannarino, Murray, & Epstein, 2008). Fidelity was satisfactory in the TF-CBT group except for five cases. These cases were omitted from the per protocol analyses. On average, the TF-CBT participants received 13.1 sessions ($SD = 3.1$; range = 4–17) before completing the posttreatment assessment, and the two assessment points were on average 33.2 weeks apart ($SD = 11.4$; range = 17–73).

The TAU group received a bona fide treatment. TAU therapists were informed that their clients were traumatized and were suffering from severe PTSS, in addition to any other comorbid conditions. They were specifically asked to give their treatment of choice, that is, the therapy that they believed to be best for their clients, thus reducing possible bias for allegiance affects. The TAU therapists were not instructed to omit any certain interventions (i.e., talking about the trauma), and the children in TAU reported a strong therapeutic alliance with their therapist (Ormhaug et al., 2014). These are all considered important criteria for an intervention to be a bona fide treatment, which allowed us to examine possible mediators of outcome (Flückiger, Del Re, Munder, Heer, & Wampold, 2014; Wampold et al., 2010).

All TAU sessions were audiotaped, and five sessions from each therapy were coded according to the TF-CBT Fidelity Checklist. None of the TAU cases met the adherence criteria for TF-CBT. In addition, three sessions from each of the TAU therapists ($n = 81$ sessions) were coded using the Therapy Process Observational Coding System—Strategies Scale (TPOCS–S; McLeod & Weisz, 2010). The following frequency and thoroughness (combined as intensity; possible range = 1–7) of 31 items across the five TPOCS–S domains were identified: client-centered (observed in 92.6% of sessions; $M = 3.0$, $SD = .8$), psychodynamic (observed in 45.7% of sessions; $M = 2.5$, $SD = .6$), family (observed in 35.8% of sessions; $M = 2.4$, $SD = .6$), cognitive (observed in 30.9% of sessions; $M = 2.8$, $SD = .8$), and behavioral (observed in 19.8% of sessions; $M = 2.6$, $SD = 1.0$). Posttraumatic cognitions were explicitly addressed in 8.6% of the coded TAU sessions. On average, participants in the TAU condition had 13.4 sessions ($SD = 4.1$; range = 4–21) before completing the posttreatment assessment, and the two assessment points were 36.4 weeks apart ($SD = 11.7$; range = 17–63).

Therapists

All therapists volunteered to participate in the study. The TF-CBT therapists ($n = 26$) received training in TF-CBT that included a 2-day training session and weekly supervision for the first two cases. The TF-CBT therapists included 21 psychologists, two psychiatrists, two educational therapists, and one social worker, each of whom treated an average of 3.0 participants ($SD = 1.4$; range = 1–6). The TF-CBT therapists had on average 10.2 years of clinical experience ($SD = 6.4$; range =

3–28). The TAU therapists ($n = 45$) treated on average 1.7 participants ($SD = 1.3$; range = 1–9) and included 23 psychologists, 12 social workers, eight educational therapists, and two psychiatrists. The majority reported that their theoretical background was psychodynamic ($n = 35$), but some TAU therapists were also trained in cognitive-behavioral therapy ($n = 16$) and systemic family therapy ($n = 15$). On average, TAU therapists had 12.5 years of clinical experience ($SD = 10.3$; range = 1–40). Fifteen of the TAU therapists reported receiving supervision on their work with the study case (mean hours of supervision = 6.3, $SD = 10.2$; range = 1–40).

Measures

Child PTSD Symptom Scale (CPSS; Foa et al., 2001). To determine eligibility, we administered the CPSS, a 17-item self-report questionnaire developed to measure PTSS in children between 8 and 18 years of age, according to the *DSM-IV* (American Psychiatric Association, 1994). Symptoms are scored on a 4-point Likert scale ranging from 0 (*not at all*) to 3 (*5 or more times a week/ almost always*). Higher scores indicate a higher level of PTSS. The CPSS has shown satisfactory internal consistency, test-retest reliability, and convergent validity (Foa et al., 2001; Nixon et al., 2013). In the current sample of 454 screened youth, the total scale showed internal consistency of $\alpha = .91$.

Post-Traumatic Cognitions Inventory—Child Version (CPTCI; Meiser-Stedman, Smith, et al., 2009). The CPTCI is a 25-item self-report measure of posttraumatic cognitions in youth ages 10 to 18. The scale is adapted from the Post-Traumatic Cognitions Inventory, a measurement of dysfunctional trauma-related appraisals in adults (Foa, Ehlers, Clark, Tolin, & Orsillo, 1999), and comprises two subscales: Disturbing and Permanent change (i.e., “I feel like I am a different person since the frightening event” and “I will never be able to have normal feelings again”) and Feeble Person in a Scary World (i.e., “Anyone could hurt me” and “I cannot stop bad things from happening to me”). Responses range from 1 (*don't agree at all*) to 4 (*agree a lot*), where higher scores indicate more posttraumatic cognitions. A recent study has shown that the CPTCI has excellent psychometric properties and is a useful tool for clinicians to assess changes in cognitions (McKinnon et al., 2016). In this sample, the two subscales were highly correlated ($r = .74$, $p < .001$) and were therefore not separated in the analyses. The total scale showed good internal consistency ($\alpha = .92$). The CPTCI was collected at three time points (T1, T2, and T3).

Clinician-Administered PTSD Scale for Children and Adolescents (CAPS-CA; Nader et al., 1996, 2004). The CAPS-CA is a structured clinical interview used to assess the frequency and intensity of the 17 symptoms of PTSD defined according to the *DSM-IV* (Nader et al., 1996, 2004). Items are scored based on symptom severity during the last month and on both the youth's answers and the clinical judgment during the interview (range = 0–136). In this sample, the total sum score showed satisfactory internal consistency ($\alpha = .90$). In the present study, the CAPS-CA instead of the CPSS was included as an outcome measure because a clinical diagnostic instrument with a clinical judgment of inten-

sity was considered to be the most thorough measure of PTSS. In the current study, the CAPS-CA was used at T1 and T3.

Mood and Feelings Questionnaire (MFQ; Angold et al., 1995). The MFQ is a 34-item self-report questionnaire measuring depressive symptoms in children and adolescents between 8 and 18 years of age. The symptoms cover the *DSM-IV* diagnostic criteria for depressive disorders and are assessed on a 3-point Likert scale ranging from 0 (*not true*) to 2 (*true*), with higher scores indicating more depressive symptoms. The scale showed an internal consistency of $\alpha = .91$ in the current sample. The MFQ was collected at three time points (T1, T2, and T3), but information from only T1 and T3 was used in the current study.

Strengths and Difficulties Questionnaire (SDQ; Goodman, 2001). The SDQ is a 25-item self-report questionnaire developed to measure general psychological adjustment in children and adolescents. The questionnaire is divided into different subscales, and the four problem-oriented subscales—the hyperactivity/inattention subscale, the emotional symptom subscale, the conduct problem subscale, and the peer relation problem subscale—are used in the current study. The questions are scored on a 3-point Likert scale ranging from 0 (*not true*) to 2 (*certainly true*), with higher scores indicating more problems. The total scale showed an internal consistency of $\alpha = .73$ in the current sample. The children and adolescents answered the SDQ items at T1 and T3.

Data Analyses

Characteristics of the sample were investigated with descriptive statistics, and differences between the attrition group and retention group were investigated with independent-samples *t* tests and Pearson's chi-square test. To investigate the main research questions, we applied two analytical approaches. Mixed-effects models were used to examine the difference in posttraumatic cognitions between the conditions as well as the cognitions within each treatment condition across time, and mediation analyses investigated the mediating effect of posttraumatic cognitions on treatment outcome.

A dependency among subsets of cases within the same data set is referred to as clustered or nested data sets. Such dependency arose in the current data set because we had repeated measures on single individuals over time and because the therapists provided treatments to more than one participant. The advantage of mixed-effects models is that they take into account the nested nature of the data by estimating a measure of random variation both between and within participants (Fairclough, 2010; Pinheiro & Bates, 2000). The models handle missing data under the missing at random (MAR) assumption. Given the longitudinal design of the study, we included participants as the second level in the analysis, and given the nested data at the therapist level, therapists were included as a third level in the analysis. The level of child posttraumatic cognitions was used as a dependent variable, and the independent variables were treatment condition and time, including a Condition by Time interaction. The mixed-effects models were based on intention-to-treat (ITT) analyses, meaning that all participants who completed the T3 assessments, including dropouts, were analyzed in the condition in which they were originally randomized. The age of the youth was entered as a covariate in the analyses.

The second analytic approach was mediation analyses. For a mediation process to be present in psychotherapy, particularly two conditions have been outlined as necessary (Kazdin, 2009). First, there has to be an intervention that leads to change in the outcome. Second, a mediator should account for the relationship between the dependent and independent variables. The terms *mediator* and *mechanism* should be distinguished (Kazdin, 2009). Whereas the mediator accounts for the relationship between the treatment and the outcome, the mechanism reveals the reasons why the change occurs. In the current study, we investigated an analytic model that took into account only the mediator and not the change mechanism.

We attempted estimation of multilevel mediation models, because these models allow clustered variables to be entered as new levels in the analyses (Preacher, Zyphur, & Zhang, 2010). More specifically, we attempted to enter therapists as a second level. Unfortunately, the models came out unstable, probably because of the large number of therapists relative to the few clients nested within each. Subsequently, the mediation analyses were conducted as single-level mediation analyses. The mediation modeling according to Preacher and Hayes (2008) was applied. The main reason for choosing this mediation approach was that we were able to investigate the indirect effect of specifically change in posttraumatic cognition on child outcome. The approach allows a significant indirect effect to be present even though the relationships in the individual paths are not significant. The bootstrap resampling method was applied using 5,000 resamples of the data. This mediation modeling framework comprises two regression models: one model for the mediator, which indicates the relationship between the independent variable (IV) and the mediator (M), or the *a* path, and one model for the outcome, which estimates the relationship between the M and the dependent variable (DV), or the *b* path, and the *c'* path, which shows the relationship between the IV and DV while controlling for the M.

The mediation models were conducted separately for three different outcomes: PTSS (CAPS-CA), depression (MFQ), and general mental health symptoms (SDQ). Because PTSS was the primary outcome in the study, the PTSS model was further divided into three different versions. In the first PTSS model (Model 1A), the mediator was the overall change in appraisals from pre- to posttreatment (T1 to T3). In the second PTSS model (Model 1B), the mediator comprised the change in cognitive appraisals from pre- to midtreatment (T1 to T2, early change), and the third PTSS model (Model 1C) consisted of the mediator measured as the change in cognitive appraisals from mid- to posttreatment (T2 to T3, late change). All variables were treated as continuous measures. Youth age was entered as a covariate in the mediation analyses.

In the mediation analyses, ITT analyses were conducted. In addition, all data were analyzed following a per protocol (PP) approach, meaning that the five participants from the TF-CBT group who did not receive TF-CBT were removed, and participants were analyzed regarding the treatment they actually received. The PP analyses were performed to examine whether they yielded results similar to those in the ITT analyses.

We estimated intraclass correlations (ICCs) based on mixed-effects models with intercept only, with therapists as a clustering variable, for the three outcome variables: PTSS, depressive symptoms, and general mental health symptoms. The significance of

including the therapist-level variance was computed by likelihood ratio tests from a comparison of the mixed-effects models with linear regressions, both estimated by maximum likelihood.

The CPTCI was completed electronically, and the computer program did not allow for missing items. However, the clinical diagnostic interview CAPS-CA had a few missing single items, and we allowed 10% missing values in computing the sum scores of CAPS-CA. Scale scores were computed based on the mean of valid items. In Mplus, the treatment of missing data is applied by full information likelihood under the MAR assumption (Muthén & Muthén, 2010).

All analyses were conducted using SPSS Version 17.0 and the R packages nlme, multcomp, and car (Hornik, 2012), and the mediation analyses were conducted in Mplus (Muthén & Muthén, 2010).

Results

Attrition, Baseline Comparisons, and ICC Values

All symptom scores at pre-, mid- and posttreatment are presented in Table 1. Of the 156 youth who completed the intake assessments, 116 (74.3%) participated in the posttreatment assessment (T3). The attrition rate was not significantly different between the two treatment conditions, and no significant differences between the retention group and the attrition group on basic characteristics such as gender and/or outcome variables were found ($p \geq .170$). However, participants in the attrition group were significantly older than participants in the retention group (15.7 years compared to 14.8 years; $p = .039$), and they reported exposure to a significantly higher number of different traumatic

events (4.3 in the attrition group compared to 3.4 in the retention group; $p = .007$).

Intraclass correlations were .038, .122, and .032 for PTSS, depressive symptoms, and general mental health symptoms, respectively. The corresponding p values for therapist-level variances were .791, .357, and .783, respectively.

Change in Posttraumatic Cognitions (Mixed-Effects Analyses)

The interaction between time and group was significant, indicating that the treatment slopes were significantly different from one another ($p = .002$). Furthermore, participants in TF-CBT changed significantly more in their cognitions from pre- to post-therapy compared to participants in the TAU condition ($p = .002$). There was also a significant reduction in posttraumatic cognitions from T1 to T2, both in TF-CBT ($p < .001$) and in TAU ($p < .001$). The change in posttraumatic cognitions from T2 to T3 was significant in the TF-CBT condition ($p < .001$) but not in the TAU condition ($p = .198$; for details, see Table 2).

Mediation Analyses (Intention-to-Treat Analyses)

In the three first models (Models 1A, 1B, and 1C), the child posttraumatic symptoms (measured by the CAPS-CA) constituted the outcome variable. Model 1A, which investigated the overall change in cognitive appraisals as a mediator and PTSS as dependent variable, had a significant indirect effect via the mediator ($CPTCI_{T3}-CPTCI_{T1}$; $p = .018$). When we investigated this model further, the c' path showed that the total relationship between therapy condition and outcome was not statistically significant when controlling for the mediator ($p = .263$). The second PTSS model (Model 1B), using early change in cognitive appraisals as a mediator variable and PTSS as dependent variable, did not reveal a significant indirect effect via the mediator ($CPTCI_{T2}-CPTCI_{T1}$; $p = .724$). The total effect of therapy condition on outcome was still statistically significant after controlling for the early change in cognitions ($p = .023$). In the third PTSS model (Model 1C), however, a significant indirect effect was found when using the late cognitive appraisals change score ($CPTCI_{T3}-CPTCI_{T2}$) as a mediator variable and PTSS as dependent variable ($p = .009$). In line with this, there was no total significant relationship between condition and outcome after controlling for the late change in cognitions ($p = .241$; for details, see Table 3).

In the next mediation models, child depressive symptoms (Model 2) and child general mental health symptoms (Model 3) constituted the outcome variables. Both models showed that there was a significant indirect effect via the mediator (the overall change in cognitive appraisals): $p = .011$ for the depression model and $p = .027$ for the general mental health model (for more details, see Table 4).

Per Protocol Analyses

Per protocol analyses were conducted in which the five cases that did not receive TF-CBT were taken out of the analyses. These analyses yielded results similar to those in the intention-to-treat analyses (data not shown).

Table 1

Description (Means and SD) of CPTCI, CAPS-CA, MFQ and SDQ from T1 to T3 by Treatment Condition

Variable	Condition	<i>n</i>	<i>M</i> (<i>SD</i>)
CPTCI T1	TF-CBT	77	62.5 (14.6)
CPTCI T1	TAU	76	63.4 (15.3)
CPTCI T2	TF-CBT	62	55.0 (17.8)
CPTCI T2	TAU	60	56.5 (19.6)
CPTCI T3	TF-CBT	54	42.7 (16.6)
CPTCI T3	TAU	60	53.2 (18.6)
CAPS-CA T1	TF-CBT	79	60.2 (19.9)
CAPS-CA T1	TAU	77	60.7 (21.2)
CAPS-CA T3	TF-CBT	55	30.6 (25.3)
CAPS-CA T3	TAU	61	42.1 (26.6)
MFQ T1	TF-CBT	79	35.4 (11.8)
MFQ T1	TAU	77	35.3 (13.3)
MFQ T3	TF-CBT	57	14.4 (13.7)
MFQ T3	TAU	62	22.7 (16.2)
SDQ T1	TF-CBT	78	18.92 (4.9)
SDQ T1	TAU	76	19.1 (5.5)
SDQ T3	TF-CBT	56	12.0 (6.5)
SDQ T3	TAU	59	14.5 (6.1)

Note. T1 = Time 1 (pretreatment); T2 Time 2 (midtreatment); T3 = Time 3 (posttreatment); CAPS-CA = Clinician-Administered PTSD Scale for Children and Adolescents; CPTCI = Post-Traumatic Cognitions Inventory—Child Version; TF-CBT = trauma-focused cognitive-behavioral therapy; TAU = treatment-as-usual; MFQ = Mood and Feelings Questionnaire; SDQ = Strengths and Difficulties Questionnaire.

Table 2
Change in Posttraumatic Cognitions Within and Between Treatment Conditions

Outcome CPTCI	Estimate	95% CI	<i>p</i>	<i>t</i> (<i>df</i>)
TF-CBT vs. TAU T2	.95	[-5.24, 7.14]	.761	.31 (84)
TF-CBT vs. TAU T3	10.07	[3.76, 16.38]	.002	3.18 (84)
T1 vs. T2 TF-CBT	-7.41	[-11.03, -3.79]	<.001	-4.04 (231)
T2 vs. T3 TF-CBT	-11.64	[-15.56, -7.72]	<.001	-5.85 (231)
T1 vs. T2 TAU	-8.14	[-11.81, -4.47]	<.001	-4.37 (231)
T2 vs. T3 TAU	-2.52	[-6.37, 1.33]	.198	-1.29 (231)

Note. CPTCI = Post-Traumatic Cognitions Inventory—Child Version; CI = confidence interval; TF-CBT = trauma-focused cognitive-behavioral therapy; TAU = treatment-as-usual; T1 = Time 1 (pretreatment); T2 = Time 2 (midtreatment); T3 = Time 3 (posttreatment).

Discussion

In this study we aimed to understand more of what may contribute to reductions in trauma-related symptoms for severely traumatized youth. The study builds on results from a randomized controlled study showing that participants receiving TF-CBT reported lower levels of PTSS, depression, and general mental health problems compared to participants in the TAU condition. This result does not in itself explain how the change occurred or by which mechanisms. To examine this, mediator analyses are necessary (Kazdin, 2009). Understanding how therapy leads to change is an important step toward optimizing and individualizing therapy.

Many RCT studies have been criticized for using control groups that are biased either because they are not bona fide treatments or because specific ingredients are left out (Wampold & Imel, 2015). In the current study, we examined mediators of therapy by comparing two bona fide treatments. We built on previous results showing that the therapeutic alliance (typically a common factor) in interaction with the specific trauma treatment predicts outcome

(Ormhaug et al., 2014). Because posttrauma cognitions are believed to be crucial in maintaining PTSS after trauma, one next step in disentangling possible change mechanisms is to examine whether change in posttrauma cognitions mediates treatment outcome, both for PTSS, which are typically targeted in trauma-focused treatments, and for nontargeted symptoms such as depression and general mental health problems.

Our first hypothesis, that TF-CBT would yield greater change in posttraumatic cognitions relative to TAU, was supported. This was not surprising given that cognitive restructuring is a core component of TF-CBT, whereas cognitive interventions were observed in less than a third of TAU cases. The finding is also in line with results of previous studies of adults with PTSD (Diehle et al., 2014). Furthermore, posttraumatic cognitions changed significantly both from pre- to midtreatment and from mid- to posttreatment in TF-CBT. In TAU, however, the cognitions changed significantly only from pre- to midtreatment. Thus, whereas posttraumatic cognitions continue to change throughout TF-CBT, this effect seems to wear off as TAU progresses.

Table 3
Results From Three Mediation Models for CPTCI Mediation on Child PTSS

Effect	Estimate	SE	95% CI bootstrap percentile	<i>p</i>
Model 1A: Overall mediation model for CPTCI mediation on child PTSS (mediator is overall change in CPTCI scores between T1 and T3)				
Path a	7.83	3.02	[1.87, 13.45]	.009
Path b	.72	.13	[.48, .99]	<.001
Path c'	5.15	4.60	[-4.28, 13.88]	.263
Indirect effect (Path a × Path b)	5.63	2.38	[1.48, 11.02]	.018
Model 1B: Early mediation model for CPTCI mediation on child PTSS (mediator is change in CPTCI scores between T1 and T2)				
Path a	-1.05	2.68	[-6.49, 4.05]	.695
Path b	.34	.15	[.05, .66]	.023
Path c'	11.49	4.63	[2.35, 20.52]	.013
Indirect effect (Path a × Path b)	-.36	1.01	[-2.88, 1.38]	.724
Model 1C: Late mediation model using bootstrap method for CPTCI mediation on child PTSS (mediator is change in CPTCI scores between T2 and T3)				
Path a	9.57	2.70	[4.42, 14.97]	.001
Path b	.55	.15	[.27, .85]	.001
Path c'	5.74	4.90	[-4.72, 14.81]	.241
Indirect effect (Path a × Path b)	5.30	2.03	[2.15, 10.28]	.009

Note. CPTCI = Post-Traumatic Cognitions Inventory—Child Version; PTSS = posttraumatic stress symptoms; CI = confidence interval; T1 = Time 1 (pretreatment); T2 = Time 2 (midtreatment); T3 = Time 3 (posttreatment).

Table 4
Results From Mediation Models for CPTCI Mediation on Child Depression and General Mental Health

Effect	Estimate	SE	95% CI bootstrap percentile	<i>p</i>
Model 2: Overall mediation model for CPTCI mediation on child depression (MFQ; mediator is overall change in CPTCI scores between T1 and T3)				
Path a	7.86	3.01	[2.10, 14.02]	.009
Path b	.49	.07	[-.35, .62]	<.001
Path c'	4.17	2.52	[-.76, 8.99]	.100
Indirect effect (Path a × Path b)	3.82	1.15	[1.08, 7.09]	.011
Model 3: Overall mediation model for CPTCI mediation on child general mental health (SDQ; mediator is overall change in CPTCI scores between T1 and T3)				
Path a	7.28	3.04	[1.42, 13.34]	.017
Path b	.19	.03	[-.13, .26]	<.001
Path c'	1.17	1.07	[-.93, 3.13]	.260
Indirect effect (Path a × Path b)	1.37	.62	[-.32, 2.78]	.027

Note. CPTCI = Post-Traumatic Cognitions Inventory—Child Version; MFQ = Mood and Feelings Questionnaire; CI = confidence interval; T1 = Time 1 (pretreatment); T3 = Time 3 (posttreatment).

Our second hypothesis was that the overall PTSS effect difference found between TF-CBT and TAU would be explained by change in posttraumatic cognitions, and this was supported. Overall, change in posttraumatic cognitions significantly mediated the treatment effect. Investigation of the timing of the mediation effect of cognitions on PTSS indicated that the change in cognitions occurring late in therapy (from mid- to posttreatment) significantly mediated the treatment effect, whereas early change (from pre- to midtreatment) did not. Thus, the main finding of the present study is that change in posttraumatic cognitions is a driving force for the difference in treatment effects found between TF-CBT and TAU. As such, change in posttraumatic cognitions seems to be a key component to recovery for traumatized youth receiving TF-CBT. This finding is in line with those of Kleim et al. (2013), in which changes in maladaptive cognitions preceded changes in PTSD symptoms for adults receiving TF-CBT. This lends support to cognitive theories of PTSD claiming that reductions in PTSS occur as a result of changing maladaptive cognitions and that maladaptive cognitions maintain and exacerbate PTSS.

The analysis also showed that changes in posttraumatic cognitions mediated the treatment effect for depression and general mental health problems. This provides further support for the notion that change in appraisals may be a key mechanism for multiple outcomes in TF-CBT. Because many traumatized youth have comorbid symptoms, this finding is clinically significant for treatment providers and suggests that negative cognitions may be pivotal in maintaining mental health problems.

However, even though the significant difference between the treatment conditions occurred late in treatment, one cannot necessarily infer from this study which components in TF-CBT contribute to changes in posttraumatic cognitions. A mediator does not necessarily explain the process of how a change occurs (Kazdin, 2009, 2014; Wampold et al., 2010). The cognitive restructuring component in TF-CBT explicitly aims to help youth to identify and modify unhelpful trauma-related cognitions. However, several other components in the protocol may contribute to these changes, and behavioral-, emotional-, and cognitive-oriented techniques may play a role in reducing posttraumatic cognitions. For instance, psychoeducation may help to normalize youth and caregiver reac-

tions to the trauma and to support accurate thoughts about what has happened and why. Improving parenting skills may help to maintain normal daily routines and help children to feel that things are not permanently changed. Also, including caregivers in therapy may improve their ability to help with their children's emotional distress and management of related behavior problems. Learning relaxation skills to reduce physiological stress and arousal and helping youth identify feelings may help them not feel so overwhelmed and vulnerable. The creating of the trauma narrative is thought to help desensitize the youth to trauma reminders and minimize avoidance behaviors. This in turn may help youth to regain a sense of control and that they are not permanently damaged by what happened. In vivo exposure may help youth cope with generalized avoidance behavior and enhance feelings of mastery. Finally, enhancing future safety and development may help youth regain hope that they can recognize and respond to danger and thus minimize feelings of future threat. All these changes may be related to alleviating PTSS, depression, and general mental health problems in multiple ways, and future research should examine these pathways.

For the PTSS model, there are more potential explanations for why the mediation effect is significantly applied to late change in posttraumatic cognitions and not to early change. Changing posttraumatic cognitions takes time and entails a broad range of techniques that are likely to work together to produce change. It may be that it is the cognitive restructuring component, which typically takes place later in the therapy process, that contributes most to changes in posttraumatic cognitions. However, it may also be that the integration and sensitive interplay between the different components contribute to changes in posttrauma cognitions. It is important to note that content analysis of the TAU condition showed that there was little direct therapeutic work addressing posttrauma cognitions, and overall, cognitive processing was present in only a third of coded sessions. Also of importance, negative cognitive appraisals were significantly reduced in TAU. However, the effects of TAU may have improved further with a stronger focus on cognitions. It may also be the ongoing exposure work that contributes to changes in cognitions, a claim proposed by Foa and Rauch (2004). In line with this, a meta-analysis did not find that

including cognitive restructuring in trauma-focused interventions led to significantly larger reductions in trauma related cognitions than did interventions that included only exposure work (Diehle et al., 2014).

The understanding of the mechanisms of change in youth trauma therapy is only commencing and is therefore lagging behind adult studies. Several therapy models have proven to be helpful in reducing trauma-related symptoms (Gillies, Taylor, Gray, O'Brien, & D'Abrew, 2012). Future research should examine more closely whether there are specific techniques that help youth alter posttrauma cognitions and regain their sense of safety and hope for recovery.

The present study has limitations. First, in terms of generalizability, because the majority of our participants were Caucasian girls, questions can be raised as to whether our findings apply to clients who are boys and/or of other ethnicities. Second, we had missing data on T3 because some of the participants dropped out of treatment or did not complete the posttreatment assessments. We do not know whether this may have biased the results; however, the analytic strategies allowed us to include all the recruited participants in the analyses. Third, the nesting of therapists is a limitation, because several therapists treated more than one participant. However, when we attempted estimation of multilevel mediation models, these models did not converge without problems. It is unclear exactly how much the nesting of therapists might have influenced the results. However, the ICC values in the current study were relatively low. The ICC expresses the variability due to the therapists in relation to the total variability in outcome among participants. A high value indicates that the outcomes of two participants who have been treated by the same therapist are more similar than are the outcomes of two participants who have been treated by two different therapists (Wampold & Imel, 2015). Low ICC values in the current study thus indicate that the therapist nesting did not influence the results too much. Fourth, when interpreting the beneficial effect of TF-CBT over TAU, one has to take into account that the TF-CBT therapists received more supervision than did the TAU therapists. Although the TF-CBT therapists were all novices in the model, and regular supervision was considered necessary to help them provide the method with fidelity, we do not know how much the supervision influenced the result. Also, this may limit the generalizability of the findings to regular clinical practice, where therapists typically do not have continuous case-by-case supervision. Fifth, we did not conduct separate analyses with different age groups, because the sample was too small. However, we did include age as a covariate in all analyses, and this step did not change the original results. Future studies should have a more specific focus on cognitions in different developmental stages.

The main implication of the current study is that changing posttraumatic cognitions seems to be essential to recovery from a range of trauma-related symptoms. In this study, posttraumatic cognitions were conceptualized as the youth's sense that the trauma has led to permanent and disturbing change and a sense of being a fragile person in a scary world (Meiser-Stedman, Smith, et al., 2009). It is encouraging that such negative posttraumatic cognitions can be targeted and modified in therapy. Particularly for youth, having persistent negative and maladaptive views of continuing threat and personal vulnerability may lead to negative developmental pathways. Our results indicate clinicians should

address appraisals of the experienced trauma when working with youth. Furthermore, it may be particularly important to address this throughout treatment and not only in the early stage of treatment. Late change in posttraumatic cognitions may be particularly beneficial for recovery.

In conclusion, this study provides further support for the key role of change in posttraumatic cognitions for treatment outcome with traumatized youth. It is important to note, however, that this study points to only changes in cognitions as a mediator of outcome. Again, a mediator may point to possible mechanisms of change but cannot explain how the change came about (Kazdin, 2009, 2014). Further investigations into the pathways of change may help in understanding more about change processes and which specific and common ingredients may be needed to help traumatized youth cope with trauma-related symptoms. In the future, this may focus and refine interventions to help clinicians tailor treatments to the individual needs of their clients.

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