

Adolescents with Complex PTSD

The daily dynamics of negative cognitions and negative emotions during TF-CBT

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Abstract

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Title: Adolescents with Complex PTSD - the daily dynamics of negative cognitions and negative emotions during TF-CBT.

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Background: In later years there has been increasing attention on the observation that some adolescents exposed to traumatic events develop disturbances in self-organization, in addition to posttraumatic stress disorder (PTSD). Disturbances in self-organization consist of difficulties in affect regulation, relational dysfunctioning and negative self-concept. This has led to a new diagnosis in ICD-11; Complex PTSD (CPTSD). Because CPTSD is a new diagnosis, there is little previous research. In addition, there is a need for studies using frequent measures, to grasp the daily dynamics of the symptomatology of adolescents with CPTSD. Negative cognitions and negative emotions may be an expression of disturbances in self-organization, and possibly maintain posttraumatic symptoms (PTSS). The present study has examined the daily dynamics of negative cognitions and negative emotions in adolescents with CPTSD, and clinically significant PTSS, during the first 60 days of trauma-focused cognitive behavioral therapy (TF-CBT). We also wanted to examine the temporal associations between negative cognitions and emotions.

Methods: This research project is based on collected data from a larger pilot study by Norwegian Center for Violence and Traumatic Stress (NKVTS) called “My everyday life”. The sample consisted of 34 adolescents between 13 and 17 years of age, receiving TF-CBT at a Norwegian mental health clinic (BUP). We used an experiencing sampling methodology (ESM) to examine the daily dynamics of negative cognitions and negative emotions. Negative cognitions and emotions were measured through CATS-2. The responses from CATS-2 were also used to divide the sample into one CPTSD-group and one PTSS-group. Data was analyzed using R via RStudio. Linear mixed effects model with random effects of intercept and slopes was used to analyze the stability of and the association between negative cognitions and emotions.

Results: There was a significant reduction in negative cognitions and emotions during the first 60 days of TF-CBT for both groups. There were no differences in the reduction when

comparing the two groups. Further, the level of negative cognitions and emotions was significantly higher for the CPTSD-group compared to the PTSS-group. Significant temporal associations between cognitions and emotions were found for both groups. The association between reduction in negative emotions the previous day and reduction in cognitions the following day was found to be weaker for the CPTSD-group. There was no differences in the association between negative cognitions the previous day and reduction in emotions the following day.

Conclusion: The present study indicates that CPTSD and PTSS are more similar than we assumed. This might indicate that evidence-based treatments developed for PTSD, such as TF-CBT, may be useful for adolescents with CPTSD. This is uplifting news. On the other hand, we also found some differences, which can inform clinical practice. Future research should use ESM to better understand the daily dynamics of symptoms for CPTSD.

Preface

Overall, it has been very interesting to gain more knowledge and insight into this group of patients, which is yet not well understood. We have devoted a lot of time and energy into this master thesis, and we are happy to finally submit it.

We would like to thank our supervisor Marianne Skogbrott Birkeland for all the help and patience through this process. We chose to write this thesis two years ago and Marianne has been very engaged in the process from the beginning. We appreciate your many comments on all our drafts, as well as interesting meetings to discuss the thesis. We especially appreciate your availability to the very end. We would also like to thank Marius and Filip and all our family and friends for the support and patience through this process. Mostly, we would like to thank each other for a collaboration that has allowed us both to share our ups and downs during this process, without hesitation or doubt.

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Abbreviations

Abbreviations	Definition
BUP	Norwegian Child and Adolescent Mental health clinics
CATS-2	Child and Adolescent Trauma Screen version 2
CPTSD	Complex Post Traumatic Stress Disorder
CSDT	Constructivist self-development theory
DSM-5	Diagnostic and Statistical Manual of Mental Disorders 5- edition
ESM	Experience Sampling Methodology
ICD-11	International Classification of Diseases 11 th revision
IWM	Inner Working Model
NKTVS	Norwegian Centre for Violence and Traumatic Stress
PTE	Potentially Traumatic Events
PTSD	Post Traumatic Stress Disorder
PTSS	Posttraumatic stress symptoms
TF-CBT	Trauma- Focused Cognitive Behavioral Therapy

1. Introduction

1.1 Background

Many adolescents have experienced traumatic events. A study of Norwegian adolescents showed that 1 in 20 had experienced physical violence, 1 in 5 were exposed to psychological abuse from their caregiver and about 6% of the adolescents had experienced sexual violence inflicted by an adult (Hafstad & Augusti, 2019). The exposure to traumatic incidents may lead to posttraumatic stress symptoms (PTSS), including flashbacks, hyperarousal and avoidance. In the later years, attention has been on the observation that some adolescents exposed to traumatic events in addition to symptoms associated with posttraumatic stress disorder (PTSD) also develop difficulties in self-organization. These difficulties include problems with emotion regulation, self-image and interpersonal functioning. This has led to the introduction of a new diagnosis, named Complex PTSD (CPTSD), in the 11th revision of the International Classification of Diseases (ICD-11). Research shows that individuals with CPTSD have a higher functional impairment compared to individuals with PTSD (Brewin et al., 2017; Cloitre et al., 2013; Elklit et al., 2014), and some scholars have argued that CPTSD demands particular therapeutic considerations (J. A. Cohen et al., 2012b; Eidhammer et al., 2017; Maercker et al., 2022). Thus, gaining a better understanding of negative cognitions and emotions in individuals with CPTSD may be crucial for effective treatment for this group. There is not enough knowledge on the daily dynamics of symptoms related to CPTSD, including how these symptoms change during treatment, or how this might differ from PTSD. This could inform us on how to help adolescents with CPTSD. The current study will investigate the stability in negative cognitions and negative emotions in adolescents with PTSD and CPTSD during treatment. In addition, we want to explore the temporal association between negative cognitions and negative emotions.

1.2 Posttraumatic stress disorder (PTSD)

PTSD differs from other psychiatric disorders in the diagnostic systems by not only including criteria regarding the onset and duration of symptoms, but also criteria that demands the presence of a traumatic event. In ICD-11 a traumatic event is defined as an event, or series of events, of extremely threatening or horrific nature (WHO, 2019). Examples of potentially traumatic events are natural disasters, sexual or physical assault, sudden or frightening death of a parent or trusted caregiver and emotional violence. Witnessing others being exposed to

these events, such as domestic violence, can also be a potential traumatic event. The trauma literature distinguishes between different types of traumatic events. Single traumas, also called type 1 trauma, is one single traumatic event that is typically of a life-threatening character. This differs from type 2 trauma, which refers to repeated exposure to traumatic events over time (Birkeland et al., 2022; Terr, 1991).

The different types of potentially traumatic events all have in common that they can lead to PTSS which might be of the intensity and extent to fulfill the criteria for PTSD in the diagnostic systems. In the Diagnostic and Statistical Manual of Mental Disorders 5th edition (DSM-5) PTSD is included in the category “trauma- and stressor-related disorders” (APA, 2013). The PTSD diagnosis in DSM-5 includes 20 symptoms across four symptom clusters (B) re-experiencing, (C) avoidance, (D) alterations in cognitions and mood and (E) alterations in arousal and reactivity. Studies indicate that the diagnostic criteria for PTSD in DSM-5 show satisfactory concordance with ICD-11 (Hafstad et al., 2017; Stein et al., 2014). To fulfill the criteria for PTSD in ICD-11 one have to experience the following symptoms (WHO, 2019):

- “Following the traumatic event or situation, the development of characteristic syndrome lasting for at least several weeks, consisting of all three core elements:
 - 1) Re-experiencing the traumatic event in the present, in which the event(s) is not just remembered, but is experienced as occurring again in the here and now. This typically occurs in the form of vivid intrusive memories or images; flashbacks, which can vary from mild (there is a transient sense of the event occurring again in the present) to severe (there is a complete loss awareness of present surroundings), or repetitive dreams or nightmares that are thematically related to the traumatic event(s).
 - 2) Deliberate avoidance of reminders likely to produce re-experiencing of the traumatic event(s). This may take the form either of active internal avoidance of thoughts and memories related to the event(s), or external avoidance of people, conversations, activities or situations reminiscent of the event(s). In extreme cases the person may change their environment (e.g., move to a different city or change jobs) to avoid reminders.
 - 3) Persistent perceptions of heightened current threat, for example as indicated by hypervigilance or an enhanced startle reaction to stimuli such as unexpected noises. Hypervigilant persons constantly guard themselves against danger and feel themselves or others close to them to be under immediate threat either in specific situations or

more generally. They may adopt new behaviors designed to ensure safety (e.g., not sitting with one's back to the door, repeated checking in vehicles' rear-view mirrors)

- The disturbance results in significant impairment in personal, family, social, educational, occupational or other important areas of functioning. If functioning is maintained, it is only through significant additional effort.”

1.3 Complex PTSD

CPTSD is a fairly new diagnosis. In 1992 Judith Herman claimed that the existing PTSD-diagnosis failed to capture the severe psychological complications observed in individuals exposed to prolonged, repeated trauma (Herman, 1992). In her review, Herman further claimed that through clinical observations, three areas of disturbances were acknowledged. First, according to Herman, the symptoms associated with repeated trauma often appeared to be more complex, persistent and extensive than those in PTSD. Second, Herman claimed that prolonged, repeated trauma often led to a development of personality changes in victims. Lastly, Herman observed that individuals exposed to repeated trauma also were vulnerable for repeated harm, including self-inflicted harm and harm inflicted by others (Herman, 1992). Based on these observations Herman introduced the term CPTSD. The DSM-IV have included this knowledge in their diagnostic manual by adding three additional symptoms to the diagnostic criteria of PTSD, which reflect the observation of tenacious alterations in mood and behavior following trauma (Maercker et al., 2013). ICD-11 has also included this knowledge by introducing CPTSD as a new diagnosis to recognize the severity of some PTSS (Maercker et al., 2013). According to ICD-11, the CPTSD-diagnosis includes the three core symptom clusters of PTSD, re-experiencing, avoidance and hypervigilance, as well as three additional clusters of symptoms which is referred to as disturbances in self-organization (WHO, 2019):

1. “Severe and pervasive problems in affect regulation. Examples include heightened emotional reactivity to minor stressors, violent outbursts, reckless or self-destructive behavior, dissociative symptoms when under stress and emotional numbing, particularly the inability to experience pleasure or positive emotions;
2. Persistent beliefs about oneself as diminished, defeated or worthless, accompanied by deep and pervasive feelings of shame, guilt or failure related to the stressor. For example, the individual may feel guilty about not having escaped from or succumbing to the adverse circumstance, or not having been able to prevent the suffering of others;

3. Persistent difficulties in sustaining relationships and in feeling close to others. The person may consistently avoid, deride or have little interest in relationships and social engagement more generally. Alternatively, there may be occasional intense relationships, but the person has difficulty sustaining them.”

As CPTSD is a new diagnosis in ICD-11 the etiology and mechanisms behind the symptoms are not well understood. Regarding etiology, a great number of studies indicate that repeated, interpersonal trauma, also known as type 2 trauma, increase the probability of displaying symptoms compatible with CPTSD (Cloitre et al., 2009; Hyland et al., 2017; Karatzias et al., 2016). A study by Birkeland and colleagues (2022) found that traumatic events in an interpersonal context, such as domestic violence and severe bullying, were correlated with higher levels of PTSS, whilst non-interpersonal trauma were correlated with lower levels of PTSS. Briere and colleagues (2008) found a linear relationship between cumulative childhood trauma and symptom complexity.

However, studies have also shown that some individuals exposed for type 1 trauma in their adult lives develop CPTSD (Cloitre, 2020; Elliott et al., 2020; Maercker et al., 2022), whereas some individuals who experience type 2 trauma have developed PTSD rather than CPTSD (Elklit et al., 2014). Hence, in the diagnostic process, type of trauma is not considered a requirement in the diagnostic process of CPTSD, but rather a risk factor (Brewin et al., 2017; Cloitre, 2020; Maercker et al., 2022).

Different perspectives can help understand how some individuals develop CPTSD after one single traumatic event (type 1 trauma). One perspective concerns genetic differences. Some individuals might have genetic dispositions making them especially vulnerable for stress related events, and as such develop disturbances in self-organizing symptoms after experiencing one single traumatic event. Another perspective is environmental dispositions, where the lack of social support, for example, can result in the individual being especially vulnerable to stressors. A third perspective is related to issues when measuring experience of traumatic events. For example, participants might feel ashamed to have experienced interpersonal trauma or several events, and thus they might be resistant to report the number of events they actually have experienced. This might create an impression in the research that single events can cause CPTSD, when it might be due to resistance to disclose the number of events experienced. This is a common issue in research on trauma and PTSD (Saunders et al., 2014). As such, there can be several reasons for this finding.

Even though some individuals develop disturbances in self-organizing symptoms or CPTSD after experiencing type 1 trauma, the research indicates that this is the exception, rather than the rule. Most psychological theorizing on the development of CPTSD assume that there is an association between disturbances in self-organizing symptoms and experiencing type 2 trauma (Brewin et al., 2017; Briere et al., 2008; Cloitre et al., 2013; Maercker et al., 2022). This is therefore also evident in the following description of disturbances in self-organizing symptoms, meaning that most of the theories and research on the development of these symptoms all assume that the cause is type 2 trauma events.

1.3.1 Difficulties in affect regulation

The first of the three additional symptom clusters of CPTSD is difficulties in affect regulation. Affect regulation includes both the ability to identify and differentiate internal emotional experiences as well as being able to express and modulate emotions safely (Cook et al., 2005). In a developmental perspective, the caregiver plays an invaluable role in learning how to discriminate and identify affective experiences. Fonagy and colleagues (2002, p. 298) claim that the ability to use self-regulating strategies is facilitated through the caregivers ability to read the infants emotional expressions and respond with empathic affect-mirroring. In this perspective, the infant's own affective experience is determined by the interaction between himself/herself and the caregiver. In cases where the caregiver has limited abilities to label and modulate the child's emotional states, the child does not learn to distinguish different emotional qualities, nor how to calm himself/herself and others down (Shcäfer et al., 2022).

Further, if the caregiver has difficulties in calming themselves down when experiencing emotional states, the caregiver might engage in poor modeling of emotion regulation as well. This might be another aspect of how the child develops maladaptive ways to regulate emotional states (Cook et al., 2005). For example, if the caregiver uses violence to express anger, the child might learn that this is a useful way to express anger.

Experiencing traumatic events represents a challenge to one's affect regulation. For example, experiencing a motor vehicle accident may create intense fear and physiological activation. Over time, these reactions often decline. However, if one has not learned how to regulate one's emotions in effective ways, the decline may happen at a slower pace or the individual is stuck in a fearful and physiological active state.

In addition, some types of trauma may increase the probability of having a caregiver who were not available for supporting one's emotion regulation, such as domestic violence.

One could imagine that parents in an abusive relationship is not adequately present for the child to help identifying, understanding and regulating its emotions.

If a child is a victim of abuse and mistreatment, the child's affective responses is likely to be dismissed, questioned or rejected. As a consequence, an inconsistency occurs between the child's own affective experience and the mirroring of the caregiver. This presents a different aspect of difficulties in affect regulation, which involves the child not being able to identify and label emotional states, as well as not trusting its own perception (Shcäfer et al, 2022). Taken together, several aspects of the caregiver-child relationship can explain difficulties in emotion regulation.

Difficulties in emotion regulation in adolescents as a consequence of trauma exposure can be expressed in various ways. For example, anger can be expressed in impulsive sexual behaviour, drug use and other forms of maladaptive coping strategies (Kilpatrick et al., 2003; Schafer et al., 2022). These strategies may be a result of the adolescent not being able to constructively express and label negative emotions, as well as an impaired ability to self-soothe. In addition, difficulties in emotion regulation can also include avoidance of emotions (Cook et al., 2005). One reason for why adolescents avoid negative emotions might be that the emotions are too painful, and as such it is difficult to tolerate them, where this might be another aspect of difficulties with emotion regulation. This may lead to the adolescent being overwhelmed by their own emotions. This might again lead to the adolescent using maladaptive coping strategies, such as drug use, to help ease the psychological pressure following the negative emotions.

1.3.2 Negative self-concept

The second CPTSD cluster is negative self-concept. To better understand how trauma can influence several aspects of the self, the Constructivist self-development theory (CSDT) can be a useful framework (McCann & Pearlman, 1992). An important aspect of this theory is the development of different self-capacities, defined as the inner abilities that allow an individual to maintain a consistent and cohesive sense of self. One of these self-capacities is the ability to maintain a sense of self as viable, benign and positive (McCann & Pearlman, 1992). To be able to develop this kind of positive self-concept one must internalize significant others as loving. The development of a sense of self as deserving of love and competent is dependent on a caregiver being receptive and sensitive (Cook et al., 2005). However, the ability to maintain a positive self-concept can be disturbed. This can occur through trauma where the caretaker fails to protect the child or inflicts harm, abuse or rejects the child. Such experiences

may lead to a model of the self as unlovable, inept, unworthy of care and defective (Cook et al., 2005). Further, individuals who have been subjected to repeated abuse often have a sense of self and self-worth that are heavily influenced by the experience of being abused (Courtois, 2004; Pearlman, 2001). This has also been illustrated with maltreated toddlers, where as young as 18 months old toddlers were more likely to respond to self-recognition with neutral or negative affect, compared to non-traumatized children (Schneider-Rosen et al., 1991). Taken together, experiencing trauma where the caretaker is somehow involved can develop into a negative self-concept, where this can lead to many negative cognitions about the self and others.

A theory that can help us understand how the negative cognitions about the self are maintained is the cognitive model of PTSD by Ehlers and Clark (2000). The model stresses the importance of cognitive appraisals of the traumatic event(s) as a maintaining factor. One appraisal is overgeneralizing, meaning that individuals overgeneralize from the traumatic event to more normal activities. In regards to a persistent negative self-concept one can argue that this is a result of such overgeneralization. The individual appraises the trauma as “proof” that they are a failure and not worthy of love. Maladaptive, negative appraisals about the PTSS itself may also fuel the individuals negative self-concept. Further, adolescents with PTSD may appraise their trauma related symptoms as a sign of weakness and as such not able to understand the symptoms as a normal reaction after trauma-exposure (Dekel et al., 2014; Ehlers & Clark, 2000). These negative appraisals of both the trauma and the PTSS can be expressed through negative cognitions about oneself. For example, the thought “I am not good enough” can be a persistent negative cognition about one's value due to this kind of overgeneralization. To summarize, trauma can disturb several aspects of the development of self-concept. An important aspect of such a negative self-concept is that it seems likely that it can generate various persistent negative cognitions about the self, but also others and the world.

1.3.3 Disturbances in relational functioning

The third cluster of CPTSD, disturbances in relational functioning, can be understood in an attachment framework. Through his studies of neglected children, John Bowlby (1969) emphasized the critical importance of the infants attachment style with its caretaker for several developmental aspects, including interpersonal functioning. He introduced the concept of Inner Working Model (IWM) which refers to the internalization of the attachment experiences that creates representations of the self and others. These representations provide

prototypes and expectations for later relationships (Schäfer et al., 2022). Interpersonal trauma, such as physical violence or sexual abuse from a caregiver, causes the child to experience the caregiver as unpredictable and hostile. These experiences may be aggregated into a basic assumption that all relationships include unpredictability and hostility, as well as leading to suffering. As a consequence, the ability to develop and maintain healthy relationships with others are negatively affected. This may lead to psychological inflexibility, preventing the adolescent being able to imagine anyone caring for them.

Secure attachment includes the caregiver teaching the child adequate social interaction and developing social capacities (Pearlman & Courtois, 2005). The disturbances in relational functioning as a consequence of trauma exposure can also be understood in a learning-perspective. The caregiver plays an important role in the development of social competence, by helping the child adequately respond to different social situations (Schäfer et al., 2022). A neglected child might not have learned the differentiation between appropriate responses within and outside the family, for example when to obey an adult and when not to (Schafer et al., 2022).

This may also lead to difficulties in trusting people and believing that they have good intentions. Exposure to trauma might include an experience of being betrayed and exposed to dangerous situations from a significant other, who was supposed to protect them. The experience of the world as dangerous and volatile leads to an assumption that the adolescent only can trust themselves. It is reasonable to believe that the more negative experiences one has, the less you trust others. This can be understood as an adaptive reaction in order to protect oneself from more harm. This is supported by a study by Gobin and Freyd (2013) who found that adults with a history of being betrayed by their caregivers were less trusting of people in general, compared to adults without a history of betrayal. Other research has found that adolescents with PTSD were more anxious and hypervigilant when exposed to negative facial expressions and other threat-related information compared to healthy controls, as well as being more attentive to this kind of information (Dalgleish et al., 2001; Garrett et al., 2012). This may indicate that individuals exposed to trauma are more cautious and sensitive to indications of negative information. This could help us understand the impact trauma has on relational functioning.

The reaction to not trust other people in order to avoid more painful experiences may be adaptive for adolescents exposed to trauma, but can cause several challenges. Firstly, it may make it difficult to create new relationships. The need to protect oneself can disturb the ability to form new relationships that challenge trauma-related expectations. This can in turn

reinforce difficulties with relationships. Thus, it is important that psychotherapy focuses on changing negative cognitions about others, such as not being trustworthy, so the adolescent can form healthy relationships that challenge their negative expectations towards others.

1.4 CPTSD and persistence of negative thoughts

Adolescents with CPTSD show difficulties in self-organizing symptoms, as described above. The predictive processing framework postulates that we use our past experiences to make predictions or hypotheses about the world, and has also been used to understand PTSD (Kube et al., 2020; Wilkinson et al., 2017). For instance, having several experiences of being mistreated, harmed or feeling unsafe can create a prediction about the world as dangerous or that others are not to be trusted. It can also lead to predictions about oneself as not worthy of love, helpless and weak. These predictions can become global and general predictions, leading to a “better safe than sorry”-mentality. This kind of mentality is more likely if one has experienced type 2 trauma (Birkeland et al., 2022). However, it might be that experiencing type 1 trauma also can result in these kinds of globalized predictions. This can be explained by individual differences regarding both dispositional and environmental vulnerabilities (Cloitre et al., 2020; Maercker et al., 2022). Further, such predictions can be expressed through maladaptive expectations and negative cognitions about one self, others and the world. Difficulties with emotion regulation may add to this and lead to a cognitive inflexibility, resulting in a negative spiral where the individual is stuck in these negative cognitions and emotions. If this is the case, it is reasonable to believe that those with CPTSD might be more persistent to change.

1.5 Treatment of PTSD and CPTSD

The recommended treatment for adolescents with PTSD is Trauma-Focused Cognitive Behavioural Therapy (TF-CBT) (J. A. Cohen & Mannarino, 2017; Jaycox et al., 2010; Jensen et al., 2014; Jensen et al., 2018; Lewey et al., 2018; Morina et al., 2017). It is a short-term therapy, usually consisting of 8-16 sessions, and was originally developed for youth who had experienced sexual abuse (J. A. Cohen et al., 2012b). The treatment model builds on the cognitive model for PTSD by Ehlers and Clark (2000), as well as a range of other different perspectives, including attachment theory, developmental neurobiology, focus on the family and the therapeutic alliance (J. A. Cohen et al., 2012a, p. 4; J. A. Cohen et al., 2017). The treatment consists of different phases with different components, however the content in each of the components and phases can be modified to suit the needs of the adolescent and family.

The first phase is stabilization and includes psychoeducation, relaxation techniques, strategies for affect regulation and cognitive mastery (a focus on association between thoughts, emotions and behavior). The second phase includes trauma narrative and cognitive processing, e.g. identifying maladaptive cognitions associated with the trauma. The third phase is an integration and consolidation phase including social skills, in vivo exposure and enhancing safety behavior. In addition, an important element is that the therapist has parallel sessions with both the adolescent and the caregiver(s) each week. Research indicates that TF-CBT is also an effective treatment for adolescents with CPTSD (J. A. Cohen et al., 2012b; Eidhammer et al., 2017; Jensen et al., 2022; Karatzias et al., 2019; Ross et al., 2021; Sachser et al., 2017). J. A. Cohen and colleagues (2017) suggest that adaptations in TF-CBT are needed to meet the additional difficulties associated with CPTSD. For example, it is recommended to expand the length of the treatment (J. A. Cohen et al., 2012b; Eidhammer et al., 2017). Furthermore, the mechanisms of change in TF-CBT and an understanding of what makes it effective on PTSS are not well understood. However, two of the most researched mechanisms of change in treatment for PTSS is negative cognitions (Brown et al., 2019; Dekel et al., 2014; Jensen et al., 2018; Kangslampi et al., 2019; Karatzias et al., 2018; Karatzias et al., 2019) and emotion regulation (Sharma-Patel & Brown, 2016; Thornback & Muller, 2015).

1.6 Change in cognitions

PTSD and CPTSD may persist over decades. For example, one report from the World Health Organization (WHO) from 2017 found that the duration for PTSS lasted on average for about six years (Kessler et al., 2017). However, this was largely dependent on type of trauma; for those who had traumas from combat in war, the PTSS lasted for over 13 years. Whereas for some participants who had experienced natural disaster, the PTSS lasted for one year. A prospective epidemiological study by Hoolbrook and colleagues (2005) investigated quality of life and PTSD outcomes in adolescents. It was found that 27 % of the adolescents had PTSD at 18 months follow up. Because CPTSD is a new diagnosis and there has only recently been developed instruments that measure CPTSD, we do not have information on the stability over years. However, it is reason to believe that CPTSD is at least as stable as PTSD. Studies have found that CPTSD is associated with worse functioning, lower work capacity and a higher symptom burden than those with PTSD (Brenner et al., 2019; Brewin et al., 2017; Cloitre et al., 2013; Elklit et al., 2014). In addition, individuals with CPTSD may have difficulties with trust and believing that someone is willing to help them. They often have

experiences of being betrayed by their caregivers (e.g. Jackson et al., 2010). This can make the therapeutic alliance, and as such the therapeutic work, especially difficult for patients with CPTSD (Fagermoen et al., 2017). Thus, CPTSD might develop into a stable state that may be resistant to change (Jackson et al., 2010; Karatzias et al., 2018).

One hypothesis is that CPTSD may be particularly stable because it is associated with negative maladaptive cognitions about oneself, others and the world. According to Ehlers and Clark (2000), maladaptive negative cognitions maintains PTSD. In line with this, Meiser-Stedman (2002) wanted to create a cognitive model of PTSD for children and adolescence. In this paper he summarizes a large body of literature stating that negative and maladaptive cognitions maintain PTSD for children and adolescence. This has also been found in later research (De Haan et al., 2019; Gomez et al., 2019; Meiser-Stedman et al., 2019). There is not as much literature on negative cognitions for adolescence and whether it works as a maintaining factor in CPTSD. However, two of the diagnostic criteria for CPTSD is indeed related to negative cognitions about oneself, others and the world.

One of these diagnostic criteria is negative self-concept. As described earlier in this introduction, negative self-concept partially emerges due to reduced or poor support from caregivers. This means that children and adolescents who have this experience learn that instead of feeling safe and exploring the world around them, they learn protective strategies to foster survival. This can lead to diminished biological and psychological flexibility, for instance related to cognitions about the self, others and the world (Ford et al., 2021, p. 34). The other two diagnostic criteria can also help explain how negative cognitions might be a maintaining factor for CPTSD. According to the predictive processing framework, adolescents who have experienced trauma can develop overgeneralizing predictions about others and the world (Wilkinson et al., 2017). By having overly negative predictions, and as such expectations, about others and the world the adolescent protects themselves against disappointment and painful experiences. This need to protect themselves can be experienced as a necessity in order to survive. However, this might lead to a negative spiral where the adolescent avoids a range of activities and avoids engaging in relationships with others, in fear of being dismissed, disappointed or hurt. Thus, the lack of positive experiences with others and the world as a safe place, may illustrate how negative cognitions about the self, the world and others can be especially persistent for those with CPTSD.

Taken together, adolescents with CPTSD might have even more stable negative cognitions than those with PTSD. These adolescents are also more likely to blame themselves for the negative experiences, and thus have difficulties in responding adequately to social

support (Cook et al., 2005). This might again reinforce the negative cognitions about oneself, but also others and the world. Several studies and reviews have found that negative cognitions can be an important mechanism of change in treatment of trauma, such as TF-CBT (Brown et al., 2019; Kangslampi et al., 2019). Studies on children and adolescence have also found that negative cognitions mediate treatment effects (Kangslampi et al., 2019; McLean et al., 2015; Meiser-Stedman et al., 2009; Smith et al., 2007). For instance, Jensen and colleagues (2018) found that post traumatic cognitions seem to be a key component to recovery for traumatized youth in treatment with TF-CBT. In other words, they argue that the change in cognitions are one of the main aspects of observed reduction in PTSS in TF-CBT. Not many studies have examined change in cognitions as a possible important mechanism in the treatment of CPTSD in particular. However, Karatzias and colleagues (2018) found that negative cognitions about the self was the most important factor in treatment of CPTSD.

Research on negative cognitions and negative emotions have been investigated by measuring negative cognitions before, under and after treatment. However, we lack knowledge whether these vary from day-to-day, and the association between negative cognitions and negative emotions.

1.7 Change in emotions

An alternative hypothesis is that it is not cognitions, but emotions that drives change in psychotherapy. A review by McLean and Foa (2017) found that shame, guilt, anger and difficulties with emotion regulation were related to greater severity of PTSD-symptoms. As people with CPTSD has difficulties with affect regulation it could be possible that learning how to identify, express and tolerate one's negative emotions may lead to less negative cognitions. This would be in line with the emotion-focused approaches that have gained popularity during the last years. Until later years, many in the field of psychology and psychotherapy viewed emotions as a consequence of cognitions, and claimed that emotions needed to be avoided and controlled (Beck, 1976 as cited in Greenberg, 2012). In contrast, Greenberg and Safran (1989) argued that emotions are informative, adaptive signals that need to be processed and given meaning. This is also in line with process research indicating that emotions are an important mechanism of change in psychotherapy (Lane et al., 2022; Samoilov et al., 2000). Further, in this perspective it is not unlikely that change in emotions mediates change in cognitions in TF-CBT.

There are several elements in TF-CBT that aim to help the patient better label and regulate experienced negative emotions. For example, the stabilization phase includes

strategies such as problem solving, seeking social support, positive distraction techniques, focusing on the present and a variety of anger management techniques (J. A. Cohen & Mannarino, 2012a, p. 14). This is based on the assumption that these techniques will help the patient better tolerate and regulate the negative emotions that might occur in the next phase, which includes the adolescents developing the trauma-narrative. By helping the adolescent regulate experienced negative emotions, one assumes an increase in general emotional stability.

There are a few studies examining change in emotion regulation as a possible mechanism of change in TF-CBT. Thornback and Muller (2015) found that different aspects of emotion regulation, including inhibition, dysregulation and negativity, was improved during TF-CBT for children (7-12 years). However, the degree of change was limited. It was also found that improvement in negativity and dysregulation were the strongest predictors of change in PTSS. Sharma-Patel and Brown (2016) examined how emotional dysregulation and self-blame mediated or moderated symptomatic changes for children and adolescents (4-17 years) in treatment for trauma. The study found that emotional dysregulation was associated with reduction in PTSS, as well as behavioral problems. This emphasizes the importance of negative emotions in treatment.

One could argue that change in emotions will in turn lead to a change in negative cognitions about one self, others and the world. As far as we know the directional association between cognitions and emotions in adolescents in treatment for CPTSD is not investigated. This means that we do not know whether it is cognitions or emotions that drive the therapeutic change in PTSS. Possible differences in the association between adolescents with CPTSD compared to PTSS is also unknown.

1.8 The need for studies with frequent measures

Cognitions and emotions may change fast. To investigate the role of cognitions and emotions in treatment of CPTSD and PTSD it is therefore necessary to measure them frequently. Most studies rely on measures before and after treatment, but this approach has difficulty investigating mechanisms of change. Retrospective assessment does not assess changes in symptoms or interactions between them, nor does it investigate dynamic fluctuations throughout the day (Chun, 2016; Greene et al., 2022). Studies within mental health investigating the correspondence between retrospective assessments and daily electronic diaries have found that participants seem to rate symptoms at a higher frequency in the daily reports compared to the retrospective questionnaires (Myin-Germeys et al., 2018; Priebe et

al., 2013). This indicates a tendency where symptom intensity often is underestimated when using retrospective measures. Using experience sampling methodology (ESM) approaches to investigate PTSS can give nuanced insights into the daily life of individuals with CPTSD and PTSD, that are not accessible by traditional retrospective assessments (Greene et al., 2022). Research has suggested that PTSS are more unstable during treatment, and thus frequent measures are especially recommended. (Naragon-Gainey et al., 2012). The participants in the present study are in treatment, and it might be that negative cognitions and emotions are more unstable during treatment. This emphasizes the need for daily reports to assess the change of symptoms from day to day, as well as how they interact with another.

The ESM-approach opens up the possibility to distinguish changes between persons, that is variability between individuals, and changes within persons, representing variability of a particular value within individuals in a sample. The inclusion of within-person variability promotes more accurate estimations of the association between traits, such as cognitions and emotions in relation to CPTSD, with dynamic daily life variables (Hamaker, 2012; Chun, 2016). Hoffart (2017) argued that between-person research in psychotherapy is not suitable to examine changes in symptoms nor give implications on therapeutic recommendations. Thus, it is clear that the opportunity to measure within-person variability through ESM is very valuable in psychotherapy research. It can be argued that it is indeed whether the individual changes within themselves, and not compared to other individuals, that is important to understand in research on psychotherapy.

There are few studies investigating individuals with PTSD with frequent measures and, to our knowledge, no such studies on individuals with CPTSD. By using ESM, Newton & Ho (2008), examined emotion occurrence, intensity and variability in a sample of women with histories of interpersonal trauma. The participants used paper-and-pen diaries to rate their emotional experiences every 30 minutes during one day. The results showed that the severity of PTSS correlated with a higher intensity and variability, but not the occurrence, of negative emotions, especially feelings of anxiety and tension. This indicates that women with more severe PTSS, which might be compatible with CPTSD, do not experience more frequent negative emotions, but have greater difficulty to regulate these emotions (Newton & Ho, 2008). This study might indicate that individuals with severe PTSS have a higher level of negative emotions, and that negative emotions are correlated with other PTSS. Based on this, it is not unreasonable to believe that negative emotions are associated with negative cognitions. However, the individuals in this study were not in treatment nor did the study

examine the temporal associations between negative emotions and negative cognitions. This is needed to better understand the development and change of symptoms during treatment.

Greene and colleagues (2018; 2020) used a sample of adult Israeli civilians to investigate the dynamic interactions of traumatic symptoms during the Israel-Gaza conflict. Data were collected by using ESM, with participants responding via their smartphone about PTSD-symptoms and negative emotions twice a day for 30 days. The study collected data as the war was ongoing, meaning that the symptoms reported were peritraumatic and not post-traumatic. The results from the temporal network showed that the different symptom-clusters were stronger predictors for negative emotions and the other way around. According to the two studies by Greene, through advanced network analysis, it was found that negative emotions predicted other PTSS, including negative cognitions, and that other PTSS predicted negative emotions. This was dependent on the type of analysis. However, this indicates that negative emotions and negative cognitions measured on a daily basis might influence each other.

In a similar study, Reeves and Fisher (2020) assessed PTSS by using daily surveys 4 times a day for 30 days. The findings show that, among other symptoms, negative emotions and negative thoughts about oneself, others or the world were the strongest predictors of other symptoms. These results indicate that both negative emotions and negative cognitions are important to target in treatment, because they predict other PTSS.

Hoffart and colleagues (2019) used ESM to understand the dynamic network between PTSD symptoms in adult patients receiving two different types of therapy, standard or modified prolonged exposure. The participants were asked to rate different PTSS once a week for at least 5 weeks, based on their experiences the last three days. The study found that hypervigilance and physiological reactivation were the strongest predictors of other PTSS. Within the temporal network it was found that physiological reactivity to intrusions one week was positively associated with distress reactivity and to flashbacks the following week. To our knowledge, this is the only study that measures PTSS through ESM during treatment, emphasizing the need for literature focusing on treatment.

All the mentioned studies are important for the present study as they also examine PTSS and the associations between them on a day-to-day basis. Only one study examined this during treatment, however this study used a sample of adults. Thus, studies examining PTSS with daily measures in a sample of adolescents are lacking.

1.9 Adolescents

Research on cognitive and emotional mechanisms in the daily life of adolescents with CPTSD are lacking. This is concerning considering that adolescence is an important developmental period for cognitive, emotional and psychosocial abilities (Steinberg, 2009). Schäfer and colleagues (2022) claim that two important developmental tasks during adolescence are acquiring emotion regulating strategies, and developing abilities that are crucial for relational functioning. Exposure to traumatic experiences before and during this period can disturb healthy development, which can lead to many negative consequences. Further, a better understanding of the cognitive and emotional mechanisms associated with CPTSD in adolescence is necessary to reduce the negative developmental consequences following trauma.

Research indicates that the developmental conditions in adolescence are associated with functioning in adulthood (Moffitt et al., 2011; Szwedlo et al., 2017). This emphasizes the need for effective treatment interventions for adolescents with CPTSD. Although studies show empirical support for the effectiveness of TF-CBT in treatment of PTSS in adolescents (Morina et al., 2016), there is also evidence indicating that some adolescents show persistent PTSS 18 months after the end treatment (Holbrook et al., 2005). Persistent PTSS have also been found to be associated with behavioral problems like drug- and alcohol abuse. Gender and age have also been established as risk factors for PTSD. For example, Trickey and colleagues (2012) found in their meta-analysis that identifying as a female was a risk factor for developing PTSD. The effect size of female sex on PTSD increased as age increased. Younger age was not found as an individual risk factor for developing PTSD.

Further, the understanding of psychological mechanisms related to PTSD and CPTSD in adolescents is necessary to avoid the prolonging of symptoms. The knowledge could help the treatment approaches to effectively prevent further development of PTSS and, thus, enhance functioning in adulthood. Therefore, research among adolescents with PTSD and CPTSD is certainly called for.

1.10 Knowledge gaps

The association between negative cognitions and emotions are not well understood in CPTSD, nor how the symptoms change from day-to-day in adolescents with CPTSD. Most previous research on PTSD and CPTSD have used retrospective assessments. There are a few ESM studies on adults with PTSD and PTSS (Greene et al., 2018; Greene et al., 2020; Newton & Ho, 2008; Reeves & Fisher, 2020), one study with adults in treatment (Hoffart et

al., 2019), however no studies to our knowledge on CPTSD. In addition, the mechanisms in TF-CBT for CPTSD are not well understood, and there are only few studies examining possible treatment effects of TF-CBT on CPTSD (Eidhammer et al., 2017; Jensen et al., 2022; Sachser et al., 2017).

1.11 Research questions

Based on these knowledge gaps, this study aimed to better understand the cognitive and emotional mechanisms associated with adolescents with CPTSD who are receiving TF-CBT. Therefore, by using day-to-day data we examined the following research questions:

1. Do negative cognitions about one self, others and the world decline in adolescents with CPTSD and PTSS? We hypothesize that there will be a reduction for both groups, however the CPTSD group will show a less reduction in negative cognitions and be more stable, compared to the PTSS group.
2. Do negative emotions, including anger, sadness and stress, decline in adolescents with CPTSD and PTSS? We hypothesize that there will be a reduction for both groups, however the CPTSD-group will show less reduction in negative emotions and be more stable, compared to the PTSS group.
3. Are less negative cognitions about one self, others and the world one day associated with less negative emotions the following day? Due to the lack of research regarding temporal associations between negative cognitions and emotions for adolescents with CPTSD, we want to explore whether this association might be weaker for the CPTSD-group.
4. Are less negative emotions one day associated with less negative cognitions about one self, others and the world the following day? Due to the lack of research regarding temporal associations between negative emotions and cognitions for adolescents with CPTSD, we want to explore whether this association might be weaker for the CPTSD-group.

2. Materials and method

2.1 Participants and recruitment

This research project is based on collected data from a larger pilot study by Norwegian Centre for Violence and Traumatic Stress (NKVTS) called “My everyday life” (in Norwegian “Min Hverdag”). The aim of the main study is to gain insight in how a smartphone app called “Min hverdag” can be integrated with treatment in a way that encourages adolescents to take ownership of their therapy, facilitates for opportunities of self-reflection, and provides tools for rehearsal of skills for managing stress (Birkeland et al., 2021). In this study, 17 Norwegian child and adolescent mental health clinics (BUP) that had already implemented TF-CBT, were invited to use the app in treatment of PTSS. Of these, 11 clinics agreed to participate with their TF-CBT therapists. Enrolment of patients started in October 2020 and ended in March 2022. Data collection included retrospective questionnaires before and after treatment with TF-CBT, as well as daily questionnaires on daily-life PTSS, cognitions and emotions.

The inclusion criteria were that the participants were adolescents between 13 and 18 years of age, that they had at least one experience of trauma, PTSS above clinical cut off and informed consent to participate in the project from the adolescent (and for those below 16 also from their caregiver). Exclusion criteria were indication of severe psychosis and/or active suicidal behavior. These criteria resulted in a total sample of $N = 56$ before data cleaning (see data cleaning section below for further details). The participants were between 13 and 19 of age ($M = 15.63$, $SD = 1.52$). There were 48 females, 7 males and one participant who did not identify as either male or female.

The participants downloaded an app on their phone during the first therapy session. This app was developed by researchers, clinicians and adolescents with PTSS. The app consisted of various functions, such as psychoeducation about trauma, a toolkit with different techniques when experiencing stress and goal functionality (see Appendix A). The participants could use these functions when they were in treatment, as a supplement to the sessions with the TF-CBT trained therapist. In addition, this app also included a daily questionnaires that took about 2-3 minutes to complete (see Appendix B). They were asked to complete these questionnaires every evening for as long as they were in treatment, which was approximately 3-4 months. The daily questionnaires were available to participants the last two hours before bedtime, which they specified when setting up the app. If they did not respond, they got a reminder 30 minutes before bedtime. In addition to the daily questionnaires, the

participants completed a standardized questionnaire (CATS-2, described in detail under measures) before and after treatment.

2.2 Incentives and ethical considerations

The first ten youths who participated received 500 NOK to participate in the study and the same participants received an additional 500 NOK to complete 80 daily assessments in total. After feedback from both participants and therapists, the reward system was changed. This resulted in the remaining participants receiving 200 NOK to participate, and then an additional 200 NOK for completing 20 daily assessments. They could receive up to 1000 NOK, meaning they had completed a total of at least 80 daily assessments.

In addition, the participants received personalized feedback on their scores to increase motivation to comply with the daily registrations of symptoms and completing their own goals (Birkeland et al., 2021). For example, based on their scores on different symptoms during the treatment, the participants could get an overview of their overall symptoms through graphs (see Appendix C). Also, when the participants completed their own goals, they received visualized stimuli (e.g. stars) intended to work as a reward.

The study is approved by the Regional Committee for Medical and Health Research Ethics (REK). Participation in the study was voluntary. Adolescents between 16 and 18 years provided informed consent themselves, whereas for adolescents between 13 and 15 years, parents provide informed consent. There are two exceptions from collecting consent from both parents. When the child welfare had the responsibility for the adolescent, they consented on the child's behalf. When the therapists had reason to believe that the adolescent was exposed to violence in close relations, adolescents from 13 years could consent on their own behalf. Any of the participants could withdraw their consent at any time during the project.

An approved Data Protection Impact Assessment (DPA) was developed in collaboration with the Norwegian Centre for Research Data (reference 680226). In addition, several of the BUPs conducted their own ethical assessments based on these documents.

2.3 Measures

2.3.1 *Child and Adolescent Trauma Screen (CATS-2)*

Child and Adolescent Trauma Screen version 2 (CATS-2) (Sachser et al., 2022) was used to measure PTSD- and CPTSD- symptoms. This questionnaire was completed by the participants before and after treatment. CATS-2 is a screening instrument to examine exposure of potentially traumatic events (PTE) and PTSS. The first part of the CATS-2 presents different PTE, based on the DSM-5-definition of traumatic incidents and consists of 16 items. The first 14 items list a number of traumatic incidents such as accidents, domestic violence, medical procedures, sexual assault, and war. Item 15 asks the participants to describe any other stressful or scary event they have experienced. Item 16 asks the participant which of the event(s) are the most bothersome today.

The second part of CATS-2 examines PTSS and is based on both the DSM-5 and ICD-11 criteria for PTSD and CPTSD. Each item is rated on a scale from 0-3: 0 = “Never”, 1 = “Once in a while”, 2 = “Half of the time” and 3 = “almost always”. CATS-2 also examines psychosocial functioning by presenting five yes/no items. These items ask whether the reported symptoms interfere with either (1) getting along with others, (2) hobbies/fun, (3) school or work, (4) family relationships and/or (5) general happiness.

Reliability analysis in SPSS showed that the items from CATS-2 used to measure PTSS have a good reliability ($\alpha=.74$). The items used to measure CPTSD proved to have an excellent reliability ($\alpha=.84$).

Other studies also find that CATS-2 has promising psychometric properties. Sachser and colleagues (2022) wanted to examine the CATS-2 specifically as a measure of PTSD and CPTSD as according to ICD-11 criteria. They had an international sample with youth and their caregivers. It was found that the score for PTSD had an adequate reliability ($\alpha=.67$), and the score for CPTSD had an excellent reliability ($\alpha=.83$). Sachser and colleagues (2022) also found that CATS-2 showed high validity when compared to CAPS-CA-5, ICD-11 criteria for PTSD and CPTSD.

2.3.2 *Categorization into PTSS and CPTSD*

We divided the dataset into two groups of participants for the purpose of the present study. The first group included the participants who fulfilled the ICD-II criteria for PTSD. We used certain items from CATS-2 to establish which participants were eligible for either the PTSD- or CPTSD-group (see Appendix D). The participants had to have *one* symptom over clinical

cut off, 2 or more, within the four clusters of symptoms. These clusters include “re-experiencing”, “avoidance”, “hyperarousal” and “functional impairment”. If the participant fulfilled these criteria, they were eligible for the PTSD-group.

In the second group only participants who fulfilled the ICD-11 criteria for CPTSD were eligible (see Appendix D). Thus, the participants in this group had to meet the criteria for PTSD and in addition had to score over cut off (2 or more) on one symptom within the following clusters; “Emotion regulation”, “Negative self-concept” and “Disturbed relationships”.

We decided to include those who did not meet the ICD-11 criteria for PTSD, but reported PTSS, in the PTSD-group. This resulted in the group consisting of 12 individuals who met the criteria for PTSD and 23 participants with PTSS, who did not fulfill the diagnostic criteria for PTSD (before data cleaning). This group will hereby be referred to as the PTSS-group.

It can be considered a rule of thumb that patients with a total score of 15 or more on CATS-2 are in need of treatment, and TF-CBT is thus recommended (Jensen et al., 2022; Sachser et al., 2022). This is also the case for the present participants, except one participant. As such, it seems reasonable to combine the individuals with PTSD and PTSS in one group, as they most likely do not differ substantially from each other, and all are in need of treatment.

These two groups, PTSS and CPTSD, were used in order to examine whether there are differences in reduction of negative cognitions and negative emotions, and potential differences in the temporal association between cognitions and emotions. The two groups were also used in the descriptive analysis.

2.3.3 Daily measures of negative cognitions

The questionnaires during the ESM period contained items regarding PTSS, including negative cognitions, social relations, positive/negative events and emotions. The items in the daily questionnaires were based on CATS-2, but were adapted to a daily response frame.

To measure daily negative cognitions participants responded to three items. These were: “During this day, to what degree have you thought “I can't trust other people”?”, “During this day, to what degree have you thought “The world is an unsafe place”?” and “During this day, to what degree have you thought “I am not good enough”?”. These variables were measured using continuous sliders (0-100) that were anchored by descriptions at the extreme ends (e.g., “not at all” to “very much”). The items were averaged, creating variables of daily negative cognitions.

We measured the reliability for this three-item scale consisting of negative cognitions, and found that it has an excellent reliability ($\alpha=.85$) in our sample. Regarding the validity of this scale, the items were adapted from CATS-2, but changed to fit the daily frame. However, the items are almost identical as in CATS-2, and as described above, CATS-2 shows high validity (Sachser et al., 2022).

2.3.4 Daily measures of negative emotions

To measure daily negative emotions participants responded to three different items. These were “During this day: have you felt angry?”, “During this day: have you felt sad?” and “During this day: have you felt stressed out?”. These items were measured using a slider from 0 to 100 with “not at all” to “almost all the time” at the extreme anchor points. The items were averaged, creating variables of daily negative emotions. We also measured the reliability of this three-item scale and found that this also has an excellent reliability ($\alpha=.81$). We do not know the validity for the negative emotions scale. This scale has been influenced and inspired by other questionnaires, as well as dialogue with adolescents who have experienced trauma. However, the present study has not run any analysis on validity. As such, this is a drawback with the present study.

2.3.5 Previous day negative cognitions and emotions

To assess the relationship between negative cognitions the previous day and daily negative emotions (and vice versa), we created new lagged variables from yesterday’s value of negative cognitions, and yesterday’s value of negative emotions. Thus, for each dataline in our long-format data file, there was one value for today’s cognitions, one for yesterday’s cognitions, one for today’s emotions and one for yesterdays emotions.

2.4 Data cleaning

For the purpose of this study we included participants who completed a minimum of 30 % of the questionnaires within the first 60 days of TF-CBT. Excluding participants with a compliance rate of lower than 30 % has been established as a rule of thumb within ESM research (Jacobson, 2020 as cited in Kirtley et al., 2022). This resulted in a sample size of $n = 34$. Some of the participants answered the questionnaires more than once during one day. In these instances, the data from the last response was used in the analysis.

2.5 Statistical analysis

2.5.1 Analysis plan

We used IBM SPSS, version 28, to carry out the descriptive analysis for this sample and analysis of reliability.

Data was analyzed using R v3.4.4 (R Core Team, 2018) via R Studio v1.4.1717 (RStudio Team, 2021). To measure variation, Intraclass Correlation Coefficients (ICC) for negative cognitions and negative emotions were calculated using the ‘lme’ function in the ‘nlme’ package (Pinheiro, 2018). For analyses of stability of and the association between negative cognitions and negative emotions we conducted a linear mixed effects model with random effects of intercept and slopes. For this, we used the ‘lme’ function in the ‘nlme’ package (Pinheiro, 2018). The figures were generated using ‘ggplot2’ (Wickham, 2009). We created tables for summaries from the models.

3. Results

3.1 Descriptive statistics

In the present study there were 34 participants in total. In the PTSS-group ($n = 18$) there were 16 females and 2 males who were between 13 and 17 years of age ($M = 15.33$, $SD = 1.33$). After data cleaning, this group consisted of 6 participants with PTSD and 12 participants with subclinical PTSS. In the CPTSD-group ($n = 16$) there were 13 females, 2 males and one who did not identify as a female nor as male. The participants in this group ranged from 13 and 17 years of age ($M = 15.69$, $SD = 1.54$).

Descriptive analysis showed that the participants in the PTSS-group had experienced 0 to 10 traumatic events ($M = 4.28$, $SD = 2.6$). The most frequently reported traumatic event was experiencing someone close dying suddenly or brutally (50.0 %, $n = 9$). There was one participant, for unknown reasons, who had not reported experiencing any of the events.

In the CPTSD-group, the participants had experienced 4 to 10 traumatic events ($M = 6.37$, $SD = 1.96$). The most frequent reported traumatic event was being bullied (75.0%, $n = 12$).

The descriptive information is summarized in the tables below (table 1 and table 2). As the participants have experienced more than one event, the percentage exceeds 100 percent (%).

Table 1*Descriptive Information on the Subsample with Clinically Significant PTSS (n = 18)*

	Mean (SD) or % (n)	Median	Range
Age, mean (SD)	15.33 (1.33)	15	13-17
Sex, female % (n)	88.9 % (16)		
Natural disaster, % (n)	0 % (0)		
Serious accident, % (n)	22.2 % (4)		
Physical violence by family member, % (n)	44.4 % (8)		
Community violence, % (n)	33.3 % (6)		
Attacked by threat, % (n)	5.6 % (1)		
Observing physical violence of family member, % (n)	38.9 % (7)		
Observing community violence, % (n)	22.2 % (4)		
Sexual assault, % (n)	44.4 % (8)		
Online sexual assault, % (n)	33.3 % (6)		
Bullying, % (n)	44.4 % (8)		
Online bullying, % (n)	44.4 % (8)		
Sudden death, % (n)	50.0 % (9)		
Medical procedure, % (n)	5.6 % (1)		
War, % (n)	0 % (0)		
Other events, % (n)	38.9 (7)		
Number of traumatic events, mean (SD)	4.27 (2.6)	4	0-10
Average daily negative cognitions, mean (SD)	37.14 (27.27)		
Average daily negative emotions, mean (SD)	39.62 (25.58)		

Table 2*Descriptive Information on the Subsample with Complex PTSD (n = 16)*

	Mean (SD) or % (n)	Median	Range
Age, mean (SD)	15.69 (1.54)	16	13-17
Sex, female % (n)	81.3 % (13)		
Natural disaster, % (n)	6.3 % (1)		
Accident, % (n)	25.0 % (4)		
Physical violence by family member, % (n)	56.3 % (3)		
Community violence, % (n)	56.3 % (9)		
Attack by threat, % (n)	6.3 % (1)		
Observing physical violence of family member, % (n)	62.5 % (10)		
Observing community violence, % (n)	56.3 % (9)		
Sexual assault, % (n)	56.3 % (9)		
Online sexual assault, % (n)	56.3 % (9)		
Bullying, % (n)	75.0 % (12)		
Online bullying, % (n)	62.5 % (10)		
Sudden death, % (n)	50.0 % (8)		
Medical procedure, % (n)	18.8 % (3)		
War, % (n)	0 % (0)		
Other events, % (n)	50.0 % (8)		
Number of traumatic events, mean (SD)	6.37 (1.96)	6	4-10
Average daily negative cognitions, mean (SD)	64.61 (27.01)		
Average daily negative emotions, mean (SD)	63.27 (25.04)		

3.2 Change and stability of negative cognitions

The intraclass correlation coefficient (ICC) can be interpreted as the proportion of the variance explained by the grouping structure in the population. The ICC of negative cognitions was 0.66, which means that 66% of the variance can be explained between individuals, whereas 34% of the variance can be explained by variance within individuals. This means that the level of cognition varies considerably across individuals but also within

individuals. In such situations, linear mixed effect analyses with fixed and random effects are appropriate.

For research question 1 we conducted a linear mixed effects analysis of negative cognitions, with time (day), female sex, age centered at 16, and CPTSD (group membership) as predictors. We added random effects of intercepts and slopes. To achieve stable models we simplified the structure of random effects, and omitted random effects of correlations between intercepts and slopes.

Table 3 shows that there was a significant reduction of negative cognitions over time. Levels of negative cognitions decline with an average -0.19 per day (Model 1). Over 60 days, the reduction is on average 11.4 on a scale from 0 to 100. We found no significant effects of sex or age. Participants with CPTSD reported higher levels of negative cognitions than participants with PTSS (Model 2). We also tested the interaction between CPTSD and time (day) in a third model including all covariates. The interaction between CPTSD and time (day) was not significant (estimate 0.07, 95% CI -0.22 to 0.36), $p = 0.648$). Thus, we did not find evidence of difference in change over time in negative cognitions for participants with CPTSD compared to participants with PTSS.

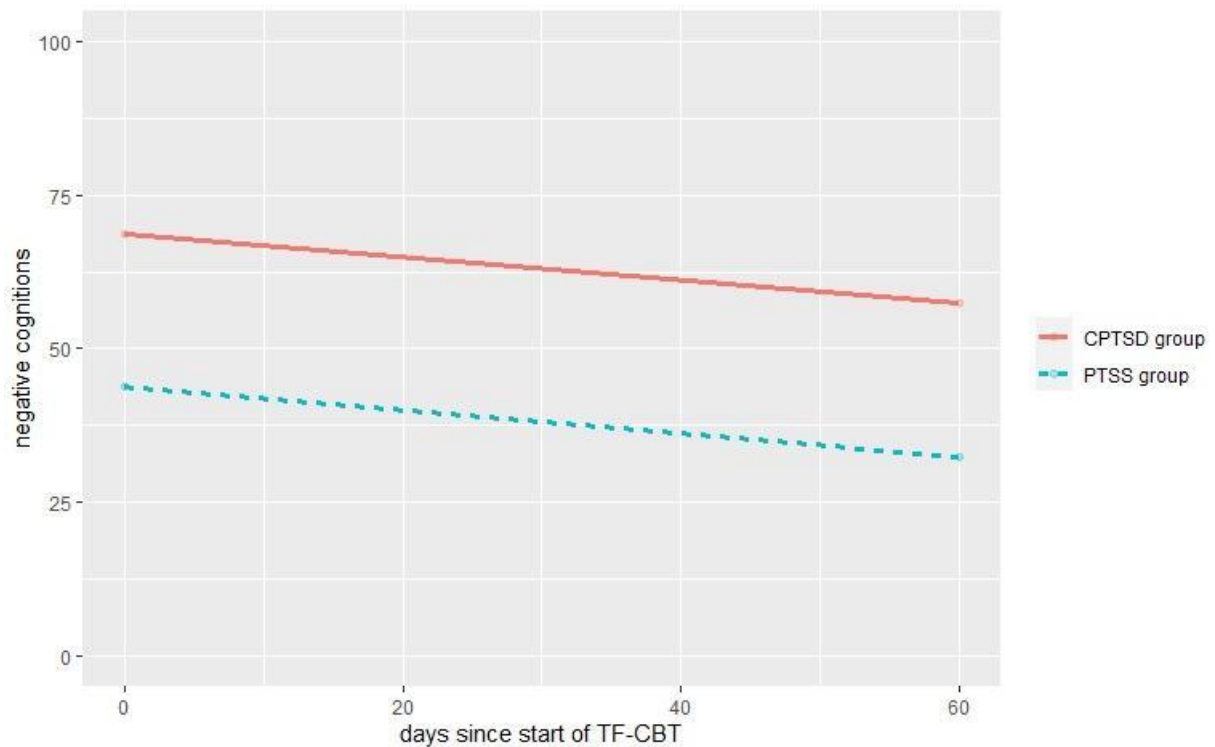
Table 3

Associations between Time, Sex, Age, Complex PTSD, and Negative Cognitions

	Model 1			Model 2		
	Estimate	95% CI	P	Estimate	95% CI	P
(intercept)	55.53	46.03 to 65.03	<.001	43.71	32.46 to 54.95	<.001
Day	-0.19	-0.33 to -0.05	0.010	-0.19	-0.33 to -0.05	0.010
Female sex	-0.01	-0.06 to 0.05	0.818	-0.02	-0.07 to 0.04	0.448
Age	0.65	-5.94 to 7.24	0.841	-0.20	-6.07 to 5.66	0.994
CPTSD				24.95	8.53 to 41.36	0.004

Figure 1

Change over Time in Negative Cognitions in Participants with Complex PTSD and PTSS



Note. Figure 1 shows the development over time for participants with CPTSD and PTSS according to Model 2. The intercepts in this figure are based on day = 0, female sex = 0 and age = 16. For all other values the figure will look similar but have different values on the y-axis.

3.3 Change and stability of negative emotions

For negative emotions the ICC was 0.58, meaning that 58 % of the variance can be explained between individuals, and 42 % of the variance can be explained within individuals. Thus, the level of emotions varies substantially between individuals, but also within individuals. Linear mixed effect analyses with fixed and random effects are therefore appropriate.

For research question 2 we conducted a linear mixed effects analysis of negative emotions, with time (day), female sex, age centered at 16, and CPTSD (group membership) as predictors. We added random effects of intercepts and slopes. As for the previous research questions, we omitted random effects of correlations between intercepts and slopes.

Table 4 shows that there was a significant reduction of negative emotions over time. Levels of negative emotions decline with on average -0.22 per day (Model 1). Over 60 days, the reduction is on average 13.2 on a scale from 0 to 100. We found no significant effects of sex or age. Participants with CPTSD reported higher levels of negative emotions than participants with PTSS (Model 2). We also tested the interaction between CPTSD and time (day) in a third model including all covariates. The interaction between CPTSD and time (day) was not significant (estimate: 0.03, 95% CI -0.22 to 0.28, $p = 0.838$). Thus, we did not find evidence of difference in change over time in negative emotions for participants with CPTSD compared to participants with PTSS.

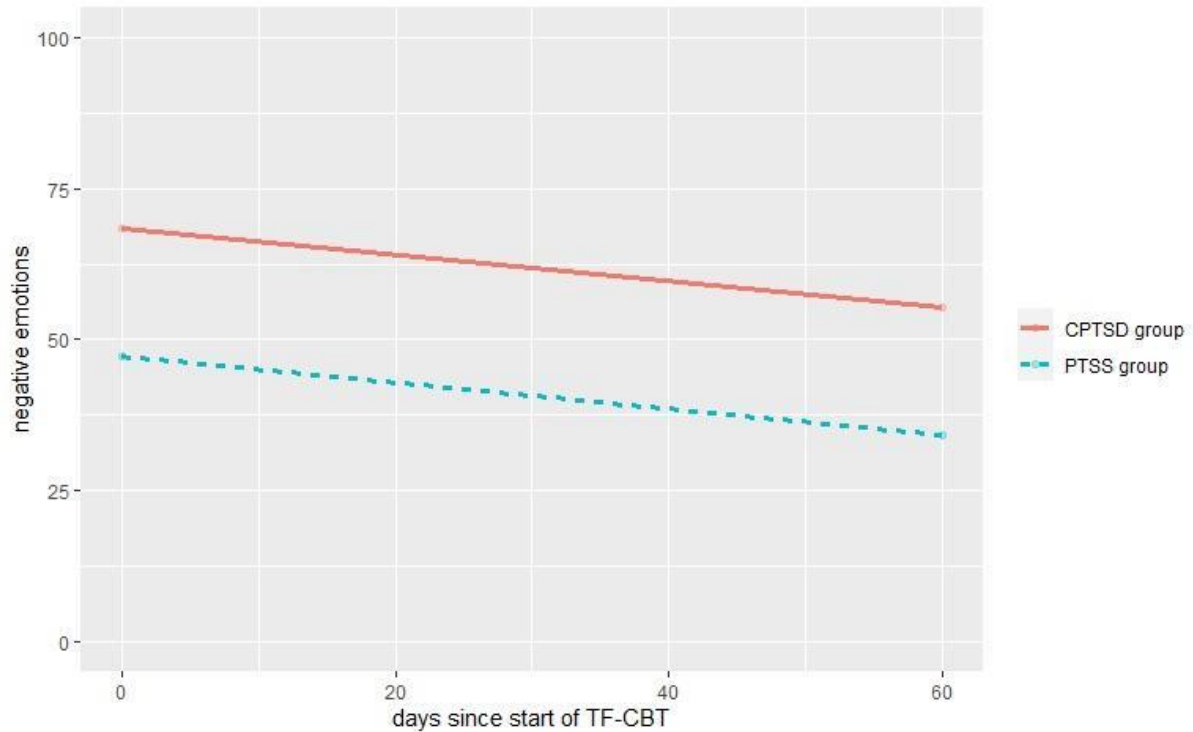
Table 4

Associations between Time, Age, Sex, Complex PTSD, and Negative Emotions

	Model 1			Model 2		
	Estimate	95% CI	P	Estimate	95% CI	P
(intercept)	57.30	49.83 to 64.77	<.001	47.22	38.64 to 55.80	<.001
Day	-0.22	-0.34 to -0.09	0.001	-0.22	-0.34 to -0.09	0.001
Female sex	-0.00	-0.05 to 0.04	0.822	-0.02	-0.05 to -0.02	0.413
Age	1.26	-3.92 to 6.43	0.624	0.53	-3.94 to 4.97	0.811
CPTSD				21.25	8.74 to 33.75	0.002

Figure 2

Change over Time in Negative Emotions in Participants with Complex PTSD and PTSS



3.4 Previous day's negative cognitions and emotions

For research question 3 we lagged the average daily negative cognitions score. This was to provide an average daily level of negative cognitions to the day prior to the negative emotion score. From there, we conducted a linear mixed effects analysis of previous day (lagged) negative cognitions, with today's negative emotions, time (day), female sex, age centered at 16 and CPTSD as predictors.

We found a significant association between the previous day's negative cognitions and today's negative emotions. We found no significant effects of sex or age. The interaction between CPTSD and previous days' negative cognitions was not significant (estimate: 0.01 95% CI, -0.12 to 0.10, $p = 0.883$). See table 5.

Table 5

Associations between Age, Sex, Negative Cognitions the Previous Day, Time, and Complex PTSD and Negative Emotions

	Estimate	95% CI	P
(intercept)	39.62	31.11 to 48.14	<.001
Day	-0.17	-0.28 to -0.05	0.004
Sex	-0.01	-0.05 to 0.02	0.497
Age	0.62	-3.62 to 4.73	0.766
CPTSD	19.92	7.98 to 31.85	0.002
Previous day's negative cognitions	0.14	0.08 to 0.19	<.001

3.5 Previous day's negative emotions and cognitions

For research question 4, we lagged the average daily negative emotions score. This was to provide an average daily level of negative emotions to the day prior to the negative cognitions score. From there, we conducted a linear mixed effects analysis of previous day (lagged) negative emotions, with today's negative cognitions, time (day), female sex, age centered at 16 and CPTSD as predictors.

We found a significant association between the previous day's negative emotions and today's negative cognitions. We found no significant effects of sex or age. The interaction between CPTSD and previous days' negative emotions was significant, though not very strong (estimate: -0.12, 95% -0.23 to -.01, $p = 0.036$). See table 6.

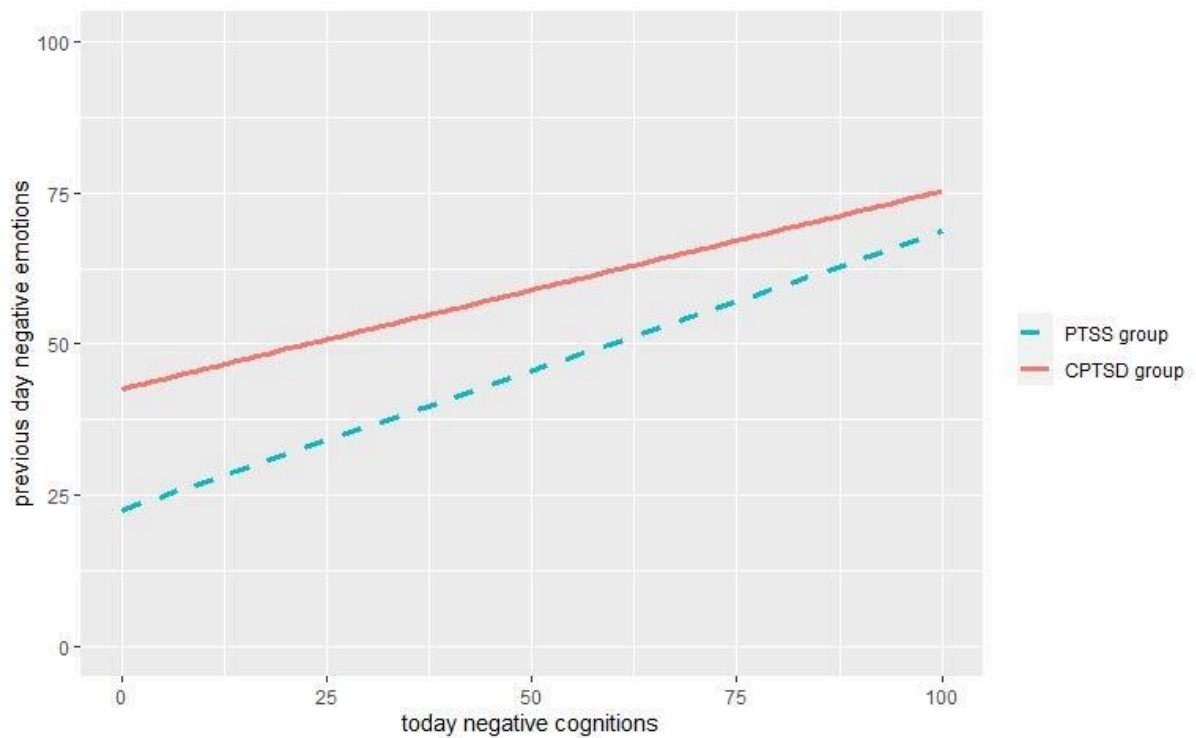
Table 6

Associations between Age, Sex, Negative Emotions the Previous Day, Time, and Complex PTSD, and Negative cognitions

	Estimate	95% CI	P
(intercept)	35.94	24.60 to 47.27	<.001
Day	-0.15	-0.30 to -0.01	0.047
Sex	-.01	-0.06 to 0.04	0.654
Age	0.48	-5.28 to 6.23	0.867
CPTSD	22.57	6.47 to 38.68	0.008
Previous day's negative emotions	0.16	0.10 to 0.21	<.001

Figure 3

Associations between Previous Day's Negative Emotions and Today's Negative Cognitions in Participants with Complex PTSD and PTSS



Note. Figure 3 shows the interaction between previous day's negative emotions and CPTSD on today's negative cognitions. It shows that the association between previous day negative emotions and today's negative cognitions is weaker for the CPTSD-group compared to the group with PTSS. Thus, adolescents with PTSS have less negative cognitions after a day with less negative emotions, but this is applicable to a lesser extent for those with CPTSD.

4. Discussion

In the present study, we set out to study whether the negative cognitions about oneself, others and the world and negative emotions (anger, sadness and stress) were reduced for adolescents with CPTSD and PTSS the first 60 days of TF-CBT treatment. We also wanted to examine whether this reduction was different for the CPTSD-group compared to the PTSS-group. We also set out to explore the temporal association between negative cognitions and negative emotions, and potential differences between the two groups regarding this.

Our main findings were that negative cognitions were reduced during the first 60 days of TF-CBT for both groups. Adolescents with CPTSD had more negative cognitions compared to the adolescents with PTSS. The change in cognitions during treatment was not different when comparing the two groups. As such, we did not find that adolescents with CPTSD are more stuck in their negative cognitions compared to adolescents with PTSS. Furthermore, we found that negative emotions were reduced during the first 60 days of TF-CBT for both groups. We did not find any differences in the reduction between the two groups. However, adolescents with CPTSD reported more negative emotions compared to the adolescents with PTSS, but the change over time was not different between the two groups.

The results show that there was an association between negative cognitions and negative emotions the same day, and an association between less negative cognitions the previous day and less negative emotions than usual the following day. We also found an association between less negative emotions the previous day and less negative cognitions than usual the following day. This means that, within every participant in the study, lower levels of cognitions and emotions one day led to a lower level of cognitions and emotions the next day. Further, we did not find that the association between negative cognitions and negative emotions was weaker for the CPTSD-group compared to the PTSS-group. However, we did find that the association between less negative emotions the previous day and less negative cognitions the following day was in fact weaker for the CPTSD-group, compared to the PTSS-group. This means that having less negative emotions one day affected the negative cognitions the following day to a lesser extent for adolescents with CPTSD.

4.1 Level of negative cognitions in daily life

Levels of negative cognitions in daily life decreased on average the first 60 days of TF-CBT for adolescents, which supported our hypothesis. This is in line with previous research

showing that negative cognitions might be a possible important mechanism of change in TF-CBT for youth (Jensen et al., 2018; Kangslampi et al., 2019; Karatzias et al., 2018; Karatzias et al., 2019).

Further, it is encouraging that we found that within-person changes in negative cognitions are reduced in daily life for adolescents with PTSS. There have been few studies examining daily variability in PTSS and using ESM. The only study that has used ESM to examine the daily dynamics of different PTSS for adults while in treatment, did not find that negative cognitions predicted other PTSS (Hoffart et al., 2019). However, other ESM studies with adults, but not in treatment, have found support for negative cognitions as a strong predictor for other PTSS (Chun, 2016; Greene et al., 2020; Reeves & Fisher, 2020). Thus, the present study adds to the existing literature by strengthening the notion that negative cognitions are important to understand the mechanisms of PTSS, but also that the within-person levels of negative cognitions are significantly reduced during treatment for adolescents.

Our finding can be understood through the cognitive model of PTSD by Ehlers and Clark (2000). The model stresses the importance of negative appraisals of the traumatic event and the PTSS a maintaining mechanism of PTSD. Such negative appraisals can be negative cognitions about oneself, others and the world. For example, in the present study the negative cognition about oneself is measured through an expression of the subjective experience of the individual's value. A common negative appraisal after trauma can be that the individual's worth is diminished or ruined, where this can be expressed through the cognition "I am not good enough". According to Ehlers and Clark this might be a maintaining mechanism in PTSS. More specifically, the maintaining element might be the experience of a potential threat, for example from others, which is expressed through negative cognitions. Further, Meiser-Stedman and colleagues (2019) argue that negative appraisals determine whether the PTSS are acute or whether the PTSS develops into a more persistent character for youth. This highlights the importance of negative cognitions in maintaining PTSS for adolescents. The present findings might indicate that TF-CBT targets the negative cognitions about the self, others and the world and might ultimately explain why the negative cognitions are reduced during the 60 days of treatment.

We do not know what phase or component of the treatment that is involved in the reduction of negative cognitions. However, as mentioned earlier, the nature of negative cognitions measured in this study relates to the experience of individuals' value, trusting others and experience of safety in the world, and this can be related to different components

and aspects of TF-CBT. For example, psychoeducation about normal reactions to trauma is an important component in the first phase of TF-CBT. As such, the adolescents might understand that the PTSS are a normal reaction to what they have experienced, instead of interpreting them as “proof” that they are worthless, or not good enough. In addition, as in all psychotherapy, alliance is also an important aspect in TF-CBT (Ovenstad et al., 2020; Ovenstad et al., 2022). By focusing on building a good relationship with the adolescent, the adolescent might experience the therapist as someone to trust, and the sessions as a safe space. A good alliance between adolescent and therapist might therefore enhance trust in others, and strengthen the belief that the world is a safe place. Consequently, the adolescent might also receive help to distinguish what is actually dangerous from what is normal and not dangerous, which might enhance the experience of the world as a safe place, instead of unsafe. The therapist offers continuity and care by being there in weekly sessions, and this might in itself result in minimizing the feeling of worthlessness and other negative cognitions.

Another important component in TF-CBT is the individual and parallel sessions with the caregiver during treatment. The aim of this work is to strengthen the caregiver in their support and understanding of the adolescents' PTSS and experiences after trauma (J. A. Cohen et al., 2012a, p. 12). This might reinforce the experience that they can trust others, and that they are worth supporting, in contrast to feeling worthless. This might also strengthen the caregiver in helping the adolescent to regulate their emotions, understanding and sort out their cognitions and experiences after the trauma, possibly resulting in increasingly more positive cognitions about themselves, others and the world.

Exposure and cognitive processing might be another important component in TF-CBT that reduces one's negative cognitions about oneself, others and the world. Exposure is a part of TF-CBT. The adolescent can be exposed physically for objects and activities they fear in relation to the trauma, but also more indirectly by talking about the traumatic experience with the therapist. This can reduce negative cognitions. In the component consisting of cognitive processing, the treatment focuses especially on the negative cognitions the adolescent might have, and as such can be particularly important in the reduction of negative cognitions. However, we do not know at what stage in the treatment the adolescents are in, nor what components of TF-CBT they have received during the 60 days. It is therefore uncertain whether the reduction of negative cognitions in the present study can be explained as a result of exposure and cognitive processing.

Taken together, several aspects of TF-CBT seem to contribute to the observed reduction in negative cognitions in adolescents with PTSS.

4.1.1 Daily cognitions in adolescents with CPTSD

We did not find differences in the reduction of negative cognitions between the two groups. This was not in line with what we hypothesized, which was that adolescents with CPTSD would have a smaller reduction in negative cognitions compared to the PTSS-group. This hypothesis was based on multiple theoretical frameworks and literature about PTSD, as well as research on CPTSD (Bowlby, 1969; Cook et al., 2005; Ehlers & Clark, 2000; Kube et al., 2020; McCann & Pearlman 1992; Shcäfer et al, 2022; Schneider et al., 1991; Wilkinson et al., 2017). The hypothesis was also based on the additional criterias for CPTSD indicate that this group indeed differs from PTSS in cognitions about oneself, others and the world.

One explanation for this finding is that TF-CBT may have a similar treatment effect for adolescents with CPTSD as those with PTSS (J. A. Cohen et al., 2012b; Eidhammer et al., 2017; Jensen et al., 2022; Karatzias et al., 2019; Ross et al., 2021; Sachser et al, 2017). Further, this can indicate that CPTSD and PTSD share the same latent mechanisms, and that both groups therefore benefit from the same treatment model. For example, the tendency to predict current and future situations in light of past experiences, as postulated through the predictive processing framework (Kube et al., 2020; Wilkinson et al., 2017), might be one of these shared latent mechanisms in CPTSD and PTSD. The lack of differences in reduction of negative cognitions between the groups might indicate that TF-CBT indeed changes these predictions into more nuanced and adaptive predictions. These might be positive results suggesting that adolescents with CPTSD are not more resistant to change than PTSS, as some researchers have postulated (Jackson et al., 2010; Karatzias et al., 2018).

However, we did find that those with CPTSD had on average a higher level in negative cognitions compared to those with PTSS during treatment. This was not surprising and also in line with previous research (Eidhammer et al., 2017; Jensen et al., 2022; Sachser et al., 2017). Given the same reduction in negative cognitions as the PTSS-group, the higher level of negative cognitions might indicate a need for more treatment sessions for adolescents with CPTSD. This might be important to be able to reduce PTSS to a non-clinical level. This is in line with research suggesting that adaptations in TF-CBT for CPTSD is important to meet the additional difficulties (J. A. Cohen et al., 2012b; 2017; Eidhammer et al., 2017). However, Jensen and colleagues (2022) found that youth with CPTSD and PTSS experienced a reduction in self-organizing symptoms at the end of treatment, with the same treatment

length. This indicated that youth with CPTSD did not need more treatment sessions to reduce symptoms to a non-clinical level. Although, it is uncertain whether the therapists made other adaptations within the timeframe of the treatment. Taken together, this indicates that even though youth with CPTSD have a higher level of symptoms, such as negative cognitions, it is uncertain whether this is an indication for the need for adaptations in TF-CBT.

4.2 Level of negative emotions in daily life

On average, levels of negative emotions in daily life decreased the first 60 days of TF-CBT for adolescents, which supported our hypothesis. For example, this was in line with Thornback and Muller (2015) who found a positive change in emotion regulation in children receiving TF-CBT. To our knowledge there are few other studies examining change in negative emotions for youth in TF-CBT.

One way to understand this finding is through Ehlers and Clark's model (2000). The model emphasizes that both negative cognitions and negative emotions are important in maintaining PTSS. However, the model postulates that it is the negative cognitions that lead to negative emotions. Based on this, the observed reduction in negative emotions can be understood as a result of the reduction in negative cognitions.

However, TF-CBT also has components directly targeting negative emotions by helping the individual identify, label and adequately regulate negative emotions. For example, in the stabilization phase there are several components focusing on helping the individual adequately regulate trauma-related emotions (J. A. Cohen et al., 2012a, p. 113). Further, the trauma narrative might also be an important component in reducing negative emotions. In developing the trauma narrative, the child learns how to regulate negative emotions that are activated whilst going through the trauma, and thus the intensity of the trauma-related emotions are reduced (J. A. Cohen et al., 2012a, p. 44). However, developing and processing the trauma-narrative is the second treatment-phase in TF-CBT and we do not know whether the participants are in this phase during the first 60 days. Despite not knowing what treatment-phase the participants have completed, our findings indicate that TF-CBT may be useful in reducing negative emotions.

4.2.1 Daily emotions in adolescents with CPTSD

We also found that adolescents with CPTSD had a higher level of negative emotions, but we did not find that the negative emotions were less reduced for CPTSD compared to the PTSS-

group. This did not support our hypothesis, which was that adolescents with CPTSD would have a smaller reduction in negative emotions compared to the PTSS-group.

Adolescents with CPTSD have often experienced type 2 trauma (Brewin et al., 2017; Briere et al., 2008; Maercker et al., 2022), and therefore a developmental perspective might be useful in understanding why adolescents with CPTSD have a higher level of negative emotions. The higher level of negative emotions can be explained through an internalization of significant others as rejecting, harmful and non-responsive to one's affective states. Constructivist self-development theory by McCann and Pearlman (1992) argues that this kind of internalizing causes a negative self-concept consisting of a sense of worthlessness. This will in turn lead to many negative emotions, such as anger, disappointment, and sadness. Further, poor emotional mirroring, for example where the child's emotions have been dismissed, may also result in difficulties in identifying, labeling and understanding one's emotions (Fonagy et al., 2002, p. 298). This will, in turn, lead to difficulties in emotion regulation and an overall higher level of negative emotions in adolescents with CPTSD.

Although adolescents with CPTSD have a higher level of negative emotions, we did not find that the reduction in these negative emotions were different from the reduction in the PTSS-group. This can be explained by the involvement of the caregiver during treatment, which might be an especially important aspect for adolescents with CPTSD. Through TF-CBT the caregiver learns how to better mirror the adolescent's emotional experiences, as well as how to help the adolescent label and regulate their negative emotions. In turn, the caregiver might therefore also be a better role model for emotion regulation.

The findings may indicate that TF-CBT is successful in reducing negative emotions for CPTSD as well as for the PTSS-group. This is in line with previous research concluding with TF-CBT being an effective treatment for CPTSD (J. A. Cohen et al., 2012b; Eidhammer et al., 2017; Jensen et al., 2022; Sachser et al., 2020). However, as described earlier, as we have only measured the first 60 days of TF-CBT, we can not exclude the possibility of possible differences between the groups after the 60 days. The differences between the CPTSD-group and the PTSS-group might have been evident at a later stage or phase in the treatment. For example, Jensen and colleagues (2022) found that CPTSD and PTSD had a similar reduction in PTSS, including negative emotions, until the final phase of treatment, where CPTSD had a steeper decline compared to those with PTSD. This suggests that the differences in reduction of negative emotions between CPTSD and PTSS might be more evident in the final phase of treatment.

4.3 Temporal effects between cognitions and emotions

We found that lower levels of negative cognitions the previous day was associated with less negative emotions than usual the following day. Thus, lower negative cognitions one day led to a within-person decrease in negative emotions the following day. Our research question regarding this temporal association was explorative, and thus we wanted to measure whether there was an association or not. The present finding is in line with research indicating that changing negative cognitions may be important in changing other PTSS (Brown et al., 2019; Greene et al., 2020; Jensen et al., 2018; Kangaslampi et al., 2019; Karatzias et al., 2018; Karatzias et al., 2019). For example, Greene and colleagues (2020) found in a temporal network analysis that PTSD symptom clusters, such as negative cognitions, were more predictive for subsequent PTSS than negative emotions were. Further, the notion that change in cognitions leads to a change in other symptoms, such as negative emotions, is also in line with the theoretical rationale for TF-CBT. The rationale suggests that a change in maladaptive cognitions results in a reduction of other PTSS (J. A. Cohen et al., 2017; Kangaslampi et al., 2019).

We also found that lower levels of negative emotions the previous day was associated with less negative cognitions than usual the following day. Thus, lower negative emotions one day led to a within-person decrease in negative cognitions the following day. We had an explorative approach regarding the temporal association. There are few studies examining the temporal association between negative emotions and negative cognitions for individuals with PTSS, and to our knowledge no such studies on adolescents with PTSS. However, one study using temporal network analysis examined participants with PTSD in treatment and found that arousal and hypervigilance were the strongest predictors for other PTSS (Hoffart et al., 2019). This can be argued to be in line with the present finding as the feeling “stress” measured in our study can indeed be one aspect of arousal. Our findings also adds to this literature, by examining whether negative emotions influence negative cognitions in a sample with adolescents, instead of adults. This therefore supports negative emotions as important in influencing other PTSS.

The present findings indicate that negative cognitions and negative emotions mutually influence each other, maybe causing a reinforcing spiral of symptoms. Based on this, one might argue that both negative cognitions and negative emotions are important aspects of change in TF-CBT for adolescents with PTSS. Network analysis using ESM for adults with PTSD have also found that trauma-related emotions and negative cognitions about one self, others and the world have the same out-strength, and as such predict other PTSS (Greene et

al., 2020; Reeves & Fisher, 2020). According to the predictive processing perspective (Kube et al., 2020; Wilkinson et al., 2017), overgeneralizing predictions based on experienced trauma, such as “the world is dangerous”, can lead to a “better-safe-than-sorry” mentality. This, as argued earlier, can result in a range of behavior that reinforces these predictions and expectations about the world and others. As a part of this, negative emotions may also play an important role as information to the individual, for example negative emotions might fuel avoidance of different activities and objects. Negative emotions might also create resistance to form healthy relationships with others based on earlier traumatic experiences. In this sense, negative cognitions, negative emotions and behavior might engage in a negative spiral. This spiral, however, may change into a more positive and adaptive spiral, if either negative cognitions or negative emotions change. The present findings, namely that reducing negative cognitions one day, may lead to a change or reduction in negative emotions the following day, and vice versa, may illustrate this. This is positive news for adolescents receiving TF-CBT.

4.3.1 Differences in temporal associations between CPTSD and PTSS

We did not find that the association between negative cognitions and subsequent negative emotions the next day was weaker for the CPTSD-group compared to the PTSS-group. Thus, when reducing negative cognitions this influences the reduction in negative emotions equally for both groups. As we had an exploratory approach, we wanted to examine whether there were any differences in the temporal associations or not. It has been well established that treatment aiming to modulate maladaptive cognitions in PTSD leads to a reduction in other PTSS, including negative emotions (Brown et al., 2019; Greene et al., 2020; Jensen et al., 2018; Kangaslampi et al., 2019; Karatzias et al., 2018; Karatzias et al., 2019). However, the present finding may illustrate that this is also the case for CPTSD. This is an interesting and novel finding, indicating that the two diagnoses might not be as different from each other as some have argued (Herman, 1992; Cloitre et al., 2013; Maercker et al., 2022).

We did find that the association between negative emotions and next-day negative cognitions was significantly weaker for the CPTSD-group compared to the PTSS-group. Thus, when reducing negative emotions this influences the reduction in negative cognitions to a less degree for CPTSD compared to the PTSS-group. This is support for our hypothesis, as we assumed that the severity of symptoms in the CPTSD-group could make this group more resistant to change (Jackson et al., 2010; Karatzias et al., 2018).

One explanation for this finding might be that it is something else than negative emotions that influence negative cognitions more for adolescents with CPTSD. From a

predictive processing perspective, the aim is to replace the old problematic predictions with new predictions that are more adaptive. This might be especially difficult for adolescents with CPTSD because they have often experienced repetitive interpersonal trauma (Brewin et al., 2017; Briere et al., 2008; Cloitre et al., 2013; Maercker et al., 2022). Thus, as argued earlier, this can create a negative spiral where the predictions are well integrated in the adolescents' understanding of oneself, others and the world, and therefore especially difficult to change. Further, one can argue that in order to replace these negative cognitions, changes in several modalities are needed. For example, Karatzias and colleagues (2018) did find that CBT-interventions were efficient for CPTSD, but also suggested that attachment style was an important contributing factor. One of the recommendations for treatment of CPTSD was to facilitate more positive attachment representations. The alliance and relationship with the therapist can indeed be important for the development of positive attachment representations. Thus, had we included measures of alliance in our daily measures, we might have found that this had a stronger association with negative cognitions the following day compared to negative emotions for CPTSD.

Another explanation might be that despite the focus in TF-CBT on labeling, understanding and regulating emotions, this might not be sufficient for adolescents with CPTSD. Taking into consideration that one of the additional criterias for CPTSD is indeed difficulties with emotion regulation, these adolescents might need a more thorough understanding and processing of what their emotions mean, accepting them and learning how to regulate them. In this perspective, it might be that it is the lack of this that creates a weaker temporal association with negative cognitions. As such, more emotion-oriented interventions might be needed to be able to change negative cognitions in adolescents with CPTSD.

A third explanation might be that the CPTSD-group needs more cognition-oriented interventions to reduce negative cognitions. The finding may indicate that a change in negative emotions is not sufficient to change the maladaptive cognitions for adolescents with CPTSD.

4.4 From a dodo-bird perspective?

Overall, our results may indicate that adolescents with CPTSD and PTSS are more similar than we initially assumed. There may be several explanations for this. One explanation might be that adolescents with CPTSD also fulfill the criteria for PTSD. CPTSD and PTSD differ from other psychiatric disorders because presence of an event is demanded. Thus, the PTSS are understood as a direct consequence of the traumatic event. This means that focusing on

the traumatic event and the negative cognitions and emotions associated with the event, might be a similarly important aspect in the treatment of CPTSD and PTSS.

Another explanation might be found through the predictive processing framework. Predictions are informed by past experiences, and in this perspective experiencing traumatic events will therefore influence and inform predictions about future and present events and situations for both groups (Wilkinson et al., 2017). Negative cognitions and negative emotions related to the traumatic event and the PTSS can be an expression of these predictions. The predictions and the negative cognitions and emotions may be in a reciprocal relationship, meaning that PTSS also maintain and fuel the predictions. For example, when the prediction triggers negative emotions, the emotions may themselves be a reason for why the prediction is thought to be fit for that situation (Wilkinson et al., 2017). This is because the negative predictions can explain both external and internal stimuli. The predictive processing framework suggests that the prediction following type 2 trauma are more heavily influenced by negative emotions (Wilkinson et al., 2017). For example, an adolescent that has experienced repetitive domestic violence during his/hers childhood might have global predictions like “I can't trust the adults around me”. This prediction includes negative cognitions, such as “I can't trust anyone”. This will often lead to negative emotions, such as fear and sadness. If the adolescent experiences something that triggers the prediction, for example a facial expression resembling anger, the prediction might not have a good fit according to the situation. However, considering the affective state that is triggered simultaneously, the prediction will have a better fit because it can explain both the internal affective state, and the external stimuli (facial expression). This might therefore result in “I feel terrified, therefore no one can be trusted”. Moreover, in this perspective, changing these cognitions or emotions might lead to a change in these underlying predictions. In turn, this might result in an alleviating of other PTSS for both groups. Taken together, this might be one way to understand why adolescents with CPTSD and PTSS show similar results regarding negative cognitions and emotions, and the temporal association between them.

These potential predictions might be changed through specific interventions in TF-CBT, or more overarching principles in psychotherapy, such as alliance. Alliance is an important aspect of treatment for both adolescents with CPTSD and PTSS. Ovenstad and colleagues (2022) found that less PTSS and better treatment outcome was associated with a stronger youth-perceived therapeutic alliance. It has been argued that patients with CPTSD have more difficulties creating a strong therapeutic alliance because of their experiences with adults failing to protect them against harm, or even inflicting harm (Fagermoen et al., 2017;

Ovenstad et al., 2020; Ovenstad et al., 2022). This has led researchers to recommend incorporating attachment style in treatment for CPTSD (Karatzias et al., 2018). This way, alliance is important for the development of positive attachment representations. This perspective might be important for both groups and result in a reduction in symptoms, however it may be especially important for adolescents with CPTSD.

Further, one can argue that TF-CBT facilitates positive attachment representations by including the caregiver in the treatment. Through the treatment, the caregiver's ability to understand the adolescents' experiences after trauma and their ability to meet the adolescents' emotional needs, is strengthened. This may change the attachment representations in the adolescent from expecting others to reject and harm them, to expectations of support and care. This will in turn reduce negative cognitions and emotions regarding oneself, others and the world. The similar reduction of negative cognitions and emotions observed when comparing the two groups might indicate that TF-CBT indeed does incorporate this through its focus on the therapeutic alliance, and by including the caregiver in the treatment process.

Although the results indicate that the two groups were more similar than we assumed, we did find some differences. If the present study had examined other variables, these differences might have been more evident. In our study we measured change through reduction of symptoms. However, had we measured functional impairment for both groups, we might have found more differences between the groups. Maercker and colleagues (2022) argue that to fully understand symptoms associated with CPTSD and the change of these during treatment, one needs to include a wide range of outcomes, including functional impairment. CPTSD is associated with a higher functional impairment (Brewin et al., 2017; Cloitre et al., 2013; Elklit et al., 2014), and in this perspective measuring functional impairment might be especially important for this group. Further, a reduction in PTSS does not necessarily mean that the subjective experience of quality of life or functioning is better (Stanicke & McLeod, 2021). This also highlights an important debate within research on psychotherapy regarding outcome measures and effect of treatment and remission.

One aspect within this debate is the importance of the client-perspective. Remission or effect of treatment may be viewed differently from the patient's perspective, than the, often narrow, measures that are typically used within research on psychotherapy (Bohart & Wade, 2013). It might be that the outcome-measures typically used within psychotherapy research fails to fathom the complexity of individual patient processes, or that potential important mechanisms derived from the research do not overlap with the patient's subjective experience of the treatment and its outcomes.

Further, it might be important to adjust the treatment according to individual differences regarding the therapeutic process. Because CPTSD is a new diagnosis we do not know how it is expressed in daily life, and it is therefore difficult to optimize the treatment based on individual differences. According to the diagnostic criteria for CPTSD, this group is characterized by having more disturbances in self-organizing symptoms. As these symptoms can be expressed through negative cognitions and emotions, our results can illuminate how CPTSD is experienced in daily life. Thus, it might be important for clinicians to assess the level of negative cognitions and emotions during treatment, in order to include the client-perspective in treatment.

4.5 Strengths and limitations

4.5.1 Research design

One of the major strengths for the present study is the use of within-person time-lagged analyses, which is invaluable in investigating the relationship between different symptoms, as well as examining different measures over the course of treatment. Understanding the development of symptoms during treatment for CPTSD, and the association between symptoms can be largely informative and useful in the development and implementation of effective interventions (Hoffart, 2017; Kangaslampi et al., 2019).

Further, studies using ESM have a high ecological validity (Chun et al. 2016; Myin-Germeys et al., 2018). ESM studies fathom the development of symptoms day-to-day avoiding problematic biases associated with retrospective measurements (Ellison et al., 2020).

4.5.2 Validity

Validity refers to an estimate of whether the research design measures what it is intended to measure or examine (R. J. Cohen et al., 2013, s. 181). One way to categorize different types of validity is by internal and external validity.

Internal validity

Internal validity is to what degree the research design adequately tests the research questions (Bordens & Abbott, 2014, s. 111). The present study used items from CATS-2, which has shown good construct validity (Sachser et al., 2022). However, the study by Sachser and colleagues (2022) did not measure the construct validity for the items asked in a daily frame,

which is how it is used in this study. In the present study we found that adolescents with CPTSD have more negative cognitions and emotions compared with the PTSS-group. Our findings can indicate that the self-organizing symptoms measured in CATS-2 are also present in daily life, and vice versa. As such, this can together potentially indicate that the items used to measure negative cognitions in the current study does measure what it is supposed to measure. The scale used to measure negative emotions was created for the purpose of the Pilot study. It was inspired by other questionnaires, as well as dialogue with adolescents who have experienced trauma. The validity for this scale is unknown, and we can therefore not rule out the possibility that this scale has not measured what it was intended to.

One aspect of the present study which strengthens the internal validity is that the participants met with a clinician evenly during treatment. The clinician was informed about the app and its questions. This limited the possibility of the participants misinterpreting the questions, as they had a person they could ask if needed, who also ensured adequate responses to the questionnaires.

However, there are several possible limitations that can have influenced the internal validity. One such limitation is the bias “careless responding”. Careless responding refers to the tendency to answer questionnaires in an inattentive manner, meaning that the participant responds without reading the content of the items properly or with a lack of attention. This may, for example, result in data that does not represent the actual level of symptoms. Eisele and colleagues (2020) found that this kind of response bias was associated with the length of questionnaires, where the lengthy questionnaire consisted of 60 items, and the short version consisted of 30 items. The daily questionnaires in the present study consisted of 25 items, which indicates that it might not be as affected by the careless response-bias due to its shorter length. However, it is uncertain whether the length have influenced the adolescents and therefore resulted in careless responding.

Another possible limitation might be that the participants had access to see their own data during the treatment, including their process and graphs on symptom scores, which can lead to a contamination bias. Even though this was created for a motivational purpose, one could argue it led to the participants answering in regards to what they might think the treatment is aiming to do – reduce symptoms – and not in regards to what they were actually experiencing. In other words, it could make the participants report symptoms based on what they think is expected of them, or what the researchers wanted from them. Daily life measurements are also dependent on the participants having insight into their own symptoms,

which we have not controlled for and, further, might be another limitation in the present study.

It is uncertain why the adolescents in the present study experienced a reduction in symptoms, which represents another limitation. It might be the treatment in itself that reduced the symptoms. However, the study did not include information on how many sessions of TF-CBT the participants had, nor what therapeutic phase in the treatment they were in. Further, we did not include the fidelity (the degree to which the treatment components were delivered as intended) of the TF-CBT treatment in our study. Therefore, it is especially difficult to know what reduced the symptoms during the treatment. Another explanation might be that there are other variables than what was measured, such as experiences and events outside of treatment, that reduced the symptoms. However, it is reasonable to believe that the reduction in symptoms is due to TF-CBT, which is in accordance with previous research (J. A. Cohen et al., 2017; Eidhammer et al., 2017; Jensen et al., 2022; Sachser et al., 2017).

External validity

External validity allows the study to generalize its results beyond the research setting (Bordens & Abbott, 2014, s. 115). The research setting includes both the sample and methodological aspects.

One of the aspects that strengthens the present study is that the collected data is a part of a naturalistic study. The participants were recruited from mental health clinics (BUP) and received treatment during data collection. This means that our sample is representative for other adolescents with CPTSD. As it is a naturalistic study, there are a range of variables that we have not controlled for. For example, more controlled studies control the variables, making sure every patient is exposed to the same treatment conditions. However, the limitation with the more controlled studies is that the sample is often cautiously selected based on specific criterias, threatening the representativity of the sample. Thus, the present study does not have these issues regarding representativity.

However, it is uncertain whether the present study is representative regarding gender. The sample consists predominantly of females, and as such the findings might not be representative for males. Nevertheless, the distribution between the genders in this study are similar compared to other studies among adolescents with PTSD that receive treatment at BUP (e.g see Jensen et al., 2022; Ormhaug, 2016). Thus, it is not clear cut.

One aspect that might challenge the external validity in the present study is the sample size. Firstly, the sample size limits the generalizability of the findings. It is necessary to

replicate the study in a larger sample. The study excluded participants with under 30% compliance, which may have resulted in exclusion of other important aspects as well, such as functional impairment. For example, answering multiple questions every day requires substantial effort, which might indicate that the present participants were able to answer over 30 % because of an overall higher functioning. Consequently, the adherence criteria might make the sample less representative and not capture the heterogeneity of CPTSD.

Due to the lack of previous ESM studies examining adolescents with CPTSD, it was difficult to estimate the power needed for the analyses in this pilot study. Consequently, it is uncertain whether there are enough participants in the sample to detect the differences between the two groups (Bordens & Abbott, 2014, s. 451).

4.5.3 Reliability

Reliability refers to the consistency of a measure or a research study. Reliability is expressed through a coefficient, which indicates the amount of variance between the true score and total variance (R. J. Cohen et al., 2013s. 145). We have found excellent reliability for the scales used to measure negative cognitions and emotions in the present study. We also found good to excellent reliability for the items used to categorize the sample into the CPTSD-group and PTSS-group.

4.6 Implications for practice and future research

The main implication of the current study is that CPTSD and PTSS might not be as different from each other as some have previously argued. This result can be a promising finding, indicating that treatment models developed for PTSS can indeed be effective in treating CPTSD. Further, the findings might indicate that it might be useful to focus on changing negative cognitions or negative emotions, as we have found that a reduction in one leads to a reduction in the other. Even though the association between negative emotions one day and negative cognitions the following day was weaker for the CPTSD-group, it still seems to be useful for both groups. In regards to this, it might be important for the clinicians to assess what type of cognitions and emotions that are most bothersome for the adolescent. It might be that the reduction in different cognitions and emotions are associated with specific interventions. However, future research is needed to examine this.

Our findings have several other implications for future research. Firstly, future research should include other measurements than cognitions and emotions, such as functional impairment, when examining adolescents with CPTSD in treatment. Secondly, when

examining change in symptoms for CPTSD, there are few studies that allow us to compare size of reduction when determining whether a change has been small, as expected or bigger than expected. It can be beneficial for future studies to have more focus on this, so that examining the effect of different treatment interventions on different symptoms is made easier. Future research should also examine how specific components in treatment manuals are associated with daily change in symptoms. Therefore, we need more research on what components in TF-CBT that are effective in changing cognitions and emotions, and at what time during treatment these changes occur. Thirdly, the findings of the study showed that there are substantial individual variations in change in symptoms during treatment. This indicates a need for more idiographic research examining individual processes to better understand the processes of change within the patients in treatment. This is especially important in the field of psychotherapy, because it allows the treatments to better target individual differences, and as such hopefully developing more effective treatments.

5. Conclusion

The results of the present study indicate that even though adolescents with CPTSD reported higher levels of negative cognitions and emotions than adolescents with PTSS, the rate of change during TF-CBT may be similar. In addition, for both groups, it seems like there is a bidirectional relation between negative cognitions and emotions. Thus, even though adolescents with CPTSD have a higher level of negative cognitions and emotions, the symptom dynamics and mechanisms of change might be similar. This might further indicate that the use of evidence-based treatments for PTSD, such as TF-CBT, is also useful for treatment of CPTSD. Insights into the daily development of symptoms for adolescents with CPTSD gives a more accurate account of level and dynamics of symptoms, which have important implications for clinical practice. Through knowledge on the daily development of symptoms during treatment, therapists can hopefully optimize treatment accordingly.

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Appendix A Toolkit from app



Appendix B

Daily questionnaires, negative cognitions and emotions

10:23 5G 10:23 5G

← Spørsmål Tilbake

I løpet av dagen i dag:
Har du tenkt «Jeg kan ikke stole på andre»?

Ikke i det hele tatt Ja, veldig mye

Tilbake Neste

5 av 25

I løpet av dagen i dag:
Har du tenkt «Verden er et utrygt sted»?

Ikke i det hele tatt Ja, veldig mye

Tilbake Neste

6 av 25

I løpet av dagen i dag:
Har du tenkt «Jeg er ikke bra nok»?

Ikke i det hele tatt

Ja, veldig mye

I løpet av dagen i dag:
Har du følt deg sint?

Ikke i det hele tatt

Nesten hele tiden

Tilbake

Neste

7 av 25

Tilbake

Neste

19 av 25

I løpet av dagen i dag:
Har du følt deg trist?

Ikke i det hele tatt

Nesten hele tiden

I løpet av dagen i dag:
Har du følt deg stresset?

Ikke i det hele tatt

Nesten hele tiden

Tilbake

Neste

20 av 25

Tilbake

Neste

21 av 25

Appendix C Overview of overall symptoms



Appendix D CATS-2

CATEGORICAL SCORING

Child's Name: _____ Date of Assessment: _____ Index Traumatic Event(s): _____

DSM-5 PTSD

DSM-5 Criteria:	# of Symptoms (Only count items rated 2 or 3)	# Symptoms Required	DSM-5 Criteria Met?	
Re-experiencing Items 1-5		1+	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Avoidance Items 6-7		1+	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Negative Mood/Cognitions Items 8-14 (highest of #9, #10 and #15)		2+	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Hyperarousal Items 15-20		2+	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Functional Impairment Set of 1-5 Yes/No questions		1+	<input type="checkbox"/> Yes	<input type="checkbox"/> No
DSM-5 PTSD Diagnosis			<input type="checkbox"/> Yes	<input type="checkbox"/> No

ICD-11 PTSD and CPTSD

ICD-11 Criteria:	# of Symptoms (Only count items rated 2 or 3)	# Symptoms Required	ICD-11 Criteria Met?	
Re-experiencing Items 2,3		1+	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Avoidance Items 6, 7		1+	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Hyperarousal Items 17,18		1+	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Functional Impairment Set of 1-5 Yes/No Questions		1+	<input type="checkbox"/> Yes	<input type="checkbox"/> No
ICD-11 PTSD Diagnosis			<input type="checkbox"/> Yes	<input type="checkbox"/> No

CPTSD Criteria (only if ICD-11 PTSD is fulfilled)				
Emotion Regulation Items 14,15a		1+	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Negative Self-Concept Items 9d, 10a		1+	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Disturbed Relationships Items 9b, 13		1+	<input type="checkbox"/> Yes	<input type="checkbox"/> No
ICD-11 CPTSD Diagnosis			<input type="checkbox"/> Yes	<input type="checkbox"/> No