An update on the clinical utility of the Children's Posttraumatic Cognitions Inventory

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Abstract

Background. The Children's Posttraumatic Cognitions Inventory (CPTCI) is a self-report questionnaire that measures maladaptive cognitions in children and young people following trauma. In this study, the psychometric properties of the CPTCI were examined in further detail with the objective of furthering its utility as a clinical tool. Specifically, we investigated the CPTCI's discriminant validity, test-retest reliability, and the potential for the development of a short-form of the measure. **Methods**. Three samples (London, East Anglia, Australia) of trauma-exposed children and young people (N=492; 7-17 years) completed the CPTCI and a structured clinical interview to measure PTSD symptoms between 1 and 6-months. Test-retest reliability was investigated in a subsample of cases. **Results**. The results showed a score in the range of 46 and 48 is the optimal cut-off on the CPTCI. The measure also had moderate to high test-retest reliability (r=.78, $p<.001$) over a two month period. The CPTCI-S had excellent internal consistency (α=.92), factor structure (CFI=0.95; TLI=0.91,; RMSEA=.072), and moderate to high test-retest reliability (r=.78, $p<.001$). A score in the range of 16 and 18 was the optimal cut-off point. **Conclusions**. The CPTCI is a useful tool to support the clinical practice of clinicians and the CPTCI-S has excellent psychometric properties.

Introduction

Over the past twenty years the body of research on the cognitive factors placing children and young people at risk of Posttraumatic Stress Disorder (PTSD) has proliferated (Dalgleish, Meiser-Stedman, & Smith, 2005; Meiser-Stedman, 2002; Salmon & Bryant, 2002). Maladaptive trauma-related cognitions, for example, viewing the self as incompetent or the world as dangerous, are thought to be principal risk factors for the development of PTSD (Ehlers, Mayou, & Bryant, 2003; Stallard & Smith, 2007). One clinical trial suggests these cognitions are important treatment targets during Cognitive Therapy for PTSD in children and young people (Smith et al., 2007).

The inclusion of a 'negative mood and cognitions' cluster in the DSM-5 is an important acknowledgement that maladaptive cognitions are central to the pathology of trauma responses (DSM-5, 2013). The Posttraumatic Cognitions Inventory (Foa, Ehlers, Clark, Tolin, & Orsillo, 1999) was the first comprehensive self-report tool to measure trauma related cognitions. The factor analysis of items from the scale produced three latent constructs termed (a) negative cognitions about the self, (b) negative cognitions about the world, and (c) self-blame. The association of the measure to the pathology of adult PTSD has been replicated in several studies (Beck et al., 2004; Mueser et al., 2008).

An adaptation of the PTCI for children and young people, known as the Children's Post-Traumatic Cognitions Inventory (CPTCI) (Meiser-Stedman, Dalgleish, Glucksman, Yule, & Smith, 2009a; Meiser-Stedman, Dalgleish, Smith, Yule, & Glucksman, 2007; Meiser-Stedman et al., 2009b) followed. The analysis of the measure's psychometrics showed it had moderate test-retest reliability (r=.70) and internal consistency (α>.75) (Meiser-Stedman et al., 2009b). Unlike the adult version of the tool, the validation study showed the factor structure of the measure was represented by two constructs defined as "*permanent and disturbing change*" and *"fragile person in a scary world"* (Meiser-Stedman et al., 2009b).

The relationship of maladaptive trauma-related cognitions to PTSD has now been demonstrated in samples of school children (Meiser-Stedman et al., 2009b), injured children with Acute Stress Disorder (Ellis, Nixon, & Williamson, 2009; Nixon et al., 2010a; Salmon, Sinclair, & Bryant, 2007), injured children with PTSD (Meiser-Stedman et al., 2009b), and youth exposed to maltreatment (Leeson & Nixon, 2011). Dutch and German translations of the measure are also available (de Haan, Petermann, Meiser-Stedman, & Goldbeck, 2015; Diehle, de Roos, Meiser-Stedman, Boer, & Lindauer, 2015).

In summary, maladaptive trauma-related cognitions are thought to be a core aspect of PTSD in children and young people. The CPTCI is a promising tool to measure these processes and, as such, the measure's psychometric properties must be examined in greater detail. This study had three aims. The first aim was to determine an appropriate cut-off for the CPTCI by establishing the measure's sensitivity to detect PTSD status. It is important to acknowledge that the terms specificity and sensitivity have strong connotations; we would like to make it clear that it is not our intention produce a cut-off measure to screen PTSD, but to highlight young people in the clinical range on their endorsement of problematic trauma-related cognitions. The second aim was to show the CPTCI's test-retest reliability in a sample that was not a part of the initial validation study (Meiser-Stedman et al., 2009b). The third aim was to create a short-form of the CPTCI to facilitate the assessment of trauma-related appraisals in clinical settings.

Method

Participants

A total of N=492 (M_{age}=12.98, *SD*=2.99, 57% male) trauma-exposed children and young people took part in the study. Data was pooled from sites in East Anglia (N=242, M_{age} =13.95, *SD*=2.87), London (N=133, M_{age} =12.77, *SD*=2.70) (Meiser-Stedman et al., 2007; Meiser-Stedman, Smith, Glucksman, Yule, & Dalgleish, 2008; Smith et al., 2007), and

Australia (N=117, M_{age}=11.79, *SD*=2.87) (Nixon, Ellis, Nehmy, & Ball, 2010b; Nixon, Sterk, & Pearce, 2012).

All study subjects were interviewed between one and six months of experiencing a trauma. The traumas experienced by children were discrete in nature, i.e. 'one-off' traumas that were not related to repeated maltreatment. The majority of children in the sample had experienced a road traffic collision (RTCs; n=221, 45%), followed by accidental injuries (n=175, 36%), and then assaults (N=96, 20%).

Each site had received ethics approval from the relevant local Institutional Review Board/Research Ethics Committee. Written, informed consent was obtained from adults and assent was also sought from young people.

At all sites the upper age limit was 17 years. In London and East Anglia the lower age limit was 8 years whereas in Adelaide it was 7 years'. Recruitment rates (i.e., the proportion of families approached that completed the initial assessment) were 30.9% to 36.9% for London prospective studies, and then 29.5% and 33.4% respectively for prospective studies carried out in Australia and East Anglia. Details of recruitment flow for all studies with the exception of East Anglia have been described in detail elsewhere (Meiser-Stedman et al., 2007; Meiser-Stedman et al., 2008; Nixon et al., 2010b; Nixon et al., 2012; Smith et al., 2007). In East Anglia, the exclusion criteria for trauma-exposed and clinical cases were as follows: intellectual disability; assaults where the assailant was the young person's caregiver or close relative; being unconscious for >15 minutes following the traumatic event; not being fluent in English; ongoing exposure to threat; history of organic brain damage; and significant risk of self-harm.

Measures

In London, interviews were carried out in the family home or a clinic and families typically brought their completed CPTCI (as part of a questionnaire package sent prior to the

appointment) on the day of their appointment. In Australia, phone interviews were carried out for trauma-exposed cases and trial referred cases completed their measures in the university clinic. In East Anglia, phone interviews were carried out for trauma-exposed cases and clinic-referred cases were either assessed at home, a local GP surgery or at the clinic.

PTSD was measured according to the DSM-IV criteria (DSM-IV, 1994) using structured clinical interviews at all sites. All interview schedules had excellent psychometric properties, and they all contained appropriate developmental adaptations for children and young people. The Clinician-Administered PTSD Scale for Children and Adolescents (CAPS-CA; Nader, 2002) and the Children's Post-traumatic Stress Disorders Inventory (CPTSD-I; Saigh et al., 2000) were administered to children in Australia and East Anglia respectively. In London, for trauma-exposed cases, the PTSD module of the Anxiety Disorders Interview Schedule - Child Version (ADIS-C; Silverman & Albano, 1996) was administered. Clinic referred cases completed the CAPS-CA (Nader, 2002).

Data-analysis

Participants were only included in the analysis if they answered all questions on the CPTCI. A total of n=42 participants did not have complete data and were therefore excluded from analysis

All analyses were carried out in SPSS Version 22 unless otherwise stated. The distributions of CPTCI and PTSD scores were skewed, but as results were replicated using transformed and raw scores, the results are reported using the raw data.

Derivation of clinical-cut-offs

The CPTCI's sensitivity and *specificity* to detect PTSD status was examined. *Sensitivity* (True Positive Rate) values measure the proportion of people who are correctly identified as having a particular condition at a particular level for a given measure. *Specificity* (True Negative Rate) values measure the proportion of healthy people who are correctly identified

as not having the condition. The CPTCI's screening properties were then evaluated further using Receiver Operator Characteristic (ROC) curves. Rules of thumb for quantifying the Area Under the Curve (AUC) are: .90-1 = excellent; .80-.90 = good; .70-.80 = fair; .60-.70 = poor; and .50-.60 = fail.

Short form

Items for the CPTCI-S (see Table 1) were chosen after consideration of their factor loadings, and their correlations with the CPTCI total score and PTSD status. A Confirmatory Factor Analysis (CFA) was carried out in EQS and MIMIC modelling was used to control for the impact of site on factor structure. One model was tested following the scale items of the CPTCI (Meiser-Stedman et al., 2009b). The factor model was fitted using robust methods as this method is best for handling correlated data with high levels of skew (Lee, Poon, & Bentler, 1995). Multiple fit indices evaluated model fit, including the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and the Root Mean Square Error of Estimation (RMSEA) (Bentler, 2007). On the CFI and TLI, a value of 0.90 shows a good fit, and a value of 0.95 shows an excellent fit (Kline, 2005). RMSEA values of $\leq$0.05 are thought to indicate a close fit, 0.05-0.08 a fair fit, and 0.08-0.10 a marginal fit by one standard deviation (Browne & Cudeck, 1992). In a sample of this size, factor loadings of $\geq$.30 are needed for that item to be considered to be of practical significance to the overall construct (Hair, Black, Babin, Anderson, & Tatham, 2006).

Results

Prevalence of PTSD

One hundred and two (21%) children and young people in the final sample had a PTSD diagnosis. As expected, children with a PTSD diagnosis (M=32.67, SD=7.98) scored more highly on the "fragile person in a scary world" subscale than children in the non-clinical range (M=19.81, SD=7.16). Children with PTSD (M=31.73, SD=9.47) produced higher scores on the

"disturbing and permanent change" scale than children in the non-clinical range (*M*=16.68, *SD*=5.74). In the full sample, the point biserial correlation of the CPTCI with PTSD diagnosis was significant (*r*=.58, *p*<*.001*). This indicates that while related to PTSD diagnoses, the short form score wasn't simply a proxy for PTSD (i.e., correlation is < .80).

The psychometric properties of the CPTCI total score

Discriminant validity. Table 2 presents the sensitivity and specificity estimates of the CPTCI total score against PTSD diagnosis at varying cut-offs. Our data show a cut-off score between 46 and 48 is optimal. With these cut-offs sensitivity scores ranged between 82.4% and 84.3%, and specificity rates ranges between 80.8% and 83.6%. Additional ROC analyses suggested that at these cut-off points AUC's were good and ranged between 82.8% and 84.9

Test-retest reliability. The test-retest reliability of the CPTCI (n=203) over a two month period was *r*=.74 for the scary world sub-scale, and *r*=.77 for the permanent change sub-scale, and *r*=.78 overall.

Development and initial validation of the CPTCI-S

CPTCI items to be included in the short-form were selected based on their item total correlations, correlations to PTSD status, and factor loadings (from a preliminary factor analysis). The item-total correlations of the CPTCI (full version) ranged from *r*=.59, *p*<*.001* to *r*=.81, *p*<*.001*, and correlations to PTSD status ranged between *r*=.31, *p*<*.001* to *r*=.62, *p*<*.001*. A preliminary confirmatory factor analysis (using the same analytic strategy as the CFA for the short form) on the full-form produced factor loadings that ranged between .53 and .81. The items included in the CPTCI-S performed strongly on all three criteria, and had item-total correlations at or above *r*=.72, *p*<*.001*, correlations to PTSD status at or above *r*=.49, *p*<*.001*, and factor loadings at or above .77.

Factor structure and internal consistency.

The data of clinic referred Adelaide cases was not included in the examination of the CPTCI-S as only subscale and total scores were available for these cases. The CFA analysis of the two-factor model produced a significant result, $\chi^2(34) = 82.59$, $p<.0001$. This model was an excellent fitting model for the data according to the CFI (0.95) and TLI (0.91), and a good fit of the data according to the RMSEA (0.072; CI: 0.057 - 0.086). The factor loadings of the CPCTI-S are presented in Table 1. Factor loadings ranged from .64 to .79, easily meeting the minimum .30 value required for practical significance in (Hair et al., 2006). The CPTCI-S had acceptable internal consistency for 'scary world' (α=.81), 'permanent change' (α=.91) dimensions and the full scale (α=.92).

Test-retest reliability. The test-retest reliability for 'scary world' (r =.74, $p<.001$) and 'permanent change' (r =.77, $p<.001$) subscales was acceptable as was the total scale (r =.78, $p<.001$).

Discriminant validity. The point-biserial correlation of the CPTCI-S with PTSD diagnosis was significant (r=.59, $p<.0001$). The sensitivity and specificity of the CPTCI-S against DSM-IV PTSD diagnosis was also impressive (Table 3). The data indicate an appropriate cut-off score in the range of 16 and 18. With these cut-offs sensitivity scores ranged between 84.8% and 91.1%, and specificity rates ranges between 82.9% and 88.1%.

Discussion

This study extended knowledge regarding the psychometric properties of the CPTCI. The pooled dataset yielded cut-offs for elevated/clinically significant scores on the CPTCI and replicated earlier findings of appropriate internal consistency and test-retest reliability. The CPTCI-S had excellent psychometric properties and slightly superior psychometrics to the CPTCI (Meiser-Stedman et al., 2009b).

Our findings replicate previous studies showing that trauma-related cognitions are strongly associated with PTSD (Leeson & Nixon, 2011; Meiser-Stedman et al., 2009a;

Meiser-Stedman et al., 2009b; Salmon et al., 2007), consistent with theoretical accounts of PTSD (Ehlers & Clark, etc) and with the changes in the DSM-5 to include a negative mood and cognitions cluster (*DSM-5,* 2013).

As stated in the introduction to this paper, we did not intend that the cut-offs on the CPTCI and CPTCI-S could be used to produce screening instruments for PTSD in youth; several measures fulfilling this function already exist (Kenardy, Spence, & Macleod, 2006; Perrin, Meiser-Stedman, & Smith, 2005). Rather, the cut-offs provide clinicians with an idea of what is a clinically significant level of negative appraisals. This may aid clinicians when assessing or formulating children's and adolescents' difficulties, and when monitoring children's progression through therapy. For researchers, the CPTCI-S offers a brief but psychometrically valid tool for measuring negative trauma-related cognitions that may be involved in the maintenance of PTSD (e.g. in large-scale surveys) or may underpin recovery in treatment trials. One research question of particular interest is whether the CPTCI is a useful tool to differentiate changes during treatments focussed on modifying cognitive aspects versus exposure based treatments for children (Nixon et al., 2012).

It is important to highlight that our reported cut-offs are tentative. We reported a cut-off range as it was clear from our analysis of the data that there was some variability in the ideal cut-off point across sites. In the future, it will be important to replicate the cut-off examination in a more homogenous sample, and a range of other samples including children that have been involved with disaster/war/abuse. It will also be important to investigate whether a similar clinical cut-off is found when comparing CPTCI scores to other psychological disorders (e.g., anxiety, depression). Future studies might investigate the convergent validity of the tool in further detail by exploring the measure's convergence with cognition words/cognitive characteristics in narratives.

To summarise, these findings add to the growing body of literature indicating trauma-related cognitions are a core feature of PTSD status following traumatic experiences. Our results underscore the importance of routinely assessing for the presence of maladaptive trauma-related cognitions in the aftermath of a trauma.

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Table 1. Factor loadings of items in the Children's Post-traumatic Cognitions Inventory – Short Form.

CPTCI-S item	*Fragile person in a scary world*	*Permanent and disturbing change*
5. I don't trust people.	.72	
7. I am no good.	.75	
10. I can't cope when things get tough.	.66	
15. Bad things always happen.	.82	
4. My reactions since the frightening event mean I have changed for the worse.		.79
6. My reactions since the frightening event mean something is seriously wrong with me.		.81
14. I used to be a happy person but now I am always sad.		.75
16. I will never be able to have normal feelings again.		.82
19. My life has been destroyed by the frightening event.		.79
21. My reactions since the frightening event show that I must be going crazy.		.77

Table 2. *Correspondence of CPTCI with PTSD status (according to DSM-IV criteria) across different cut-off scores.*

Cut-off	*Sensitivity (N=102)*	*Specificity (N=390)*	*Cut-off*	*Sensitivity (N=102)*	*Specificity (N=390)*
≥ 50	81.4%	86.2%	≥ 41	89.2%	71.5%
≥ 49	82.4%	84.6%	≥ 40	90.2%	68.7%
≥ 48	82.4%	83.6%	≥ 39	91.2%	65.1%
≥ 47	84.3%	82.6%	≥ 38	91.2%	62.6%
≥ 46	84.3%	80.8%	≥ 37	94.1%	60.8%
≥ 45	85.3%	79.5%	≥ 36	95.1%	58.7%
≥ 44	86.3%	79.0%	≥ 35	96.1%	54.9%
≥ 43	88.2%	76.4%	≥ 34	97.1%	51.8%
≥ 42	88.2%	74.1%			

Table 3. *Correspondence of CPTCI-S with PTSD status (according to DSM-IV criteria) across different cut-off scores for the full sample.*

Cut-off		*Sensitivity* (N=79)	*Specificity* (N=377)	Cut-off	*Sensitivity* (N=79)	*Specificity* (N=377)
≥ 25		55.7%	97.1%	≥ 19	82.3%	89.9%
≥ 24		65.8%	96.6%	≥ 18	84.8%	88.1%
≥ 23		73.4%	94.7%	≥ 17	86.1%	85.7%
≥ 22		77.2%	93.9%	≥ 16	91.1%	82.9%
≥ 21		77.2%	93.9%	≥ 15	91.1%	76.1%
≥ 20		81.0%	91.5%			