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Symptom structure of ICD-11 Complex Posttraumatic Stress Disorder (CPTSD) in trauma-exposed foster children: examining the International Trauma Questionnaire – Child and Adolescent Version (ITQ-CA)

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ABSTRACT

Background: The 11th edition of the International Classification of Diseases (ICD-11) introduces Posttraumatic Stress Disorder (PTSD) and Complex Posttraumatic Stress Disorder (CPTSD) as two distinct trauma-related disorders. Numerous studies support the proposed symptom structure of ICD-11 CPTSD in adults, but only a few studies have examined CPTSD symptom structure in children, reporting diverging results. To assess ICD-11 CPTSD in children, the International Trauma Questionnaire (ITQ) was recently adapted for children and adolescents (ITQ-CA), with no validated German version available yet.

Objective: This study aimed (1) to test the symptom structure of ICD-11 CPTSD in a sample of trauma-exposed foster children using the ITQ-CA, and (2) to examine the concurrent, convergent and discriminant validity of the German ITQ-CA.

Method: Altogether, 161 Austrian foster children completed a set of standardized measures, resulting in a final sample of 135 trauma-exposed foster children meeting the inclusion criteria. Psychometric properties of the ITQ-CA were assessed using confirmatory factor analysis (CFA), bivariate correlations and multivariate regression.

Results: CFA supported ICD-11 CPTSD symptom structure in children as a two-factor higher-order model with PTSD and Disturbances in Self-Organization (DSO) as correlated factors with very good model fit, while a one-factor higher-order model also fitted the data very well. High factor loadings and excellent levels of internal reliability evidenced the psychometric adequacy of the ITQ-CA. Concurrent and convergent validity were evidenced by high correlations between ITQ-CA scales and criterion variables (PTSD symptoms, depression, anxiety, dissociation, lifetime traumatization). Discriminant validity was partly supported by PTSD and DSO being differently predicted by exogenous criterion variables.

Conclusions: CPTSD symptom structure in children is in support of the ICD-11 conceptualization. The reliability and validity of the German ITQ-CA are evidenced for the first time, identifying it as an easy-to-use screening instrument to assess ICD-11 PTSD and CPTSD in children. Further implications and areas for upcoming studies are discussed.

Estructura de los síntomas del TEPT complejo de la CIE-11 en niños de crianza temporal expuestos a traumas: Revisión del Cuestionario Internacional sobre Traumatismos - Versión para niños y adolescentes (ITQ-CA)–

Antecedentes: La CIE-11 recientemente publicada presenta el trastorno de estrés postraumático (TEPT) y el trastorno de estrés postraumático complejo (TEPT-C) como dos trastornos distintos relacionados con trauma. Numerosos estudios apoyaron la estructura de síntomas propuesta de TEPT-C en adultos de la CIE-11, pero solo unos pocos estudios examinaron la estructura de síntomas de TEPT-C en niños, reportando resultados divergentes. Para evaluar TEPT-C en niños según la CIE-11, el Cuestionario Internacional de Trauma (ITQ) fue adaptado recientemente para niños y adolescentes (ITQ-CA), sin una versión alemana validada disponible todavía.

Objetivo: El estudio actual se estableció para (1) probar la estructura de síntomas de TEPT-C según la CIE-11 en una muestra de niños de crianza temporal expuestos a traumas utilizando el ITQ-CA y para (2) examinar la validez concurrente, convergente y discriminante de la versión en alemán del ITQ-CA.

Método: Ciento sesenta y un niños de crianza temporal austriacos completaron un conjunto de medidas estandarizadas, lo que resultó en una muestra final de 135 niños de crianza temporal expuestos a traumas que cumplieron con los criterios de inclusión. Las propiedades psicométricas del ITQ-CA se evaluaron mediante análisis factorial confirmatorio (AFC), correlaciones bivariadas y regresión de objetivos multivariados.

Resultados: AFC respaldó la estructura de síntomas de TEPT-C según CIE-11 en niños como modelo de dos factores de orden superior con TEPT y DSO (Perturbaciones en la

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🔗 Supplemental data for this article can be accessed here.

organización del sí mismo) como factores correlacionados con muy buen ajuste del modelo, mientras que un modelo de un factor de orden superior también se ajustó muy bien a los datos. Las altas cargas factoriales y los excelentes niveles de confiabilidad interna evidenciaron la adecuación psicométrica del ITQ-CA. La validez concurrente y convergente se evidenció por las altas correlaciones entre las escalas ITQ-CA y las variables de criterio (síntomas de TEPT, depresión, ansiedad, disociación, traumatismo de por vida). La validez discriminante fue apoyada en parte por el TEPT y DSO siendo diferenciadamente predicho por variables de criterio exógenas.
Conclusiones: La estructura de los síntomas del TEPT-C en los niños respalda la conceptualización de la CIE-11. La confiabilidad y validez de la ITQ-CA alemana se evidencia por primera vez, identificándola como un instrumento de cribado fácil de usar para evaluar el TEPT y TEPT-C de la CIE-11 en niños. Se discuten más implicaciones y áreas para futuros estudios.

创伤暴露的寄养儿童中ICD-11复杂性PTSD的症状结构:对国际创伤问卷-儿童和青少年版 (ITQ-CA) 的考查–

背景: 最近发布的ICD-11引入了创伤后应激障碍 (PTSD) 和复杂性PTSD (CPTSD) 作为两种不同的创伤相关障碍。许多研究支持了成人中提出的ICD-11 CPTSD症状结构, 但只有极少数研究考查了儿童CPTSD症状结构, 并且报告的结果大不相同。为评估儿童的ICD-11 CPTSD, 最近针对儿童和青少年改编了国际创伤问卷 (ITQ-CA), 但尚无经过验证的德语版可用。
目的: 本研究旨在 (1) 使用ITQ-CA考查创伤暴露的寄养儿童样本中ICD-11 CPTSD的症状结构, 以及 (2) 考查德语版ITQ-CA的同时效度, 收敛效度和区分效度。
方法: 161名奥地利寄养儿童完成了一套标准化测量, 最终获得了135名符合纳入标准的创伤暴露寄养儿童样本。使用验证性因子分析 (CFA), 双变量相关和多目标回归分析评估ITQ-CA的心理计量学性质。
结果: CFA支持儿童ICD-11 CPTSD症状结构作为拟合良好的, 以PTSD和DSO为相关因子的两因子高阶模型, 而单因子高阶模型也很好地拟合了数据。高因子载荷和极好的内部信度证明了ITQ-CA在心理计量方面的合格性。同时效度和收敛效度由ITQ-CA量表与标准变量 (PTSD症状, 抑郁, 焦虑, 解离, 终身创伤) 之间的高度相关得到验证。外源标准变量对PTSD和DSO不同的预测程度部分支持了区分效度。
结论: 儿童CPTSD症状结构支持ICD-11的概念化。首次证明了德语版ITQ-CA的信效度, 将其确定为评估儿童ICD-11 PTSD和CPTSD的简便易用的筛查工具。讨论了进一步的影响和即将开展的研究领域。

1. Introduction

In the 11th edition of the International Classification of Diseases (ICD-11), the World Health Organization (2018) introduces Posttraumatic Stress Disorder (PTSD) and Complex Posttraumatic Stress Disorder (CPTSD) as two distinct trauma-related disorders under the general parent category 'disorders specifically associated with stress'. PTSD comprises three symptom clusters, namely, re-experiencing the trauma here and now, avoidance of traumatic reminders and persistent sense of current threat. CPTSD comprises the three symptom clusters of PTSD and additionally Disturbances in Self-Organization (DSO). DSO comprises three symptom clusters, which are affective dysregulation, negative self-concept and disturbances in relationships.

Theoretically, the symptom structure of ICD-11 CPTSD is best reflected in a multidimensional and hierarchical model with PTSD and DSO as related but distinct constructs, each comprising three clusters of symptoms. A number of studies have tested this model alongside competing models using precise descriptions of ICD-11 symptom content. The two-factor higher-order model, comprising PTSD and DSO as related second-order factors, was identified as best fitting in a number of studies in adults (e.g. Hyland, Shevlin, Brewin et al., 2017; Karatzias et al., 2016; Vallières et al., 2018), but not all studies replicated these findings. A correlated six-factor model, in which the six PTSD and DSO factors are distinguished and correlated on the first-order level, was also identified as best fitting in a number of studies (e.g. Ben-Ezra et al., 2018; Ho et al., 2019). Furthermore, some studies reported that both models, the two-factor higher-order model and the correlated six-factor model, fitted the data similarly well (e.g. Cloitre, Shevlin et al., 2018; Ho et al., 2020). In general, the two-factor higher-order model appears to provide superior fit in traumatized and clinical populations (e.g. Hyland, Shevlin, Brewin et al., 2017), while the correlated six-factor model provides superior fit in general population samples (e.g. Ben-Ezra et al., 2018). Studies using archival data reported similar findings (e.g. Böttche et al., 2018; Shevlin et al., 2017). Taken together, the symptom structure of ICD-11 CPTSD seems to be best reflected in a two-factor higher-order model or a correlated six-factor model, evidencing the need for additional studies in different samples using precise descriptions of ICD-11 symptom content. This is further emphasized by the recent debate about whether ICD-11 CPTSD is a distinct, cohesive and valid construct, as well as strengths and limitations of various statistical procedures (i.e. latent class/profile analysis) for testing the construct validity of ICD-11 CPTSD (Cloitre et al., 2020; Ford, 2020).

It has been hypothesized that symptom structure in children and adolescents (hereafter referred to as 'children', unless otherwise specified) may be different from that in adults owing to developmental changes taking place during this life stage (Kazlauskas et al., 2020) and that diagnostic criteria of ICD-11 CPTSD for children may hence be specified in the future (Brewin et al., 2017). Two studies have investigated this issue to date using precise descriptions of ICD-11 symptom content, reporting diverging results. One study, conducted in a sample of foster children, identified the two-factor higher-order model as best fitting (Haselgruber, Sölva, & Lueger-Schuster, 2020b), while another study conducted in the general population identified the correlated six-factor model as best fitting (Kazlauskas et al., 2020), evidencing the need for further research.

The recently published International Trauma Questionnaire (ITQ) (Cloitre, Shevlin et al., 2018) is the only validated measure to assess ICD-11 CPTSD in adults, and was shown to exhibit convergent and discriminant validity in a number of studies. Depression was more strongly associated with DSO and anxiety more strongly with PTSD (e.g. Ho et al., 2020; Hyland, Shevlin, Elklit et al., 2017), while some studies reported stronger associations between anxiety and DSO (e.g. Ho et al., 2019). Research on ICD-11 CPTSD and dissociation is scarce (Shevlin et al., 2017) and the few studies conducted to date reported bivariate associations between dissociation and all ICD-11 CPTSD symptom clusters (Hyland, Shevlin, Fyvie, Cloitre, & Karatzias, 2020). Modelling unique interrelations between variables using network analysis, however, Knefel, Tran, and Lueger-Schuster (2016) showed that symptoms of dissociation are clustered with PTSD rather than DSO. Lastly, female gender was repeatedly identified as a risk factor for CPTSD (e.g. Cloitre et al., 2019) and was strongly associated with both PTSD and DSO symptomatology (Hyland, Shevlin, Elklit et al., 2017), as were increased rates of childhood trauma (Ho et al., 2020, 2019; Shevlin et al., 2017).

The ITQ has also been identified as an applicable measure in children, with a recommendation for further optimization (Haselgruber et al., 2020b). In line with this notion, the ITQ's authors revised the validated version of the ITQ in consultation with child and adolescent trauma assessment experts to provide a child-adapted version, the International Trauma Questionnaire – Child and Adolescent Version (ITQ-CA) (Cloitre, Bisson et al., 2018). The ITQ-CA comprises the same number of items and scoring scheme as the ITQ with adapted item formulations to increase comprehensibility for children. To date, only one study has examined the ITQ-CA (Kazlauskas et al., 2020), evidencing its validity in a sample of Lithuanian children from the general population. Following this approach, the current study was set up to translate the ITQ-CA into German and examine its validity in a sample of Austrian foster children.

Foster children are exposed to particularly high rates of childhood trauma (Greeson et al., 2011), since the most common background for foster care placement is a history of maltreatment by a parental caregiver (Oswald, Heil, & Goldbeck, 2010). Accordingly, foster children exhibit a rate of mental health problems that is exceptional for a non-clinical population (Tarren-Sweeney, 2008), with high rates of PTSD and comorbid disorders (e.g. Salazar, Keller, Gowen, & Courtney, 2013). Despite these issues, foster children are remarkably underinvestigated (Greeson et al., 2011) and little is known about complex trauma-related disorders in this vulnerable population of children (e.g. Sölva, Haselgruber, & Lueger-Schuster, 2020).

Deriving from the current state of knowledge, the present study aimed (1) to test the symptom structure of ICD-11 CPTSD in a sample of trauma-exposed foster children using the ITQ-CA, and (2) to examine the validity of the German ITQ-CA. Addressing aim 1, we tested a series of possible representations of ICD-11 CPTSD symptom structure, based on best fitting models in previous studies (e.g. Hyland, Shevlin, Brewin et al., 2017; Kazlauskas et al., 2020). Addressing aim 2, we examined the ITQ-CA regarding (a) concurrent validity by examining associations between its scales and PTSD symptom clusters as assessed by an independent PTSD measure; (b) convergent validity by examining associations between its scales and criterion variables; and (c) discriminant validity by testing distinct contributions of predictors commonly associated with CPTSD for PTSD and DSO simultaneously. We expected female gender and children's lifetime traumatization to predict both PTSD and DSO, and tested for discriminant validity based on theory and empirical findings, hypothesizing that (i) anxiety would more strongly predict PTSD while depression would more strongly predict DSO, and (ii) dissociation would predict PTSD, but not DSO.

2. Method

2.1. Participants and procedure

Data assessment for the current study was conducted in the course of a larger research project financed by the Government of Lower Austria and carried out in six foster care facilities in Lower Austria. All children aged 10 years and older currently living in foster care were invited to participate in the study voluntarily and written consent was obtained from each participant. The study was approved by the Ethical Board of the University of Vienna (#00328).

Data assessment was conducted in the respective foster care facility of residence by a team of clinical psychologists and trained master's students in clinical psychology. The administration of all questionnaires

was monitored closely to supervise assessment and ensure availability in case of children being affected by questions entailing traumatic experiences and related symptomatology. Group sessions were generally conducted with two children and one psychologist, mainly to assist in case of reading difficulties. If indicated due to emotional, cognitive or other reasons, assessments were completed in individual sessions instead.

Between March and September 2019, 161 foster children participated in the study, filling out a set of standardized measures. Participants who provided answers with high levels of missing values (> 50% on the ITQ-CA), did not report any traumatic experiences or were older than 18 years were excluded, resulting in a final sample of 135 trauma-exposed foster children with sufficient data on the ITQ-CA. Of this final sample, 75.6% participated in the assessment of another study conducted in 2018, examining the ITQ in foster children (Haselgruber et al., 2020b), while the current study is based on a different data set, including a differently composed sample at a different point in time, using different measures (e.g. the ITQ-CA).

The mean age of the final sample was 14.27 years (SD = 2.34), with more boys (68.9%) than girls. The majority of children attended special needs school (40.7%), secondary school (23.7%) or work-related school (14.8%). The mean duration of foster care placement was 2.84 years (SD = 2.45), ranging from 0 to 11 years. Most children (91.9%) had contact with their parents.

2.2. Measures

The ITQ-CA (Cloitre, Bisson et al., 2018) is a 22-item self-report measure to assess PTSD and CPTSD in children. Six items are used to assess the three clusters of PTSD: re-experiencing (Re1, Re2), avoidance (Av1, Av2) and threat (Th1, Th2); and six items are used to assess the three clusters of DSO: affective dysregulation (AD1, AD2), negative self-concept (NSC1, NSC2) and disturbances in relationships (DR1, DR2). Participants indicate on a five-point Likert-scale ranging from 0 ('never') to 4 ('almost always') how much they were bothered by each symptom over the past month. Scores ≥ 2 ('moderately') indicate the presence of a symptom. In addition, five items each are used to measure functional impairment for both PTSD and DSO symptomatology, assessing impairment in areas of friends, family, school, other important areas and general happiness. Functional impairment items were answered on a binary scale (yes/no). For the current study, the ITQ-CA was translated into German and back-translated into English to be reviewed by the authors of the original measure. Translations were further reformulated and examined until the final

translated version was approved by the authors of the original measure.

The Child and Adolescent Trauma Screen (CATS) (Sachser et al., 2017) was used to assess PTSD according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5). Comprising 20 items, the CATS assesses symptoms of intrusions, avoidance, negative alterations in cognition and mood ('negative alterations') and hyperarousal. Participants indicate on a four-point Likert scale ranging from 0 ('never') to 3 ('almost always') how much they were bothered by each symptom over the past 2 weeks. The reliability of CATS subscales was acceptable to good for intrusions ($\alpha = 0.81$), avoidance ($\alpha = 0.62$) and negative alterations ($\alpha = 0.78$); only the subscale hyperarousal ($\alpha = 0.57$) was weak. The internal reliability for total CATS scores was very good ($\alpha = 0.90$).

The CATS checklist (Sachser et al., 2017) was used to assess lifetime traumatization, comprising 14 dichotomized items. In this checklist, exposure to physical and sexual violence, death or injury, sudden or violent death of close persons, natural disasters and exposure to war are assessed. To assess overall lifetime traumatization, we calculated a summed total score of exposure to all traumatic life events, ranging from 0 to 14. Participants who did not report exposure to at least one of the 14 events of lifetime traumatization were excluded from the analysis.

The Patient Health Questionnaire-9 (PHQ-9) (Kroenke, Spitzer, & Williams, 2001) and the Generalized Anxiety Disorder Scale-7 (GAD-7) (Spitzer, Kroenke, Williams, & Löwe, 2006) were used to assess depression with nine items (PHQ-9) and anxiety with seven items (GAD-7). Participants indicate on a four-point Likert scale ranging from 0 ('not at all') to 3 ('nearly every day') how much they were bothered by each symptom over the past 2 weeks. Scores ≥ 10 are used to identify the presence of depression and anxiety. The PHQ-9 and GAD-7 have been used in children frequently, with strong psychometric properties (e.g. Allgaier, Pietsch, Frühe, Sigl-Glöckner, & Schulte-Körne, 2012; Mossman et al., 2017). The reliability of the PHQ-9 ($\alpha = 0.89$) and GAD-7 ($\alpha = 0.88$) was good in the current study.

The Adolescence Dissociative Experience Scale (ADES-8) (Martinez-Taboas et al., 2004) is an eight-item measure to assess dissociation. Participants indicate on a numerical 11-point scale ranging from 0 to 10 how frequently they experience dissociative symptoms. Scores ≥ 3 are used as a cut-off to identify clinically relevant levels of dissociative symptoms. The reliability of the ADES-8 was good in the current study ($\alpha = 0.84$).

2.3. Data analysis

Based on findings in previous studies using the ITQ (e.g. Cloitre, Shevlin et al., 2018; Hyland, Shevlin,

Brewin et al., 2017) and the ITQ-CA (Kazlauskas et al., 2020), we specified four alternative models of ICD-11 CPTSD symptom structure in children using confirmatory factor analysis (CFA). Model 1 represents a single-factor model with all items loading on a single latent factor (CPTSD). Model 2 comprises six correlated first-order factors (re-experiencing, avoidance, threat, affective dysregulation, negative self-concept, disturbances in relationships). Model 3 comprises six first-order factors and one second-order factor (CPTSD). Model 4 comprises six first-order factors and two correlated second-order factors (PTSD, DSO), with first-order factors re-experiencing, avoidance and threat loading onto PTSD, and first-order factors affective dysregulation, negative self-concept and disturbances in relationships loading onto DSO (Figure 1).

We specified all models in Mplus (version 7.3) using the robust weighted least squares estimator (WLSMV) as the most appropriate method of analysing ordinal indicators in a CFA context (Brown, 2006). Missing data on the ITQ-CA were very low (0.7–3.0%) and handled using the pairwise present analysis method as the default setting with WLSMV in Mplus. To evaluate the goodness of fit, the comparative fit index (CFI), Tucker–Lewis index (TLI) and root mean squared error of approximation (RMSEA) were calculated, with CFI and TLI > 0.90 and RMSEA < 0.08 reflecting acceptable model fit. To directly compare the four nested and non-nested models regarding fit, we reran the analysis using robust maximum likelihood estimator (MLR) with 5000 points of Monte Carlo integration to calculate the Bayesian information criterion (BIC) as a suitable and commonly used fit index for model comparison (Masyn, 2013). Lower values indicate better model fit, with a 10-point difference being indicative that the lower BIC model provides significantly better fit (Raftery, 1995).

After identifying the best fitting model, we calculated composite reliability scores (CR) for all scales, as recommended for measures with small numbers of items, such as the ITQ-CA. To examine concurrent and convergent validity of ITQ-CA scales based on the best fitting model, correlations between latent factors and criterion variables were calculated. Criterion variables to examine concurrent validity comprised PTSD symptoms as assessed by the CATS. Criterion variables to examine convergent validity comprised lifetime traumatization and psychopathology (depression, anxiety, dissociation). Lastly, we tested whether a range of potential predictive factors for CPTSD (gender, age, time in care, lifetime traumatization, depression, anxiety, dissociation) would distinctively predict PTSD and DSO simultaneously using multivariate regression. To examine the results of validity and investigate how PTSD and DSO based on the preferred model of CPTSD symptom structure relate to criterion variables, PTSD and DSO were included as

latent factors in validity analyses, in line with previous studies (e.g. Ho et al., 2020, 2019).

3. Results

3.1. Trauma exposure and psychopathology

Participants on average reported 4.08 lifetime traumatic experiences (Mdn = 4.0, SD = 2.30), ranging from one to 12 events. Overall, 11.1% of the sample reported one type of traumatic experience, 36.3% two or three types of experience, 27.5% four or five experiences, 17.7% six or seven experiences and 7.3% more than seven experiences in their lifetime. Girls reported significantly higher rates of sexual abuse, sexual assault, sudden or violent death of a close person, all CPTSD symptoms, depression and dissociation than boys (Table 1). Exploratory analysis regarding age (≤ 14, ≥ 15 years) and type of lifetime trauma experienced (only interpersonal, only non-interpersonal, both) evidenced differences between age groups regarding disturbances in relationships and that children experiencing only non-interpersonal trauma reported less symptomatology in the majority of CPTSD symptoms than children experiencing both types (see Table S1, online supplementary data).

3.2. Symptom structure of ICD-11 CPTSD

Model fit statistics for all models tested using CFA are presented in Table 2. Regarding RMSEA, CFI and TLI, all models except for Model 1 exhibited very good fit. Models 2–4 yielded very good fit regarding RMSEA, CFI and TLI, with negligible differences between the models in all three fit indices (Chen, 2007). Using the BIC, our results clearly evidence that Models 3 and 4 exhibit significantly better fit than Model 2 (BIC = 4065.420), as indicated by a difference ≥ 10 points of the BIC, while Model 3 (BIC = 4036.227) and Model 4 (4039.882) fitted the data similarly well.

Taking all indices together and considering the theoretical structure of ICD-11 CPTSD, Model 4 was selected as the best fitting model in children using the ITQ-CA, as it comprised high CFI and TLI, and low RMSEA and BIC, and is in line with theoretical assumptions and previous findings.

Standardized factor loadings of the selected model are presented in Table 3. All first- and second-order factor loadings were statistically significant (p < .001), positive and high. All first-order factor loadings of PTSD and DSO symptoms were > 0.50. Similarly, all second-order factor loadings were high and loaded strongly onto their respective factor of PTSD and DSO (> 0.70 in all cases).
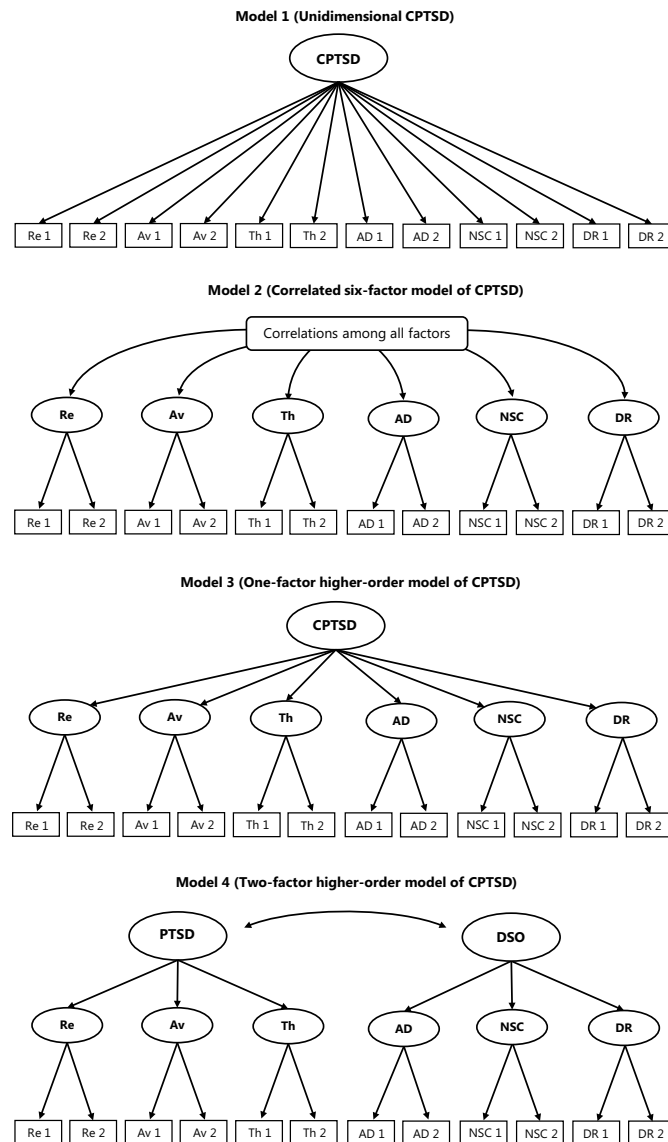
Model 1 (Unidimensional CPTSD)

Model 2 (Correlated six-factor model of CPTSD)

Model 3 (One-factor higher-order model of CPTSD)

Model 4 (Two-factor higher-order model of CPTSD)

Figure 1. Four alternative models of ICD-11 CPTSD using the ITQ-CA. Re, re-experiencing; Av, avoidance; Th, sense of current threat; AD, affective dysregulation; NSC, negative self-concept; DR, disturbances in relationships.

PTSD and DSO were highly correlated ($r = 0.92$, $p < .01$). CR estimates derived for ITQ-CA scale scores were excellent for both scales of PTSD (CR = 0.85) and DSO (CR = 0.95).

3.3. Concurrent, convergent and discriminant validity of the ITQ-CA

Examining concurrent validity, moderate to strong bivariate correlations were found between all ITQ-CA scales and PTSD symptom clusters as assessed by the CATS (Table 4). Larger than any other correlation among variables, the strongest correlations were found between ITQ-CA factors and respective CATS subscales, as follows: re-experiencing and intrusions ($r = 0.73$), avoidance from both measures ($r = 0.74$), threat and hyperarousal ($r = 0.84$), affective dysregulation and negative alterations ($r = 0.84$), negative self-concept and negative alterations ($r = 0.78$), and disturbances in relationships and negative alterations ($r = 0.71$). The second-

order factor PTSD correlated more strongly with intrusions ($r = 0.84$), avoidance ($r = 0.65$) and hyperarousal ($r = 0.71$), while the second-order factor DSO correlated more strongly with negative alterations ($r = 0.83$).

Examining convergent validity, moderate to strong bivariate correlations between ITQ-CA scales and all criterion variables were found (Table 4). PTSD and DSO correlated moderately to strongly with depression, anxiety and dissociation, whereas PTSD correlated most strongly with dissociation ($r = 0.59$) and DSO with anxiety ($r = 0.63$). Lifetime traumatization correlated moderately with PTSD ($r = 0.43$) and DSO ($r = 0.47$).

Examining discriminant validity of ITQ-CA scales, PTSD was significantly predicted by female gender ($\beta = 0.41$), lifetime traumatization ($\beta = 0.40$), depression ($\beta = 0.25$) and dissociation ($\beta = 0.22$), explaining 59.3% of variance. DSO was significantly predicted by female gender ($\beta = 0.37$), time in care ($\beta = -0.16$), lifetime traumatization ($\beta = 0.39$) and anxiety ($\beta = 0.28$),

Table 1. Descriptive statistics of lifetime traumatization, CPTSD symptoms, general psychopathology and gender differences.

Variable	Boys	Girls	Total	χ^2-Test statistic
Lifetime traumatization				
Natural disaster	30.1%	21.4%	27.4%	1.095
Serious accident or injury	77.4%	73.8%	76.3%	0.208
Robbery	14.1%	18.5%	15.8%	0.618
Physical abuse in family	29.0%	40.5%	32.6%	1.725
Physical abuse in community	41.9%	52.4%	45.2%	1.275
Witnessing physical abuse in family	19.4%	33.3%	23.7%	3.126
Witnessing physical abuse in community	63.4%	54.8%	60.7%	0.914
Sexual abuse	7.5%	23.8%	12.6%	6.969**
Sexual assault	3.2%	19.0%	8.1%	9.678**
Sudden or violent death of close person	27.2%	52.4%	35.1%	8.046**
Physical attack	11.8%	7.1%	10.4%	0.683
Witnessing physical attack	19.4%	9.8%	16.4%	1.911
Scary medical procedure	19.6%	31.0%	23.1%	2.103
Experience of war	4.3%	2.4%	3.7%	0.584
CPTSD symptomatology				
Re-experiencing	28.0%	71.4%	41.5%	22.525**
Avoidance	34.4%	61.0%	42.5%	8.217**
Sense of current threat	40.9%	59.5%	46.7%	4.049*
Affective dysregulation	46.2%	71.4%	54.1%	7.394**
Negative self-concept	23.7%	64.3%	36.3%	20.657**
Disturbances in relationships	25.8%	57.1%	35.6%	12.399**
Psychopathology				
Depression	23.5%	47.2%	30.8%	6.608*
Anxiety	17.3%	27.8%	20.5%	1.683
Dissociation	18.8%	50.0%	28.4%	11.911**

All tests were chi-squared tests with one degree of freedom.
*p < .05. **p < .01.

Table 2. Model fit statistics of confirmatory factor analysis for alternative models of ICD-11 CPTSD using the ITQ-CA.

Model	χ^2 (df)	RMSEA (90% CI)	CFI	TLI	BIC
1	138.813 (54)*	0.108 (0.086, 0.130)	0.946	0.934	4063.345
2	56.116 (39)*	0.057 (0.015, 0.088)	0.989	0.982	4065.420
3	73.324 (48)*	0.063 (0.031, 0.090)	0.984	0.978	4036.227
4	71.370 (47)*	0.062 (0.029, 0.090)	0.985	0.978	4039.882

N = 135; χ^2, chi-square goodness of fit statistic; df, degrees of freedom; RMSEA (90% CI), root mean square error of approximation with 90% confidence interval; CFI, comparative fit index; TLI, Tucker–Lewis index; BIC, Bayesian information criterion.
*p <.05.

explaining 62.1% of variance. Hypotheses of discriminant validity were partly rejected (i) and partly confirmed (ii), thus partly supporting the ITQ-CA's discriminant validity. Detailed results of the conducted analysis including 95% CIs are reported in Table 5.

4. Discussion

This study was conducted to test the symptom structure of ICD-11 CPTSD and examine the validity of the German ITQ-CA in a sample of trauma-exposed foster children. The two-factor higher-order model was supported as the symptom structure of ICD-11 CPTSD in children based on statistical and theoretical considerations, while a one-factor higher-model also fitted the data very well. The current results support the German ITQ-CA's concurrent and convergent validity, and partly its discriminant validity.

Symptom structure of ICD-11 CPTSD was chosen to be best reflected in a two-factor higher-order model, with PTSD and DSO as correlated second-order constructs, each comprising three first-order factors. This is in line with the theoretical conceptualization of ICD-11 and numerous studies in adults using the ITQ (e.g. Hyland, Shevlin, Brewin et al., 2017). Recent studies in children reported the two-factor higher-order model as best fitting in foster children using the ITQ (Haselgruber et al., 2020b) and the correlated six-factor model as best fitting in children from the general population using the ITQ-CA (Kazlauskas et al., 2020). As foster children have been shown to resemble more a clinical than a non-clinical population (Tarren-Sweeney, 2008), results in children seem to corroborate findings in adults, where the two-factor higher-order model was more often identified as best fitting in clinical populations (e.g. Hyland, Shevlin, Brewin et al., 2017) and the correlated six-factor model as best fitting in the general population (e.g. Ben-Ezra et al., 2018). Differences in symptom structure between studies may thus be rooted in the population addressed (clinical vs general population) rather than the age of the sample (children vs adults). However, with a number of models exhibiting very good model fit in the present study, additional research is needed to further examine the symptom structure of ICD-11 CPTSD in the general population and clinical samples of children.

Regarding model fit comparisons in the current study, it is important to note that Models 2–4 all exhibited very good fit regarding RMSEA, CFI and TLI, with differences not interpretable as meaningful (Chen, 2007). The BIC, however, clearly favoured Models 3 and 4, both fitting the data similarly well. This can be explained by the high correlation between PTSD and DSO in Model 4, which may be indicative of PTSD and DSO representing less distinctive factors in children as assessed by the ITQ-CA than by the ITQ (Haselgruber et al., 2020b; Hyland, Shevlin, Brewin et al., 2017). This may be attributable to item formulations or due to age and associated developmental changes, warranting further research using the ITQ-CA. Thus, Model 4 was chosen ultimately, exhibiting very good model fit and being in line with former findings and theoretical assumptions, while the correlated six-factor model (Model 2) and the one-factor higher-order model (Model 3), distinguishing between PTSD and DSO symptomatology on the first-order level while entailing different representations of second-order factors, also produced very good fit. Future studies should consider these models as feasible alternatives of ICD-11 CPTSD symptom structure in children, as further emphasized by the recent debate about the validity of ICD-11 CPTSD diagnoses and the distinguishability of PTSD and CPTSD (Cloitre et al., 2020; Ford, 2020). The current results may contribute to the present discussion by explicating that

Table 3. Standardized factor loadings and standard errors for the two-factor higher-order model (Model 4).

Items	Re	Av	Th	AD	NSC	DR
Bad dreams of what happened (Re 1)	0.82 (0.06)					
Pictures in my head of what happened (Re 2)	0.92 (0.05)					
Trying not to think/have feelings about it (Av 1)		0.81 (0.07)				
Staying away from what reminds me (Av 2)		0.76 (0.06)				
Being overly careful (Th 1)			0.55 (0.11)			
Being jumpy (Th 2)			0.55 (0.10)			
Having trouble calming down when upset (AD 1)				0.62 (0.07)		
Not being able to have any feelings (AD 2)				0.81 (0.06)		
Feeling like a failure (NSC 1)					0.91 (0.03)	
Thinking I am not a good person (NSC 2)					0.89 (0.03)	
Not feeling close to other people (DR 1)						0.88 (0.04)
Having a hard time staying close to other people (DR 2)						0.80 (0.05)

First order factors	PTSD	DSO
Re-experiencing (Re)	0.82 (0.05)	
Avoidance (Av)	0.82 (0.07)	
Sense of current threat (Th)	0.78 (0.13)	
Affective dysregulation (AD)		0.98 (0.08)
Negative self-concept (NSC)		0.93 (0.03)
Disturbances in relationships (DR)		0.88 (0.03)

All factor loadings are statistically significant ($p < .001$). $N = 135$.
PTSD, Posttraumatic Stress Disorder; DSO, Disturbances in Self-Organization.

Table 4. Bivariate correlations between ITQ-CA symptom clusters and criterion variables.

ITQ-CA	PTSD (CATS)				Psychopathology			Lifetime traumatization
	Intrusions	Avoidance	Negative alterations	Hyperarousal	Depression	Anxiety	Dissociation	
Re-experiencing	0.73	0.40	0.57	0.48	0.59	0.38	0.53	0.37
Avoidance	0.65	0.74	0.59	0.57	0.48	0.52	0.42	0.33
Sense of current threat	0.66	0.46	0.61	0.84	0.50	0.50	0.51	0.36
Affective dysregulation	0.78	0.54	0.84	0.83	0.57	0.57	0.41	0.45
Negative self-concept	0.67	0.37	0.78	0.57	0.69	0.66	0.50	0.44
Disturbances in relationships	0.60	0.38	0.71	0.50	0.52	0.50	0.40	0.42
PTSD	0.84	0.65	0.72	0.71	0.65	0.56	0.59	0.43
DSO	0.73	0.45	0.83	0.66	0.65	0.63	0.47	0.47

PTSD, Posttraumatic Stress Disorder; CATS, Child and Adolescent Trauma Screen; DSO, Disturbances in Self-Organization.
All correlations are significant at $p < .01$.

Table 5. Standardized regression coefficients (β), 95% confidence intervals (95% CI) and standard errors (SE) predicting latent PTSD and DSO factors simultaneously.

Predictor variables	PTSD			DSO		
	β	95% CI	SE	β	95% CI	SE
Gender (female)	0.41**	(0.26, 0.57)	0.08	0.37**	(0.22, 0.52)	0.08
Age	−0.09	(−0.29, 0.11)	0.10	0.06	(−0.11, 0.23)	0.09
Time in care	−0.02	(−0.17, 0.13)	0.08	−0.16*	(−0.29, −0.03)	0.07
Lifetime traumatization	0.40**	(0.23, 0.56)	0.08	0.39**	(0.23, 0.56)	0.08
Depression	0.25*	(0.02, 0.47)	0.12	0.17	(−0.02, 0.35)	0.09
Anxiety	0.12	(−0.08, 0.32)	0.10	0.28**	(0.11, 0.46)	0.09
Dissociation	0.22*	(0.05, 0.39)	0.09	0.11	(−0.04, 0.25)	0.07
Variance explained		59.3%			62.7%	

Gender (0 = male, 1 = female).
*$p < .05$, **$p < .01$.

PTSD and DSO symptomatology seem well distinguishable in children on the first-order level using the ITQ-CA, while future research is needed to further examine the constructs' representation and distinguishability on the second-order level. Studies using larger samples may furthermore consider age and type of trauma exposure to evaluate whether CPTSD symptom structure in children may present differently at different ages or owing to exposure to different traumatic events.

Examining the validity of the ITQ-CA, we first established the measure's applicability by high factor loadings for all first- and second-order factors and excellent levels of internal reliability for both scales of PTSD and DSO. Concurrent validity was evidenced by bivariate correlations between ITQ-CA scales and PTSD symptom clusters as assessed by the CATS, with ITQ-CA scales correlating most strongly with respective CATS subscales, directly replicating findings in adults (Karatzias et al., 2016). Most notably, the second-order factor PTSD correlated more strongly with intrusions, avoidance and hyperarousal according to the DSM-5 PTSD model, whereas the second-order factor DSO correlated more strongly with negative alterations. As in adults (Karatzias et

al., 2016), this finding suggests that the conceptualization of DSM-5 PTSD, especially the negative alterations cluster, may reflect a more complex psychological response to trauma exposure than the strict set of symptoms reflected in ICD-11 PTSD, which also seems to be the case in children. Taken together, our results support the ITQ-CA's concurrent validity in children for the first time and provide evidence that ICD-11 reduced PTSD symptomatology to its core, reflecting a more 'specific' disorder (Shevlin et al., 2018), while DSO entails a broader set of non-trauma-specific symptoms.

Convergent validity of ITQ-CA scales was evidenced by high correlations with all criterion variables. PTSD and DSO both correlated strongly with depression, while PTSD correlated most strongly with dissociation and DSO most strongly with anxiety. In line with the current results, former studies reported high rates of depression and anxiety in PTSD and CPTSD groups (Cloitre et al., 2019) and associated anxiety, depression and dissociation with PTSD and DSO symptomatology (e.g. Ho et al., 2019; Hyland et al., 2020). Also in line with former studies and the ICD-11 conceptualization, PTSD and DSO were clearly associated with lifetime traumatization (Ho et al., 2020; Shevlin et al., 2017).

Discriminant validity of ITQ-CA scales was partly evidenced by criterion variables distinctively and differently predicting PTSD and DSO simultaneously, explaining a substantial amount of variance in both constructs. PTSD was significantly predicted by female gender, lifetime traumatization, depression and dissociation, while DSO was significantly predicted by female gender, time in care, lifetime traumatization and anxiety. Testing for discriminant validity, anxiety predicted DSO but not PTSD, while depression predicted PTSD but not DSO. This finding was in contrast to our expectation and some findings in adults (e.g. Hyland, Shevlin, Elklit et al., 2017), leading to rejection of the first hypothesis of discriminant validity. It has to be noted, however, that not all studies reported similar findings (Ho et al., 2019) and that the present study is the first to examine the unique predictive value of depression and anxiety for PTSD and DSO in children. The current results may also indicate that the complex interrelations between CPTSD symptomatology and comorbid psychopathology in children may be different compared to those in adults, demonstrating the need for future research. Dissociation was identified as a predictor for PTSD, but not DSO symptomatology in the current study, evidencing a distinct relation between PTSD and dissociation in children, in line with former results (Knefel et al., 2016), leading to acceptance of the second hypothesis of discriminant validity. To examine whether dissociation may

mutually increase with complex trauma reactions and thus serve as a clinically useful indicator for differential diagnosis (Hyland et al., 2020), further research in children is needed. As expected, female gender and lifetime traumatization were identified as predictive factors for both PTSD and DSO, in line with former studies (e.g. Ho et al., 2020; Hyland, Shevlin, Elklit et al., 2017). Time in care negatively predicted DSO but not PTSD, which may well reflect the positive benefits of foster care in reducing the broader set of ICD-11 DSO symptomatology over time in some cases, while the narrow set of ICD-11 PTSD symptomatology may require more specific treatment strategies in any case to reduce. Taken together, the current results partly support the ITQ-CA's discriminant validity by exogenous criterion variables predicting PTSD and DSO simultaneously, partly as hypothesized. Our findings evidence the need for further studies examining the ITQ-CA, the distinguishability of PTSD and DSO, and the complex interrelation of CPTSD symptomatology and comorbid psychopathology in children.

Regarding foster children, our results evidence high rates of traumatization and psychopathological symptoms in this vulnerable population. Analysis revealed gender differences regarding trauma exposure, with girls reporting significantly higher rates of sexual abuse, sexual assault and sudden/violent death of a close person (e.g. Haahr-Pedersen et al., 2020). Subsequent analysis evidenced gender differences regarding CPTSD symptomatology, with girls exhibiting significantly higher rates of PTSD and DSO symptoms, as has been shown in studies in adults (e.g. Ben-Ezra et al., 2018). Taken together, our results confirm foster children as more of a clinical than a non-clinical population (Tarren-Sweeney, 2008), exhibiting high rates of trauma exposure and psychopathological symptoms.

The current study has several limitations. First, the study was conducted in a relatively small sample of foster children compared to studies in adults, limiting the generalizability of the findings. Secondly, concurrent validity of ITQ-CA scales was assessed using an independent measure to assess DSM-5 PTSD. While the current results directly replicate findings in adults (Karatzias et al., 2016), and concordance between ICD-11 and DSM-5 PTSD symptoms was shown to be generally high in a number of studies (e.g. Shevlin et al., 2018), inherent differences between concepts do limit findings on concurrent validity. At the present point in time, no other measure to assess ICD-11 CPTSD was available, and upcoming studies using distinct measures of ICD-11 CPTSD are needed to further examine and establish concurrent validity of the ITQ-CA. Thirdly, the preferred model of symptom structure

(Model 4) was chosen based on statistical and theoretical considerations, while Model 3 also fitted the data very well. Thus, the high correlation between PTSD and DSO and partly unexpected results of discriminant validity limit the current findings on discriminant validity and evidence the need for future studies examining the ITQ-CA. Lastly, all measures were applied using self-report forms. Even though this limitation was constant across all analyses, ensuring the interpretability of the results, upcoming studies using clinical interviews as well as addressing additional informants (e.g. caregivers) are needed. With differences between child- and caregiver-reports as a robust finding in clinical child psychology (e.g. Haselgruber, Sölva, & Lueger-Schuster, 2020a), the need for a caregiver version of the ITQ-CA becomes evident, and should be the subject of future research.

5. Conclusion

CPTSD symptom structure in trauma-exposed foster children is in support of the ICD-11 conceptualization. A two-factor higher-order model, including PTSD and DSO as correlated second-order constructs, was preferred in the current study. With an alternative model comprising only one second-order factor (CPTSD) also fitting the data very well, the need for future research on CPTSD symptom structure in children becomes evident. The German ITQ-CA exhibited high factor loadings and excellent levels of internal reliability, demonstrating its applicability for the first time. Our results provide support for the concurrent and convergent validity of the ITQ-CA, and limited evidence for its discriminant validity. Taken together, this study demonstrates the German ITQ-CA as a viable, easy-to-use screening instrument to assess ICD-11 PTSD and CPTSD in children, as well as the need for future studies examining the ITQ-CA. With differences between child and caregiver reports as a robust finding and crucial theme in clinical child psychology, future research should aim at constructing and testing a caregiver version of the ITQ-CA to further increase its utility and usability.

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Data availability

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