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Factor structure and symptom classes of ICD-11 complex posttraumatic stress disorder in a South Korean general population sample with adverse childhood experiences

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ABSTRACT

Background: Adverse childhood experiences (ACE) are known as risk factors for poor adulthood mental health, including ICD-11 posttraumatic stress disorder (PTSD) and complex PTSD (CPTSD). While many studies focused on the association of ACE and CPTSD, examining variant symptom patterns related to ACE is lacking.
Objective: This study aimed to identify the factorial validity of the ICD-11 CPTSD and its distinctive symptom classes in Korean adults with ACE from a representative community sample and examine the risk factors and clinical symptoms that distinguish the CPTSD symptom classes.
Methods: We conducted a cross-sectional retrospective study with the International Trauma Questionnaire data from 800 adult general population with ACE histories. A confirmatory factor analysis, latent class analysis, analysis of variance and multinomial logistic regression were conducted.
Results: Results of confirmatory factor analysis supported a six-factor correlation model, while a two-factor higher-order model with PTSD and disturbances in self-organization (DSO) as correlated constructs also showed excellent fit. A latent class analysis identified six classes, including a distinctive ICD-11 CPTSD and PTSD, additionally a DSO with sense of threat, a DSO, an emotion dysregulation, and a low symptom class, showing distinguished features in ACE patterns, lifetime trauma, depression, somatization, panic disorder, and subtypes of dissociation.
Conclusions: The factorial and discriminant validity of ICD-11 CPTSD for Korean ACE survivors were confirmed. Recognizing the pervasive impact of patterns of ACEs and lifetime trauma would be helpful in access to and delivery of appropriate mental health services. Variation in symptom presentations of CPTSD and the role of dissociation should be of concern, that it may bring complicated life outcomes to people with ACEs.

The *International Classification of Diseases* 11th version (ICD-11; World Health Organization, 2018a) presents separate diagnoses of posttraumatic stress disorder (PTSD) and complex PTSD (CPTSD). ICD-11 PTSD is a narrower conceptualization of the PTSD compared to what is described in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM, American Psychiatric Association, 2013), and includes three symptom clusters of re-experiencing in the here and now (RE), avoidance of traumatic reminders (AV), and a sense of current threat (TH). CPTSD is defined in terms of these three symptom clusters plus three additional symptom clusters of affective

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dysregulation (AD), negative self-concept (NSC), and disturbed relationships (DR). These additional symptom clusters are collectively termed 'Disturbances in Self-Organization' (DSO). Substantial empirical support has accumulated to support the construct validity of the ICD-11 model of PTSD and CPTSD (Brewin et al., 2017; Brewin, 2020). A valid self-report measure for these disorders also had been developed, named the International Trauma Questionnaire (ITQ; Cloitre et al., 2018). A diagnosis of PTSD is made when at least one of two symptoms from each three PTSD cluster is present and there is evidence of functional impairment. A diagnosis of CPTSD is made when at least one of two symptoms from each three PTSD and three DSO cluster is present and there is evidence of functional impairment in relation to both sets of symptoms (Cloitre et al., 2018).

Support for the factorial validity of the CPTSD symptoms has been derived from confirmatory factor analysis (CFA) studies among different populations worldwide. These studies have converged on two models that distinguish PTSD and DSO symptoms. One model is a correlated six factor model (RE, AV, TH, AD, NSC, and DR) and the second is a two-factor higher-order model (PTSD and DSO). Among treatment seeking samples, most studies have identified the higher-order model (e.g., Cloitre et al., 2018; Hyland et al., 2017; Karatzias et al., 2016; Kazlauskas, Gegieckaite, Hyland, Zelviene, & Cloitre, 2018; Vallieres et al., 2018), while in non-clinical traumatized samples most studies have identified the correlated six factor model (e.g., Cloitre et al., 2018; Ho et al., 2019; Mordeno, Nalipay, & Mordeno, 2019; Murphy, Elklit, Dokkedahl, & Shevlin, 2018).

The discriminant validity of PTSD and CPTSD had also been examined extensively with wide range of different populations. There were studies using the former versions of the ITQ, and studies using other instruments that measure the symptom concepts of CPTSD. Studies with treatment clinical samples using a former version of the ITQ have consistently identified two distinctive classes of respondents with symptom profiles reflective of CPTSD and PTSD (Barbieri et al., 2019; Karatzias et al., 2017; Hyland, Ceannt et al., 2018; Karatzias et al., 2017; Ben-Ezra et al., 2018). A recent study using the final version ITQ with a non-clinical traumatized population from South Africa identified a DSO class in addition to CPTSD and PTSD (Rink & Lipinska, 2020).

Studies using instruments other than ITQ with traumatized community populations also identified other symptoms classes in addition to CPTSD and PTSD. With community resettled refugees in Australia, four classes - a high affect dysregulation group (high AD with low PTSD and moderate levels of other DSO symptoms) in addition to CPTSD, PTSD and low symptom groups - were identified (Liddell et al., 2019). Similarly, a factor mixture model study showed that refugees in the US population were grouped into five classes including a subthreshold PTSD class and a PTSD with low mood class along with CPTSD, PTSD and a low symptom class (Frost et al., 2019).

Variant patterns were also found in studies with population other than refugees. Among Danish and Israeli people with varying levels of prolonged interpersonal trauma, a latent class analysis (LCA) revealed an anxiety subtype and a dissociative PTSD subtype in addition to CPTSD, PTSD and low symptom group (Palic et al., 2016). From community adolescent and young adults of Germany, a DSO dominant class, along with a CPTSD, a PSTD, and a non-pathological class was identified (Perkonigg et al., 2016). Similarly, previous study conducting a latent profile analysis (LPA) with adult survivors of childhood institutional abuse, using measurements representing CPTSD symptoms, identified a DSO only group, characterized by a higher DSO and similar probability of sense of threat symptoms compared to the PTSD group, suggesting that this group may be associated with personality disorders, anxiety or fear-based disorders (Knefel, Garvert, Cloitre, & Lueger-Schuster, 2015).

While the discriminant validity of CPTSD and PTSD has been clearly identified, data from traumatized community samples seem to identify some unique variations in symptom presentations other than CPTSD and PTSD, such as, a DSO cluster dominant group, regardless of whether instruments were used. This is tentative since the final validated ITQ was not used in most of the studies, therefore, an examination of these patterns with the finalized version of the ITQ and comparing their features with ICD-11 CPTSD may provide useful evidence for understanding the pervasive impact of trauma and help ensure appropriate access to, and delivery of, mental health services.

Meanwhile, the impact of adverse childhood experiences (ACE) on poor mental health, including depression, PTSD, borderline personality disorder (BPD), dissociation, substance use, and suicidal attempts has been repeatedly demonstrated (Fung, Ross, Yu, & Lau, 2019; Herzog & Schmahl, 2018; Merrick et al., 2017; Schalinski et al., 2016). ACEs include physical, emotional, and sexual abuse, physical and emotional neglect, domestic violence, incapability of the caregiver or separation from the caregiver, having a maladaptive household member, peer-bullying, and exposure to community violence (World Health Organization, 2018b). Elevations of ACE were found in East Asian population (Ho, Bressington et al., 2020), and accumulation of ACE were shown to impact adulthood mental health in South Korean college student population (Kim, 2017). It also has been focused as a risk factor for PTSD and CPTSD measured with ITQ in an American community sample (Cloitre et al., 2019), and young adults in East Asia (Ho et al., 2019; Ho, Hyland et al., 2020). Also, Frewen, Zhu, and Lanius (2019) revealed the significant impact of ACE among a Canadian sample recruited online. ACE was correlated with ICD-11 PTSD, while lifetime trauma showed a relatively stronger correlation than ACE. However, for ICD-11 CPTSD, ACE had higher correlations than lifetime trauma and predicted CPTSD whereas lifetime trauma did not (Frewen et al., 2019).

While it is known that rather than a single type of ACE, multiple ACEs are associated with negative health outcomes (Hughes et al., 2017), recent studies had focused on the co-occurrence patterns of ACEs. For instance, an East Asian study identified a household violence pattern and a household dysfunction pattern of ACEs, which were both risk factors of PTSD and CPTSD (Ho, Bressington et al., 2020). Therefore, when seeking different patterns of CPTSD constructs, ACE patterns should be a risk factor of concern.

To date, there is no study examining the validity of ICD-11 PTSD and CPTSD in an East Asian nationally representative population. This study aimed to test the factorial and discriminant validity of ICD-11 CPTSD within a Korean representative community sample exposed to ACEs, and to examine the risk factors and clinical symptoms associated with CPTSD symptom classes. We hypothesized that the six-factor correlated factor model and the two-factor higher-order model would provide acceptable model fit for the latent structure of the ICD-11 CPTD symptoms measured by the ITQ, as previous studies had shown that these two models yielded good fit (e.g., Ben-Ezra et al., 2018; Choi, Kim, & Lee, 2020; Cloitre et al., 2018; Ho et al., 2019; Karatzias et al., 2016; Owczarek et al., 2020), with

six-factor correlated model generally showing better fit in community populations. We also hypothesized that LCA would reveal distinctive classes of CPTSD, PTSD, low-symptom, and an additional class, such as the low PTSD-high DSO class (e.g., Ben-Ezra et al., 2018; Knefel et al., 2015), or the affect dysregulation class (e.g., Liddell et al., 2019; Perkonigg et al., 2016), identified in community sample studies. Symptom correlates among classes were explored upon the evidence from previous studies related to CPTSD (e.g., Hyland et al., 2017; Knefel et al., 2015) or ACE (Fung et al., 2019; Schalinski et al., 2016), and those symptoms which were previously captured under the disorders of extreme stress not otherwise specified (DESNOS) category (Pelcovitz et al., 1997), such as depression, panic, somatization, dissociation, and self-harm symptoms. We hypothesized that CPTSD would have the highest levels of all symptoms showing greatest functional impairment, and PTSD would show higher levels than the DSO or affect dysregulation group, except for dissociative symptoms. Risk factor analyses for distinct classes included different patterns of ACE, cumulative lifetime trauma, and demographic variables such as gender, age, education, marital, employment, and economic status. We hypothesized that abuse experience in ACE (e.g., Ho et al., 2019; Ho, Hyland et al., 2020), total lifetime trauma (e.g., Cloitre et al., 2019), younger age (e.g., Ben-Ezra et al., 2018; Karatzias, Hyland et al., 2019), female gender (e.g., Cloitre et al., 2019; Liddell et al., 2019), non-marital relationship (e.g., Ben-Ezra et al., 2018), and non-employment and low economic status (e.g., Hyland et al., 2017) would increase the risk of higher impairment.

1. Method

1.1. Participants and procedures

This study was approved by the Institutional Review Board of the first author's affiliation. A stratified random sampling technique was adapted based on the proportional distribution of the general population of Korea, according to the population distribution of gender, age, and residential location from the Statistics Bureau of Republic of Korea. Participants were invited through an advertisement on the online panel site and agreed to an electronic informed consent before starting the online survey. Participants eligible for the study had to have an age above 19, use Korean as their first language, and have been exposed to at least one ACE. From 4,250 potential participants, a total of 800 participants were selected for having ACE and were eligible for the study. Credit points usable in the online site were given for participation.

1.2. Measures

ICD-11 CPTSD and PTSD was assessed with the ITQ, a validated measurement for ICD-11 PTSD and CPTSD (Cloitre et al., 2018). It consists of a total of 18 items; six items for PTSD symptoms, three items assessing PTSD symptom related functional impairment, six items for DSO, and three items for assessing functional impairment of DSO. Responses are made on five-point Likert scale from not at all (0) to extremely (4). The probable diagnosis of PTSD was made when at least one from each RE, AV and TH symptom, and at least one from three functional impairment items were rated ≥ 2. Probable diagnosis of CPTSD was given when at least one from each AD, NSC and DR symptom, and at least one from according functional impairment items were rated ≥ 2, in addition to PTSD endorsement (World Health Organization, 2018a). The Korean version, translated by the first author, was backward translated into English from a professional translator, which was reviewed by the experts from the WHO ICD-11 PTSD/CPTSD working group. The final version was revised according to the review. Cronbach's alphas were reliable in our study (.92 for PTSD and .91 for DSO).

Exposure to eleven ACEs were assessed responding to a yes (1) or no (0) response to experiences of physical, emotional, and sexual abuse, emotional and material neglects, separation of parents, witnessing domestic violence, having maladaptive household members, and peer exclusion or bullying, before age of 18 (Felitti et al., 1998). The Korean version was used (Kim, 2017). Summed score of ACE in this study ranged from one to 11, with a mean score of 3.60 (SD = 2.36).

Additionally, lifetime direct exposure to sixteen potential traumas according to the DSM-5 were collected through a yes (1) or no (0) response using the Life Events Checklist-5 (LEC-5, Weathers et al., 2013). The Korean version (Bae, Kim, Koh, Kim, & Park, 2008) was used in this study, including exposures to natural and man-made disasters, life threatening accidents or illness, physical and sexual violence, war zone experience, sudden or violent bereavement, intensive human suffering, and causing violence to others. Our study showed summed score of LEC-5 ranging from one to 16 with a mean score of 1.87 (SD = 1.74).

The Korean version Patient Health Questionnaire (PHQ; Han et al., 2009; Park, Choi, Choi, Kim, & Hong, 2010) was used to assess depression (PHQ-9), somatization (PHQ-15), and panic disorder (PHQ-PD). PHQ-9 assess frequencies of nine depressive episode symptoms on a four point Likert scale from not at all (0) to nearly every day (3), PHQ-15 assess severity of fifteen somatic symptoms on a three point Likert scale from not bothered at all (0) to bothered a lot (2), and PHQ-PD ask occurrence of panic episodes according to the DSM-5 algorithm assessing a probable presence of a panic disorder. Cronbach's alpha for PHQ-9 was .91, for PHQ-15 it was .88. Probable diagnosis of a panic disorder in our study was 5.8 % (n = 46).

To assess dissociation, the Dissociative Symptoms Scale (DSS; Carlson et al., 2018) was used to assess moderately severe dissociation, and the Traumatized Identity Questionnaire (TIQ; Choi & Lee, 2016) was used to measure dissociation in trauma memory and dissociative self-harm behaviors. The DSS include subfactors such as depersonalization-derealization, cognitive-behavioral reexperience, sensory misperception, and gaps in awareness and memory, and Cronbach's alpha for each factor in this study were .92, .89, .92, and .91, respectively. Frequency of each 20 item was rated on a five-point Likert scale from not at all (0) to more than once a day (4). Validation study of the Korean version DSS is in preparation. With the TIQ, to assess dissociation of trauma memory we used the six-item identity disintegration subscale, and to measure dissociative self-harm behaviors we used five-item identity dysfunction subscale (Choi & Lee, 2016). Responses were made on a seven-point Likert scale from not at all (1) to extremely (7). Cronbach's alpha

for dissociation in trauma memory and dissociative self-harm behavior in this study were both .93.

1.3. Analysis

First, CFA was conducted with a robust maximum likelihood estimation using R latent variable analysis (Gana & Broc, 2019). Three hypothetical models included the followings; Model 1 is a unidimensional one factor (CPTSD) model, which is the baseline model, Model 2 is a correlated six-factor (RE, AV, TH, AD, NSC, and DR) model, and Model 3 is a first-order six-factor loaded on a higher-order correlated PTSD and DSO factor model, as models 2 and 3 were the best fitting models in numerous previous studies. Fit indices included chi-squared test, the Tucker-Lewis index (TLI; Tucker & Lewis, 1973), the comparative fit index (CFI; Bentler, 1990), the bayesian information criterion (BIC; Schwarz, 1978), and the root mean square error of approximation (RMSEA; Steiger, 1990). An excellent fit for the TLI and CFI require values larger than .95, for RMSEA, under .05 indicate close fit, .05–.08 indicate acceptable fit, and for BIC, lower value indicates better fit.

Second, a latent class analysis (LCA) was performed to determine the number of latent classes in the sample, based on the probability of meeting the diagnostic criterion ($\geq$2) for twelve items in PTSD and DSO. The analysis was done using Mplus 8.5 (Muthén & Muthén, 2020) with MLR and STARTS = 500 50 options. That is, a robust maximum likelihood estimator (Yuan & Bentler, 2000) was used for the estimation method, and 500 initial and 50 fin. l random starting values were used to avoid the local maxima problem. Six models having different numbers of latent classes (2–7 classes) were compared based on the Akaike Information Criterion (AIC; Akaike, 1987), the Bayesian Information Criterion (BIC; Schwarz, 1978), and the sample size adjusted BIC (SSABIC; Sclove, 1987). All the indices indicate that the lower values are the better models. Also, the Lo-Mendell-Rubin adjusted likelihood ratio test (LMR-LRT; Lo, Mendell, & Rubin, 2001) and the bootstrap likelihood ratio test (BLRT; McLachlan & Peel, 2000) with 1000 bootstrap samples were used to compare models with an increasing number of latent classes. The final model was selected considering the above selection indices, test results, and the interpretability of the latent classes.

Third, the prevalence of each ACE was investigated among each symptom class. The participants were assigned to one symptom class by the final model selected in the LCA. For each class, the proportion of experience for each ACE item was calculated.

Fourth, associated clinical symptoms among symptom classes were compared using analysis of variance (ANOVA), with post-hoc analysis of Scheffé. Lastly, multinomial logistic regression (MLR) was conducted to identify risk factors predicting each class compared to the reference class.

2. Results

2.1. Descriptive statistics and probable prevalence of ICD-11 CPTSD and PTSD

The mean age of the participants was 40.74 years (SD = 10.92, range 20–59), and 51.25 % reported themselves as men and 48.75 % as women. The majority had an education level of college or university (77.2 %). Marital status showed that 59.3 % were married or cohabiting, 36.8 % were non-married, 1.4 % were bereaved, and 2.6 % were divorced. Among them, 16.6 % were living alone. Occupation status showed that 57.8 % were permanently employed, 10.7 % were temporally employed, 9.5 % were employers, 10.7 % were unpaid family workers or houseworkers, and 11.4 % had no current job. A low economic status group was categorized, including people whose income range goes below 60 % of the median income of the annual South Korean monthly household income defined by the Ministry of Health and Welfare. Sixty-four people (8%) were included in the low economic status group.

Responses to each ACE and lifetime trauma (LEC-5) item are presented in Supplementary Table 1. All participants reported at least one ACE and one lifetime trauma event. Summed ACEs ranged from one to 11; exposure rate to one ACE was 23.3 %, two ACEs was 18.6 %, three ACEs was 13.5 %, four ACEs was 12.1 %, and five or more ACEs was 32.5 %. Rate of exposure to each ACE ranged from 17 % (household member incarcerated) to 52.4 % (emotional abuse). Exposure rate to each lifetime trauma ranged from 2.9 % (caused others damage) to 26.8 % (physical violence, non-weapon). According to the diagnostic algorithm of ITQ, the rate of probable ICD-11 PTSD was 6.8 % (n = 54) and probable ICD-11 CPTSD rate was 26.4 % (n = 211).

2.2. Confirmatory factor analysis (CFA)

Statistics for the three models are presented in Table 1. While Model 1 did not show acceptable fit indices, Model 2 and 3 showed excellent fit for the CFI and TLI value. For the RMSEA value, Model 2 showed a close fit and Model 3 showed an acceptable fit. For the BIC value, Model 2 had the lowest level followed by Model 3. Based on RMSEA and BIC values, we decided that Model 2 best describe

Table 1
Fit Indices for Confirmatory Factor Analysis of the Three Models.

Model	Chi square	df	CFI	TLI	BIC	RMSEA	RMSEA 90 % CI
1	1112.33	54	0.85	0.81	26086.96	0.16	0.15−0.17
2	97.03	39	0.99	0.99	25171.93	0.04	0.03−0.05
3	201.98	47	0.98	0.97	25223.40	0.06	0.06−0.07

Note. CI, confidence intervals.

our data, followed by Model 3. Factor loadings and correlations in each Model 2 and 3 are presented in Fig. 1. For Model 2, factor loadings ranged from .78 (AD1) to .89 (NSC2) and correlations between factors ranged from .61 (RE and NSC) to .91 (RE and TH). For Model 3, first-order factor loadings ranged from .79 (AD1) to .88 (NSC2), higher-order factor loadings ranged from .88 (AD) to .96 (TH) and correlations between PTSD and DSO factor was .82.

2.3. Latent class analysis (LCA)

Each of the LCA models of 2–7 classes yielded a solution in which the best log-likelihood converged across random seeds. Fit indices of these analyses are presented in Table 2. The entropy was 0.872 or higher in all models, indicating that the latent classes successfully separated the participants (Lubke & Muthén, 2007). The model selection indices and tests have yielded different results. The BIC supported a five-class model, the SSABIC and LMR-LRT supported a six-class model, and the AIC and BLRT supported a seven-class model. Nylund, Asparouhov, and Muthén (2007) suggested using BLRT for reliable results when the dependent variable is categorical. However, the log-likelihood was not converged in 51.6 % of 1000 bootstrap draws for the 7-class model, and as a result, the *p*-value from the BLRT was not trustworthy. In addition, the smallest class in the 7-class model represented only 4.3 % of the sample, as well as this class did not add practical interpretability. Therefore, we selected the 6-class model.

Symptom probabilities according to each class are presented in Fig. 2 and Supplementary Table 2. Class 1 (n = 156, 19.5 %), characterized by high probabilities for all twelve CPTSD symptoms, was labeled as the "CPTSD" class. Class 2 (n = 59, 7.4 %), characterized by low probabilities of RE, moderate to high probabilities of AV, TH, and DSO symptoms was labeled as the "DSO with sense of threat (DSO-TH)" class. Class 3 (n = 78, 9.8 %) had low probabilities in RE, NSC and DSO, moderate probabilities in AV, TH, and AD, which was labeled as the "emotion dysregulation (ED)" class. Class 4 (n = 165, 20.6 %), with high probabilities for RE and moderate to high probabilities for rest of the factors was labeled as the "PTSD" class. Class 5 (n = 71, 8.9 %) had low probabilities for PTSD symptoms, however, the DSO symptoms had moderate to high probabilities, therefore was labeled as the "DSO" class. Lastly, Class 6 (n = 271, 33.9 %) which had low probabilities across all symptoms was labeled as the "low symptom" class.

2.4. Prevalence of adverse childhood experiences among six classes

Prevalence for each ACE across classes are presented in Fig. 3. While prevalence was mostly under .70, prevalence of an experience below .30 was considered low (Masyn, 2013).

The CPTSD, DSO-TH, and PTSD classes showed relatively higher prevalence across ACEs than the DSO, ED, and low symptom class. The CPTSD class was characterized by higher emotional, physical, and sexual abuse, and higher prevalence to have a maladaptive household member (ACE 8, 9, 10). The PTSD class showed similar patterns to CPTSD, however, had a lower prevalence for emotional abuse.

The DSO-TH class was distinctive to show highest prevalence related to emotional abuse and neglect, witnessing domestic violence and peer bullying, however showed lower prevalence related to sexual abuse and having a maladaptive household member. The DSO class had similar patterns, however with lower prevalence than the DSO-TH class, except that prevalence for peer bullied experience was similar to the severe symptom classes.

The ED and low symptom classes had moderate prevalence of emotional and physical abuse; however, prevalence of other experiences were low.

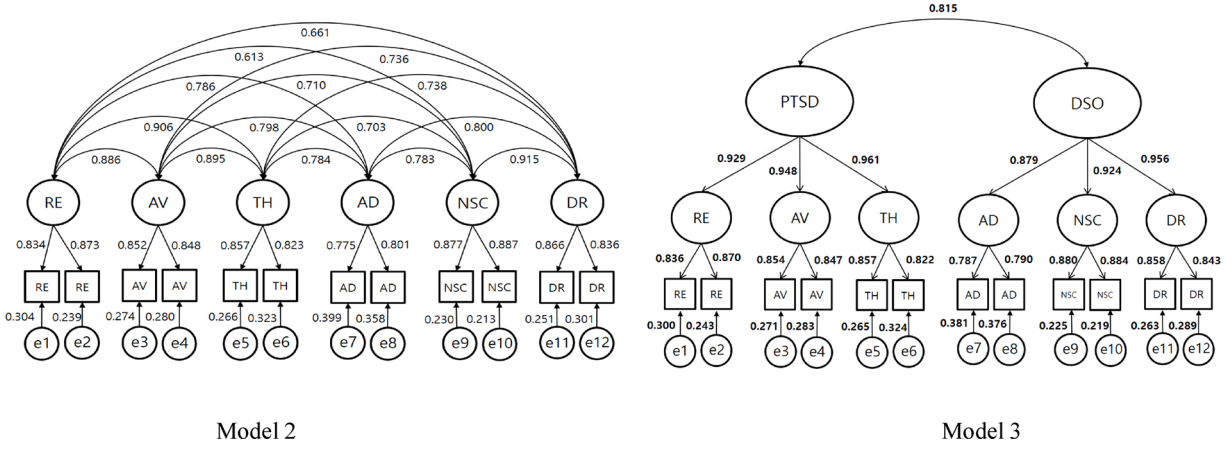

Fig. 1. Factor loadings and correlations of complex posttraumatic stress disorder (CPTSD) constructs in Model 2 and 3. RE, reexperience; AV, avoidance; TH, current sense of threat; AD, affect dysregulation; NSC, negative self-concept; DR, disturbed relationships.

Table 2
Fit Indices for One to Seven Latent Class Analyses.

Number of classes	Number of parameters	*AIC*	*BIC*	*SSABIC*	*LMR LRT*	p^1	*BLRT*	p^2	*Entropy*
2	25	9431.88	9538.99	9469.60	–	–	–	–	.934
3	38	8716.31	8894.32	8773.65	733.13	.00	741.57	.00	.915
4	51	8435.58	8674.49	8512.54	303.24	.00	306.73	.00	.915
5	64	8362.29	8662.11	8458.87	98.16	.01	99.29	.00	.876
6	77	8315.26	8675.98	8431.46	72.20	.03	73.03	.00	.872
7	90	8298.91	8720.53	8434.73	41.87	.13	42.35	.01	.878

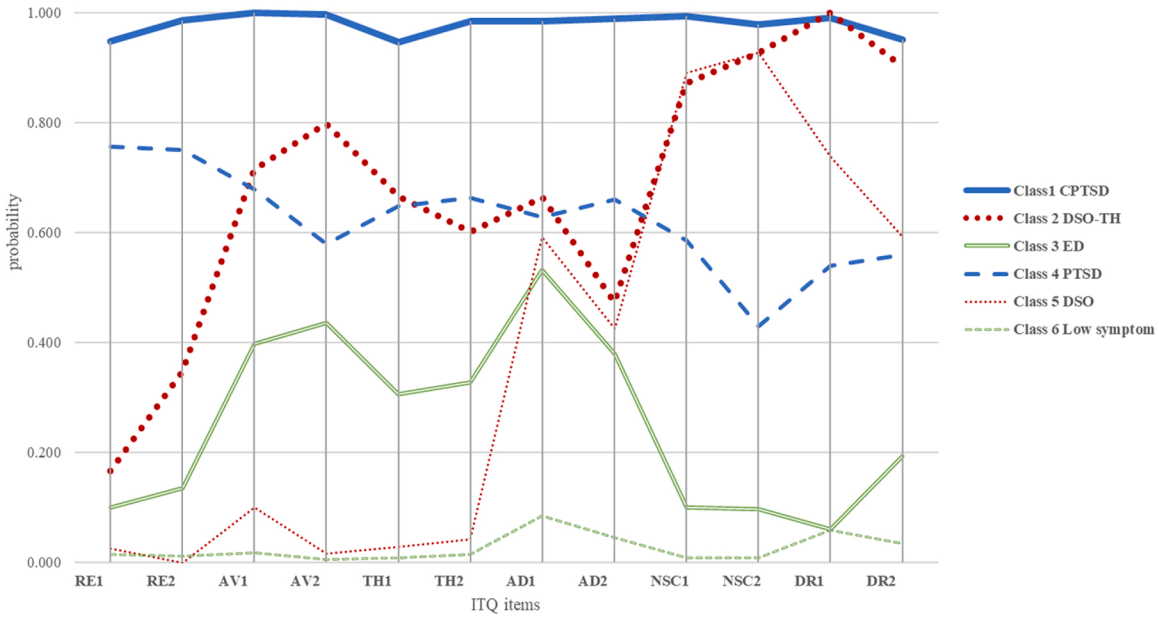

Fig. 2. Probability for each symptom in a six latent class analysis. CPTSD, complex posttraumatic stress disorder; DSO, disturbances in self-organization; ED, emotion dysregulation; PTSD, posttraumatic stress disorder; RE, reexperience; AV, avoidance; TH, sense of current threat; AD, affect dysregulation; NSC, negative self-concept; DR, disturbed relationships.

2.5. Differences in total ACE, lifetime trauma and clinical symptoms according to symptom classes

Table 3 presents the results of the ANOVA tests. Total number of ACEs and lifetime traumas, and clinical symptoms such as depression, somatization, dissociation, self-harm, and rate of panic disorder were compared between classes. All variables showed significant differences among classes. The CPTSD, DSO-TH and PTSD classes showed the highest numbers of ACE. For number of lifetime trauma, the CPTSD class experienced the most, more than the PTSD class, however, had no difference compared to the DSO-TH class.

For depression, CPTSD and DSO-TH classes had the highest symptom levels. For somatization, CPTSD, DSO-TH and PTSD classes had the highest symptom levels. For probable panic disorder, the CPTSD class showed the highest rate than the rest of the classes. In pairwise two-proportion *Z* tests, the CPTSD group showed a significant difference in the rate of panic disorder diagnosis with ED, PTSD, DSO, and low symptom groups, respectively ($Zs > 3.094$, $ps < .05$, Bonferroni corrected).

The CPTSD class, followed by PTSD class, had the highest frequencies of depersonalization-derealization and cognitive-behavioral reexperience. DSO-TH showed relatively lower levels on these symptoms, however, sensory misperception and gaps in awareness and memory were comparable among the CPTSD, PTSD and DSO-TH classes. Additionally, for trauma memory disintegration, the CPTSD and the DSO-TH showed the highest levels, followed by both PTSD and DSO class. For dissociative self-harm, the CPTSD class had the highest level, followed by both DSO-TH and PTSD class.

The low symptom class had the lowest levels across most of the clinical symptoms, except for detachment symptom that showed similar level with the ED and DSO classes. The ED class showed mostly similar levels to the DSO class, however, for compartmentalization the DSO class had a higher level of symptom.

2.6. Multinomial logistic regression (MLR) predicting symptom class

MLR results are presented in Supplementary Table 3. Relative to the low symptom group, risk factors for CPTSD included ACE [odds

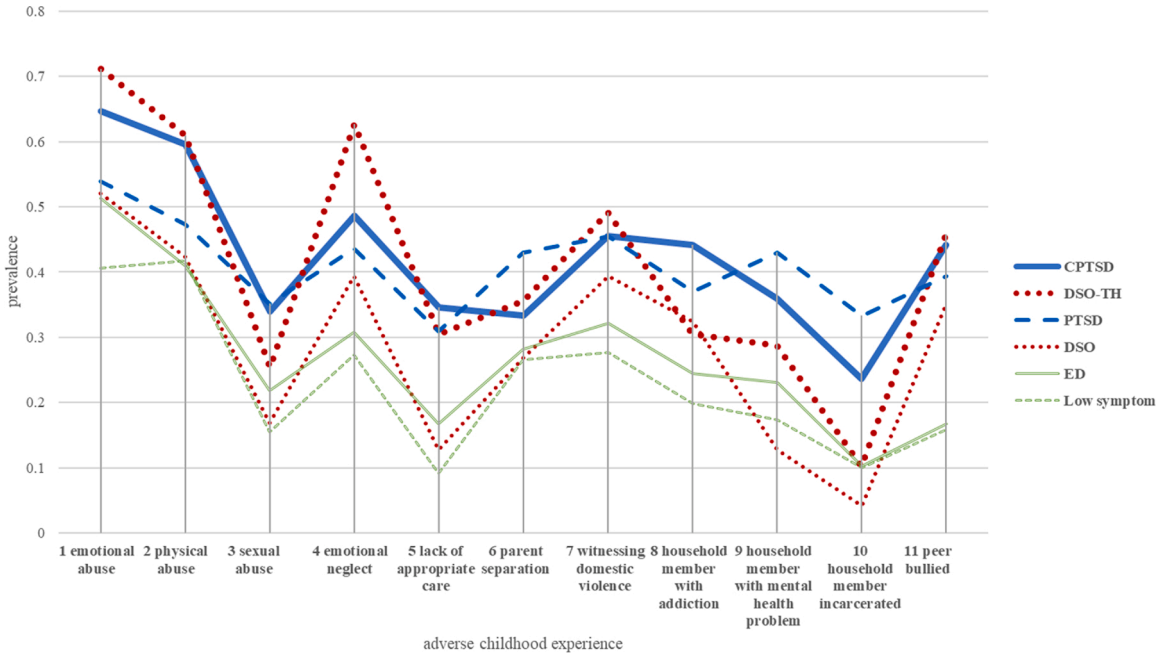

Fig. 3. Prevalence of each adverse childhood experiences among six classes. CPTSD, complex posttraumatic stress disorder; DSO, disturbances in self-organization; TH, sense of current threat; ED, emotion dysregulation; PTSD, posttraumatic stress disorder.

ratio (*OR*) = 1.55, 95 % *CI* = 1.39–1.72], lifetime trauma (*OR* = 1.20, 95 % *CI* = 1.05–1.36), and younger age (*OR* = .97, 95 % *CI* = .95–.99). Risk factors for DSO-TH included ACE (*OR* = 1.54, 95 % *CI* = 1.35–1.77) and unemployment (*OR* = 6.17, 95 % *CI* = 2.57–14.85). Risk factors for PTSD included ACE (*OR* = 1.58, 95 % *CI* = 1.42–1.76) and younger age (*OR* = .97, 95 % *CI* = .95–.99). Risk factors for ED included being female (*OR* = 2.16, 95 % *CI* = 1.28–3.65). Finally, risk factor for DSO included non-marriage status (*OR* = 1.99, 95 % *CI* = 1.09–3.66).

Seeking ACE and lifetime trauma as risk factors, relative to the DSO, more ACEs increased the risk for CPTSD (*OR* = 1.37, 95 % *CI* = 1.19–1.58), DSO-TH (*OR* = 1.36, 95 % *CI* = 1.15–1.61), and PTSD (*OR* = 1.40, 95 % *CI* = 1.21–1.61). Relative to the ED, ACE (*OR* = 1.35, 95 % *CI* = 1.18–1.55) and lifetime trauma (*OR* = 1.31, 95 % *CI* = 1.05–1.64) increased CPTSD, and ACE increased PTSD (*OR* = 1.38, 95 % *CI* = 1.20–1.58). Relative to PTSD, lifetime trauma increased the risk for CPTSD (*OR* = 1.37, 95 % *CI* = 1.17–1.61).

While having similar levels of ACE and lifetime trauma, gender was found to be a predictive factor for ED. Women had increased risk for ED, compared to DSO (*OR* = 2.05, 95 % *CI* = 1.05–4.00) and low symptom, as presented above. Unemployment was found to be a consistent predictive factor for DSO-TH, while having similar level of ACE and lifetime trauma, being unemployed increased the risk of DSO-TH relative to PTSD (*OR* = 3.03, 95 % *CI* = 1.34–6.85) and CPTSD (*OR* = 4.16, 95 % *CI* = 1.70–10.20).

While controlling for ACE and LEC, DSO had demographic risk factors compared to more severe symptom classes. DSO had low economic status as a risk factor compared to the PTSD (*OR* = 2.86, 95 % *CI* = 1.09–7.53), DSO-TH (*OR* = 3.28, 95 % *CI* = 1.03–10.51) and CPTSD (*OR* = 3.48, 95 % *CI* = 1.22–9.89). Also, marital status (without partner) was a risk factor of DSO, compared to the DSO-TH (*OR* = 2.29, 95 % *CI* = 1.02–5.19) and CPTSD (*OR* = 2.40, 95 % *CI* = 1.24–4.66).

3. Discussion

To understand variant symptom patterns among adult survivors of ACE, we first examined the construct and discriminant validity of the ICD-11 CPTSD and identified variant symptom classes consisting of CPTSD constructs. Among our sample the probable prevalence of ICD-11 PTSD was 6.8 % and ICD-11 CPTSD was 26.4 %. The PTSD prevalence was slightly higher than has been observed in other general community sample studies using the ITQ (e.g., Ben-Ezra et al., 2018; Cloitre et al., 2019; Ho et al., 2019; Hyland, Karatzias et al., 2020; Karatzias, Murphy et al., 2019), probably due to the fact that ACE exposure was an inclusion criterion in this study. The CPTSD prevalence was also higher than these community sample studies, showing a similar rate to some refugee and organized violence studies (e.g., Barbieri et al., 2019; Kazlauskas et al., 2018; Murphy et al., 2018). High rate of CPTSD can be explained by the high exposure rate of ACE, as 32.5 % of people had more than five ACEs, this may be supported by the report that found a dose-response relationship of childhood trauma and CPTSD (Cloitre et al., 2019).

The factorial and discriminant validity of ICD-11 CPTSD for Korean ACE survivors were confirmed. Factor analysis showed that a six-factor correlated model best described our data, also followed by the ICD-11 CPTSD higher-order model. LCA identified distinctive CPTSD and PTSD classes using the ITQ. We concluded that ICD-11 CPTSD possesses good validity, distinctive of other symptom profiles with distinguished levels of symptomatology and function. The CPTSD class was related to higher exposure to all ACEs and cumulative

Table 3
Differences in Adverse Childhood Experiences (ACE), Lifetime Trauma and Clinical Symptoms among Six Classes.

	CPTSD [1]		DSO-TH [2]		ED [3]		PTSD [4]		DSO [5]		Low symptom [6]			
	M	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*F* (5, 794)	*Scheffé*
Total ACE	4.69	(2.72)	4.51	(2.28)	2.96	(2.05)	4.52	(2.22)	3.14	(2.21)	2.52	(1.73)		
Total lifetime trauma	2.58	(2.53)	2.03	(1.56)	1.54	(1.02)	1.64	(1.55)	1.94	(1.62)	1.63	(1.38)	7.89***	1 > 3,4,6
Depression	14.01	(6.12)	13.20	(5.74)	6.00	(4.27)	11.95	(4.59)	7.56	(5.28)	3.21	(3.34)	146.02***	1 = 2 > 3 = 5 > 6, 1 > 4 > 3 = 5 > 6
Somatization	12.94	(6.50)	10.81	(5.30)	6.54	(3.92)	12.21	(5.31)	6.32	(4.79)	4.33	(3.72)	90.43***	1 = 2 = 4 > 3 > 6, 3 = 5
Depersonalization-derealization	8.30	(6.25)	5.68	(5.72)	2.33	(3.50)	7.82	(5.35)	1.58	(2.53)	.82	(1.87)	92.84***	1 > 2 > 3 = 5 = 6, 1 = 4 > 3 = 5 = 6
Cognitive-behavioral reexperience	5.93	(4.35)	4.29	(4.13)	1.69	(2.44)	5.39	(3.79)	1.23	(1.87)	.52	(1.14)	95.37***	1 > 2 > 3 = 5 = 6, 1 = 4 > 3 = 5 = 6
Sensory misperception	6.39	(5.67)	4.53	(5.18)	1.49	(2.49)	6.42	(4.89)	1.07	(2.31)	.48	(1.49)	79.47***	1 = 2 = 4 > 3 = 5 = 6
Gaps in awareness/memory	7.17	(5.43)	5.42	(5.05)	2.40	(3.10)	6.68	(4.67)	1.90	(2.53)	.94	(1.70)	80.90***	1 = 2 = 4 > 3 = 5 = 6
Dissociation in trauma memory	28.27	(6.14)	26.53	(7.06)	15.46	(6.50)	22.30	(6.21)	19.72	(8.16)	9.94	(5.38)	215.30***	1 = 2 > 4 = 5 > 3 > 6
Dissociative Self-harm behavior	22.59	(5.45)	18.83	(6.73)	10.49	(5.53)	17.84	(5.81)	12.89	(6.13)	6.78	(3.34)	233.17***	1 > 2 = 4 > 3 > 6, 1 > 2 = 4 > 5 > 6
	n	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	*n*	(%)	χ^2(5)	
Probable diagnosis of panic disorder	20	(12.80)	5	(8.50)	2	(2.60)	15	(9.10)	2	(2.80)	2	(.70)	33.75***	

Note. *** $p < .001$; CPTSD, complex posttraumatic stress disorder; DSO, disturbance in self-organization; TH, sense of current threat; ED, emotion dysregulation; PTSD, posttraumatic stress disorder.

lifetime trauma, showing the highest levels of clinical symptoms, such as depression, somatization, panic, dissociation, and self-harm, supporting previous studies that had reported CPTSD as the most debilitating disorder (Cloitre et al., 2019; Hyland, Shevlin, Fyvie, & Karatzias, 2018; Karatzias, Hyland et al., 2019).

The PTSD class had ACE patterns similar to the CPTSD class, however, showed less probability of childhood emotional abuse, and had relatively lower exposure to lifetime trauma. Depersonalization-derealization and cognitive-behavioral reexperience, which can be categorized into detachment dissociation (Holmes et al., 2005), and somatization scores were similar to CPTSD, however, had lower depression, panic, dissociation in trauma memory, and dissociative self-harm behaviors. Previous study also reported that ICD-11 CPTSD showed higher levels of dissociation than PTSD (Elklit, Hyland, & Shevlin, 2014; Hyland, Shevlin, Fyvie, Cloitre, & Karatzias, 2020).

We examined dissociation more specifically, the PTSD class showed comparable detachment levels but lower trauma memory dissociation as the CPTSD class. Our PTSD class may represent the dissociative subtype PTSD (APA, 2013), which was also found in a previous LCA study on interpersonal trauma (Palic et al., 2016). Also, a previous Korean sample study found that interpersonal trauma was more associated with dissociative PTSD rather than non-dissociative PTSD (Kim et al., 2019), which supports that our sample is more likely to have a dissociative PTSD.

Consistent with the fact that the six-factor correlation model had best fit, LCA additionally identified classes that showed distinguished characteristics from CPTSD or PTSD, namely as the DSO-TH, DSO, and ED class, which described 26.1 % people from the sample. Therefore, we suggest that ACE may result in unrecognized, nevertheless clinically important features other than CPTSD and PTSD.

The DSO-TH, a high DSO combined with avoidance and sense of threat symptoms, had been previously identified with childhood institutional abuse survivors (Knefel et al., 2015). This class had similar exposures to ACE and lifetime trauma as the CPTSD class, and additionally, a distinctive high level of emotional abuse and neglect. Levels of depression, somatization, and dissociation in trauma memory were similar to the CPTSD class, while panic, detachment dissociation, and dissociative self-harm were lower than CPTSD.

Because they have symptom constructs comparable to CPTSD, only with lower RE and lower cognitive-behavioral reexperience; however, with similar sensory misperception, gaps in awareness and memory, and trauma memory dissociation, we may assume that this group represents people who have inhibited trauma memories, largely associated with attachment trauma, who cannot recall contextualized explicit memories of trauma but suffers with implicit memories of emotional abuse (e.g., Brewin, 2011; Chu, Frey, Ganzel, & Matthews, 1999; Ehlers & Clark, 2000). It was known that childhood emotional abuse greatly explained dissociation among other types of childhood abuse (Haferkamp, Bebermeier, Mollering, & Neuner, 2015), and because DSO-TH was characterized by the high rate of emotional abuse and neglect, dissociation might have affected symptom presentations.

Future studies seeking longitudinal trajectory through treatment course may reveal interesting characteristics of this group, this may be a transient group to develop CPTSD, for example the RE symptoms may fluctuate as treatment progresses and inhibited memories are recollected. Along with this DSO-TH group, and that the CPTSD group had high dissociation in trauma memory and dissociative self-harm behaviors, this adds to the idea that the CPTSD treatment should be delivered in a sequenced way, focusing on self-regulation skills including targets for dissociation (e.g., Brand & Stadnik, 2013) as the first-phase that prepares the second-phase trauma focused treatments (Cloitre, 2016; Karatzias, Murphy et al., 2019), which would be especially true to clients with ACEs.

The DSO and ED class, also detected in previous studies (e.g., Ben-Ezra et al., 2018; Liddell et al., 2019; Perkonigg et al., 2016), generally had similar exposure levels of ACE and lifetime trauma compared to the low symptom group, except that the DSO had high levels of peer-bullied experience. DSO resembled the ACE patterns of DSO-TH, however in a lower probability level. The DSO class seemed to be related to emotional adversities among ACEs. The DSO and ED group had similar levels of clinical symptoms, which were higher than the low symptom group, suggesting that DSO and ED group also require attention for mental health care.

Among demographic variables, younger age was a risk factor for CPTSD and PTSD, which is in line with previous reports (Ben-Ezra et al., 2018; Karatzias, Hyland et al., 2019). However, gender did not affect CPTSD or PTSD, also in line with some previous reports (e.g., Ho, Hyland et al., 2020; Palic et al., 2016), but not others (e.g., Cloitre et al., 2019; Liddell et al., 2019). Being women was only associated to be in the ED class. No gender difference maybe because ACE exposure has no gender disparity (e.g., Ho, Bressington et al., 2020).

Intriguingly, unemployment was strongly related to the DSO-TH class. Also, having low economic status and no intimate partner were associated with the DSO class. The DSO-TH and DSO classes which are low in RE, represents a failure in recollection of their ACE memory, may find it difficult to connect their symptoms to the past ACE. In this case the DSO-TH and DSO class people may underrecognize their symptoms and neglect their difficulties, resulting in prolonged problems such as unemployment, low economic status, and difficulty having an intimate relationship. A previous Grounded Theory analysis can give a clue to this result, where people who were unaware of and had suppressed their trauma impacting their symptoms ("emotional ignorance"), resulted in overcompensations and incapability in life (Stadtmann, Maercker, Binder, & Schnepp, 2018). Therefore, recognizing DSO-TH and DSO class people and being aware of the variant impact of ACE is an important clinical concern.

Limitations of this study include that we used retrospective yes-no self-reports of ACE and lifetime trauma. Reuben et al. (2016) had compared retrospective and prospective ACE assessments from the Dunedin cohort study. They showed that retrospective and prospective reports showed a moderate effect size association, discussing that both type of ACE data “shares common” and also each “unique information (p.1110).” They stressed that retrospective self-reports of ACE may overestimate subjective life outcomes (e.g., psychopathology), while underestimating objective health outcomes (e.g., biomarker indices). So according to Reuben and colleagues’ suggestions, further studies should include objectively measured life outcomes, in the case of mental health it may be achieved through using structured clinician ratings or including official records of life outcome data.

Also, while detecting a sensitive period of ACE maybe important in treatment (Herzog & Schmahl, 2018), because symptoms such

as dissociation and depression is determined by the type and timing of ACE (Schalinski et al., 2016), there are limitations in the measurement of ACE in this study that we did not gather age of occurrence.

Since community sample data were collected, future studies should seek confirmation through mental health service seeking population. This was also a retrospective cross-sectional study, which cannot confirm that the identified risk factors are actual causes to symptoms classes, a longitudinal data should be collected to support our risk factor analyses. Lastly, the DSS measuring subfactors of dissociation, was not validated into Korean, so a validation study of the Korean DSS should further be reported to support our findings.

Although, this study broadened our understanding concerning the psychological consequences of ACE. In addition to identifying and validating ICD-11 CPTSD and PTSD, we found variant symptom presentations, which further should be recognized in clinical settings, for instance assessing the connection of the past ACE and current symptoms. The role of dissociation in symptom presentations should be further examined, to seek clinical adjustments according to treatment phases. Moreover, raising awareness to the dissociation in some cultures, where harmfulness of ACE is still under acknowledged, would be critical in preventing these complicated psychological sufferings.

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Declaration of Competing Interest

The authors report no declarations of interest.

Appendix A. Supplementary data

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