Ansiedad y Estrés 31(2) (2025) 60-70

Ansiedad y Estrés

https://www.ansiedadyestres.es

Original

Psychological treatment in childhood trauma with support in virtual reality

Macarena Prieto Larrocha, Mavi Alcántara López, Maravillas castro sáez, Antonia Martínez Pérez, Visitación Fernández Fernández and Concepción López-Soler

Universidad de Murcia - Campus de Espinardo murcia, Murcia SPAIN.

ARTICLE INFO

Article history:
Received 15 July 2024
Accepted 9 May 2025

Keywords:
Child abuse
Post-traumatic reactions
Virtual reality
EMMA-Child

A B S T R A C T

This research aims to analyse the effectiveness of psychological treatment in children who have undergone multiple traumatic events. An adaptation of cognitive-behavioral therapy with narrative components, supported by the EMMA-CHILD virtual reality system, was applied to 77 boys and girls in care (6 to 16 years). The following pre and post-treatment tests were applied: Child Behavior Checklist (CBCL) to caregivers. The Spanish version of the State-Trait Anger Expression Inventory in Children and Adolescents (STAXI-NA), Children's Depression Inventory (CDI), Multifactor Self-Evaluative Child Adaptation Test (TAMAI), all applied to children. A standardized mean difference effect size was used based on the t score to verify the efficacy of each treatment group. The implementation of PEDIMET TF-CBT offered significant improvements in PTSD, depression symptoms. In addition, children showed reductions in trait anger and progress in anger control, producing statistically significant changes and moderate effect sizes in both STAXI-NA measures, and in general adaptation to various contexts, with clinically and statistically significant improvements found in global, personal, social and school adaptation with moderate to high effect sizes. Due to its playful content, application of VR in psychological treatment of children and adolescents increases involvement and pleasure in therapy. As regards the VR system used in the present study, "The World of EMMA", adds new and important possibilities to treatment.

Tratamiento psicológico en trauma infantil con apoyo de realidad virtual

Palabras clave:
Maltrato infantil
Reacciones postraumáticas
Realidad virtual
EMMA-Child

R E S U M E N

Esta investigación tiene como objetivo analizar la eficacia del tratamiento psicológico en menores con múltiples traumas. Se ha aplicado una adaptación de la terapia cognitivo-conductual, con componentes narrativos en el sistema de realidad virtual EMMA-infancia que fue aplicado a 77 niños y niñas en acogida (de 6 a 16 años). Se aplicaron las siguientes pruebas pre y post: Child Behavior Checklist (CBCL) a cuidadores. Inventario de Expresión de Ira Estado-Rasgo en Niños y Adolescentes (STAXI-NA), Inventario de Depresión Infantil (CDI), Test Autoevaluativo Multifactorial de Adaptación Infantil (TAMAI), todas aplicadas a los niños. Se utilizó el tamaño del efecto de diferencia de medias estandarizado (d) en función de la puntuación t para verificar la eficacia de cada grupo de tratamiento. La implementación de PEDIMET TF-CBT ofreció importantes mejoras en el trastorno de estrés postraumático y los síntomas depresivos. Además, mostraron reducciones en ira rasgo y mejoras en el control de la ira, obteniendo cambios estadísticamente significativos y tamaños del efecto moderados tanto en el STAXI-NA como en la adaptación general, con mejoras clínicas y estadísticamente significativas en adaptación global, personal, social y escolar con tamaños de efecto de moderados a altos. La aplicación de la realidad virtual en el tratamiento de niños y adolescentes aumenta la implicación y el placer de la terapia debido a su componente lúdico. En cuanto al sistema de realidad virtual utilizado en el presente estudio, "El mundo de EMMA", añade nuevas e importantes posibilidades al tratamiento.

* Corresponding author.
Email address: mavialcantara@um.es (M. Alcantara Lopez).

https://doi.org/10.5093/anyes2025a09
1134-7937/© 2025 Sociedad Española para el Estudio de la Ansiedad y el Estrés - SEAS. Colegio de la Psicología de Madrid. Todos los derechos reservados.

Introduction

The most pressing public health issue is child abuse, often referred to as the "hidden epidemic" (Lanius et al., 2010), due to its severe and enduring impact on both the physical and mental well-being of victims, as well as on society as a whole., One in two children, equating to one billion children or adolescents worldwide, experience some type of violence annually (World Health Organization, 2020).

Exposure to recurrent traumatic events during early childhood, including neglect, inadequate protection, physical, emotional, and sexual abuse, as well as witnessing gender- based violence, leads to various disturbances in psychological development, attachment relationships, cognition, emotional regulation, impulse control, and self- concept (Cervera et al., 2020; López-Soler, 2008; Van der Kolk et al., 2019). These issues are classified as complex trauma by the International Classification of Diseases, 11th edition (World Health Organization, 2018). Reactions to traumatic situations are varied and diverse (Cervera et al., 2020), and the psychological impact resulting from these situations is modulated according to a series of variables, such as the characteristics of the event suffered, individual characteristics of the victim, and the contextual characteristics surrounding the person who suffers the event, with social support being the most relevant protective element (Carlson and Balenberg, 2000). Because intrafamilial social support networks are likely to be more damaged in cases of intrafamilial sexual abuse than in cases of domestic violence, it is consistent with such high rates of PTSD (59%) and Complex Trauma (40%), according to ICD-11 criteria, in adolescents who have suffered sexual assault (Villalta et al., 2020). In addition, other international research observed that having suffered sexual abuse in childhood (OR = 2.33; 95% CI: 1.20-4.54), is a higher risk factor than physical neglect (OR = 1.81; 95% CI: 1.02-3.20) for developing externalizing symptoms, and juvenile delinquency (Porto-Faus et al., 2019).

Children and adolescents in both residential and family care endure additional challenges, including experiences of separation, the loss of relationships, and frequent transitions between care settings. These young individuals often exhibit symptoms of post- traumatic stress, associated with anxiety, depression, and behavioral and adjustment disorders (González-García et al., 2017; López-Soler, 2012; Martín et al., 2020). As a result, in 2016, the United Nations Member States unanimously adopted the new global agenda for 2030, which for the first time established a specific objective to eliminate all forms of violence against children (Council of Europe, 2017; World Health Organization, 2019). Abuse during childhood generates lasting dysfunctions in brain regulation mechanisms, such as the hypothalamic-pituitary-adrenal axis, generating significant physical consequences and alterations in the development of brain structures (Van Rooij et al., 2020). The fact that children are exposed to traumatizing situations is a condition that predisposes them to the development of additional psychopathologies, since the brain, being an organ with a capacity for plasticity, i.e., modifiable in the face of experiences, if these experiences are traumatic, early and affect children with a developing brain, they will cause it to develop on a basis of trauma and not on a basis of attunement or secure attachment between caregivers and children, which is the basis for adequate emotional regulation, and may result in the brain of children not reaching optimal functionality (Breidenstine et al., 2016; Tian et al., 2024).

Trauma Focused-CBT

In psychological treatment of childhood trauma, the main evidence-based treatment guidelines, such as the British National Institute for Clinical Excellence (NICE, 2018) and the American Academy of Child and Adolescent Psychiatry (Cohen, et al., 2010; Lee et al., 2015), recommend *cognitive behavioral therapy* (CBT) as first-choice treatment. Trauma- Focused Cognitive Behavioral Therapy (TF-CBT; Cohen et al., 2006) is the only one mentioned as a *well-established effective treatment* (Dorsey et al., 2017; Kliethermes et al., 2017).

A series of meta-analytical reviews of experimental and quasi-experimental trials with TF-CBT, were shown as superior to other therapies in reducing PTSD, anxiety, depression and behavioral problems in children and adolescents who were victims of various kinds of abuse (Cox et al., 2025; Mavranezouli et al., 2020; Xiang et al., 2021; Wang et al., 2023). Over the last two decades, research interest has focused on verifying the effectiveness of TF-CBT adaptations in children exposed to complex trauma in reducing PTSD symptoms, depression, behavioral problems, anger, self-concept and global health (Amedu & Dwarika, 2024; Bartlett et al., 2018; Goldbeck et al., 2016; Jensen et al., 2022; Sachser et al., 2017).

TF-CBT is a psychological treatment of cognitive behavioral basis focused on children aged between 4 and 18 exposed to acute or chronic traumatic events. It proposes a format of individual sessions, both for young people and their caregivers, as well as joint sessions. CBT-FT integrates cognitive-behavioral components and other theoretical perspectives, including attachment theory (Bowlby and Solomon, 1989), in its interest in the incorporation of the primary supportive caregiver into therapy, and humanistic approaches (Rogers et al., 1981), considering the clinician-child relationship as crucial to successful implementation of FT-CBT techniques (Cohen et al., 2006). Therapy involves a range of components: *psychoeducation and parenting skills, affective expression and regulation, relaxation skills, cognitive coping skills, trauma narrative development and processing, in vivo gradual exposure, conjoint parent-child sessions and enhancing safety and future development.*

The live/imaginary exposure technique that incorporates TF-CBT has proven very effective in reducing PTSD, both in adults and children, and recognized by the American Psychological Association and NICE as a treatment of choice (APA, 2006). Nonetheless, there are certain barriers to its implementation, such as difficulties some have both in imagining the traumatic event and in becoming emotionally involved with the memory of the trauma, both due to a "disconnection" and excessive emotionality (Foa et al., 2013). At the same time, resistance from both patients and clinicians to its application is because of very painful emotions caused by exposure to traumatic memories and experiences (Ruzek et al., 2014). Factors that may be particularly sensitive for children, due to challenges in cognitively articulating their experiences and conveying the emotions they feel.

In this regard, abused children, besides avoiding memories, may reflect a tendency to reject and deny traumatic experiences in familial settings, as individuals frequently idealize their attachment figures and rationalize the behaviour of their aggressors. In many cases, there is a failure to acknowledge harm caused. Addressing these matters can lead to feelings of disorientation, pain, and rejection, driven by a dual purpose: to avoid suffering and to protect their attachment figures (Herman, 1992; López-Soler, 2008; López-Soler et al., 2008).

Virtual Reality Exposure Therapy, VRET

Virtual Reality (VR) has emerged as a viable alternative for facilitating exposure techniques for patients who struggle with real-life exposure or imaginative scenarios. The potential benefits

of utilizing virtual reality include: (1) VR offers a highly realistic simulation of reality, which helps patients who have challenges with imaginative thinking (Powers et al., 2013); (2) it enables comprehensive and precise control over the presentation of feared stimuli or traumatic events, thereby enhancing cognitive avoidance and increasing emotional engagement, a crucial factor in the success of exposure techniques (Botella et al., 2015); (3) it provides a greater level of privacy compared to traditional in vivo exposure methods; (4) it enables creation of scenarios that extend beyond real-life experiences, promoting self-learning and overlearning (Gutiérrez-Maldonado et al., 2009); (5) clinicians can quickly halt exposure if it becomes excessively distressing for the patient (Parrish et al., 2016); (6) it offers a timeless and secure environment, ensuring safety and protection (Kim & Kim, 2020); and (7) it reduces both cost and time linked to exposure by simulating the feared stimulus within the therapeutic setting, as opposed to real-world in vivo exposure (Repetto et al., 2011).

Several systematic reviews have recently been published aiming to evaluate the effectiveness of research using Virtual Reality Exposure Therapy (VRET) for PTSD treatment (Botella et al., 2015; Carl et al., 2019; Eshuis et al., 2020), as well as for PTSD and depressive symptoms associated with trauma in adults (Kothgassner et al., 2019). Re- search concludes that VRET is an effective and efficient alternative in PTSD treatment, superior to control conditions and other psychological therapies, and comparable to standard interventions based on exposure to PTSD. Eshuis et al. (2020), concluded VRET can be an effective alternative to current treatments, particularly in patients with PTSD who have not responded to previous treatments. Likewise, research highlights high satisfaction and acceptability by patients (Botella et al., 2015; Rizzo & Shilling, 2017). All reviews conclude with the need to develop more quality research, as well as inclusion of studies evaluating the impact of VR-EBT on other frequently occurring comorbid PTSD symptoms. VR is shown to be effective in various contexts, both in general clinical and hospital contexts to reduce pain and anxiety in pediatric patients (Eijlers et al., 2019; Ridout et al., 2021).

Virtual Reality in the psychological treatment of children and adolescents

In recent years, new technologies have increasingly been used for evaluation and treatment of problems related to mental health, both in adults, children and adolescents. Clinical practice with adolescents suggests behavioral procedures require those which guarantee their understanding and cooperation, as well as large doses of flexibility and creativity (Gutiérrez-Maldonado et al., 2009).

The application of VR to therapies with children and adolescents has shown effectiveness in training attention and social skills, cognitive rehabilitation and overall, in children with diagnoses of ADHD and autism spectrum disorder (Kim & Kim, 2020). Kothgassner & Felnhofer (2020) recently performed a systematic review on studies that used VRET for anxiety disorders in children and adolescents. They concluded that though there are encouraging results for treatment of social anxiety, school phobia, and specific phobias, research on VRET in children and adolescents with anxiety disorders remains rare. The authors found no studies with VRET in children and adolescents with PTSD.

Besides advantages resulting from application of VR to therapy in adults, research indicates further benefits in therapy when applied to children and adolescents; One notable advantage is that the immersive and relatable environments offered by VR resonate well with younger individuals, enhancing its effectiveness in therapeutic settings. (Lauricella et al., 2014), the attractiveness of its playful aspect, which aids motivation and adherence to treatment (Alcántara-López et al., 2017; Kim & Kim, 2020; López-Soler et al., 2011); and the effectiveness and efficacy that therapeutic techniques bring when applied in the virtual environment, since VR is experienced with a greater degree of reality by children more than adults (Bailey & Bailenson, 2017).

Despite the high potential of VR as a tool for treatment of various anxiety disorders, ADHD and ASD in childhood, as well as in treatment of PTSD in adults, there is still notable lack of research regarding PTSD in children and adolescents (Kothgassner & Felnhofer, 2020) and other symptoms associated with complex trauma.

Virtual Reality TF-CBT

In recent years, initial applications of the therapeutic technique within the framework of TF-CBT have been published, using the virtual reality system known as "EMMA world". This system has been employed in the psychological treatment of various conditions, including trauma and stress-related disorders such as adjustment disorder and PTSD (Baños et al., 2011; Guillén et al., 2018). Additionally, it has been used for training mindfulness skills within the context of virtual reality dialectical behavioral therapy (Navarro-Haro et al., 2017).

The GUIIA-PC research team at the University of Murcia (Spain) conducted the first adaptation of this system in 2008 called "EMMA-Child". The first steps of the application of Virtual Reality TF-CBT were implemented with a child victim of domestic abuse (López-Soler et al., 2011) and with a group of 8 children and adolescent victims of com- plex traumas who lived in foster homes and in family foster care (Alcántara-López et al., 2017). Virtual Reality TF-CBT was effective in reducing PTSD and internalizing (anxiety, depression), externalizing (hyperactivity, behavioral problems) symptoms, and in improving anger control and global adaptation of children and adolescents.

Given the clear positive effects that the VR tool can provide to adherence, effective- ness and efficacy of TF-CBT and the scarcity of studies of this type in the abused child and adolescent population, this present work is the first pilot study to international level of the application of Virtual Reality TF-CBT in children and adolescents with complex trauma. The working hypothesis is that that intervention will result in a clinically significant decrease in symptoms associated with post-traumatic stress, depression, as well as both internalizing and externalizing behavioral issues. We also anticipate improvements in anger management and the psychosocial adjustment of these children and adolescents.

Method

Recruitment and Assessment Procedures

Participants were children in care (group home and family foster homes) from Spain and selected from the *Project for the Evaluation, Diagnosis and Psychological Intervention for Children in Care (PEDIMET),* agreed between the Department of Family and Social Policies and the University of Murcia, from 2008. The children and adolescents—were treated at the Virgen de la Arrixaca University Hospital (Murcia, Spain) by a psychologist with at least 5 years' experience in clinical intervention and with specific training in application of TF-CBT. children and adolescents sent by Child Protection were randomly assigned to a psychologist. First, an interview was carried out with the main

Table 1
Components adapted from TF-CBT for Virtual Reality TF Prieto (2016)

Components	Description
Psychoeducation (P) Parenting (P)	Discussion and education about child abuse in general and typical emotional and behavioral reactions to the subject. Training for caregivers/ educators in behavioral management strategies and positive communication.
Relaxation (R)	Relaxation training based on breathing techniques, progressive mental and muscle relaxation.
Affective Expression and Regulation (AER)	Improving ability to identify and express emotions, helping the young person to manage emotional reactions regarding abuse, and practise selfcontrol and selfrelaxation.
CognitiveCoping (CC)	Helps the child or adolescent understand the connection between thoughts, feelings, and behaviors; explore and correct misattributions related to everyday events.
Trauma Narrative Development and Processing (TN) Book of life.	Gradual *exposure exercises*, including narrating the trauma verbally or in writing, and processing erroneous and/ or harmful thoughts linked to the abuse. *Mindfulness* techniques are implemented that promote development of full attention and coping with emotions associated with trauma.
In vivo exposure(IE)	By gradual in vivo exposure to traumarelated stimuli, the child or adolescent learns to control their own emotional reactions.
Self-**C**oncept and identity Reconstruction (SCIR)	Promotion of selfknowledge, development of a positive personal identity, feelings of selfefficacy and establishment of appropriate connections.
Enhancing Safety and Social Skills (ESSS)	Education and training in safety skills and improvement in interpersonal relationships. Developing new skills in managing future traumarelated stressors.

caregiver or guardian, consent for the intervention was requested from these and the child and the procedure and treatment aims were explained. The pre- and post-intervention evaluations were conducted by psychologists other than those who performed the psychological treatment. One hundred and seventy-seven children and adolescents were initially selected, of whom 46 finished the process and completed post-intervention evaluation. Follow-up could not be performed due to the large sample loss, for reasons of return to biological family, adoption or foster care, change of region or country.

Participants

Spanish children and adolescents aged 6 to 16 years (average 11 years, *SD* 2.35) who had suffered severe and chronic intrafamilial violence were recruited into the study. The final sample was 46 participants, 24 (52.2%) boys and 22 (47.8%) girls, and mainly Spanish nationals (76.1%), the rest were nationalities from Africa, Latin America and Eastern European countries. Thirty-one (67.4%) were in group homes for abused children, 11 (23.9%) in kinship foster care (grandparents or aunts/uncles), 3 in foster families and 1 in adoptive family. The children and adolescents had experienced two or more forms of trauma (e.g., neglect, emotional, physical abuse, and witnessed domestic violence). All had suffered neglect and interpersonal violence.

The inclusion criteria were: being referred to PEDIMET, being between 6 and 18 years of age, having experienced severe and chronic intrafamilial maltreatment, and showing severe adjustment disorders and/or emotional and/or behavioral disorders. Exclusion criteria included participants whose single trauma exposure was sexual abuse, present intellectual disability, generalized developmental disorders or psychotic disorders. This research received informed consent from all participants and the Child Protection Council.

Therapy

Adaptation of TF-CBT

Virtual Reality Trauma Focused-CBT (Virtual Reality TF-CBT) is based on an adaptation of the TF-CBT (Cohen et al., 2006), manualized CBT for children and adoles- cents between 4 and 18 years old, exposed to different traumatic events (acute or chronic). It proposes a format of individual sessions, both for minors and their caregivers, as well as joint sessions. Likewise, it includes a series of treatment components included in the acronym PRACTICE: Psychoeducation, Relaxation, Affective modulation, Cognitive coping, Trauma narrative and processing, In vivo-exposure, Conjoint sessions and Enhancing safety.

An adaptation of the original Trauma-Focused Cognitive Behavioral Therapy (TF- CBT) model, as developed by Cohen et al. in 2006, has been implemented. This adaptation, known as Virtual Reality TF-CBT (López-Soler et al., 2022), retains the acronym Practice (see Table 1) and encompasses all modules except for *the Conjoint sessions with parents*. This exclusion is due to the fact that most children were residing in group homes and had minimal or no contact with their family of origin. The designated caregiver for each child received guidance and support, psychoeducation regarding post-traumatic responses in children and adolescents, and training in educational skills aimed at educators and foster or adoptive family members through the initial *Parenting* component

As part of the component Trauma Narrative the *book of life* technique was included. Intended to facilitate the narration of traumatic events, the child or adolescent relates their life in different chapters which represent the past containing the traumatic experiences, the present and the future. It has 3 aims; (a) to help in elaboration of past traumatic experiences, (b) support integration of this experience into their lives and (c) promote creation of positive future expectations.

A further novelty in this adaptation of the TF-CBT was inclusion of a specific component, *Self-Concept and identity Reconstruction,* aimed toward enriching the self- concept, self-esteem and self-efficacy of abused children and adolescents. The main objective was to work on alterations in self-perception and self-esteem which had been observed in children and adolescents exposed to complex traumas (Herman, 1992).

Therapy is structured in a sequential manner across various modules. The initial phase focuses on establishing a therapeutic alliance and achieving emotional stabilization, as suggested by Herman (1992). The second phase involves addressing exposure to traumatic events, while the third phase emphasizes personal empowerment and reintegration (see Figure 1).

Sixteen sessions were designed, though as recommended by the authors, children and adolescents received between 16 and 22 sessions to devote more time to the initial phase of stabilization and to establish trust between therapist and children with

symptomatology associated with complex trauma (Cohen et al., 2012). Therefore, duration of treatment ranged from 6 to 9 months. Three TF-CBT adaptations were designed for two age groups, 6 to 11 and 12 to 16.

Figure 1. Distribution of Virtual Reality TF-CBT components per session (Prieto 2016).

Session 1	P	AER	R				
Session 2	P	AER	CC	R			
Session 3	P	AER	CC	ESSS	R		
Session 4	P	AER	CC	ESSS	SCIR	R	
Session 5	P	AER	CC	ESSS	SCIR	R	
Session 6	P	AER	TN	SCIR	R		
Session 7	P	AER	TN	SCIR	ESSS	R	
Session 8	P	TN	IE	SCIR	R		
Session 9	P	TN	IE	SCIR	AER	ESS S	R
Session 10	P	TN	IE	ESSS	R		
Session 11	P	IE	ESSS	R			
Session 12	P	TN	IE	ESSS	CC	R	
Session 13	P	TN	CC	R			
Session 14	P	TN	R				
Session 15	P	TN-NL	R				
Session 16	P	TN-BL	R				

Note. AER: Affective Expression and Regulation; R: Relaxation; P: Psychoeducation Parenting; CC: Cognitive Coping; SCIR: Self-Concept and Identity Reconstruction; R: Relaxation; TR: Trauma Narrative; IE: In Vivo Exposure; ESSS: Enhancing Safety and Social Skills

Inclusion of VR

Virtual Reality TF-CBT used EMMA (Engaging Media for Mental Health Appli- cations) Virtual Reality (VR) system, adapted to childhood and adolescence EMMA- Childhood. This technology is based on creating three-dimensional environments allowing the child or adolescent to interact in the environment in real time. Previous research suggests it might be useful in treating children who are victims of complex traumas (Alcántara-López et al., 2017; López-Soler et al., 2011).

The use of EMMA-Childhood was implemented in *relaxation, affective expression and regulation, trauma narrative development and processing (book of life), and in vivo gradual exposure* components (Table 2 and Figure 2).

Clinical assessment measures Measure Completed by Caregivers Child Behavior Checklist (CBCL)

The CBCL collects information provided by primary caregivers to evaluate behavioral and social problems in school-age children (6-18 CBCL, Achenbach & Rescorla, 2001). The CBCL 6-18 comprises 113 items and provides scores for three main scales: *internalizing, externalizing, and total.* As well as scores on 8 scales based on syndromes collected in the Diagnostic and Statistical Manual of Mental Disorders (4th ed., text rev.; DSM-IV-TR; American Psychological Association, 2000). The internal reliability of the scales based on the DSM for the American version ranged between .72 and .91 (Achenbach & Rescorla, 2001) and were quite similar to those found for the Spanish population: .71 and .87 (Sardinero et al., 1997). and .70 and .82 (Lacalle et al., 2012). Criterion validity of the Spanish version was assessed and found acceptable against a structured psychiatric interview (.69 to .83; Estrada et al., 2010). A caregiver report was used instead of a self- report because we believe that increasing the number of informants, including third parties, increases the clinical validity of the assessment.

Figure 2. Some elements from the virtual reality system EMMA-Child.

Measures Completed by children Child PTSD Symptoms Scale (CPSS)

CPSS (Foa et al., 2001) is the children's version of the Post-traumatic Diagnostic Scale (PDS; Foa et al., 1997). It is designed

Table 2
Activities in EMMA-Child for components of Virtual Reality TF-CBT (López-Soler, 2022)

Relaxation (R)	Create environments conveying calm (music and scenery) to practise relaxation.
Affective Expression and Regulation (AER)	Select colours, objects, images, music, and scenarios symbolizing the emotion worked on in the session, associating it with vital situations. Detect certain emotions in others through images associated with significant people in your life.
Trauma Narrative Development and Processing (TN) Book of life.	Select elements representing a safe place. Go through the different virtual scenarios to train awareness of bodily sensations. Represent real or fictional characters with music and images whom you identify with. Symbolise the narrative created about your life story through a character from a song, story or movie. Make a collage by inserting images into the virtual book that represent who you are and what has hap- pened to you. Write chapter title in the virtual book and insert images symbolizing the chosen experiences.
In vivo exposure (IE)	Choose feared images from lowest to highest degree. Expose yourself to traumatic events represented with colours, objects, images, music, scenery and atmospheric conditions, identifying thoughts and emotions, and recounting your experience. Select the virtual image symbolizing the pain or suffering experienced Choose objects and images related to the traumatic event you wish to eliminate from your life, enter these into the meaning transformer and press the transformation button.

to evaluate PTSD and severity of symptoms in children and adolescents who have suffered a traumatic event. Based on DSM-IV di- agnostic criteria, it evaluates total PTSD and three groups of symptoms: reexperiencing, avoidance and hyperarousal. It has a four-point Likert type response format referring to frequency of manifestation of symptoms. This test has adequate psychometric properties in Spanish children, internal consistency (.83 to .89) and cross-language reliability (.93; Kassam-Adams et al., 2013).

Children´s Depression Inventory (CDI)

CDI (Kovacs, 1992) is a self-report instrument which measures depressive symptomatology in children from 7 years of age. It provides two indices: *dysphoria and negative self-esteem*, the sum of which offers a *total depression* index. CDI has been shown to have adequate construct validity and internal consistency ranged between .70 and .94 in clinical and non-clinical samples (Kovacs, 1992). Studies conducted in the Spanish population have offered data with adequate internal consistency, with Cronbach's alphas ranging between .82 and .88 (Masip et al., 2010).

State-Trait Anger Expression Inventory in Children and Adolescents (STAXI-NA)

The Spanish version of the State-Trait Anger Expression Inventory in Children and Adolescents (STAXI-NA; Spielberger et al., 2009), enables evaluation of anger in children between the ages of 8 and 17. Anger is assessed through three components: anger control, internalized expression, and externalized expression of anger. It also allows us to evaluate anger as state and trait. Measures of *trait anger and anger control* were selected for this study. The internal consistency of subscales ranges between .52 and .87 (del Barrio et al., 2004), showing acceptable reliability. In another study conducted with samples similar to those of the present study, adequate alpha coefficients were obtained for trait anger (.84) and anger control (.73; López-Soler et al., 2012).

Multifactor Self-Evaluative Child Adaptation Test (TAMAI)

The TAMAI (Hernández, 1998) is a self-assessment tool designed for children aged 8 and above, providing insights into their adaptation across multiple contexts, personal, social, educational, and familial settings. It also offers a global measure of adaptation. The test comprises two reliability criteria: pro- image and contradictions. The author reports adequate internal consistency values ranging from .70 to .92 across the various scales. As regards convergent validity, the TAMAI presented significant correlations with the CBCL, as well as with several assessments of anxiety and depression symptoms (Lastra et al., 2001), and with self-reported feelings of sadness (Siverio & García, 2006).

Analyses

Analyses were performed using the SPSS statistical 24.0 package. The demographic characteristics of the sample were presented using percentages for categorical variables and using means and standard deviations for continuous measures. Paired *t*-tests were calculated to assess change between pre and post treatment measures. A standardized mean difference effect size (*d*) was used based on the *t* score to verify the efficacy of each treatment group (Hedges et al., 2013).

As for the magnitudes of the effect sizes, values < .20 were interpreted as no effect, values between .20- .50 as small, values between .50- .80 as medium effect, and values >.80 as large effect (Cohen, 1988).

Results

The internal consistency of tests applied is high, obtained through the alpha coefficient, .880 in the CPSS, .891 in the CDI, .749 in the CBCL, .853 in the STAXI-NA and .910 in the TAMAI.

As shown in Table 3, the implementation of *PEDIMET* TF-CBT offered significant improvements in PTSD symptoms. The children and adolescents reported clinically and statistically significant reductions in reexperiencing, avoidance, and hyperarousal symptoms, reflecting moderate to high effect sizes. Likewise, there were statistically significant improvements and high effect sizes in depressive symptoms captured by the CDI. There were moderate effect sizes specifically for dysphoria, and high effect sizes for negative self-esteem. Primary caregivers reported clinically and statistically significant reductions with high effect sizes in internalizing, externalizing, and global behavior problems. The children and

Table 3. Improvements after *PEDIMET* TF-CBT implementation.

Measure	Subscale	*N*	Pretest M (*SD*)	Posttest M (*SD*)	*P* value	*d*
CPSS	Reexperiencing	37	6.05 (4.2)	2.06 (2.8)	< .001	1.078
	Avoidance	37	6.59 (5.4)	2.25 (3.5)	< .001	.910
	Hyperarousal	37	4.86 (4.3)	2.19 (3.2)	< .001	.901
	Functional impairment	37	2.6(1.6)	1.13(1.3)	<.001	.713
	Total PTSD	32	18.13 (12.5)	6.50 (8.7)	< .001	.709
CDI	Dysphoria	39	6.23 (4.1)	3.49 (2.9)	< .001	.774
	Self-esteem	39	6.74 (3.1)	4.36 (2.7)	< .001	.850
	Total Depression	39	12.95 (6.5)	7.85 (4.8)	< .001	.933
CBCL	Internalizing	41	14.32 (8.3)	8.20 (5.9)	< .001	.690
	Externalizing	41	22.22 (13.1)	11.83 (9.3)	< .001	.850
	Total problems	41	63.15 (31.6)	35.46 (22.9)	< .001	.880
STAXI- NA	Trait anger	40	14.43 (3.4)	11.90 (3.2)	< .001	.752
	Anger-Control	40	15.83 (4.1)	17.95 (3.6)	< .01	-.474
TAMAI	Personal adjustment	41	11.70 (5.9)	6.68 (5.6)	< .001	.976
	School adjustment	41	10.89 (5.6)	7.51 (6.5)	< .001	.643
	Social adjustment	41	12.20 (4.9)	7.39 (3.3)	< .001	.904
	General adjustment	41	34.80 (12.8)	21.95 (12.7)	< .001	1.186

adolescents showed reductions in trait anger and progress in anger control, producing statistically significant changes and moderate effect sizes in both STAXI-NA measures. Similarly, children and adolescents improved their general adaptation to various contexts, with clinically and statistically significant improvements found in global, personal, social and school adaptation with moderate to high effect sizes.

No differences by sex were found between the different age ranges (6-11 years and over 12 years) in the post-test measures, except in the group over 12 years, where girls (M = 13.5; SD = 5.06) outperformed boys (M = 5.2; SD = 2.58) in personal maladjustment in the TAMAI questionnaire (t = -3.21; p < .05). As Table 4 and 5 shows, significant differences were also found on the CDI, CBCL, and CPSS scales between the pre-test and post-test in the age ranges 6-11 years and 12-16 years. At pretest the CPSS total scale correlated significantly with the trait anger scale (r = .609), and negative self-esteem correlated with anger control (r = -.519). At post-test, the internalizing problems scale correlated with negative self-esteem (r = .576), dysphoria with trait anger (r = .536), and total depression with trait anger (r = .580).

Discussion

The aim of this research was to analyses the preliminary effectiveness of *Virtual Reality* TF-CBT (López-Soler et al., 2022), an adaptation of the original TF-CBT model (Cohen et al., 2006) including VR for treatment of post-traumatic stress and associated symptoms in children and adolescent victims of complex trauma in foster care (group homes, kinship foster care, foster/adoptive families). Results showed the *Virtual Reality* TF-CBT, led to statistically significant improvements in clinical measures to post-traumatic stress symptoms, depression, behavioral problems, anger issues and personal, social and school adjustment, with large to moderate effect sizes.

The efficacy of adaptations of TF-CBT has been tested in children who have suffered three or more traumatic events, including neglect, disruptions in attachment during crucial developmental periods, significant alterations in caregiving, psychological and physical abuse, exposure to domestic violence, and, in certain instances, sexual abuse (Cox et al., 2025; Hoskins et al., 2018).

This study has shown that adapting TF-CBT for the Spanish population is both acceptable and feasible. It marks the first adaptation of TF-CBT for Spanish children and adolescents, affirming that this therapy can be readily modified for various cultures and for children who have experienced complex traumas in diverse foster care settings, as established by earlier research (Cox et al., 2025; Jensen et al., 2022; Sachser et al., 2017).

Virtual Reality TF-CBT has been effective in reducing clinical indicators linked to total posttraumatic stress and their symptoms. These results support existing literature on the efficacy of TF-CBT in child victims of complex trauma (Bartlett et al., 2018; Ross et al., 2021; Sachser et al., 2017; Steinberg et al., 2019; Wang et al., 2023), finding better results in reexperiencing symptoms compared to another research (Bartlett et al., 2018).

Positive results in reducing reexperiencing symptoms could be due to several rea- sons. Firstly, to implementation of the *book of life* (in the *trauma narrative development and processing component*, TN) module, as a narrative tool to facilitate emotional ex- pression and elaboration of traumatic events. These results could support the theory that emotional writing is an effective tool in therapeutic work (Andreu-Mateu et al., 2012).

Virtual reality has demonstrated its acceptability and effectiveness for treatment of PTSD in adults (Botella et al., 2015; Carl et al., 2019; Eshuis et al., 2020), with de- pressive symptoms associated with trauma (Kothgassner et al., 2019), and with the child and adolescent population (Alcántara-López, et al., 2017; López-Soler, et al., 2011). The application of VR in psychological treatment of children and adolescents increases involvement and pleasure in therapy, given its playful content. As regards the VR system used in the present study, "The World of EMMA", adds new and important possibilities to treatment. Firstly, it constitutes an adaptive device, meaning it adjusts its presentation and actions to the immediate aims and needs of the child in real time. Secondly, the system uses symbols, landscapes and other elements which allow us to personalize the virtual environment to create our own psychological environment. This innovative approach not only allows the system to be used in treatment of a wide range of disorders, but also to incorporate the characteristics of each problem and each individual in a personalized way. The system's remarkable adaptability and significant flexibility have been proven in numerous studies on PTSD treatment (Botella et al., 2015) and among children who have experienced physical and psychological abuse (López-Soler et al., 2008).

The virtual reality program EMMA World can be applied to different mental health problems, because the program maintains a common structure in all its applications, although with small adaptations depending on the problem being treated. These small adaptations are related to the contexts and visual stimuli used within the program for each disorder and person, thus ensuring a personalization of the intervention. Thus, the visual stimuli to be used in the case of PTSD to facilitate narrative exposure will vary from person to person, as each patient will choose which stimuli to use, and in the case of fibromyalgia, this program will be used more to enhance relaxation and stress reduction. Maintaining a common structure in terms of the intervention protocol and the EMMA World program, despite its application in different disorders, provides a number of advantages, such as the possibility of adapting therapies without the need for multiple software developments and improving the implementation of psychological therapy. However, a possible disadvantage has to do with the fact that, by using the same structure in all mental health problems, it is not guaranteed that sufficient adjustments are made to fully adapt the system to each specific problem and patient (Baños et al., 2011; Botella et al., 2010).

It is especially interesting to observe the reduction in depression. Though the study did not specifically examine which components may have been particularly beneficial for treatment outcomes, teaching skills with which to regulate emotions and correct maladaptive appraisals appear central to many effective interventions (Berliner, 2005). The cognitive and affective regulation components incorporated in TF-CBT can address symptoms linked to both depression and post-traumatic stress. Alternatively, reduction in depressive symptoms may be due to a decrease in PTSD reactions. Traumatized children and adolescents may begin to feel hopeful about the future when they experience relief from PTSD.

As initially indicated, the *PEDIMET* TF-CBT included a specific component of *Self- Concept and Identity Reconstruction (SCIR)*, aimed at enriching the self-concept, self- esteem and self-efficacy, based on alterations in self-perception and self-value observed in children and adolescents exposed to complex trauma (Herman, 1992). Results showed significant improvements in negative self-esteem, suggesting that the incorporation of this SCIR component brings important benefits to children's and adolescents' perception and personal esteem. This research is original because it is the first study in Spain and in the world to apply the virtual reality system EMMA in children in care.

A further positive effect of *PEDIMET* TF-CBT was in reduction of behavioral problems, the main caregivers of these

children and adolescents witnessed significant improvements in both internalizing problems with a moderate and large effect on externalizing problems. These results are similar to those found by some authors regarding effectiveness of TF- CBT in reducing behavioral problems in abused children and adolescents (Bartlett et al., 2018; Deblinger et al., 2011; Steinberg et al., 2019). The results of our research offer more encouraging data by finding significant reductions in internalizing, post-traumatic, externalizing symptomatology and improvements in adaptation, compared to other studies that applied virtual reality in other samples, and in which only improvements were found in behavioral problems in general, and benefits in internalizing behavior, but not in externalizing problems, anger, or general problems (Cohen et al., 2011; Dorsey et al., 2014; Hoskins et al., 2018; Steinberg et al., 2019; Wang et al., 2023).

Limitations of study and future lines of research

An important limitation of this study is the small sample size which greatly limits generalization of results found. In addition, the lack of a control group in this research could compromise the results; however, this was the only possible option, since the inclusion of children in the control group would probably have resulted in the dropout from the research of the children who would later receive the treatment, since foster children often change homes or families. The study does not provide information on the evolution of children´ symptoms due to insufficient follow-up data. This was due to sample loss and changes in guardianship and residence. Finally, another possible limitation of the study has to do with the profile of each psychologist who applied the intervention. although there is a common treatment protocol.

The GUIIA-PC research team is currently conducting a controlled comparison of various PEDIMET treatment protocols. This study aims to clarify which protocol demonstrates the highest differential efficacy and whether a particular therapeutic model is more suitable for addressing specific symptoms or disorders, as noted by Deblinger et al. (2011). Furthermore, the research seeks to enhance the understanding of the specific components of therapy that lead to improvements in symptoms associated with child abuse. It will also examine the impact of sociodemographic factors—such as age, gender, type of abuse, residential versus family foster care, duration of guardianship, time spent in care facilities, foster care disruptions, and visits with biological family—on the effectiveness of treatment.

Finally, another line of future research is to verify the effect of the inclusion of virtual reality on the efficacy of TF-CBT, which allow confirmation of preliminary findings (López-Soler et al., 2011).

Findings were very promising, suggesting that future studies and development of the virtual reality environment for children and adolescents are warranted. VR appears a promising, cost-effective, feasible, and acceptable technology for providing exposure to social anxiety for assessment and treatment of adolescents. Virtual reality technologies, like those in this study, can increase access to evaluation and treatment for vulnerable populations. Virtual reality simulations can also increase efficiency of practice, particularly when resources are limited. Future research should assess its use with diverse children and adolescent populations as well as comparing the effectiveness of VR and in vivo exposure social anxiety treatment approaches. If virtual reality approximates in vivo exposure among socially anxious children and adolescents, future research should focus on developing and testing cost-effective treatment modalities and cognitive-behavioral assessment of virtual reality exposure that prevents chronic social anxiety symptoms and development of other highly comorbid conditions among children and adolescents that persist into adulthood.

Ethical Responsibilities

Protection of people and animals. The authors declare that no experiments on human beings or animals were carried out for this research.

Data confidentiality. The authors declare that they have followed their workplace protocols regarding publication of patient data.

Right to privacy and informed consent. The authors declare that no patient data appears in this article.

Conflict of interests

The authors report no conflict of interest.

Acknowledgments

This research was carried out thanks to collaboration between General Directorate of Family and Social Policies and the University of Murcia, through the “Project for Assessment, Diagnosis and Psychological Intervention in Maltreated Children” (PEDIMET).

References

Achenbach, T. M, & Rescorla, L. A. (2001). Manual for the ASEBA School-Age Forms & Profiles Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.

Alcántara, M., Castro, M., Martínez, A., Fernández, V., & López-Soler, C. (2017). El sistema de realidad virtual EMMA-Child para el tratamiento del trauma infantil: experiencias iniciales. *Revista de Psicología Clínica con Niños y Adolescentes, 4*(3), 26-34.

Amedu, A. N., & Dwarika, V. (2024). Enhancing the mental health of children, students, and adolescents with trauma and PTSD through TF-CBT. *Archives of trauma research, 13*(1), 1-11.

American Psychological Association. (2000). Diagnostic and statistical manual of mental disorders. Washington DC.

American Psychological Association. (2006). Evidence-based practice in psychology: APA presidential task force on evidence-based practice. *American Psychologist, 61*, 271-285.

Andreu-Mateu, S., Botella, C., Quero, S., Guillén, V., y Baños, R. M. (2012). La utilización de la realidad virtual y estrategias de psicología positiva en el tratamiento de los trastornos adaptativos. *Revista internacional de psicología clínica y de la salud, 20*(2), 323-348.

Bailey, J. O., & Bailenson, J. N. (2017). Immersive virtual reality and the developing child. In *Cognitive development in digital contexts* (pp. 181-200). Academic Press. https:// doi.org/10.1016/B978-0-12-809481-5.00009-2

Baños, R. M., Guillén, V., Quero, S., Garcia-Palacios, A., Alcaniz, M., & Botella, C. (2011). A virtual reality system for the treatment of stress-related disorders: A preliminary analysis of efficacy compared to a standard cognitive behavioral pro- gram. *International Journal of Human-Computer Studies, 69*(9), 602-613. https://doi.org/10.1016/j.ijhcs.2011.06.002

Bartlett, J. D., Griffin, J. L., Spinazzola, J., Fraser, J. G., Noroña, C. R., Bodian, R., ... &Barto, B. (2018). The impact of a statewide trauma-informed care initiative in child welfare on the well-being of children and youth with complex trauma. *Chil- dren and Youth Services Review, 84,* 110-117. https://doi.org/10.1016/ j.childyouth.2017.11.015

Botella, C., García-Palacios, A., Guillén, V., Baños, R. M., Quero, S., & Alcañiz, M. (2010). An adaptive display for the treatment of diverse trauma PTSD victims. *Cyberpsychology, Behavior, and Social Networking, 13*(1), 67-71. https://doi.org/ 10.1089/cyber.2009.0353

Botella, C., Garcia-Palacios, A., Vizcaíno, Y., Herrero, R., Baños, R. M., & Belmonte, M. A. (2013). Virtual reality in the treatment of fibromyalgia: a pilot study. *Cy- berpsychology, Behavior, and Social Networking, 16*(3), 215-223. https://doi.org/ 10.1089/cyber.2012.1572

Botella, C., Serrano, B., Baños, R. M., & García-Palacios, A. (2015). Virtual reality exposure-based therapy for the treatment of post-traumatic stress disorder: a review of its efficacy, the adequacy of the treatment protocol, and its acceptability. *Neuropsychiatric Disease and Treatment, 11*, 2533-2545. https://doi.org/10.2147/ NDT.S89542

Breidenstine, A. S., Bailey, L. O., Zeanah, C. H., & Larrieu, J. A. (2016). Attachment and trauma in early childhood: *A review. Assessment of Trauma in Youths,* 125-170.

Bowlby, J., & Solomon, M. (1989). *Attachment theory*. Los Angeles, CA: Lifespan Learning Institute.

Carlson, E. B., & Balenberg, C. J. (2000). A Conceptual Framework for the Impact of Traumatic Experiences. *Trauma, Violence, & Abuse, 1*(1), 4-28. https://doi.org/10.1177/1524838000001001002

Carl, E., Stein, A. T., Levihn-Coon, A., Pogue, J. R., Rothbaum, B., Emmelkamp, P., ... & Powers, M. B. (2019). Virtual reality exposure therapy for anxiety and related disorders: A meta-analysis of randomized controlled trials. *Journal of anxiety dis- orders, 61*, 27-36. https://doi.org/10.1016/j.janxdis.2018.08.003

Cervera, I. M., López-Soler, C., Alcántara-López, M., Castro, M., Fernández, V., & Pérez, A. (2020). Consecuencias del maltrato crónico intrafamiliar en la infancia: trauma del desarrollo. *Papeles del Psicólogo/Psychologist Papers, 41*(3), 219-227

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (Hillsdale).

Cohen, J. A., Mannarino, A. P., & Deblinger, E. (2006). *Treating trauma and traumatic grief in children and adolescents.* New York, NY, US: Guilford Press.

Cohen, J. A., Mannarino, A. P., & Iyengar, S. (2011). Community treatment of posttraumatic stress disorder for children exposed to intimate partner violence: a randomized controlled trial. *Archives of Pediatrics & Adolescent Medicine, 165*(1), 16- 21. https://doi.org/10.1001/archpediatrics.2010.247

Cohen, J. A., Mannarino, A. P., Kliethermes, M., & Murray, L. A. (2012). Trauma-focused CBT for youth with complex trauma. *Child abuse & neglect, 36*(6), 528- 541. https:// doi.org/10.1016/j.chiabu.2012.03.007

Cohen, J. A., The Work Group On Quality Issues, & AACAP Work Group on Quality Issues (2010). Practice parameter for the assessment and treatment of children and adolescents with posttraumatic stress disorder. *Journal of the American Academy of Child & Adolescent Psychiatry, 49*(4), 414-430. https://doi.org/10.1016/ j.jaac.2009.12.020

Corno, G., Bouchard, S., Baños, R. M., Rivard, M. C., Verdon, C., & De Montigny, F. (2020). Providing Psychological and Emotional Support After Perinatal Loss: Protocol for a Virtual Reality-Based Intervention. *Frontiers in Psychology, 11*, 1262. https://doi.org/10.3389/fpsyg.2020.01262

Council of Europe (2017). *Ending all forms of violence against children by 2030: The Council of Europe's contribution to the 2030 Agenda and the Sustainable Devel- opment Goal.* https://rm.coe.int/ending-all-forms-of-violence-against-children-by-2030-the-council-of-e/1680732f2d

Cox, S., Parkinson, S., Herbert, J., Tucker, E., Octoman, O., & Bromfield, L. (2025). Trauma-focused cognitive behavioral therapy for children and young people who have experienced forms of child maltreatment other than child sexual abuse: A review of the evidence. *Children and Youth Services Review,* 108159. https:// doi.org/10.1016/j.childyouth.2025.108159

Deblinger, E., Mannarino, A. P., Cohen, J. A., Runyon, M. K., & Steer, R. A. (2011). Trauma– focused cognitive behavioral therapy for children: impact of the trauma narrative and treatment length. *Depression and Anxiety, 28*(1), 67-75. https://doi.org/ 10.1002/da.20744

Del Barrio, M. V., Aluja, A., &Spielberger, C. D. (2004). Anger assessment whith the STAXI-CA: psychometric properties of a new instrument for children and adoles- cents. *Personality and Infividual Differences, 37,* 227-244. https://doi.org/10.1016/ j.paid.2003.08.014

Dorsey, S., McLaughlin, K. A., Kerns, S. E., Harrison, J. P., Lambert, H. K., Briggs, E. C., ... & Amaya-Jackson, L. (2017). Evidence base update for psychosocial treat- ments for children and adolescents exposed to traumatic events. *Journal of Clini- cal Child & Adolescent Psychology, 46* (3), 303 - 330 . https://doi.org/ 10.1080/15374416.2016.1220309

Dorsey, S., Pullmann, M. D., Berliner, L., Koschmann, E., McKay, M., y Deblinger, E. (2014). Engaging foster parents in treatment: A randomized trial of supplementing Trauma- focused Cognitive Behavioral Therapy with evidence-based engagement strategies. *Child abuse & neglect, 38*(9), 1508-1520. https://doi.org/10.1016/j.chiabu.2014.03.020

Eshuis, L. V., van Gelderen, M. J., van Zuiden, M., Nijdam, M. J., Vermetten, E., Olff, M., & Bakker, A. (2020). Efficacy of immersive PTSD treatments: A systematic review of virtual and augmented reality exposure therapy and a meta-analysis of virtual reality exposure therapy. *Journal of Psychiatric Research*, 143:516-527. https:// doi.org/10.1016/j.jpsychires.2020.11.030.

Estrada, M. D., Rajmil, L., Serra-Sutton, V., Tebé, C., Alonso, J., Herdman, M., ... & Starfield, B. (2010). Reliability and validity of the Spanish version of the Child Health and Illness Profile (CHIP) Child-Edition, Parent Report Form (CHIP- CE/ PRF). *Health and Quality of Life Outcomes, 8*(1), 78. https://doi.org/ 10.1186/1477-7525-8-78

Eijlers, R., Utens, E. M. W. J., Staals, L. M., de Nijs, P. F. A., Berghmans, J. M., Wijnen, R. M. H., Hillegers, M. H. J., Dierckx, B., &Legerstee, J. S. (2019). Systematic Review and Meta-analysis of Virtual Reality in Pediatrics: Effects on Pain and Anxiety. *Anesthesia and Analgesia, 129*(5), 1344-1353. https://doi.org/10.1213/ANE.0000000000004165

Farnia, V., Naami, A., Zargar, Y., Davoodi, I., Salemi, S., Tatari, F., &Alikhani, M. (2018). Comparison of trauma-focused cognitive behavioral therapy and theory of mind: Improvement of posttraumatic growth and emotion regulation strategies. *Journal of Education and Health Promotion, 7,* 58-64. https://doi.org/10.4103/ jehp.jehp_140_17

Foa, E. B., Cashman, L., Jaycox, L., & Perry, K. (1997). The Validation of a self-report measure of posttraumatic stress disorder: The Posttraumatic Diagnostic Scale. *Psyhological Assessment, 9*(4), 445- 451.

Foa, E. B., Gillihan, S. J., & Bryant, R. A. (2013). Challenges and successes in dissemi- nation of evidence-based treatments for posttraumatic stress: Lessons learned from prolonged exposure therapy for PTSD. *Psychological Science in the Public Interest, Supplement, 14*(2), 65-111. https://doi.org/10.1177/1529100612468841

Foa, E. B., Johnson, K., Feeny, N. C., & Treadwell, K. R. T. (2001). The Child PTSD Symptom Scale (CPSS): Preliminary psychometrics of a measure for children with PTSD. *Journal of Clinical Child Psychology, 30*(3), 376-384. https://doi.org/ 10.1207/S15374424JCCP3003_9

Goldbeck, L., Muche, R., Sachser, C., Tutus, D., & Rosner, R. (2016). Effectiveness of trauma-focused cognitive behavioral therapy for children and adolescents: A ran- domized controlled trial in eight German mental health clinics. *Psychotherapy and psychosomatics, 85*(3), 159-170. https://doi.org/10.1159/000442824

González-García, C., Bravo, A., Arruabarrena, I., Martín, E., Santos, I., & Fernández del Valle, J. (2017). Emotional and behavioral problems of children in residential care: Screening detection and referrals to mental health services. *Children and Youth Serves Review, 70,* 100-106. https://doi.org/10.1016/j.childyouth.2016.12.011

Grasso, D. J., Joselow, B., Marquez, Y., & Webb, C. (2011). Trauma-focused cognitive behavioral therapy of a child with posttraumatic stress disorder. *Psychotherapy, 48*(2), 188. https://psycnet.apa.org/doi/10.1037/a0023133

Guillén, V., Baños, R. M., & Botella, C. (2018). Users' opinion about a virtual reality system as an adjunct to psychological treatment for stress-related disorders: A quantitative and qualitative mixed-methods study. *Frontiers in psychology, 9,* 1038. https://doi.org/10.3389/fpsyg.2018.01038

Gutiérrez-Maldonado, J., Magallón-Neri, E., Rus-Calafell, M., &Peñaloza-Salazar, C. (2009). Virtual reality exposure therapy for school phobia. *Anuario de Psicología, 40*(2), 223-236.

Hayes, J. P., LaBar, K. S., Petty, C. M., McCarthy, G., & Morey, R. A. (2009). Alterations in the neural circuitry for emotion and attention associated with posttraumatic stress symptomatology. *Psychiatry Research: Neuroimaging, 172*(1), 7-15. https://doi.org/10.1016/j.pscychresns.2008.05.005

Hedges, L. V., Pustejovsky, J. E., & Shadish, W. R. (2013). A standardized mean differ-ence effect size for multiple baseline designs across individuals. *Research Synthe- sis Methods, 4*(4), 324-341. https://doi.org/10.1002/jrsm.1086

Herman, J. L. (1992). Complex PTSD: A syndrome in survivors of prolonged and re- peated trauma. *Journal of Traumatic Stress, 5,* 377-391. https://doi.org/10.1002/ jts.2490050305

Hernández, P. (1998). Test *Autoevaluativo Multifactorial de AdaptaciónInfantil.* Madrid: TEA Ediciones.

Hoskins, D., Duncan, L. G., Moskowitz, J. T., & Ordóñez, A. E. (2018). Positive Adap- tations for Trauma and Healing (PATH), a pilot study of group therapy with La- tino youth. *Psychological Trauma: Theory, Research, Practice, and Policy, 10*(2), 163. https://doi:.org/10.1037/tra0000285

Jensen, T. K., Braathu, N., Birkeland, M. S., Ormhaug, S. M., & Skar, A. M. S. (2022). Complex PTSD and treatment outcomes in TF-CBT for youth: a naturalistic study. European Journal of Psychotraumatology, 13(2), 2114630. https://doi.org/ 10.1080/20008066.2022.2114630

Joiner, V. C., & Buttell, F. P. (2018). Investigating the usefulness of trauma-focused cog- nitive behavioral therapy in adolescent residential care. *Journal of evidence-in- for med social work, 15* (4), 457 - 472.https://doi.org/10.1080/23761407.2018.1474155

Kassam– Adams, N., Gold, J. I., Montaño, Z., Kohser, K. L., Cuadra, A., Muñoz, C., & Armstrong, F. D. (2013). Development and psychometric evaluation of child acute stress measures in Spanish and English. *Journal of Traumatic Stress, 26*(1), 19-27. https://doi.org/10.1002/jts.21782

Kim, S., & Kim, E. (2020). The use of virtual reality in psychiatry: a review. Journal of the Korean Academy of *Child and Adolescent Psychiatry, 31*(1), 26. https://doi.org/10.5765/ jkacap.190037

Kliethermes, M. D., Drewry, K., & Wamser, R. A. (2017). Trauma-focused cognitive- behavioral therapy. In *Evidence-Based Treatments for Trauma-Related Disorders in Children and Adolescents* (pp. 219-243). Cham: Springer Nature Switzerland.

Konanur, S., Muller, R. T., Cinamon, J. S., Thornback, K., & Zorzella, K. P. (2015). Ef- fectiveness of trauma-focused cognitive behavioral

therapy in a community-based program. *Child Abuse & Neglect, 50*, 159-170. https://doi.org/10.1016/ j.chiabu.2015.07.013

Kothgassner, O. D., & Felnhofer, A. (2020). Lack of research on efficacy of virtual reality exposure therapy (VRET) for anxiety disorders in children and adolescents. *Neu- ropsychiatrie,* 1-8. https://doi.org/10.1007/s40211-020-00349-7

Kothgassner, O. D., Goreis, A., Kafka, J. X., Van Eickels, R. L., Plener, P. L., & Felnho- fer, A. (2019). Virtual reality exposure therapy for posttraumatic stress disorder (PTSD): a meta-analysis. *European journal of psychotraumatology, 10*(1), 1654782. https://doi.org/10.1080/20008198.2019.16547822

Kovacs, M. (1992). *Children´s Depression Inventory*. North Tonawanda: Multihealth Systems.

Lacalle, M., Ezpeleta, L., & Doménech, J. M. (2012). DSM-oriented scales of the Child Behavior Checklist and Youth Self-Report in clinically referred Spanish children. *The Spanish Journal of Psychology, 15*(1), 377-387. https://doi.org/10.5209/ rev_SJOP.2012.v15.n1.37344

Lanius, R. A., Vermetten, E., & Pain, C. (2010). The impact of early life trauma on health and disease: The hidden epidemic. *Cambridge, UK.*

Lastra, I., Martínez-Chamorro, M. J. & Luzuriaga, C. (2001). El test autoevaluativo mul- tifactorial de adaptación infantil (TAMAI). ¿Útil en el cribado de psicopatología infanto-juvenil? *Informaciones Psiquiátricas, 166,* 191-203.

Lee, T., Fouras, G., & Brown, R. (2015). Practice parameter for the assessment and man- agement of youth involved with the child welfare system. *Journal of the American Academy of Child & Adolescent Psychiatry, 54*(6), 502-517. https://doi.org/10.1016/j.jaac.2015.03.005

López-Soler, C. (2008). Las reacciones postraumáticas en infancia y adolescencia mal- tratada: el trauma complejo. *Revista de Psicopatología y Psicología Clínica, 13*, 159-174.

López-Soler, C., Castro, M., Alcántara, M., & Botella, C. (2011). Sistema de realidad vir- tual EMMA-infancia en el tratamiento psicológico de un menor con estrés postrau- mático [EMMA-childhood virtual reality system in the psychological treatment of a child with post-traumatic stress]. *Revista de Psicopatología y Psicología Clínica, 16* (3), 189-206.

López-Soler, C., Castro, M., Daset, L., Alcántara, M., Fernández, V., Prieto, M., y Puerto, J.C. (2008). Consecuencias del maltrato grave en la infancia: conceptualización y diagnóstico de las reacciones postraumáticas complejas. *Revista Ciencias Psico- lógicas, II,* 103-119.

López-Soler, C., Fernández, M. V., Prieto-Larrocha, M., Alcántara-López, M. V., Saéz, M. C., & López-Pina, J. A. (2012). Prevalencia de las alteraciones emocionales en una muestra de menores maltratados. *Anales de Psicología/Annals of Psychol- ogy, 28*(3), 780-788. https://doi.org/10.6018/analesps.28.3.140441

López-Soler, C., Martínez, A., Alcántara, M., Castro, M. & Fernández, V. (2022). *Reacciones postraumáticas a lo largo de la infancia y la adolescencia. Intervención en el trauma del desarrollo.* Klinik.

Mannarino, A. P., Cohen, J. A., & Deblinger, E. (2014). Trauma-Focused Cognitive-Be- havioral Therapy. In S. Timmer & A. Urquiza. (Eds.), *Evidence-Based Ap- proaches for the Treatment of Maltreated Children* (pp. 165-185). Cleveland, USA: Netherlands.

Martín, E., González-García, C., del Valle, J.F., & Bravo, A. (2020). Detection of behavioral and emotional disorders in residential child care: Using a multi-informant approach. *Children and Youth Services Review, 108,* 104588. https://doi.org/10.1016/j.childyouth.2019.104588

Masip, A. F., Amador-Campos, J. A., Gómez-Benito, J., & del Barrio, V. (2010). Psy- chometric properties of the Children's Depression Inventory in community and clinical sample. *The Spanish journal of psychology, 13*(2), 990-999. https://doi.org/10.1017/ S1138741600002638

Mavranezouli, I., Megnin–Viggars, O., Daly, C., Dias, S., Stockton, S., Meiser–Sted- man, R., ... & Pilling, S. (2020). Research Review: Psychological and psychoso- cial treatments for children and young people with post– traumatic stress disorder: a network meta–analysis. *Journal of Child Psychology and Psychiatry, 61*(1), 18-29. https://doi.org/10.1111/jcpp.13094

Miller– Graff, L. E., & Campion, K. (2016). Interventions for posttraumatic stress with children exposed to violence: Factors associated with treatment success. *Journal of clinical psychology, 72*(3), 226-248. https://doi.org/10.1002/jclp.22238

Navarro-Haro, M. V., López-del-Hoyo, Y., Campos, D., Linehan, M. M., Hoffman, H. G., García-Palacios, A., ... & García-Campayo, J. (2017). Meditation experts try Virtual Reality Mindfulness: A pilot study evaluation of the feasibility and ac- ceptability of Virtual Reality to facilitate mindfulness practice in people attending a Mindfulness conference. *PloS one, 12* (11), e 0187777 . https://doi.org/10.1371/journal.pone.0187777

NICE, National Institute for Clinical Excellence (2018). *Post-traumatic stress disorder.* (NICE guideline NG116). Londres: NICE. https://www.nice.org.uk/guid- ance/ng116/

Parrish, D. E., Oxhandler, H. K., Duron, J. F., Swank, P., & Bordnick, P. (2016). Feasi- bility of virtual reality environments for adolescent social anxiety disorder. *Re- search on Social Work Practice, 26* (7), 825 - 835. https://doi.org/10.1177/1049731514568897

Porto-Faus, D., de Moraes, C. L., Reichenheim, M. E., Souza, L. M. B. da M., & Taquette, S. R. (2019). Childhood abuse and community violence: Risk factors for youth violence. *Child Abuse & Neglect, 98*, 104182. https://doi.org/10.1016/ j.chiabu.2019.104182

Powers, M. B., Briceno, N. F., Gresham, R., Jouriles, E. N., Emmelkamp, P. M. G., & Smits, J. A. J. (2013). Do conversatins with virtual avatoars increase feeligns of social anxiety? *Journal of Anxiety Disorders, 27,* 398–403. https://doi.org/10.1016/ j.janxdis.2013.03.003

Prieto Larrocha, M. (2016). *Eficacia de la terapia cognitivo conductual (TCC) y de la TCC-focalizada en el trauma en infancia maltratada*. Tesis Doctoral. Universidad de Murcia. http://hdl.handle.net/10201/48124

Rogers, C. R. (1981). The foundations of the person-centered approach. *Dialectics and Humanism, 8*(1), 5-16.

Ridout, B., Kelson, J., Campbell, A., & Steinbeck, K. (2021). Effectiveness of Virtual Reality Interventions for Adolescent Patients in Hospital Settings: Systematic Re- view. *Journal of Medical Internet Research, 23*(6), e24967. https://doi.org/ 10.2196/24967

Rizzo, A. S., & Shilling, R. (2017). Clinical virtual reality tools to advance the prevention, assessment, and treatment of PTSD. *European Journal of Psychotraumatol- ogy, 8*(sup5), 1414560. https://doi.org/10.1080/20008198.2017.1414560

Ross, S. L., Sharma-Patel, K., Brown, E. J., Huntt, J. S., & Chaplin, W. F. (2021). Complex trauma and Trauma-Focused Cognitive-Behavioral Therapy: How do trauma chronicity and PTSD presentation affect treatment outcome? *Child abuse & neglect, 111,* 104734. https://doi.org/10.1016/j.chiabu.2020.104734

Ruzek, J. I., Eftekhari, A., Rosen, C. S., Crowley, J. J., Kuhn, E., Foa, E. B., ... & Karlin, B. E. (2014). Factors related to clinician attitudes toward prolonged exposure therapy for PTSD. *Journal of Traumatic Stress, 27*(4), 423-429. https://doi.org/10.1002/ jts.21945

Sachser, C., Keller, F., & Goldbeck, L. (2017). Complex PTSD as proposed for ICD– 11: Validation of a new disorder in children and adolescents and their response to Trauma– Focused Cognitive Behavioral Therapy. *Journal of Child Psychology and Psychiatry, 58*(2), 160-168. https://doi.org/10.1111/jcpp.12640

Sardinero, E., Pedreira, J. L. y Muñiz, J. (1997). El cuestionario CBCL de Achenbach: adaptación española y aplicaciones clínico epidemiológicas. Clínica y Salud, 8, 447–480. Retrieved from https://www.proquest.com/scholarly-journals/el- cuestionario-cbcl-de-achenbach-adaptación/docview/2478596743/se-2

Siverio, M. A. & García, M. D. (2006). Inadaptación y autopercepción de tristeza en niños y adolescentes. *Revista de Psicología General y Aplicada, 58,* 425-451.

Silverman, W. K., Ortiz, C. D., Viswesvaran, C., Burns, B. J., Kolko, D. J., Putnam, F. W., & Amaya-Jackson, L. (2008). Evidence-based psychosocial treatments for children and adolescents exposed to traumatic events. *Journal of Clinical Child & A dolescent Psychology, 37* (1), 156 - 183 . https://doi.or g/ 10.1080/15374410701818293

Simon, V. A., Feiring, C., & Cleland, C. M. (2016). Early stigmatization, PTSD, and perceived negative reactions of others predict subsequent strategies for processing child sexual abuse. *Psychology of Violence, 6*(1), 112.

Smith, P., Dalgleish, T., & Meiser– Stedman, R. (2019). Practitioner review: posttrau- matic stress disorder and its treatment in children and adolescents. *Journal of Child Psychology and Psychiatry,60*(5), 500-515. https://doi.org/10.1111/jcpp.12983

Spielberger, C. D., Del Barrio, V., & Aluja, A. (2009). STAXI-NA. *Inventario de expresión de ira estado-rasgo en niños y adolescentes.* Madrid: TEA Ediciones.

Steinberg, A. M., Layne, C. M., Briggs, E. C., Liang, L. J., Brymer, M. J., Belin, T. R., ... & Pynoos, R. S. (2019). Benefits of treatment completion over premature ter- mination: Findings from the national child traumatic stress network. *Psychiatry, 82*(2), 113-127. https://doi.org/10.1080/00332747.2018.1560584

Tian, Y., Li, W., Wu, X., & Cheng, X. (2024). Childhood traumatic experiences and complex posttraumatic stress disorder in Chinese adolescents: The mediating role of attachment. *Psychological Trauma: Theory, Research, Practice, and Policy.* Advance online publication. https://doi.org/10.1037/tra0001719

Van der Kolk, B., Ford, J.D., & Spinazzola, J. (2019). Comorbidity of developmental trauma disorder (DTD) and post-traumatic stress disorder: Findings for the DTD field trial. *European Journal of Psychotraumatology, 10*(1), 1562841. https:// doi.org/10.1080/20008198.2018.1562841

Van Rooij, S. J. H., Smith, R. D., Stenson, A. F., Ely, T. D., Yang, X., Tottenham, N., Stevens, J. S., & Jovanovic, T. (2020). Increased Activation of the Fear Neurocircuitry in Children Exposed to Violence. *Depression and anxiety, 37*(4), 303-312. https://doi.org/10.1002/da.22994

Villalta, L., Khadr, S., Chua, K.-C., Kramer, T., Clarke, V., Viner, R. M., Stringaris, A., & Smith, P. (2020). Complex post-traumatic stress symptoms in female adolescents: The role of emotion dysregulation in impairment and trauma exposure after an acute sexual assault. *European Journal of Psychotraumatology, 11*(1), 1710400. https://doi.org/10.1080/20008198.2019.1710400

Wang, W., Chen, K., & Zhang, H. (2023). Effectiveness of trauma-focused cognitive behavioral therapy among maltreated children: A meta-analysis. *Research on social work practice, 33*(8), 913-928. https://doi.org/10.1177/10497315221147277

World Health Organization (2018). *International Statistical Classification of Diseases and Related Health Problems.* Retrieved from: (11th Revision). https://icd.who.int/browse11/l-m/en#/http%3a%2f%2fid.who.int%2ficd%2fen-tity%2f585833559

World Health Organization (2019). *INSPIRE handbook: Action for implementing the seven strategies for ending violence against children.* World Health Organization.

World Health Organization (2020). *Global status report on preventing violence against children.* http:// apps.who.int/iris

Xiang, Y., Cipriani, A., Teng, T., Del Giovane, C., Zhang, Y., Weisz, J. R., Li, X., Cuijpers, P., Liu, X., Barth, J., Jiang, Y., Cohen, D., Fan, L., Gillies, D., Du, K., Ravindran, A. V., Zhou, X., & Xie, P. (2021). Comparative efficacy and acceptability of psychotherapies for post-traumatic stress disorder in children and adolescents: A systematic review and network meta-analysis. *Evidence-Based Mental Health, 24*(4), 153-160. https://doi.org/10.1136/ebmental-2021-300346