

# Evaluating Effective Pediatric Psychological Trauma Treatments Post-Traumatic Natural Disasters

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**How to cite this paper:** Jayaprakasam, S. (2022) Evaluating Effective Pediatric Psychological Trauma Treatments Post-Traumatic Natural Disasters. *Open Journal of Psychiatry*, 12, 246-268.

<https://doi.org/10.4236/ojpsych.2022.123019>

**Received:** May 27, 2022

**Accepted:** July 24, 2022

**Published:** July 27, 2022

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## Abstract

What are the best treatment approaches for children experiencing trauma after natural disasters? Historically, the U.S. emergency response system has not provided psychological support to communities impacted by disasters. Instead, the traditional emergency response community focused on ensuring the physical survival of the individuals and communities that it protects. The goal of all disaster interventions, whether physical or psychological in nature, is to restore the individual to his/her level of pre-disaster functioning. Emphasizing psychological intervention and treatment after disasters is essential in restoring health in individuals post-trauma because mental health is necessary for proper physical health, forming of coping mechanisms, and the ability of individuals to move past the trauma and lead normal lives. At young ages, the body is still developing mentally and physically, meaning the impact of a traumatic event may be completely different from that of most adults. For example, children have greater thought suppression, which leads to an associated increase in PTSD and internalizing behaviors. Thus, children require a different treatment approach to ensure that trauma is not long-lasting and prevalent in future adult life, such as through trouble expressing and regulating emotions, as well as vulnerability to future exposure to stress, which may negatively impact individuals' identity and interpersonal abilities. The purpose of this review paper is to evaluate various memory-related disorders to then explain the pros and cons of various treatment approaches based on their efficiency in treating PTSD-related symptoms post-natural disasters in children. This review identifies the best pediatric trauma treatment approaches used after natural disasters, highlighting a lack of efficient, effective, and specific psychological treatments. By comparing various existing psychological treatments, this paper provides future directions for research by identifying existing gaps in the field and explains contrasting approaches for

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various memory-related and natural disaster related psychological trauma disorders.

### Keywords

Natural Disasters, Pediatric, Psychology, Mental Health, Trauma, Psychotherapy, CISD, CBT, CPT, Prolonged Exposure, TF-CBT, Psychological First Aid

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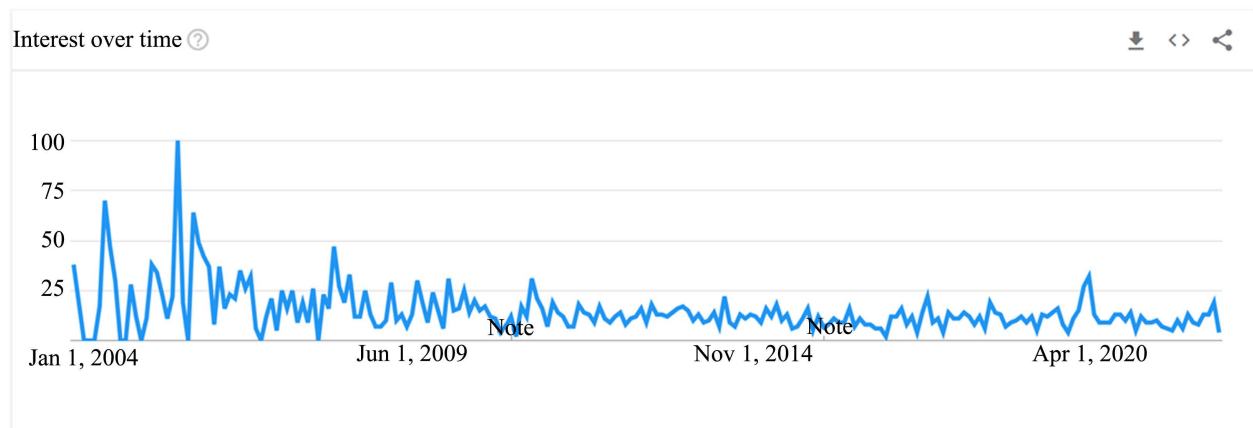
## 1. Introduction

The traditional emergency response focuses on preparing for and ensuring the physical survival and safety of the individuals and communities that it protects, as seen in **Figure 1** [1]. Similarly, the goal of all disaster interventions, whether physical or psychological in nature, is to build healthy individuals [2]. Throughout history, the U.S. emergency response system has lacked in providing psychological support to disaster-impacted communities, especially to younger children and adolescents. Children and adolescents, ages two to 19, have psychological and physical characteristics distinct from their adult counterparts. As such, different treatment approaches than the existing generalized methods are necessary for adults ages 20 and up. At these younger ages, the body is still developing mentally and physically, meaning the impact of a traumatic event may be completely different from that of most adults. Thus, children require a different treatment approach to ensure that trauma impacts on children are not long-lasting and prevalent in future adult life.

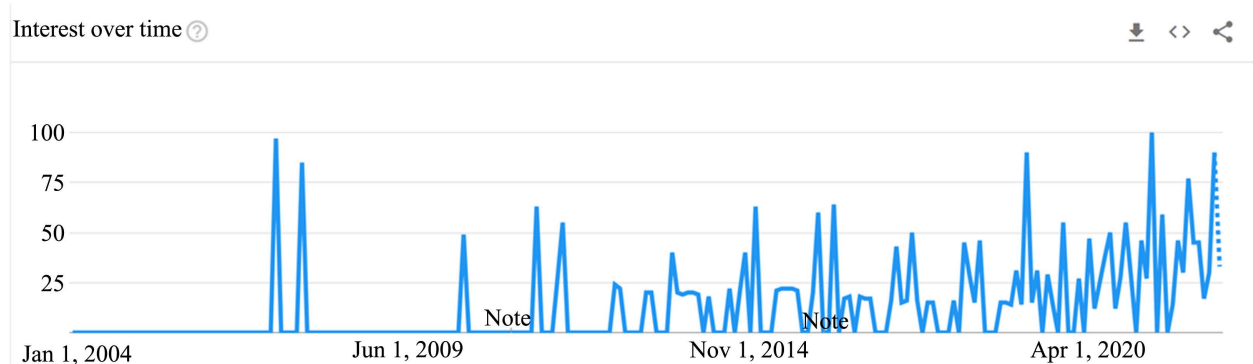
The aims of the current review are to identify the best practices and evidence-based strategies used to restore children in communities to as close to psychological pre-disaster health as possible. Through evaluating stress-related memory patterns for communities' post-disaster and dissecting the advantages and disadvantages of existing trauma treatments, this paper identifies the best treatment methods existing today and reveals the necessity for further research into pediatric psychological trauma treatments. This paper explores memory patterns and some common memory disorders post-natural disasters, and then discusses existing treatment approaches for these memory disorders in children. Through the exploration of these treatment approaches, this review highlights a lack of effective psychological treatments for children post-natural disaster trauma and reveals areas for future research and development.

The U.S. Federal Emergency Management Agency (FEMA) and the Stafford Act—an act that grants power to most Federal disaster response activities as they refer to FEMA programs—define disasters as occurrences resulting in severe property damage, deaths, and/or multiple injuries [3]. The scope of natural disasters excludes human-caused occurrences. Primary examples of natural disasters may include earthquakes, volcanoes, flooding, typhoons, hurricanes, and tornados [4]. The general psychological response to natural disasters differs from

## Disaster Mental Health 2004-Present Google Searches:



## Disaster Physical Health 2004-Present Google Searches:



**Figure 1.** This image graphically depicts the comparison between the greater emphasis on physical health over mental health post-disasters in the United States. Via graphing the amount “disaster mental health” was searched on Google on the top graph and the amount “disaster physical health” was search on Google on the bottom graph, the image demonstrates a consistent greater search for physical health over mental health, highlighting the need to stress education about the importance of mental and psychological care (Google Trends, 2022). Google Trends. (2022, May 21). Google Trends.

<https://trends.google.com/trends/explore?date=all&geo=US&q=disaster%20physical%20health>.

other traumatic events in that victims lack someone/something to target their emotional response towards, leading to different emotional and physical responses [5]. Since many natural disasters tend to traumatize large populations of people at once, they can result in epidemics of Survivor Guilt, the guilt of surviving when many others died, and other PTSD symptoms [6].

Symptoms, such as PTSD, which arise from natural disasters and other stressful events, may lead to trauma [7]. Trauma is an emotional response to a negative event, like natural disaster, which this paper will specifically focus on [8]. Immediate, short-term trauma effects after the event include shock and denial, while longer reactions include unpredictable emotions, flashbacks, strained relationships and physical symptoms like headaches or nausea [6]. After a traumatic event, these effects and feelings are common, but some people, especially children who do not receive proper treatment, have difficulty moving on and living normal adult lives. Psychologists can help these individuals find con-

structive ways of managing their emotions through various treatments [6]. A common effect of traumatic events is PTSD, post-traumatic stress disorder. PTSD causes intense, disturbing thoughts that last long after the traumatic event has ended, such as reliving the event through flashbacks or nightmares, feeling sadness, fear, or anger, or feeling detached from others [9]. A meta-analysis study of the prevalence of PTSD among children and adolescents after earthquakes and floods indicated that children and adolescents are more vulnerable and thus should be in top priority when discussing psychological care for post-traumatic natural disasters [8]. New research must be conducted to discover more effective treatment approaches for children facing memory and stress-related disorders post-natural disasters. This can only be possible if the government refines their policies on post-disaster services and runs early screening, immediate intervention, and ongoing monitoring for PTSD, as well as mental and emotional support [8].

## 2. Memory Patterns Associated with Post-Disaster Trauma in Children

Memory processing can be divided into three main stages: encoding, storage, and retrieval. In a traumatic event, these stages are all affected. The first step, encoding, is the short-term memory that processes sensations and thoughts. Encoding memory can hold information for up to 30 seconds [10]. The next stage, storage, transforms encoded information to be retained in the brain.

The hippocampus and the amygdala are brain structures that specifically function in encoding memory. The hippocampus puts the experience in chronological order and into perspective, which allows for the formation of explicit memories, or cognitive memory, which are memories that can be remembered and recalled in the prefrontal cortex of the brain [9]. Overall, the hippocampus and explicit memory integrate sensory data into a clear picture, add a time tag, and transfer the memory into long-term episodic memory to be retrieved later. On the other hand, the amygdala, sorts past sensory experiences as implicit memories, which are unconscious but affect thoughts and behaviors [9]. Implicit memories have intense arousal, meaning they can be quickly associated with future stressful or threatening situations, enabling an instant response to danger. Although normally the amygdala neurons encode fear memory while the hippocampus focuses on the context of the fear, during traumatic events, amygdala activity increases, correlating with clear implicit memories. This intensifies traumatic memories, impairing the time-keeping abilities of the hippocampus and explicit memory [9]. Thus, when encoding is impacted during a stressful situation, patients later have trouble remembering details, which can result in intensified memory recollection or can result in fragmented or impaired memories.

When impacted by trauma, the hippocampus also disrupts the storage of information by affecting the encoding of conscious explicit memory when blocked or damaged by stress hormones or inhibited by intense amygdala activation [9]. This causes impairment of information encoding and storage for aspects of the

experiences that are not considered essential for survival or have emotional importance, such as the sequence of events and peripheral details, leading to disorganized and incomplete narrative memories [9].

The final stage of memory processing is memory retrieval [10]. Over time, memories generally fade, becoming more abstract over time. Sometimes memories from other stories or experiences combine in the brain, supplying inaccurate details that are re-encoded into the overall memory and its abstract story [10]. Unlike this fading of general memories over time, memories of traumatic experiences are less likely to fade over time [11]. There is generally a heightened sensitivity in recalling traumatic events when encountering trauma cues [12]. Memories are typically stored in distributed brain networks, including the cortex and are readily accessed to consciously remember an event, but new research finds that stressful events primarily activate subcortical memory regions of the brain [13]. This reroutes the processing of stress-related memories within the brain circuits so that the memories cannot be consciously accessed [13].

All people have different responses to traumatic events, so different treatment approaches work better for different people. Young children under the age of three are unable to truly retain memories and face unique issues, such as childhood amnesia. Older children, between the ages of 3 and 18 typically have some similar memory patterns and psychological responses to traumatic events, such as suppressed memories, dissociative phenomena, and selective memory. Studies of structural and functional neuroimaging during adolescence, between ages 12 to 18, have shown that neural circuitry undergoes major reorganization during this age range, particularly in the “emotional brain” and the self and social cognition [14]. This occurs due to general decreases in the gray matter volume, due to a reduction in the number of synapses [14]. For example, risk-taking behavior may provide a feedback mechanism that optimizes brain development during adolescence. Typically, by age 18 - 20, most subcortical white matter and association pathways reach a plateau [14].

### **1) Childhood Amnesia**

The formation of personal memories typically begins at age three and gradually increases in number until approximately age seven, after which adult memory distribution is adopted [9]. New research reveals that many early memories, pre and post age three, become inaccessible, resulting in childhood amnesia [15] [16]. Childhood amnesia, a term coined by Sigmund Freud, is the inability to recall events that occurred in one’s infancy and/or early childhood [17]. Unlike normal forgetting, childhood amnesia is the forgetting of early life events to a significantly greater degree and a lower ability for recollection as time since the event increases [18].

While thinking about childhood amnesia and the fact that true memories are only retained after age 3, we must consider how traumatic natural disaster events impact children of ages 3 and under versus older children between ages three-18. Though it is commonly believed that this young age and lack of adult knowledge or experiences protects children from the impacts of a traumatic event, research

from the National Child Traumatic Stress Network provides new evidence that young children do face many symptoms of trauma if they sense their parents, or themselves, are in danger [19]. These symptoms differ from those of adults or older children since younger children are unable to verbalize their emotional responses, or fully understand their situation, and thus young children under the age of three require different treatment approaches to prevent the prevalence of the trauma in the child's future.

## 2) Suppressed Memories

The DSM-IV, the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders created by the American Psychiatry Association, is a classification system for psychiatric disorders, and its goal is to diagnose, study, and treat these if possible. According to this manual, a key PTSD symptom in Criterion D—including negative changes in an individual's cognition and mood—is the inability to remember important aspects of the traumatic event [20]. Suppressed memories are created by a process called state-dependent learning; when the brain creates memories in a certain mood or state, particularly of stress or trauma, those memories become inaccessible in a normal state of consciousness [21]. Suppression refers to the unconscious act of burying distressing memories and feelings, and once buried, these suppressed memories are no longer a part of a person's awareness unless they hypothetically retrieve the memories [21].

Current studies about the retrieval of suppressed memories have proven inconclusive, leading to a big debate in the psychology field – can suppressed memories be retrieved and if retrieved, are these memories real and can they be deliberately suppressed [22] [23]? The controversial topic of memory suppression is a psychological concept introduced by Sigmund Freud, who asserted that a person confronted with something too mentally distressing to accept might unconsciously discard that information, essentially forgetting the event. Though Freud found that some people seemed to later recall these lost memories, especially under hypnosis, the accuracy and realism of the memories are questionable [24]. On top of the risk of inaccurate memories during retrieval, attempting to recover suppressed memories also created new symptoms in some people, such as an increase in traumatic stress like nightmares, intrusive memories, and dissociative phenomena [25]. Multiple studies also proved the possibility of implanting false memories in other people. False memory syndrome occurs when someone believes that false memories are actually recovered memories [22]. People with false memories believe and describe the implanted memories, sometimes even more vividly than actual memories. It is generally impossible to determine whether most recovered memories are accurate or false [23]. These false memories may affect the lives and emotional health of those affected. Though the accuracy of these memories and if memories themselves can be recovered, the topic of memory suppression is at the heart of much current memory and psychotherapy research studies [26]. The patterns of the impact of trauma will have a future implication on adulthood functioning. Currently, memory re-

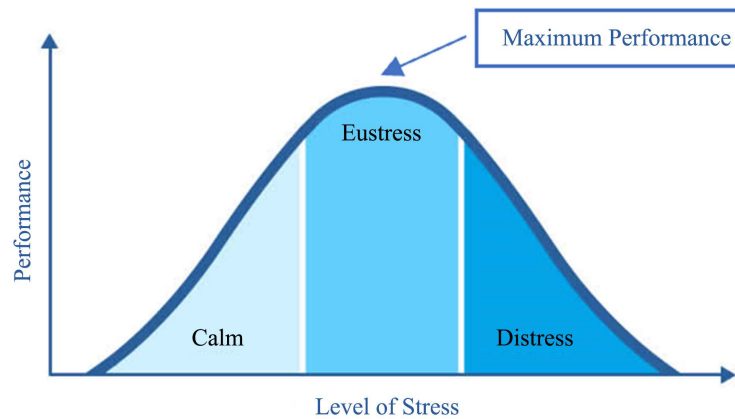
searchers and clinicians agree that the phenomenon of memory suppression does occur, and recovering this memory is rare [27]. Studies also show that memory is often inaccurate and can have outside influences, such as through television, the experiences of others, and social media [27].

When traumatic events, such as natural disasters, occur to children, the brain block stressful memories, inherently creating suppressed memories. Studies have shown that the associated stress from natural disasters can also physically alter the structure of children's brains, causing the formation of a smaller amygdala and hippocampi in young children [28]. The amygdala, which controls emotions and decision-making when smaller, leads to lower cognitive control and inhibition of emotions like aggression [28]. Similarly, the hippocampus controls emotions and memory formation, so smaller hippocampi can lead to learning problems or other memory impairments, and a lack of emotional control [28].

### **3) Selective Memory & Flashbulb Memory**

Selective memory is another memory-based disorder, in which one can remember certain events but not remember others at a particular point in time [29]. In other words, selective memory is a person's ability to remember certain information and not other information [30]. These memories may be held back on purpose, meaning, only the subconscious or unconscious mind holds the inaccessible memory. Similarly, selective amnesia occurs when a traumatic event takes place, and the individual forgets all memories about the event [29]. To the individual, it is as if the event never occurred.

Another instance of a similar memory pattern is called Flash Bulb Memory. This is a memory of a traumatic event that creates a strong and very accurate memory of, not the event itself, but learning about it [31]. Because Flash Bulb Memories are formed during immense emotional arousal, they are autobiographical memories, meaning they are highly personal, so the primary focus is on the individual, while everything else is secondary [31]. Some studies of flash bulb memories involved patients learning about a disaster and having an emotional reaction, then either recalling or mis-recalling the relevant context after a relatively short period of time, ranging from 6 months to 3 years [31]. The biggest finding was that highly-distress individuals recalled the context of information over time at a higher level than they recalled the semantic information, information heard about instead of experienced and was very confident about this detailed memory [31]. New studies have found that the amygdala plays a role in encoding and retrieving the memories of significant public events, but it is highly debated if these "memories" are accurate enough to be considered their own category of memory [32]. Though these studies have high significance, the very long-term retention of flashbulb memory context has not yet been measured and studied. An additional issue with these studies is that flashbulb memories may deteriorate over time, just like everyday memories. Similarly, researchers question whether flashbulb memories are significantly different from everyday memories, which are susceptible to distortion as seen in **Figure 2** [33].



**Figure 2.** Stress can be beneficial to an extent, eustress, but may also become harmful, distress, if the level of stress is too high. Although more research must be conducted to identify if there is mathematic formula to calculate the peak of eustress, this is where maximum performance occurs, as seen in the bell curve above. When stress is past this peak, the reliability of memories decreases significantly. Batson, J. (2011). *What is Stress?* The American Institute of Stress. <https://www.stress.org/daily-life>.

#### 4) Dissociative Phenomena

Dissociation is when memory patterns stemming from traumatic experiences lead to stress symptoms, such as amnesia, depersonalization, and derealization. Derealization causes patients to perceive the world as distorted, falsified, or lacking depth, while depersonalization causes patients to question their physical reality and their consciousness [34]. This phenomenon works by compartmentalizing information in isolated fragments instead of as a unitary whole [35]. In dissociation, memory is not lost but, rather, temporarily unavailable for retrieval during a period of time [36]. Many researchers argue that there is little to no empirical support for such a theory, while others believe that this phenomenon helps survivors shelter themselves from the pain of some traumatic memories [36]. The type of trauma and age that the event occurs can be predictive of having dissociative phenomena later. For example, if a person is dissociating at the time of trauma, they are more likely to exhibit dissociation later in life.

Some researchers propose that dissociation is a way of organizing information, dividing attention, or creating distance from oneself [36]. Patients facing dissociation could be highly functioning or unable to function at all, but all patients face memory problems *i.e.*, childhood amnesia, time loss, black-outs, etc. Most patients with childhood amnesia also face dissociative phenomena later in life [36]. The Journal of Nervous and Mental Disease published an article that discovered that the strongest effect on severe forms of dissociative experiences was emotional neglect, suggesting that abuse and neglect have a significant impact on the development of dissociative psychopathology in adolescents [37]. On the other hand, another study published by Karger found that among childhood trauma types, only physical abuse and physical neglect predicted dissociation [38]. Though the exact causes of dissociative phenomena are still highly debated, more research is needed into childhood causes of dissociative phenomena and



their appearance in children during childhood. This may be partially due to the fact that relatively little empirical work that focused on dissociative symptoms in response to traumatic stress had been published when the DSM-IV and International Classification of Diseases-10 (ICD-10) were developed, and even less has been published on the pediatric side [39].

Although dissociation is a prevalent symptom in PTSD, with estimates ranging from 12-30%, many studies of patients with post-traumatic natural disaster events have not demonstrated a correlation between natural disasters themselves and dissociation, unlike other traumatic events, such as abuse which have a clear causal relationship with dissociative phenomena [40]. One such study explored 216 directly exposed survivors of mass shootings, floods, or a firestorm completed structured diagnostic interviews providing lifetime pre-disaster and post-disaster in the first 6 post-disaster months. Researchers found that neither general nor pathological dissociation was independently associated with disaster-related PTSD, indicating that dissociation does not appear to be a mental health outcome of disaster trauma [41]. Similarly, some clinicians who work with trauma victims believe that this dissociation is a person's way of sheltering themselves from the pain of the memory, while other researchers argue, however, that there is little or no empirical support for such a theory [27]. More research must be conducted into the mechanism and function of dissociation and its origins.

### **3. Post-Disaster Psychotherapy Treatment Approaches**

Many general psychological patient-based treatment approaches for trauma exist today. Although it is beneficial to have general treatments, it is vital to utilize as specialized treatments as possible for patients because personalizing treatments allows for more accuracy and success in restoring individuals to pre-trauma health. Additionally, there are even less effective psychological treatment approaches for post-traumatic natural disaster events for children and adolescents. Most treatment approaches, including CPT, PE, and CISD, are intended for adults after any traumatic event. At the same time, only some treatment approaches that have been researched to be effective for younger populations include Psychological First Aid and TF-CPT [42].

Conceptualizing many of these treatments can be helpful by using a Russian doll metaphor. The outermost covering, Psychotherapy, or talk therapy, is a way to help people with mental illnesses by controlling troubling symptoms to increase well-being and healing [26]. Inside psychotherapy, cognitive behavioral therapy, CBT is a big umbrella term for all processes and therapies having to do with behavioral therapy. Inside this term is cognitive processing therapy, CPT, a specific type of CBT focused on treating trauma. Inside CPT is TF-CBT, which approaches the trauma through a trauma lens and is more manualized but has higher dropout rates than CPT because it faces the trauma head-on.

To consider the gaps in research and effective treatments for children and

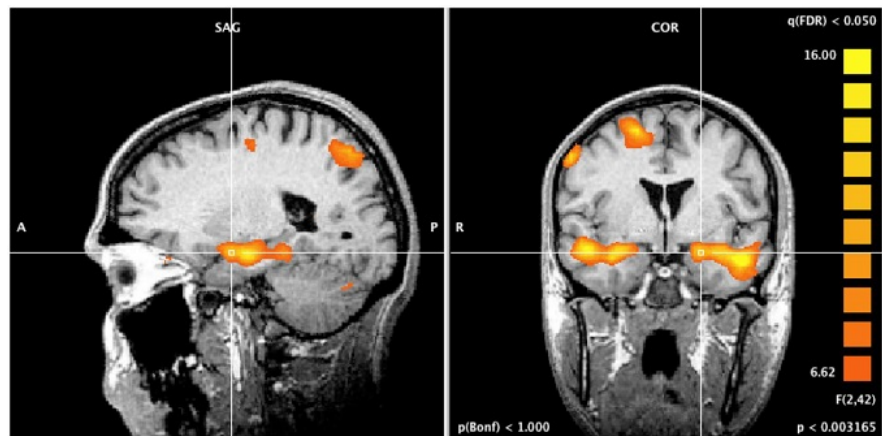
adolescents, initial Sections (1 - 4) will focus on psychological treatments for adults and their potential for application in post-traumatic natural disaster events, then commenting on potential treatments in later Sections (4 and 5) for younger patients.

### 1) Cognitive Processing Therapy CPT

A type of long-term psychological therapy is CPT; Cognitive Processing Therapy is a specific type of cognitive behavioral therapy, CBT, which reduces PTSD symptoms after natural disasters [43]. Typically, CPT is delivered over 12 sessions to help patients learn how to modify negative attitudes and practices related to their trauma. The goal is that the patient then creates a new, more positive outlook and understanding of the traumatic event, which reduces ongoing negative effects on the patient's current life. CPT specifically focuses on the core trauma themes of safety, trust, power and control, esteem, and intimacy

CPT can be delivered both individually and in structured group sessions, where patients will have out-of-session practice assignments [43]. This allows for multiple different paths to receive effective treatment after a traumatic experience with natural disasters, so patients can be comfortable in either an individual or group setting while receiving treatment. In some studies, CBT, such as CPT, has shown it can be helpful in cases where medication alone has not worked, as it focuses on re-training thoughts and behaviors to form practical strategies that can be incorporated into everyday life to help patients cope better with future stresses and difficulties, even after the treatment has finished [44]. CPT has been especially successful, because it can be completed in a brief period of time compared to other talk-therapies, allowing for a lower patient dropout rate.

On the other hand, there are also multiple disadvantages to CPT. Due to the structured nature of CPT, it may not be suitable for people with more complex mental health needs or learning difficulties. Additionally, since CPT involves confronting emotions and fears, patients may experience initial periods of additional anxiety or discomfort. Some therapists also argue that because CPT only addresses current problems and specific issues, it does not address possible underlying causes of mental health conditions, and because CPT focuses on the individual's capacity to change themselves, it does not address wider systemic problems that have a significant impact on a patient's health and wellbeing [44]. Focusing on the narrow scope of psychotherapies post-natural disasters, regardless of pre-disaster health, CPT has been repeatedly proven to be a rather successful treatment approach. Although there have not been studies generalizing CPT for children, it is an effective treatment for adults [43]. The clear effectiveness of CPT demonstrates the importance of patient-specific, specialized therapies that are unique to the experiences of individual patients, as seen in **Figure 3** [45]. More research must be conducted into the effectiveness of CBT in children or similar treatments for pediatric patients.



**Figure 3.** FMRI imaging depict how CBT improves brain connections in people suffering from psychosis. The image above highlighting these stronger connections were proven to be associated with long-term reduction in symptoms and recovery eight years later. *Study: Cognitive Behavioral Therapy (CBT), not medication, drives long-term rewiring of the brain to help reduce psychosis symptoms.* (2017, January 27). SharpBrains. <https://sharpbrains.com/blog/2017/01/27/study-cognitive-behavioral-therapy-cbt-not-medication-drives-long-term-rewiring-of-the-brain-to-help-reduce-psychosis-symptoms/>.

CPT enhances executive connectivity; more specifically, Cerebellum connectivity lessens long-term impacts of trauma, such as through dissociation [45]. This increased connectivity is why CBT is often argued to be more effective than medication as seen in **Figure 3** [45].

## 2) Prolonged Exposure PE

Similar to CBTs, Prolonged Exposure, PE, is another effective, personalized, and highly popular psychological treatment for adults after natural disaster induced traumatic events [46] (About Prolonged Exposure Therapy|Center for the Treatment and Study of Anxiety|Perelman School of Medicine at the University of Pennsylvania, n.d.). PE is based on emotional processing theory, which states that traumatic events are not processed emotionally at the time of the event, but rather that fear is represented in memory as a cognitive structure, including representations of the feared stimuli, responses, and the meaning associated with the stimuli and its responses [47]. A fear structure typically represents realistic threats, but fear structures can become dysfunctional when the association between stimulus elements does not accurately reflect the real world but is instead incorrectly associated with threat or danger [48]. Unlike CPT, PE is more focused on revisiting the context of the traumatic event to alter the dysfunctional fear structures, so they are no longer problematic. By loosening up these structures, therapists allow patients to confront their avoidance of thinking or talking about the traumatic event. Over the course of the treatment, patients use imaginal exposure to process the memory repeatedly for 30 - 60 min and learn to use in vivo to approach situations that patients have been avoiding [49]. Therapists then predict discomfort during and between sessions, which they then use to teach patients cognitive restructuring to evaluate realism and assign homework. For example, if a patient was a tsunami survivor, triggers may be bodies of water,

swimsuits, etc., so during PE therapy, the patient and therapist will work together to encounter these triggers and work past them.

The biggest disadvantages to PE include the weekly time commitment and the forcing of patients to experience unpleasant feelings and memories. If patients are committed to their well-being and regaining mental health, PE has been proven to be highly effective for PTSD symptoms [48]. Although PE cannot be used for pediatric patients, PE is a treatment approach that is strongly recommended by both the APA and VA/DoD guidelines for the treatment of PTSD in adults [47]. A meta-analysis on the effectiveness of PTSD found the average PE-treated patient fared better than 86% of patients in control conditions on PTSD symptoms at the end of treatment [50]. Another similar study suggests that intensive PE, iPE, can be safe and effective in PTSD patients with multiple interpersonal traumas and after multiple previous treatment attempts. Although intensive prolonged exposure therapy for chronic PTSD patients following multiple trauma and multiple treatment attempts usually lasts several months with sessions being delivered on a weekly basis, this new study highlights that an accelerated administration of iPE in chronic PTSD patients can still be effective [51]. This study emphasized that although previous treatment attempts were unsuccessful in these patients, 71% showed partial or complete response during iPE with low dropout rates [51]. As seen by numerous studies, PE is clearly a very effective treatment approach to the post-traumatic events, such as natural disasters. More research must be conducted to evaluate the effectiveness of PE in pediatric patients.

### 3) Critical Incident Stress Debriefing CISD

Contrasting with the previous treatment approaches, Critical Incident Stress Debriefing, CISD, is a small group, supportive crisis intervention process [52]. CISD is a group natural disaster approach, and one of the many crisis intervention techniques which are included under the Critical Incident Stress Management Program, CISM, which is a protocol to help individuals involved in a “critical incident” to share experiences and be provided with referrals for further [53]. CISM is also sometimes referred to as “psychological first aid”. Unlike the previous treatment approaches, the CISD process does not constitute any form of psychotherapy, but is rather a supportive, crisis-focused discussion of a traumatic event, or a critical incident [53]. The main goal of CISD is to reduce distress and assist individuals in dealing with physical or psychological symptoms that are associated with trauma exposure by debriefing, allowing those involved with the incident to process and reflect on the event’s impact [52].

Despite its positive goal, there has been debate regarding CISD’s effectiveness in preventing PTSD symptoms and other psychological disorders, as it is iatrogenic. Although some researchers claim that most people who receive debriefing find it helpful, many critics of CISD argue that finding the treatment helpful does not equal preventing mental disorders or even reducing PTSD [54]. Some studies claim that the debriefing process of CISD may not only be ineffective but may also cause harm by potentiating PTSD symptomology due to patients re-

ceiving less personalized treatment, and instead, hearing the experiences of other individuals, which can lead to some believing that the traumatic experience of one group member is their own, worsening PTSD symptoms [55]. On the other hand, a study on traumatized bank employees found that when CISD is combined with other interventions within a CISM program the results are even stronger [55].

Given these conflicting findings from various studies, it may not be ethically justifiable to employ this intervention in light of evidence indicating not only that it does not reduce posttraumatic stress, but that it may also cause harm to patients despite many positive and effective findings as well. Additionally, CISD is often offered as compensation for traumatic events in the workplace because it is a cost and time-effective alternative to personalized therapies, such as CPT and PE, but since CISD does not appear to reduce psychological harm, it may be extremely unethical for companies to offer this group-therapy [56]. Some patients even report perceiving “feel better” momentarily after the traumatic event due to CISD, but given the lack of empirical support for the positive effects of CISD, they should not be used as the first line of treatment or prevention of PTSD until there is a better understanding of their effects through well-designed, controlled studies of future research [57].

#### **4) Psychological First Aid PFA**

Traditional disaster response—even when performed by psychologists—looks a lot more like triage work than traditional psychotherapy. Aid workers may only connect briefly with each person they help, and their primary functions are to provide emotional support and to help people access the resources they need most [58]. Once basic needs are met and high-risk individuals receive the additional help they require, psychologists typically turn their focus toward helping people build coping strategies, such as basic relaxation techniques and setting short-term goals.

Psychological First Aid, PFA, is a modular approach to helping children, adolescents, adults, and families immediately after and during disasters. The goal of this approach is to reduce the initial distress caused by traumatic events and to foster appropriate coping [59]. PFA can be provided by mental health or other disaster response workers who provide early assistance to patients as part of organized disaster response efforts. These providers may include first responder teams, incident command systems (ICS), faith-based organizations, Community Emergency Response Teams (CERT), Medical Reserve Corps (MRC), the Citizens Corps, and other disaster relief organizations [59]. The goals of PFA include establishing a human connection in a non-intrusive manner, providing physical and emotional comfort, orienting distraught survivors, gathering information as appropriate, and connecting survivors to social support networks [59]. This connection of survivors with social support reduces depressive and PTSD symptoms following natural disasters.

Overall, the purpose of PFA is to assess the immediate concerns and needs of an individual in the aftermath of a disaster and not to provide on-site therapy

[60]. After immediate concerns are addressed, professionals provide resource and connect patients to follow up resources, such as local therapists and support groups. PFA is extremely successful in reaching a variety of age, social, and ethnic groups. Its training offers a good understanding of how to offer some basic support to somebody who may be at a crisis point to all students wanting to learn PFA [42]. Although PFA has been proven to accomplish its goal of providing immediate care at the scene of the aftermath of disasters, as a relatively newly developed treatment, more research must be conducted to confirm its efficiency and gain statistics proving its success in reducing depressive and PTSD-related symptomologies [61]. Psychological First Aid provides immediate psychological care to those most in need after trauma and cannot be used for long-term care therapies.

### **5) Trauma-Focused Cognitive Behavioral Therapy TF-CBT**

In comparison to the previous treatment approaches of CPT and PE, TF-CBT, Trauma-Focused Cognitive Behavioral Therapy, is an evidence-based treatment for children and adolescents impacted by trauma as well as their parents or caregivers [62]. Research shows that TF-CBT successfully resolves a broad array of emotional and behavioral difficulties associated with single, multiple and complex trauma experiences [63]. TF-CBT is a conjoined parent-child treatment that uses cognitive-behavioral principles and exposure techniques to treat PTSD, depression, and behavioral problems [64]. The primary goal of TF-CBT treatment is to reduce PTSD symptoms among children and adolescents by providing a structure for the use of cognitive-behavioral principles, CBT, in the role of the caregiver and the developing nature of a child's coping abilities [64]. TF-CBT was designed to be delivered in about 8 - 25 sessions of outpatient treatment, depending on the needs and abilities of the child and caregivers, by addressing the emotional reactions of parents, caregivers, and children who were not involved in perpetrating the natural disaster or subsequent post-traumatic stress [65]. Key elements of TF-CBT intervention include psychoeducation, gradual exposure, behavior modeling, coping strategies, and body safety skills training [63].

Although more research is necessary to determine whether TF-CBT is effective in reducing behavior problem and symptoms of depression and how effective TF-CBT is in vulnerable populations, overall, TF-CBT has demonstrated positive outcomes in reducing symptoms of posttraumatic stress disorder [64]. In order to provide TF-CBT, clinicians must undergo a training program and get officially certified after taking a knowledge-based exam, thus allowing for a level of professionalism and knowledge prior to caregiving [63]. Additionally, 21 randomized controlled trials in the U.S., Europe and Africa comparing TF-CBT to other active treatment conditions, all documented that TF-CBT was superior for improving children's trauma symptoms and responses [63]. Many supplementary studies have also shown that traumatic stress and depression improve more with TF-CBT than with non-specific therapy, regardless of gender, ethnicity, race, and youth age [63].

## 4. Gaps, Limitations, and Future Directions in Research

### 1) Experimentation Methods in Uncontrolled Observational Studies

It is important to consider this review and the scope of literature in the context of its limitations. Unlike typical, controlled scientific experiments, psychological research cannot be conducted with complete control over the test subject's environment. For ethical reasons, memory researchers do not subject people to a traumatic event to assess their memory of it. Thus, memory-related trauma issues have not been directly studied and we cannot definitively know whether a memory of a traumatic event is encoded and stored differently from a memory of a nontraumatic event. This means that most psychological studies with memories and human emotions must be considered uncontrolled observational studies [66]. In these uncontrolled studies, all variables cannot be controlled, allowing for confounding variables, which influence both the independent and dependent variables, making cause-and-effect relationships seem present, even when they do not [67].

Additionally, evidence and studies are limited for highly vulnerable populations, such as children at high risk of suicidal or violent behavior, those with developmental disability, psychosis or substance use, and parents or caregivers with psychosis or substance use disorders [64]. For example, individuals with disabilities tend to have more intense PTSD symptoms; lower-income individuals tend to face higher impacts post-disaster financially and psychologically, thus worse mental health and additional pre-existing conditions. These groups are essential in understanding psychological trauma and the lack of research on these vulnerable populations lessens the reliability of our findings. Future studies in the field of memory research on post-traumatic events must focus on these more vulnerable minority populations to evaluate the validity of treatment approaches in diverse patient populations. This research would involve enrolling more diverse candidates into studies related to treatments of memory-related post-trauma conditions.

### 2) Intervention Timing and Provider Qualifications

In the field of trauma treatment itself, there has historically been debate in prioritizing groups who receive treatment, the timing of this intervention, and the qualifications of treatment providers, through creating and implementing a method of screening before intervening, which includes “who needs psychological intervention” and “who does not,” providers can get a better sense of whether individuals need intervention and if the given intervention will have a positive effect. If such a difference is found, our data can be more reliable. The timing of professional intervention should also be further addressed, because pushing people to discuss their feelings and thoughts shortly after trauma may not be beneficial, as seen by the negative effects of CISM when groups were forced to participate. Further research must be conducted to determine an ideal time for intervention in young people, and to determine who needs the intervention.

Additionally, the provider of the intervention should be a competent, well-trained

mental health practitioner who has experience working with individuals who have experienced trauma. It is concerning that some treatments, like CISD, is being implemented in vulnerable populations and is facilitated by providers with limited backgrounds in mental health education [55]. Future research must be conducted into the necessity for proper professional training, as well as the ideal timing of interventions. A potential study to determine if provider qualifications are creating different outcomes could involve studying various individuals' post-treatment for natural-disaster related trauma and their improvement comparative to other individuals who received care from providers with a lesser or greater education level.

### **3) Lack of Pediatric-Specific Case Studies**

Ideal trauma treatments after a natural disaster, scalable, efficient, and evidence based, are inadequate in children and adolescents. CPT and PE, two approaches used on children and adolescents, are not particularly designed for kids and may not work as effectively as specialized programs and treatments. The most common and currently the best treatment for youth, is TF-CBT, which has the highest success rate for lowering anxiety and depression in children after disaster. The next biggest priority in the research field for psychology, disaster preparedness, and emergency medicine, is the need for more trauma treatment method options for children and adolescents.

Some adult treatments, such as the idea of CISD, are promising because they are scalable but are iatrogenic, causing more harm than treating or addressing underlying trauma from disasters. Like TF-CBT, CISD is a generalized treatment approach for a large group of people who all have different perspectives and require personalized treatment approaches. CISD is especially harmful to children, who are easily influenced by the opinions and experiences of others and tend to internalize the experiences and emotions of others as their own. A potential future direction for researchers in the trauma-psychology field is creating a beneficial group therapy approach, as this would be both cost and time-effective if properly executed with appropriate training for psychologists wanting to use the approach.

### **4) Potential New Research during COVID-19**

Currently, the world is in the midst of a global pandemic with COVID-19. This pandemic has highlighted the pressing need to emphasize mental health services. Mental stresses have increased for many people, especially children due to social isolation and a lack of patterns in daily life. Like another natural disaster, this pandemic has also disproportionately affected lower income and more vulnerable populations. These factors have increased PTSD and other stress-related disorders in children and other vulnerable populations [68]. It is more crucial than ever to conduct more research into the effectiveness of new mental health treatment approaches in children and other missing populations from past case studies of memory and PTSD-related disorders post-natural disasters.

Additional research must also be conducted into current behavioral health responses to large-scale public health emergencies. By learning the effects of



psychological support on communities post-disasters, our ability to respond and recover from future events can drastically improve. For these studies to be conducted, there must be new tools and techniques developed and tested, as well as a screening method for past conditions of mental, physical, and drug/alcohol abuse in order [2]. Most current studies on this topic are observational studies, or epidemiologic study designs, that assess causation relationships to comparatively evaluate the accuracy of treatments, such as cohort designs and randomized controlled trials [69]. For these research studies to be verified there must be more prospective studies, which collect data over time [69]. New prospective studies must be conducted into the psychological effects of COVID-19 and the effectiveness of various pediatric treatments for post-traumatic natural disasters.

## 5. Conclusions

According to the CDC, “Every year, approximately 400 natural disasters occur worldwide. Added to these are 30 - 40 armed conflicts... The future may bring more calamity to more places around the world; climate change is a scientific certainty, and with it comes an increased level of dangerous weather events in all coastal areas around the globe” [70]. Additionally, as explained earlier, the toll on the mental health of individuals who survive these disasters must be taken care of for these individuals to have healthy and happy lives. In children and adolescents, this mental care is particularly essential due to the nature of trauma manifestation later in life, impacting the lives of younger individuals with more serious problems and for a longer period. Overall, the aim of this paper was to identify the best pediatric treatments for trauma post-natural disasters. Through reviewing various research studies and data sets, the current best pediatric psychotherapies were identified to be PFA and TF-CBT due to their high number of documented studies demonstrating their effectiveness in treating trauma in pediatric patients’ post-natural disaster-related stresses.

For large-scale changes to be made in improving pediatric trauma treatment approaches there must be long-lasting impacts on current policies and the healthcare system. These systems highly prioritize physical health over mental health and deemphasize long-term mental health care for post-traumatic events. Reforms must occur to prioritize mental health education, increase funding for psychotherapy research, and diversify individuals in psychology studies.

## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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### **Abbreviation Note List**

PTSD	Post-Traumatic Stress Disorder
FEMA	Federal Emergency Management Agency
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders
ICD-10	10 <sup>th</sup> Revision of the International Statistical Classification of Diseases
CBT	Cognitive Behavioral Therapy
CPT	Cognitive Processing Theory
PE	Prolonged Exposure
CISD	Critical Incident Stress Debriefing
PFA	Psychological First Aid
TF-CBT	Trauma Focused Cognitive Behavioral Therapy
ICS	Incident Command Systems
CERT	Community Emergency Response Team
MRC	Medical Reserve Corps
COVID-19	Disease caused by the SARS-CoV2 virus
CDC	Center for Disease Control