

Hurricane Helene's Aftermath: A First Responder's PTSD (A Case Report)

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Abstract

The primary focus of this article is directed towards the rehabilitation and restoration of function in a first responder tasked with identifying and recovering remains from the aftermath of Hurricane Helene. His involvement included operating a heat-seeking drone for identification purposes, as well as a Zodiac boat for the recovery of remains. Regarding his recovery involvement, he identified the deceased mother of a close friend, thereby triggering his PTSD reaction. Salient excerpts from his storm-induced treatment for PTSD are included in the case study section of this article.

A binaural sound-based intervention called RESET Therapy (RT) (Reconsolidation Enhancement by Stimulation of Emotional Triggers) has been found to rapidly unlock the emotional aspects of long-term memories of trauma among combat veterans with PTSD. An iPhone version of RT named Resolve-It! has been developed and utilized in this case report. Its purpose is to provide home-based support that exceeds what is available in a traditional office visit. Resolve-It! is a binaural sound generator device used for nonverbal remediation, control, and reduction of varied emotional or physiologically based difficulties.

Examples of targeted complications may include stress/anxiety/trauma reactions or other factors such as prolonged grief, pain, or addiction tendencies that are stored in key long-term memory sites in the brain. Within this context, our first responder was treated solely through telehealth for his PTSD condition. Foundational aspects of RT are elucidated, including method and theoretical perspective, as well as essential components of the reconsolidation process. Additionally, current research findings related to the cumulative stress response, including neuroinflammation, trauma, and the use of telehealth, are briefly reviewed.

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Introduction

Hurricane Helene occurred in late September 2024, causing at least 249 deaths, thereby producing the most lethal hurricane in the contiguous United States since 2005. The latter event was a consequence of Hurricane Katrina [1]. At least 59.6 billion in damages and recovery needs were estimated [2]. Among those who died, 106 people were in North Carolina, surpassing the state record of 80 deaths recorded in a 1916 flood [3]. The consequent effects on Western North Carolina were cascades of water running down inclined areas, causing destructive mudslides. In particular, Asheville, North Carolina, is situated in a basin surrounded by a mountainous terrain, leaving it susceptible to river runoff and extreme flooding [4].

Consequent to the storm, 42 deaths were reported in Buncombe County, as well as notable destruction of infrastructure and residential areas [5]. Among the reported fatalities, eleven members of one Asheville family were lost due to the storm's effects [6]. Additionally, the North Carolina Sheriff's Association reported that two officers were killed by flood waters during rescue operations

[7]. First responders were tasked with the responsibility of dealing with the aftermath of storm fatalities [8].

The case report aspect of this article focuses on the toll that Hurricane Helene took on a first responder responsible for handling the recovery of human remains. Where possible, the included research addressed a common aspect of our first responders' experiences. For example, he operated a heat-seeking drone to assist in the recovery of remains. Unfortunately, members of a family that he was close to were lost in the storm, and he identified one of these deceased individuals.

Cumulative Stress Response

Cumulative stress occurs among those who work in chronically challenging situations. It is a consequence of various anxiety-inducing factors, such as coping with situations in which one feels powerless, an inability to rest or relax due to job demands, heavy workloads, poor communication, and numerous frustrations. Over their years of service, many first responders face repeated exposure to ongoing stress and episodic trauma. Consequently, a shift may occur within the affected individual, leading to difficulties with emotional

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regulation, memory, and decision-making, along with symptoms like anxiety, depression, and trouble concentrating.

Urban search and rescue (SAR) involves coordinated efforts to locate and assist in the recovery of living and deceased victims following an emergency or disaster. Different search techniques are employed depending on the terrain and weather conditions. Aides such as drones are being utilized to help facilitate SAR operations [11]. A shift is occurring in the research of stress effects on drone operators from war-related trauma to civilian-related disturbance, such as that found among first responders [12].

Generally, there is an unspoken code among first responders regarding the handling of stress-related matters. In various professions, such as firefighting and law enforcement, it is expected that individuals suppress inner discomfort or discord lest others perceive this as a sign of weakness or a probable character defect. Customary means of addressing stress-related matters are typically available, such as using alcohol to neutralize the accumulating effects of stress [13]. When customary means fail, self-destructive inclinations emerge. “Despite a decline in national suicide trends, first responders in the United States are more likely to die by suicide than in the line of duty [14].

Concentrating on firefighters alone, a national cross-section of US firefighters found that 47% reported thinking about suicide, 19% admitted planning suicide, and 16% revealed they had attempted suicide during their fire service career [15]. Some estimate that firefighters are 72% more likely to die by suicide than the general U.S. working population [16]. Sadly, many factors may impede first responders from receiving help. Such factors include shame and stigma associated with mental health, lack of research and resources, and a belief that seeking mental health support will impact employment and/or peer perceptions [17].

Trauma

Traumatic responses are believed to become imprinted in an emotionally reactive part of the brain known as the limbic system, particularly in a region called the amygdala [18]. The effects consequent to experiencing traumatic encounters are thought to cause a condition called Post-Traumatic Stress Disorder (PTSD) [19]. Symptoms of this state include sleep disturbance, nightmares, changes in memory and concentration, intrusive thoughts, hyperarousal, flashbacks, and startle responses [20]. PTSD is believed to represent manifestations of stress-induced changes in brain structure and function, leading to long-term alterations in brain circuits involved in the stress response [21].

A 2025 study examined urban firefighters in the United States and Canada utilizing a 15-item measure of post-traumatic stress symptomology. Results from both countries were similar, with samples revealing “high odds ratios for PTSD due to the work strain variable” (p. 139). Overall results indicated that firefighters from both countries were four to six times more likely to develop PTSD as compared to those levels experienced by crime victims in the US [22].

Disaster relief workers may be triggered by personal life incidents that resonate with their experiences related to disasters [23]. Experiencing a personal loss in a particular incident has been found to result in higher “levels of trauma, anxiety, hopelessness, and a past-negative time perspective [24]. A 2024 study investigated post-9/11 military personnel with elevated PTSD levels and increased levels of trauma exposure. The results revealed accelerated levels of biological aging, thereby

lending support to the hypothesized association between PTSD and accelerated senescence. People with advanced aging have higher rates of disability, develop more chronic diseases, and have a greater risk of premature mortality [25].

Neuroinflammation

The current study explored the close relationship between PTSD and neuroinflammation. Neuro-inflammation is thought to be a defense response of the nervous system associated with the activation of neuroimmune cells such as microglia, which act as the resident immune cells, and astrocytes, which support neuronal function and synaptic activity [26]. The following authors analyzed the relationship between neuroinflammation, PTSD, and stress-induced activation of the hypothalamic–pituitary–adrenal (HPA) axis. They also investigated changes in inflammatory markers in brain regions related to PTSD, thereby providing new insight into the presence of neuroinflammation in PTSD [27].

Maladaptive stress, such as that present in PTSD, disrupts the nervous, endocrine, and immune systems. The effects of this disruption produce chronic neuroinflammation and severe neuro-psychiatric symptoms, resulting in serious immune system dysregulation. Emotional trauma increases neural connectivity, particularly involving enhanced communication between the amygdala (which detects threats), the insula (which perceives awareness of the physical body and emotions), and the hippocampus (which stores memory) [28].

“From a teleologic perspective, it follows that a nervous system response to threat resulting in hypervigilance may also manifest in an immunological response to threat, i.e., inflammation. It appears that stress/trauma begets inflammation, and inflammation begets mental health disorders and an increased the risk of developing PTSD” [28].

Different features of memory are affected in PTSD, such as the shutting down of executive functioning, resulting in difficulty learning and remembering new items. In particular, verbal items related to the speech center of the brain become negatively impacted. Limbic system activation triggers flashbacks that contain prominent sensory elements, as well as emotions and bodily sensations [19]. Brodmann's area 19 is primarily associated with visual processing [29]. Increased activation in PTSD may replicate the vivid visual components of traumatic memories that intrude as flashbacks [30].

Method & Theoretical Perspective

RESET Therapy (RT) (Reconsolidation Enhancement by Stimulation of Emotional Triggers) is a remedial treatment that harnesses resonating binaural sound to alter the restoration/reconsolidation of targeted trauma memories. Through the use of uniquely attuned binaural sound frequencies, the intervention blocks the negatively hyper-aroused emotional and somatic aspects of trauma from being restored into long-term memory. The memory is selectively ‘lit up’ (or triggered) in the emotionally sensitive regions of the brain, such as the amygdala, through the patient’s intentional focus. The treatment aims to identify a resonant sound frequency that reverberates with the disturbing memory. The term ‘target’ is used in RT, suggesting that the investigators are going to turn off the ‘switch’ in the brain that produces the PTSD symptoms [31].

Within this context, change is perceived to occur through a profound sensory shift that restores brain circuitry to a homeostatic balance. A unique feature of RT is that, due to its non-verbal nature, the patient is spared from the shame and

vulnerability associated with potentially embarrassing self-disclosure. Similarly, the therapist is less inclined to develop secondary aspects of PTSD due to frequent secondary exposure to traumatic material [32]. While still considered experimental, RT therapy is rapid in its effects, requiring fewer treatment sessions than conventional psychotherapies.

Cumulative evidence has identified associations between the immune and inflammatory systems and trauma [33]. It is known that traumatic experiences produce elevated rates of proinflammatory markers. This emerging reality becomes the challenge facing the mental health practitioner who has traditionally approached the issue primarily from a psychodynamic or cognitively-based point of view.

Three Foundational Pillars

The transformative nature of RT stems from the discovery, made around the turn of the century (2000), that interfering with the memory reconsolidation process can facilitate the alteration of long-term, stored emotional memories [34]. RT is considered a transformational method, which posits that traumatic memory circuits have unique frequencies distinct from those of normal memory circuits [35].

Three pillars of neuro-scientific knowledge form the basis for RT Therapy. The work of Nader and associates forms the first essential column. The authors reported that “New memories are initially labile and sensitive to disruption before being consolidated into stable long-term memories” (36). Restated, their findings suggest that every time a fear memory is re-energized, it is re-established (reconsolidated or restored) primarily in the amygdala and hippocampus brain regions. Theoretically, one might perceive of these brain regions as being equivalent to a locked storage vault for long-term, emotionally charged, traumatic memories.

The transformative treatment approach noted in LeDoux’s work is one where certain aspects of a traumatic memory (e.g., the fear component or strong emotional component) are effectively ‘erased’ from stored memory. The content aspect of the disturbing memory remains, but the intense emotional aspect drops out once the memory has reconsolidated. According to Ecker et al., transformational approaches involve several naturalistic steps in the change process, including the brain’s unlearning and erasure of a targeted component of memory. The steps involved include:

A. The index trauma or target must be reactivated or triggered using salient cues.

B. There must be a mismatch and unlock by creating a new experience that is at odds with the patient’s implicit non-verbal understanding of how the world works. With RT, the mismatch is created through identifying personally unique binaural sound frequencies, which unlock memory circuits, making them labile and susceptible to being updated by new learning.

C. There is a window of vulnerability of approximately 5 hours’ duration before the memory synapses have relocked to store the newly reconsolidated material [37].

The second support pillar is related to the development of a binaural sound generator called the Bio-Acoustical Utilization Device [38], which has the capability of producing a selective binaural beat that serves as the vehicle for change. Once the selected frequency has been established, an offset frequency (binaural) is attuned to where it subjectively causes the target-related sensations to fade or diminish.

The third foundational pillar is related to the pioneering work by Lindenfeld et al., which has led to the finding that unique sounds can become an effective ‘key’ to temporarily disengage and alter the stored emotional aspects of the hippocampal-based memory storage system [39].

Telehealth Treatment

Telehealth offers a promising and effective way to deliver treatment for PTSD through HIPAA-compliant platforms, thereby increasing access to care and overcoming barriers for individuals who may otherwise struggle to access treatment. A recent study evaluated clinical outcomes for PTSD symptoms that were offered as an employer-based mental health benefit for employees. 82.91% of participants experienced either improvement or recovery of PTSD symptoms [40]. Other authors note that PTSD telehealth treatment has consistently demonstrated a significant reduction in PTSD symptoms [41-42].

The exploratory development and addition of an iPhone version of RT extends access and affordability to a vast array of potential users. Thus, the ability of those with mental health conditions to experience an affordable binaural-sound-based treatment via personal or telehealth means becomes a distinct and unique possibility. Furthermore, it enhances patients’ access to self-sustaining remediation over time and distance, thereby improving their mental health.

The author and colleague had program developers create an auxiliary iPhone app called ‘Resolve-It!’ to facilitate an active and ongoing treatment process for individuals seeking trauma remediation. Specifically, Resolve-It! is a binaural sound generator used for the remediation, control, and reduction of varied emotional or physiologically based difficulties. Examples of targeted issues may include stress/trauma reactions or other factors such as prolonged grief, pain, or addiction that are stored in key long-term memory sites in the brain.

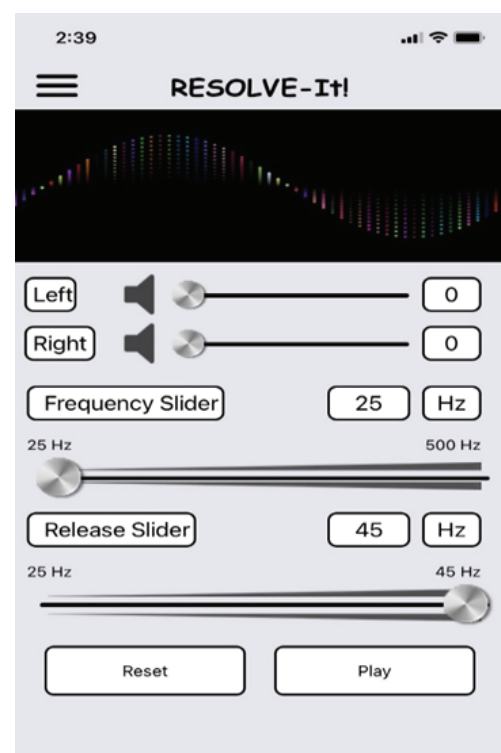


Figure 1. Resolve-It! Image.

The application has been specifically designed to use a combination of separate and specific independent volume controls and sound generators for each ear. The volume control sliders are measured in decibels (dB), ranging from 0 to 100. The sound intensity is contingent upon the volume control level that the iPhone is set at. In contrast, the left ear frequency slider is set to range from 25 to 500 Hertz (Hz). The secondary right ear frequency slider resets itself to the frequency selected in the left ear slider and then creates an additional range of 20 Hz. For example, if a frequency of 380 Hz is identified in the left ear, the secondary range in the right ear will extend from 380 to 400 Hz. When the frequency and offset settings are correctly identified by the treating therapist or trained patient, a rhythmic pulsating sound will be noticeable midway in the mind. This is referred to as the resonant frequency.

Case Report

John Casey (Fictitious name) (JC) is currently employed as an officer with the Asheville Fire Department located in Buncombe County, North Carolina. He has nearly 20 years of service, following in his father's footsteps, who had served as a volunteer firefighter. He initiated contact with this psychologist via telehealth, which occurred on 12/04/2024, reporting that:

"Since Hurricane Helene, things have set me back. I was involved with the recovery of bodies from the storm, and it has affected me. I've been having flashbacks related to this matter. It has also affected my marriage. Yesterday, I was involved in a task with a fire truck, and I ended up breaking down and crying. We recovered numerous remains from the storm, and now I find myself struggling to shut down my emotions. My wife says I'm quick to get upset."

JC endorsed experiencing intrusive thoughts, avoidance tendencies, hyperarousal, and negative mood changes. Clinically, he met the criteria for the diagnosis of Post-Traumatic Stress Disorder (PTSD). For the uninformed, PTSD is a persistent condition consequent to mental and emotional stress that occurs as a result of injury or severe psychological shock. The condition produces a vivid and intense recall of trauma, resulting in dulled responses to others and to the outside world in general.

Two weeks later, he reported that:

12/18/2024: "Emotionally, I've had a difficult time with the past two work periods. For example, last night, there was a double homicide with one shot in the chest and the other in the head. These were young people, and it's hard for me to deal with that. On an earlier day, I had to deal with a guy jumping off a bridge. I'm becoming numb to a lot of the stuff. I want to focus on the hurricane-related work so I can feel like myself again. My mood and my attitude have been troublesome. I don't want to continue feeling like this."

Throughout the therapy session, which took place via telehealth at the fire station, JC was listening to calls related to a fire that had occurred in downtown Asheville. The reason for this was that he might be activated to respond at any time. "This is my life. Even when I'm not on call, I'm on call."

On 12/25/2024, JC shared that:

"I've been getting into arguments with my wife. We got into a heated argument this past Friday. I got pissed off about some things. This incident occurred in front of the children. Things had been bothering me about her over the past week or two, and the issue had been building up. I gotta figure out how to not let

my emotions get the best of me. I need to learn how to discuss things when they arise rather than keeping them inside."

1/18/2025 - "I'm still having issues with the after-effects of Helene. I was on duty for 11 days straight and only got to sleep at my own house for 2 or 3 nights. What bothers me most is the tragic loss of my close friend's parents and her son. The father was a professional person, and the storm swept away his office. I was at the riverbank and saw it happen. I can't get the images out of my mind."

Due to his crisis state, JC was initially provided with foundational support, including training in diaphragmatic breathing procedures, followed by instruction in meditation practices that enabled him to quiet his overthinking tendencies. His next step involved training in the use of Subjective Units of Distress (SUDS) so that he might estimate changes in the trigger intensities that he experienced. JC came to understand that this treatment approach was dependent solely on sensory factors rather than his thought processes. He would frequently say, "I have to feel it to heal it."

He was next instructed in the use of Resolve-It! trying out the app within the context of a telehealth treatment session. He experienced immediate success, noting a distinct change in his overall demeanor. Consequently, he frequently used the app independently. The results of these efforts are demonstrated in the following verbatim material.

2/10/2025- JC reports that he has been managing his anger better than before.

When I do the sound treatment, it's wild. Like last night, the wind was terrible, but the sound eased my mind. I felt good. I talked. I didn't get angry. I was, like, speaking my mind. Since I've been through this treatment, when I encounter others who have gone through things like I have, I can help them out. I'm able to converse with people in a straight, clear, and focused manner. When I go through a tour, which is four shifts, I'm likely to be involved with at least one death. We had one last week and one the week before that. One of them was someone's dad. It's as if the treatment has made me more resilient.

2/17/2025 - In his next visit, JC provided an overview of his therapy experience,

"When I started, I had never been in therapy before, so I was skeptical. As I delved into it, the layers began to peel away. I found myself opening up, changing. Among the first things I learned was belly breathing, but I also discovered the importance of putting my mind in a neutral state through meditation, which I found to be the most crucial step at that time. Before I knew this, it seemed as though I couldn't stop my mind from overthinking.

The very first time we did the binaural sound, you coached me on what to do. I was thinking, 'What the hell?' but then I thought, 'What do I have to lose?' You taught me that the best way to create the experience was to imagine being fully immersed in it, as though I were in a movie. Then, I was to bring all of my involved feelings that were present, including sight, sound, smell, and skin sensation. You told me about Subjective Units of Distress (SUDs), which range from a maximum level of 10 to 0 (none), and to identify the intensity of the target so I could report the level back to you.

You taught me how to find the sound frequencies that connected with the things that triggered my emotions. The way I experienced it, I imagined a tightly closed flower bud, and then the sound allowed it to open rapidly and bloom into a blossom. All of this happened within about five minutes. On the SUD

scale, I initially rated my negative feelings as a seven, and after five minutes, they had dropped to a three.

After this experience, you asked me to bring it up again, but I wasn't able to bring up my feelings about it. They were gone! Now, I'm able to discuss my Hurricane Helene experience without being unsettled by it. Things have been going pretty well for me. I've had no reoccurrence of the emotional parts of the traumas related to my involvement in the storm."

As evidenced in the following excerpts, JC was fully able to recall and elucidate emotionally charged material without experiencing triggered reactivity within himself. Before his training, he was frequently preoccupied with thoughts about the matter and suppressed his recollection of the events that occurred during the storm. He reported that, following his repeated use of the app, his mood had normalized, as had his memory and interpersonal relationships. He continues to use the app to maintain his resilience within the context of the traumatic events he frequently faces.

3/07/2025: "The first storm incident I was involved in occurred on the day the hurricane made landfall. I was in quickly rising water, about knee-deep, directing three fire personnel who were on a zodiac boat team. We were assigned to rescue nine people from a homeless encampment. One of them came out and said that you gotta be careful because someone's got a gun in there. The police went back with the homeless guy to defuse the situation because they were told that the guy with the gun was scared. One of the ladies there was quite large, and she had a sizable scooter-like device that was underwater; she wanted us to help her retrieve it. We told her that we couldn't do that because we couldn't get it on the boat. She gave us a hard time, cussing at us, but we were able to get everybody out without incident.

Following that, we returned to the command center, where there were only two of us, and communication was limited. The division chief said that everybody was staying, nobody was going home, because many of the men couldn't make it in. That morning, I learned that the power was out all over town, including the house where my daughter was. I learned through her mother's call that a tree had destroyed the house, and her mother wasn't there with her. This worried me greatly because I couldn't leave to check on her. Even if I could have gone, there was no access to her because the trees were down and the roads were blocked. I didn't know if she was ok, and we were told to stay there. After worrying about her throughout the day, I finally learned that she, her grandmother, and her grandfather were able to crawl out of the house and were okay.

The flooding continued, and people needed to be rescued from their homes and apartments. I recall that approximately 48 calls were coming in that required prioritization. There were many things we couldn't reach due to fallen trees, rising water levels, and roads that had washed away. On one occasion, a tree fell onto a fire truck, forcing the crew to evacuate. The wind was also blowing quite hard during those first few days. My crew got split up, and we didn't have enough people to do the job.

Four days into the storm, we moved into the recovery of bodies stage. Previously, I had been trained as a drone operator and obtained my state license. Part of the training included preparation for using the heat-seeking drone in hurricane winds. Throughout the storm, I was intermittently in the command bus where the drone was located. I flew the drone to sites where I thought there might be cadavers. I then directed boat teams to those locations.

At one site, there were several houses where the road had washed out. I had a heat-seeking sensor on my drone and used it to identify eight remains. Many of them were older persons who did not want to leave their property during the storm. What bothered me about that particular matter was that all those people could have been saved! Because of their stubbornness, they decided to stay.

Another incident involved the loss of my close friend's mother, father, and son. Someone at Biltmore's Estate was conducting cleanup and contacted us, stating that he believed he had located a body in the mud. We brought the cadaver dog on board and proceeded to the scene. The fellow said, 'I think there may be a body in that pile of rubbish there.' I investigated and was pretty sure that we had found a body. There were about eight feet of debris, including pallets and various types of junk, and we began digging.

When we reached the body, I was able to identify her because of the name on the driver's license in her pocket. I instantly knew it was my friend's mother, and because of this, I felt the urge to gently touch and cleanse her face before placing her in a body bag. At that moment, I felt terrible. The day before, I was notified by the guys in the Zodiac that bodies had been found down further on the other side of the river, including my friend's dad and her son. I had grown up with their daughter and considered her to be a close friend.

I was assigned to dispatch that night and was unable to sleep. I kept thinking about that incident. Someone from my friend's family called me to inquire about the situation, and I couldn't do it. One thought that went through my mind was that at least they were together. I believe that helped me deal with it at that time, to some extent. In retrospect, I think this is where my PTSD began. Afterwards, as I reflect on it, I identified a total of 22 or 23 remains.

Another event I recall took place near a machine shop. I heard shooting occurring up the road, and we ran and hid. Hearing those gunshots and not knowing where they were coming from was concerning to us. A significant amount of looting occurred around that time, which temporarily halted our recovery efforts.

At around 10:00 that night, I went to check on the guys at the federal building by myself because they weren't answering the radio. In retrospect, I shouldn't have done that. When I arrived, I saw four guys walking toward a fire truck about 25 yards away. A curfew was in place, beginning around 7:00 o'clock. I looked away for a second, and then I could see only one guy left. I figured they were trying to break into the fire truck to steal equipment.

I told the guy standing guard that a curfew was in effect, and he then cursed me out. I told him that he and his four friends had to vacate the area because it was federal property. I said, I think you and your friends might consider leaving the area now because I have backup coming any minute. The guy went off toward his friends, cussing at me, and then they all left. Afterwards, I thought that was a pretty close call.

Discussion

This case report documents the first use of a binaural sound-based app called Resolve-It!, which is specifically designed to remediate PTSD via a telehealth platform. JC was selected for this study due to his status as a first responder, which required him to participate in the recovery of human remains following a destructive storm. Following Hurricane Helene, this firefighter sought to avoid emotionally charged events, had difficulty

articulating his experiences, and struggled with recalling details. He willingly participated in the study, noting that: “If this could help me, it could also help my fellow first responders.”

Conclusion

Selectively adjusted binaural sound demonstrates efficacy in the rapid remediation of PTSD, whether it be through a hardwired instrument or a phone-based app. Furthermore, the treatment appears to be effective whether it's delivered through in-person meetings or the telehealth interface. The latter option appears to have sustained resilience in our case report recipient on an ongoing basis. For first responders, this offers effective intervention to remediate the effects of future traumatic encounters rapidly.

Unfortunately, due to the crisis state that this first responder presented in, immediate therapeutic intervention was necessary. This precluded the use of pre- and post-treatment psychometric measurements and/or brain-mapping procedures. Thus, we are left with only a subjective perspective of the effectiveness of the intervention. If feasible, a future case study will be conducted using pre- and post-measures.

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Institutional Review Board Statement

This case report is not a formal study.

Informed Consent Statement

The case report participant reviewed and approved of submission of this article.

Data Availability Statement

All of the generated data can be found within the article.

Conflicts of Interest

The author declares no conflicts of interest as the referenced app is currently available at no cost through the Apple Store.

References

1. Brewin CR, Atwoli L, Bisson JI, et al. Post-traumatic stress disorder: evolving conceptualization and evidence, and future research directions. *World Psychiatry*. 2025;24:52-80. doi:10.1002/wps.21269
2. Bruce MJ, Pagán AF, Acierno R. State of the science: evidence-based treatments for posttraumatic stress disorder delivered via telehealth. *J Trauma Stress*. 2025;38:5-15. doi:10.1002/jts.23074
3. Bourassa KJ, Garrett ME, Caspi A, et al. Posttraumatic stress disorder, trauma, and accelerated biological aging among post-9/11 veterans. *Transl Psychiatry*. 2024;14:4. doi:10.1038/s41398-023-02704-y
4. Carson LM, Marsh SM, Brown MM, Elins KL, Tiesman HM. An analysis of suicides among first responders—Findings from the National Violent Death Reporting System, 2015–2017. *J Safety Res*. 2023;85:361-370. <https://pmc.ncbi.nlm.nih.gov/articles/PMC11284622/pdf/nihms-2009932.pdf>
5. Du J, Diao H, Zhou X, et al. Post-traumatic stress disorder: a psychiatric disorder requiring urgent attention. *Med Rev*. 2022;2(3):219-243. doi:10.1515/mr-2022-0012
6. Ecker B, Ticic R, Hulley L. *Unlocking the Emotional Brain: Eliminating Symptoms at Their Roots Using Memory Reconsolidation*. New York, NY: Routledge; 2012. doi:10.4324/9780203804377
7. Gonzalez DE, Lanham SN, Martin SE, et al. Firefighter health: a narrative review of occupational threats and countermeasures. *Healthcare*. 2024;12(4):440. <https://pmc.ncbi.nlm.nih.gov/articles/PMC10888326/>
8. Hagen AB, Cangialosi JP, Chenard M, Alaka L, Delgado S. National Hurricane Center Tropical Cyclone Report: Helene (AL092024). 2025. https://www.nhc.noaa.gov/data/tcr/AL092024_Helene.pdf
9. Henderson A, Jewell T, Huang X, Simpson A. Personal trauma history and secondary traumatic stress in mental health professionals: a systematic review. *J Psychiatr Ment Health Nurs*. 2025;32:13-30. doi:10.1111/jpm.13082
10. Hori A, Murakami M, Oshima F, van der Wijngaart R. Feasibility of schema therapy for recurrent depression in a disaster relief worker with prior post-traumatic stress disorder treatment using prolonged exposure therapy. *Behav Sci (Basel)*. 2024;14(12):1156. <https://www.mdpi.com/2076-328X/14/12/1156>
11. Kearney BE, Lanius RA. Why reliving is not remembering and the unique neurobiological representation of traumatic memory. *Nat Ment Health*. 2024;2(10):1142-1151. <https://www.nature.com/articles/s44220-024-00324-z>
12. Kinderlehrer DA. Inflammation as the common pathophysiological linking stress, mental illness, autoimmunity, and chronic disease. *J Biomed Res Environ Sci*. 2024. <https://www.jelsciences.com/articles/jbres1889.pdf>
13. Kwon HS, Koh SH. Neuroinflammation in neurodegenerative disorders: the roles of microglia and astrocytes. *Transl Neurodegener*. 2020. <https://link.springer.com/content/pdf/10.1186/s40035-020-00221-2.pdf>
14. Lanius RA, Williamson PC, Densmore M, et al. The nature of traumatic memories: a 4-T fMRI functional connectivity analysis. *Am J Psychiatry*. 2004;161(1):36-44. doi:10.1176/appi.ajp.161.1.36
15. Lawlis F. About the BAUD. 2006. <http://www.baudtherapy.com/about.htm>
16. Li J, Tong L, Schock BC, et al. Post-traumatic stress disorder: focus on neuroinflammation. *Mol Neurobiol*. 2023;60:3963–3978. doi:10.1007/s12035-023-03320-z
17. Lindendorf G, Rozelle G. PTSD: brain on fire: a RESET Therapy (QEEG) brain map analysis case study of an Afghanistan combat veteran. Unpublished manuscript. 2015. https://www.academia.edu/19524765/PTSD_Brain_On_Fire
18. Lindendorf G, Rozelle G, Soutar R, Hummer J, Sutherland M. Post-traumatic stress remediated: a study of eight combat veterans. *New Mind J*. 2019. <https://nmindjournal.com/post-traumatic-stress-remediated-a-pilot-study-of-8-combat-veterans/>
19. Lindendorf GL, Rozelle G, Hummer J, Sutherland MR, Miller JC. Remediation of PTSD in a combat veteran: a case study. *NeuroRegulation*. 2019;6(2). https://www.researchgate.net/publication/335209889_Remediation_of_PTSO_in_a_combat_veteran_A_case_study
20. Longestay O. Search and rescue (SAR). In: *The Routledge Handbook of Disaster Response and Recovery*. Routledge; 2025:27-35. <https://www.taylorfrancis.com/chapters/edit/10.4324/9781003414834-5/search-rescue-sar-oriane-longestay>
21. Maidenberg M. What first responders teach us about cumulative stress. *Psychol Today*. 2021. <https://www.psychologytoday.com/us/blog/being-your-best-self/202101/what-first-responders-teach-us-about-cumulative-stress>
22. Miller E. NC's cost for Hurricane Helene damage is nearly \$60 billion, state says. *WRAL.com*. December 17, 2024.
23. Morales C. 106 people still missing after Hurricane Helene. *The New York Times*. October 22, 2024. <https://www.nytimes.com/2024/10/22/us/helene-north-carolina-missing.html>
24. Morland LA, Wells SY, Glassman LH, et al. Advances in PTSD treatment delivery: review of findings and clinical considerations for the use of telehealth interventions for PTSD. *Curr Treat Options Psych*. 2020;7:221-241. doi:10.1007/s40501-020-00215-x
25. Nader K, Schafe GE, Le Doux JE. Fear memories require protein synthesis in the amygdala for reconsolidation after retrieval.

- Nature. 2000;406(6797):722-726. <https://pubmed.ncbi.nlm.nih.gov/10963596/>
26. North Carolina Department of Health and Human Services (NCDHHS). Hurricane Helene storm-related fatalities. 2025. <https://www.ncdhhs.gov/assistance/hurricane-helene-recovery-resources/hurricane-helene-storm-related-fatalities>
27. Ober R. Helene death toll rises to 106 in North Carolina. Citizen Times. February 12, 2025. <https://www.citizen-times.com/story/news/local/2025/02/12/helene-death-toll-rises-to-106-in-north-carolina/78473844007/>
28. Owusu JT, Wang L, Chen SY, et al. Real-world evaluation of an evidence-based telemental health program for PTSD symptoms. *Sci Rep*. 2025;15:730. doi:10.1038/s41598-024-83144-6
29. Oz IT, Cona G. Impact of indirect trauma and disaster media exposure on psychological states and temporal processes: the case of the 2023 Turkey earthquakes. *Clin Psychol Psychother*. 2024;31(6). <https://onlinelibrary.wiley.com/doi/pdf/10.1002/cpp.70008>
30. Rotunda RJ, Herzog J, Dillard DR, King E, O'Dare K. Alcohol misuse and correlates with mental health indicators among firefighters. *Subst Use Misuse*. 2024;60(2):236-243. doi:10.1080/10826084.2024.2422975
31. Ruderman Family Foundation. The Ruderman White Paper on Mental Health and Suicide of First Responders. 2018. <https://www.responder1.org/wp-content/uploads/2020/05/Ruderman-Foundation-Report-2018.pdf>
32. Russo C, Myers-Hunziker S. More research needed to understand PTSD-related injuries. *Breast Cancer*. 2025. <https://apuedge.com/more-research-needed-to-understand-ptsd-related-injuries/>
33. Sab M, Chen C, El-Hage W, et al. Half a century of research on posttraumatic stress disorder: a scientometric analysis. *Curr Neuropharmacol*. 2024;22(4):736-748. <https://pubmed.ncbi.nlm.nih.gov/37888890/>
34. Schiller D, Monfils MH, Raio CM, et al. Preventing the return of fear in humans using reconsolidation update mechanisms. *Nature*. 2010;463(7277):49-53. doi:10.1038/nature08637
35. Shalev A, Cho D, Marmar CR. Neurobiology and treatment of posttraumatic stress disorder. *Am J Psychiatry*. 2024;181(8):705-719. doi:10.1176/appi.ajp.20240536
36. Sherin JE, Nemeroff CB. Post-traumatic stress disorder: the neurobiological impact of psychological trauma. *Dialogues Clin Neurosci*. 2011;13(3):263-278. doi:10.31887/DCNS.2011.13.2/jsherin
37. Snipes A. Hurricane Helene kills 11 people, one Asheville family. *Fox Carolina*. October 10, 2024. <https://www.foxcarolina.com/2024/10/10/hurricane-helene-kills-11-people-one-asheville-family/>
38. Theodoratou M, Kougioumtzis GA, Yotsidi V, et al. Neuropsychological consequences of massive trauma: implications and clinical interventions. *Medicina (Kaunas)*. 2023;59(12):2128. doi:10.3390/medicina59122128
39. Van der Kolk BA. *The Body Keeps the Score: Brain, Mind, and Body in the Healing of Trauma*. New York, NY: Viking Penguin; 2014. <https://www.amazon.com/Body-Keeps-Score-Healing-Trauma/dp/0143127748>
40. Vigil NH, Beger S, Gochenour KS, et al. Suicide among the emergency medical systems occupation in the United States. *West J Emerg Med*. 2021;22(2):326-332. doi:10.5811/westjem.2020.10.48742
41. Witt AC. A brief history of debris flow occurrence in the French Broad River watershed, western North Carolina. *N C Geogr*. 2005;13. <https://www.researchgate.net/publication/260076217>
42. WXII. North Carolina sheriff employees killed in flood waters. 2024. <https://www.wxii12.com/article/north-carolina-sheriff-employees-killed-flood-waters/62446588>