

Centering prayer in the treatment of Post-Traumatic Stress Disorder (PTSD)

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Abstract

Post-traumatic stress disorder (PTSD) is a mental and behavioral disorder that develops from experiencing a traumatic event. A significant proportion of sexual assault survivors develop PTSD. Research indicates that 75% of sexual assault survivors meet the criteria for PTSD one month after the assault. PTSD treatment combines psychotherapy, medication, hypnosis, meditation, and emerging therapies to help individuals manage trauma-related symptoms and regain control over their lives. Nonetheless, despite advances in PTSD treatments, there remains a pressing need for new approaches to address gaps in current care. We recently demonstrated that centering praying (CP) is useful in treating Parkinson's disease.

Objective: To treat female patients complaining of PTSD due to sexual abuse or rape with CP.

Methods: We will develop a randomized controlled trial studying five females from 18 to 35 years old who complain of PTSD due to sexual abuse or rape. Five women paired in an age without any neurological, psychiatric, or systemic disorder will be the control group. Patients will be randomly selected blindly according to the DSM-5 criteria by two neurologists. Comorbid major psychiatric disorders, substance abuse, or severe medical conditions will be excluded. Each patient and the control subjects will be studied by computer tomography to exclude any neurological condition. Outcome Measures will be the PTSD Checklist for DSM-5 (PCL-5) and the quantitative computer tomography (QEEGt). Secondary outcomes will be the PHQ-9 (Patient Health Questionnaire-9) to assess depression specifically,

Results: Demographic data showed a significant improvement in patients' clinical condition assessed by PLC-5 and PHQ-9 after CP treatment. QEEGt records demonstrated a stable pattern in all five patients: an increase of theta activity (4–8 Hz) in the left parietal-temporal-occipital areas of PTSD patients. Figure 3 shows a grand average of the five patients, demonstrating an important augmentation of theta activity in this region. Z-values in the QEEGt map show a progressive decrement of the statistically significant Theta increment above our normative data as long as the CP treatment progresses.

Conclusion: We conclude that CP appears to offer a distinct and accessible pathway for managing PTSD, promoting emotional regulation, resilience, and a sense of inner peace rooted in spirituality.

Keywords: Posttraumatic stress disease (PTSD); Centering Prayer (CP); Quantitative electric tomography (QEEGt); Delta band; Sexual abuse; Depression

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1 Introduction

Post-traumatic stress disorder (PTSD) is a mental and behavioral disorder that develops from experiencing a traumatic event, such as sexual assault, warfare, traffic collisions, child abuse, domestic violence, or other threats to a person's life or well-being. Symptoms may include disturbing thoughts, feelings, or dreams related to the events, mental or physical distress to trauma-related cues, attempts to avoid trauma-related cues, alterations in the way a person thinks and feels, and an increase in the fight-or-flight response. These symptoms last for more than a month after the event. Young children are less likely to show distress but may express their memories through play. A person with PTSD is at a higher risk of suicide and intentional self-harm.¹⁻⁹

Trauma is an emotional response to a horrific event. This can include but is not limited to such things as experiencing a natural disaster, being victimized physically or emotionally, a rape, a mugging, surviving a terrible automobile accident, losing a loved one before your eyes, witnessing your home burn to the ground, or surviving an act of terror. Trauma may occur in childhood and be beyond the reach of accessible memory, or it may have occurred days ago. Initially, our systems are shocked, and we tend to deny the whole thing. Over time, the reactions may manifest as nausea, headaches, nightmares, startle responses, flashbacks, and intense and unstable emotional responses to specific events^{2, 6, 10, 11}.

Most people who experience traumatic events do not develop PTSD. People who experience interpersonal violence such as rape, other sexual assaults, being kidnapped, stalking, physical abuse by an intimate partner, and childhood abuse are more likely to develop PTSD than those who experience non-assault-based trauma, such as accidents and natural disasters.¹²⁻¹⁸

Those who experience prolonged trauma, such as slavery, concentration camps, or chronic domestic abuse, may develop complex post-traumatic stress disorder (C-PTSD). C-PTSD is similar to PTSD but has a distinct effect on a person's emotional regulation and core identity.^{19, 20}

Antidepressants of the SSRI or SNRI type are the first-line medications used for PTSD and are moderately beneficial for about half of people. Benefits from medication are less than those seen with counseling.²¹

In the United States, about 3.5% of adults have PTSD in a given year, and 9% of people develop it at some point in their life. In much of the world, rates are between 0.5% and 1% annually. Higher rates may occur in regions of armed conflict. It is more common in women than men.^{15, 22-25}

The term "post-traumatic stress disorder" came into use in the 1970s, in large part due to the diagnoses of US military veterans of the Vietnam War. The American Psychiatric Association officially recognized it in 1980 in the third edition of the Diagnostic and Statistical Manual of Mental Disorders.²⁶

PTSD has been associated with a wide range of traumatic events. The risk of developing PTSD after a traumatic event varies by trauma type and is the highest following exposure to sexual violence (11.4%), particularly rape (19.0%). Men are more likely to experience a traumatic event (of any type). Trauma from sexual abuse and rape is particularly impactful due to the intense violation of personal safety and bodily autonomy, often resulting in profound psychological, emotional, and physical repercussions.^{7, 27-31}

1.1. Profound Psychological Impact

- *Violation of Personal Boundaries:* Sexual abuse and rape are inherently invasive, often leaving survivors feeling powerless, unsafe, and betrayed. This loss of control can make it challenging for survivors to trust others and feel secure, leading to lasting anxiety, self-blame, and shame.
- *Risk of PTSD:* Rape and sexual abuse have one of the highest rates of PTSD among all trauma types, surpassing that of combat veterans. The pervasive and intrusive nature of PTSD symptoms – including flashbacks, hypervigilance, and avoidance – can severely hinder survivors' daily lives, relationships, and overall mental health.
- *Complex PTSD in Prolonged Abuse:* Chronic or repeated sexual abuse, especially when experienced during childhood, often leads to complex PTSD, characterized by emotional dysregulation, difficulties with self-worth, and persistent issues with interpersonal relationships.

1.2. Physical Consequences and Somatic Trauma

- *Bodily Injury and Chronic Pain:* Rape survivors may experience physical injuries, including vaginal trauma, bruising, and other bodily harm. These injuries can serve as persistent reminders of the assault, increasing the

likelihood of somatic symptoms like chronic pain, gastrointestinal issues, and other stress-related health problems.

- *Neurobiological Impact:* Sexual trauma can alter brain structures and functions, particularly in the amygdala, hippocampus, and prefrontal cortex, which regulate fear, memory, and executive functioning. These changes make survivors more susceptible to anxiety, hypervigilance, and mood disorders, reinforcing the need for long-term therapeutic support.

PTSD symptomatology is characterized by^{11, 13, 32, 33}:

1.2.1 *Re-experiencing symptoms:*

- Flashbacks—reliving the trauma over and over, including physical symptoms like a racing heart or sweating
- Bad dreams
- Frightening thoughts.

Re-experiencing symptoms may cause problems in a person's everyday routine. They can start from the person's thoughts and feelings. Words, objects, or situations that remind the person of the event can also trigger re-experiencing.

1.2.2 *Avoidance symptoms:*

- Staying away from places, events, or objects that are reminders of the experience
- Feeling emotionally numb
- Feeling strong guilt, depression, or worry
- Losing interest in activities that were enjoyable in the past
- Having trouble remembering the dangerous event.

Things that remind a person of the traumatic event can trigger avoidance symptoms. These symptoms may cause a person to change their routine. For example, a person who usually drives may avoid driving or riding in a car after a bad car accident.

1.2.3 *Hyperarousal symptoms:*

- Being easily startled
- Feeling tense or "on edge"
- Having difficulty sleeping and having angry outbursts.

Hyperarousal symptoms are usually constant and are not triggered by things that remind one of the traumatic event. They can make the person feel stressed and angry and make it hard to do daily tasks like sleeping, eating, or concentrating.

1.3. PTSD treatment

Post-traumatic stress disorder (PTSD) can significantly impact a person's quality of life. While therapy is the gold-standard treatment, medications can also help reduce the severity of symptoms. Here are some commonly used drugs for PTSD, such as selective serotonin reuptake inhibitors (SSRIs). These medications work by affecting neurotransmitter levels in the brain.^{1, 33-36}

Most faith traditions have two forms of prayer, meditation, and contemplation, the most generally accepted interfaith term. Most believers practice meditation, a discursive form of prayer engaging the imagination in thought and sometimes spoken words. One medical research category has statistically shown the healing effects of theistic discursive prayer on the one praying. A separate medical research category has shown the healing effects of non-theistic concentrative meditation on the one practicing meditation. However, there is considerably less research on contemplative prayer, a theistic form of concentrative prayer.³⁷⁻⁴¹

1.4. Quantitative electric tomography (QEEGt)

Quantitative electric tomography, especially techniques like LORETA (Low-Resolution Electromagnetic Tomography) and sLORETA (Standardized LORETA), is used to locate the sources, or "generators," of electrical activity within the brain and project these onto MRI slices to give a precise, visual representation of brain function. We recently ran a pilot study of five patients complaining of bipolar disorder in the depressive phase vs. five normal subjects matched in age and gender.⁴²⁻⁴⁷

A very stable QEEGt pattern and frontal alpha asymmetry were observed in all five patients. Hence, this pattern was used to compare QEEGt before and after practicing centering prayer (CP). Our main result showed that the focal left frontal Alpha increment disappeared after CP, significantly reducing depressive and anxious symptoms. We also recently demonstrated that CP is beneficial in treating Parkinson's disease.^{48, 49}

Building on these previous studies, we propose that Centering Prayer (CP) could be a promising tool to alleviate PTSD symptoms, offering hope for those affected.

Objective

To treat female patients diagnosed with PTSD due to sexual abuse or rape with CP to improve PTSD symptoms.

2 Methods

Our study will be conducted by two experienced neurologists, ensuring the highest standard of evaluation for our five PTSD patients and five normal subjects. PTSD will be diagnosed according to the DSM-5 criteria, including critical elements.^{15, 50, 51}

2.1. Inclusion criteria

Here are the inclusion criteria for Post-Traumatic Stress Disorder (PTSD) based on the **DSM-5** (Diagnostic and Statistical Manual of Mental Disorders, 5th Edition). For the diagnosis or inclusion in PTSD studies or treatment programs, individuals typically need to meet the following criteria^{15, 52-54}:

- **Willingness to participate in the protocol with written informed consent.**
- **Exposure to a Traumatic Event:**
 - The individual must have been exposed to actual or threatened death, serious injury, or sexual violence in one or more of the following ways:
 - Direct experience of the traumatic event.
 - Witnessing the event as it occurred to others.
 - Learning that the traumatic event happened to a close family member or friend.
 - Repeated or extreme exposure to aversive details of the traumatic event (such as in first responders, paramedics, etc.).
- **Intrusive Symptoms (at least 1 of the following):**
 - Recurrent, involuntary, and distressing memories of the traumatic event.
 - Distressing dreams related to the event.
 - Dissociative reactions (e.g., flashbacks) where the individual feels or acts as if the event is happening again.
 - Intense psychological distress or physiological reactions to reminders of the traumatic event.
- **Persistent Avoidance of Trauma-Related Stimuli (at least 1 of the following):**
 - Avoiding thoughts, feelings, or conversations related to the trauma.
 - Avoiding activities, places, or people that evoke memories of the trauma.
- **Negative Alterations in Mood or Cognition (at least 2 of the following):**
 - Inability to remember important aspects of the traumatic event.
 - Persistent, exaggerated negative beliefs about oneself, others, or the world.
 - Distorted thoughts about the cause or consequences of the traumatic event, leading to self-blame or blaming others.
 - Persistent negative emotional state (e.g., fear, horror, anger, guilt, or shame).
 - Marked decrease in interest or participation in significant activities.
 - Feelings of detachment or estrangement from others.
 - Persistent inability to experience positive emotions (happiness, satisfaction, or love).
- **Altered Arousal and Reactivity (at least 2 of the following):**
 - Irritable behavior and angry outbursts without apparent provocation.
 - Reckless or self-destructive behavior.
 - Hypervigilance.
 - Exaggerated startle response.
 - Problems with concentration.
 - Sleep disturbances (difficulty falling or staying asleep, frequent awakenings, nightmares).
 - Duration of Symptoms:

- Symptoms must persist for more than 1 month following the traumatic event.
- **Significant Distress or Impairment:**
 - Symptoms cause significant impairment in social, occupational, or other important areas of functioning.
 - Non-willingness to participate in the protocol.
 - Severe Medical Conditions:
 - Presence of severe or unstable medical conditions that could interfere with participation, such as uncontrolled diabetes, active cancer, or advanced heart disease.
 - Conditions that may affect mental or cognitive functioning, such as traumatic brain injury (unless the study targets explicitly this comorbidity).
- **Primary Diagnosis of Other Mental Health Disorders:**
 - A primary diagnosis of specific mental health conditions, especially those that might overshadow PTSD symptoms or complicate treatment, including:
 - Psychotic disorders (e.g., schizophrenia).
 - Bipolar disorder.
 - Severe major depressive disorder if the focus is exclusively on PTSD.
 - Substance use disorders (alcohol or drug dependency) unless the study is designed to include comorbid substance abuse.
- **High Risk of Self-Harm or Suicide:**
 - Active suicidal ideation with intent or a recent history of suicide attempts. Individuals at high risk may be excluded for safety reasons, as they may need intensive mental health support outside the study's scope.
 - Severe self-harming behaviors, mainly if ongoing, as this may require focused treatment not provided in the study.
- **Current Substance Abuse:**
 - Active alcohol or substance abuse that could impair the individual's ability to participate reliably in the study or adhere to the treatment protocol.
 - Depending on the study requirements, Recent substance detoxification may also be an exclusion criterion.
 - Other pharmacological treatments to anxiety and depression.
- **Cognitive Impairment:**
 - Severe cognitive impairment or dementia that may interfere with comprehension, recall, or the ability to follow study procedures.
 - Any neurological disorder (e.g., Alzheimer's disease, advanced Parkinson's) that would interfere with participation and data reliability.
- **Lack of Stable Living Environment or Support System:**
 - Homelessness or lack of a stable support system may be an exclusion criterion, as these individuals might have difficulty adhering to study protocols.
 - Individuals without access to reliable transportation if in-person visits are required frequently.
- **Currently Receiving Intensive PTSD Treatment:**
 - Individuals currently engaged in other intensive forms of PTSD treatment, such as inpatient care, or those receiving new psychotherapy or medication that could interfere with the study.
 - Concurrent participation in other clinical trials or therapies for PTSD unless the study is specifically designed to assess combination treatments.
- **Pregnancy:**
 - In some studies, pregnancy may be an exclusion criterion if the interventions could pose a risk to the mother or fetus or if the survey is not designed to accommodate the physiological changes and mental health needs associated with pregnancy.
- **Non-Spanish-Speaking or Language Barriers (in some cases):**
 - Studies may require participants to be fluent in the research team's primary language, mainly if interpreters are unavailable or the study materials are only validated in one language.
- **Legal or Forensic Status:**
 - Individuals involved in ongoing legal or forensic cases related to the trauma, as their involvement could affect disclosure and bias study outcomes.
 - Those under legal supervision (e.g., probation, parole) may be excluded depending on study requirements.

When considering a diagnosis, the clinician will still need to use clinical interviewing skills and a recommended structured interview to determine a diagnosis—respondents with a known trauma history to identify a single traumatic event that causes the most current distress.

We will randomly select from our neuropsychological outpatient database five women between 18 and 35 years old who suffered sexual assault (rape) or abuse in childhood or adolescence and five women paired in age with patients with no history of neurological disorder systemic disease.

All patients and normal subjects will be assessed with the PTSD Checklist for DSM-5 (PCL-5,⁵⁴ and the **PHQ-9** (Patient Health Questionnaire-9),^{16,36} before and after the CP treatment.

PCL-5

Instructions: Below is a list of problems that people sometimes have in response to a very stressful experience. Please read each problem carefully and then circle one of the numbers to the right to indicate how much you have been bothered by that problem in the past month.

In the past month, how much were you bothered by:	Not at all	A little bit	Moderately	Quite a bit	Extremely
1. Repeated, disturbing, and unwanted memories of the stressful experience?	0	1	2	3	4
2. Repeated, disturbing dreams of the stressful experience?	0	1	2	3	4
3. Suddenly feeling or acting as if the stressful experience were actually happening again (as if you were actually back there reliving it)?	0	1	2	3	4
4. Feeling very upset when something reminded you of the stressful experience?	0	1	2	3	4
5. Having strong physical reactions when something reminded you of the stressful experience (for example, heart pounding, trouble breathing, sweating)?	0	1	2	3	4
6. Avoiding memories, thoughts, or feelings related to the stressful experience?	0	1	2	3	4
7. Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)?	0	1	2	3	4
8. Trouble remembering important parts of the stressful experience?	0	1	2	3	4
9. Having strong negative beliefs about yourself, other people, or the world (for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous)?	0	1	2	3	4
10. Blaming yourself or someone else for the stressful experience or what happened after it?	0	1	2	3	4
11. Having strong negative feelings such as fear, horror, anger, guilt, or shame?	0	1	2	3	4
12. Loss of interest in activities that you used to enjoy?	0	1	2	3	4
13. Feeling distant or cut off from other people?	0	1	2	3	4
14. Trouble experiencing positive feelings (for example, being unable to feel happiness or have loving feelings for people close to you)?	0	1	2	3	4
15. Irritable behavior, angry outbursts, or acting aggressively?	0	1	2	3	4
16. Taking too many risks or doing things that could cause you harm?	0	1	2	3	4
17. Being "superalert" or watchful or on guard?	0	1	2	3	4
18. Feeling jumpy or easily startled?	0	1	2	3	4
19. Having difficulty concentrating?	0	1	2	3	4
20. Trouble falling or staying asleep?	0	1	2	3	4

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<https://www.ptsd.va.gov/professional/assessment/documents/using-PCL5.pdf>

Figure 1 PTSD Checklist for DSM-5

- A total score of 31-33 or higher suggests the patient may benefit from PTSD treatment.
- Scores lower than 31-33 may indicate the patient either has subthreshold symptoms of PTSD or does not meet the criteria for PTSD, and this information should be incorporated into treatment planning.

We will also use the **PHQ-9** (Patient Health Questionnaire-9) to assess depression in all subjects. It consists of nine questions that align with the diagnostic criteria for major depressive disorder in the DSM-IV/DSM-5. Each item is scored from 0 to 3, and the total score helps determine the severity of depression.

2.2. PHQ-9: Patient Health Questionnaire

Over the last two weeks, how often have you been bothered by the following problems?

Please select the option that best describes how frequently you've experienced each issue.

Table 1 Patient Health Questionnaire (PHQ-9)

	Question	Not at all (0)	Several days (1)	More than half the days (2)	Nearly every day (3)
1.	Little interest or pleasure in doing things	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	Feeling down, depressed, or hopeless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	Trouble falling or staying asleep or sleeping too much	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	Feeling tired or having little energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	Poor appetite or overeating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	Feeling bad about yourself — or that you are a failure or have let yourself or your family down	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	Trouble concentrating on things, such as reading the newspaper or watching television	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	Moving or speaking so slowly that other people could have noticed. Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	Thoughts that you would be better off dead or of hurting yourself in some way	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2.3. PHQ-9 Score Interpretation

All subjects, patients, and controls should be willing to pray using God's name. They will receive training in interfaith contemplative prayer, Centering Prayer (CP), and practice it for 20 minutes twice daily for 15 days.

Table 2 PHQ-9 Score Interpretation

Score Range	Severity	Interpretation
0 - 4	Minimal or None	Symptoms do not typically indicate depression; it is often considered normal fluctuation.
5 - 9	Mild Depression	Low-level depressive symptoms: watchful waiting or active monitoring is recommended.
10 - 14	Moderate Depression	Symptoms likely meet the criteria for mild major depression; it is recommended to consider therapy.
15 - 19	Moderately Severe Depression	Symptoms likely indicate moderate major depression. Therapy or combined treatment is advised.
20 - 27	Severe Depression	Symptoms indicate major depression; immediate attention with psychotherapy and/or medication is needed.

2.4. Quantitative electric tomography (QEEGt) assessment

We will study all patients using quantitative electric tomography (QEEGt), the methodology of which can be found elsewhere. The Cuban Human Brain Mapping Project has collected normative data on resting-state EEG from a representative sample of the Cuban population. This dataset includes recordings from 282 healthy participants aged 18-68 years, collected between 2004 and 2008. The data includes high-density EEG recordings under various conditions (eyes closed, eyes open, hyperventilation, and recovery).^{46, 47, 55}

In Quantitative EEG tomography (qEEGt), Z-scores (or Z-values) indicate the degree to which an individual's brain activity deviates from a normative database. These Z-values express how far the observed EEG power in each frequency

band (delta, theta, alpha, beta, gamma) diverges from the typical or "normal" activity. Color coding is often used to visually represent these deviations' magnitude and direction.^{56,57}

2.5. Understanding Z-Scores in QEEGt.

2.5.1 What Z-Scores Represent:

- Z-scores are statistical values that indicate the number of standard deviations a particular data point is from the mean of the normative population.
- A z-score of 0 signifies no deviation, meaning the observed activity is precisely at the population mean.
- Positive z-scores represent activity above the normative mean, while negative z-scores indicate activity below it.

2.5.2 Color Coding of Z-Scores:

- The color gradient typically spans from blue to red, with intermediate colors (often green) indicating minimal deviation:
 - Blue: Represents lower-than-normal activity (negative z-scores).
 - Green: Represents close-to-normal activity (z-scores near zero).
 - Red: Represents higher-than-normal activity (positive z-scores).
- Each color shade correlates with a specific range of z-scores, often from -3 (dark blue, significant deviation below average) to +3 (bright red, significant deviation above normal).

A CT-SCAN will exclude that the patients and normal subjects do not have important lesions in the brain.

2.6. Statistical analysis

In this study, we utilized the IBCO Statistica (version Statistica 14) to perform a paired t-test analysis, assessing the differences between pre- and post-intervention measurements within the same subjects. This statistical approach was chosen due to its robustness in detecting mean differences in related and small samples, allowing for precise comparison within individuals rather than between groups. Using Statistica-14, we ensured that our paired t-test was performed with stringent statistical rigor, yielding results that could confidently highlight any significant changes attributable to the intervention. This methodological choice underscores our commitment to accurate, reliable data analysis, enhancing the study's internal validity and the credibility of our findings.

2.7. Prayer instructions⁵⁸⁻⁶⁰

The Abrahamic faiths have practiced contemplative prayer for centuries: Judaism's Kabbalah, Christianity's mysticism, and Islam's Sufism. Because they are wordless forms of listening to God and in silence, there is no dogma, and they can be taught interfaith. To summarize, patients and normal subjects will be instructed to gently let them go every time they become aware of their thoughts and return to their preselected sacred word, which symbolizes their desire to be with God and not their thoughts.^{58,59}

They will be asked to do this quietly for 20 minutes, with eyes closed, without physical or verbal interaction with others. CP is taught as a vehicle to open oneself up to the gift of contemplative prayer. We will use the following stepped methodology for CP training as demonstrated in the video given at MD Anderson Cancer Center (<https://www.youtube.com/watch?v=v5g8dNCnQNU&t=1134s>):

- STEP 1: Choose a sacred word to symbolize your intention to consent to God's presence and action within.
- STEP 2: Sitting comfortably with eyes closed, settle briefly; silently introduce the sacred word.
- STEP 3: When you become aware you are engaged with your thoughts, return ever-so-gently to the sacred word.
- STEP 4: At the end of the 20-minute prayer period, remain silent with your eyes closed for a few minutes

3 Results

Table 3 This table includes demographic details, trauma type, and conditions of participants, with separate columns for PLC-5 and PHQ-9 scores before and after CP treatment

Participant	Age	Type of Trauma	Current Conditions	PLC-5 Before CP	PLC-5 After CP	PHQ-9 Before CP	PHQ-9 After CP
Woman 1	18	Rape in adolescence	Severe anxiety, depression	80	15	22	5
Woman 2	24	Rape in adolescence	Moderate anxiety, depression	70	20	18	4
Woman 3	26	Rape in adolescence	Moderate to severe anxiety, depression	75	20	21	4
Woman 4	30	Sexual abuse by a relative at age 20	Moderate anxiety, depression	70	25	18	3
Woman 5	29	Sexual abuse by a relative at age 21	Moderate anxiety, depression	60	10	16	2

Note that the PLC-5 has 20 items representing the severity of each PTSD symptom. This table describes the values of this scale before and after CP for each patient.

Taking into consideration the 20 items, we constructed a table with the results before and after CP:

- Repeated, disturbing, and unwanted memories of the stressful experience?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Repeated, disturbing dreams of the stressful experience?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Suddenly feeling or acting as if the stressful experience were happening again (as if you were back there reliving it)?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Feeling very upset when something reminds you of the stressful experience?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Have strong physical reactions when something reminds you of the stressful experience (e.g., heart pounding, trouble breathing, sweating)?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Avoiding memories, thoughts, or feelings related to the stressful experience?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Avoiding external reminders of the stressful experience (e.g., people, places, conversations, activities, objects)?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Trouble remembering important parts of the stressful experience?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Have strong negative beliefs about yourself, others, or the world (e.g., "I am bad," "No one can be trusted," "The world is dangerous")?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Blaming yourself or someone else for the stressful experience or what happened after it?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Have strong negative feelings such as fear, horror, anger, guilt, or shame?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Loss of interest in activities you used to enjoy?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Feeling distant or cut off from other people?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Trouble experiencing positive feelings (e.g., being unable to feel happiness or love)?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)

- Irritable behavior, angry outbursts, or acting aggressively?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Taking too many risks or doing things that could cause harm?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Being "super alert" or watchful or on guard?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Feeling jumpy or easily startled?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Having difficulty concentrating?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)
- Trouble falling or staying asleep?
Not at all (0) A little bit (1) Moderately (2) Quite a bit (3) Extremely (4)

Table 4 Individual Item Scores PCL-5 for Each Patient

PCL-5 Item	Patient 1 Before	Patient 1 After	Patient 2 Before	Patient 2 After	Patient 3 Before	Patient 3 After	Patient 4 Before	Patient 4 After	Patient 5 Before	Patient 5 After
Item 1	4	1	4	1	4	1	4	2	3	1
Item 2	4	1	4	1	4	1	4	2	3	1
Item 3	4	1	4	1	4	1	4	2	3	1
Item 4	4	1	4	1	4	1	4	2	3	1
Item 5	4	1	4	1	4	1	4	2	3	1
Item 6	4	1	4	1	4	1	4	2	3	1
Item 7	4	1	4	1	4	1	4	2	3	1
Item 8	4	1	4	1	4	1	4	2	3	1
Item 9	4	1	4	1	4	1	4	2	3	1
Item 10	4	1	4	1	4	1	4	2	3	1
Item 11	4	1	3	1	4	1	3	1	3	0
Item 12	4	1	3	1	4	1	3	1	3	0
Item 13	4	1	3	1	4	1	3	1	3	0
Item 14	4	1	3	1	4	1	3	1	3	0
Item 15	4	1	3	1	4	1	3	1	3	0
Item 16	4	0	3	1	3	1	3	1	3	0
Item 17	4	0	3	1	3	1	3	1	3	0
Item 18	4	0	3	1	3	1	3	1	3	0
Item 19	4	0	3	1	3	1	3	1	3	0

Item 20	4	0	3	1	3	1	3	1	3	0
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Notes:

- Patient 1:
 - Before Treatment: 80.
 - After Treatment: 15
- Patient 2:
 - Before Treatment: 70.
 - After Treatment: 20.
- Patient 3:
 - Before Treatment: 75.
 - After Treatment: 20.
- Patient 4:
 - Before Treatment: 70.
 - After Treatment: 25.
- Patient 5:
 - Before Treatment: 60.
 - After Treatment: 10

Figure 1 shows the five PTSD patients' Checklist scores before and at the end of treatment. According to the scales, all patients demonstrated significant improvement. It is necessary to state that cases 1, 2, and 3 suffered a full rape with body injuries.

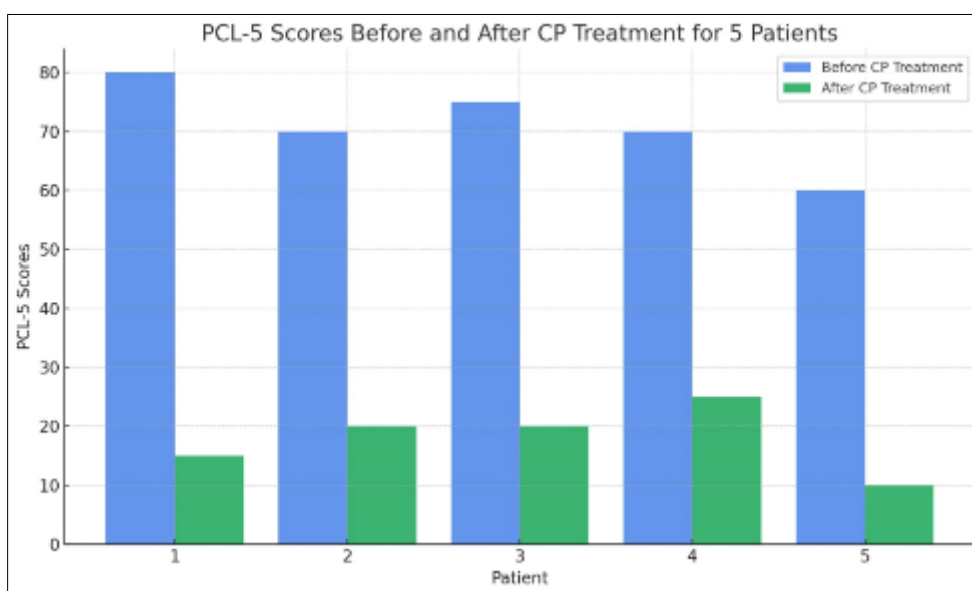


Figure 2 This figure shows the five PTSD patients' Checklist scores before (Basal) and after the treatment

Here are the results of the paired t-test comparing all subjects' scores collectively before and after treatment:

- t-Statistic: 15.63
- P-Value: 0.000098
- Statistical Significance: True ($p < 0.5$)

This result indicates a statistically significant difference between the "before" and "after" treatment scores across all subjects, with a p-value well below the threshold of 0.5. This suggests that the treatment likely had a significant effect on the scores.

Of course, the PCL-5) scale did not apply to the control group. Nonetheless, they all felt quiet after finishing the CP sessions.

Table 5 PHQ-9 scores in the five patients

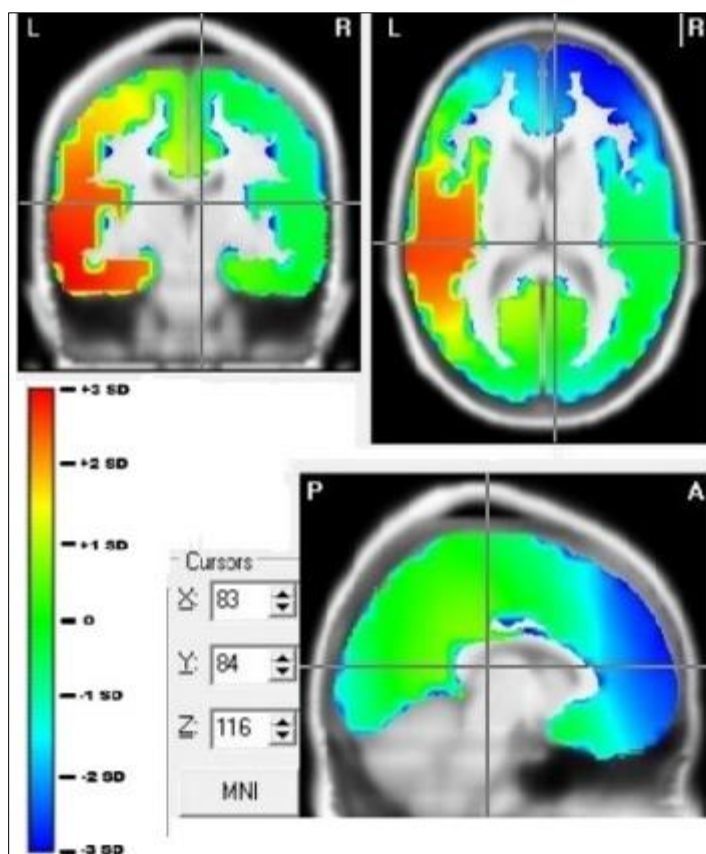
Patient	Before CP (Score)	Before CP (Intensity)	After CP (Score)	After CP (Intensity)
Patient 1	22	Severe Depression	5	Low-Level Depression
Patient 2	18	Moderate Major Depression	4	Normal
Patient 3	21	Severe Depression	4	Normal
Patient 4	18	Moderate Major Depression	3	Normal
Patient 5	16	Moderate Major Depression	2	Normal

The paired t-test results for the PHQ-9 scores before and after treatment are as follows:

- T-Statistic: 24.24
- P-Value: 0.000154
- Statistical Significance: True ($p < 0.05$)

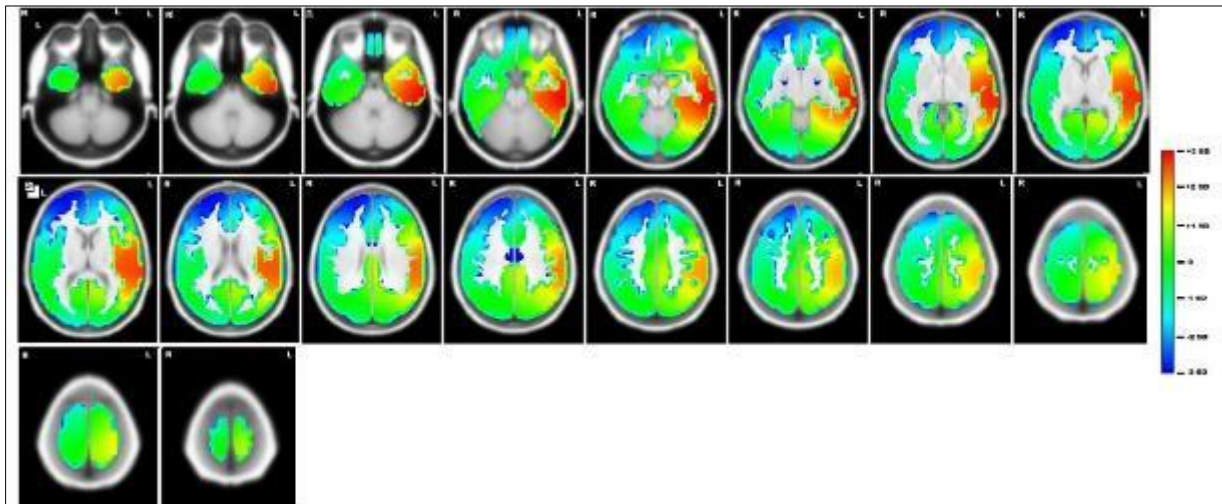
These results indicate a statistically significant difference between the initial and after-treatment PHQ-9 scores, suggesting a meaningful effect of the treatment on depression.

QEEGt records demonstrated a stable pattern in all five patients: an increase of theta activity (4–8 Hz) in the left parietal-temporal-occipital areas of PTSD patients. Figure 3 shows a grand average of the five patients, demonstrating an essential augmentation of theta activity in this region.



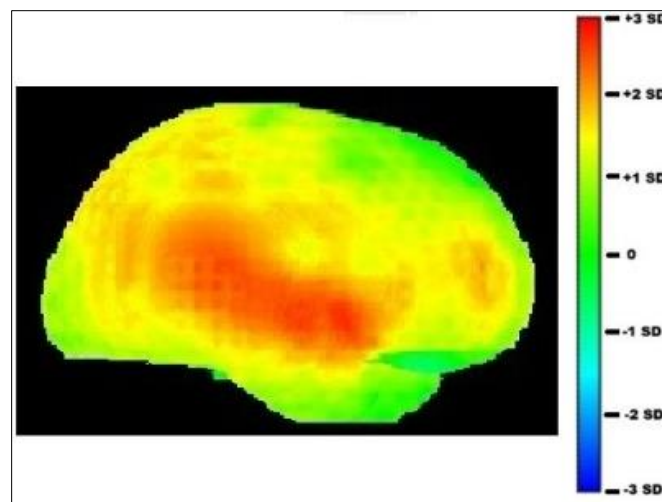
Z-values in the QEEGt map show a statistically significant increment of 2 or 3 standard deviations (SD) of theta activity (4–8 Hz) in the left parietal-temporal-occipital areas of PTSD patients above our normative. There is also a statistically significant decrement of theta activity in frontal regions, lateralized to the right hemisphere.

Figure 3 The grand average of the QEEGt maps is in the frontal, axial, and sagittal planes



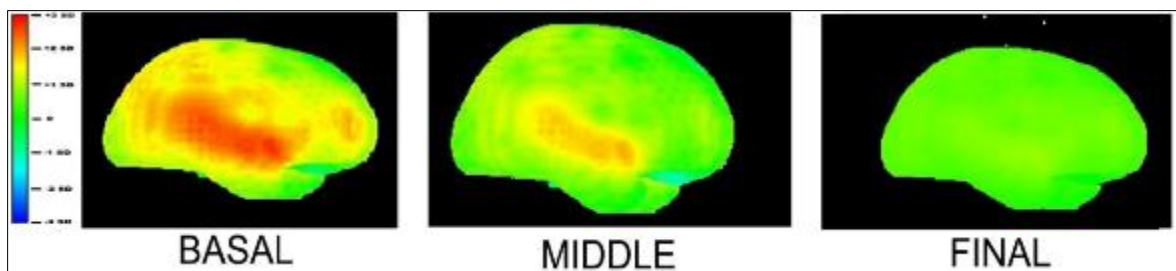
Z-values in the QEEGt map show a statistically significant increment of 2 or 3 standard deviations (SD) above our normative data. There is also a statistically significant decrement of theta activity in frontal regions, lateralized to the right hemisphere.

Figure 4 The grand average of the QEEGt maps shows all axial planes



Z-values in the QEEGt map show a statistically significant increment of 2 or 3 standard deviations (SD) of Theta activity above our normative data.

Figure 5 QEEGt-3D map reconstruction of the grand average of the five patients



Z-values in the QEEGt map show a progressive decrement of the statistically significant Theta increment above our normative data as long as the CP treatment progresses.

Figure 6 QEEGt follow-up grand average before beginning (BASAL), in the middle (MIDDLE), and after finishing CP sessions

4 Discussion

This study underscores the potential of centering prayer as an effective intervention for PTSD, showing marked improvements in PCL-5 and PHQ-9 scores, which align with DSM-5 criteria for PTSD symptoms.

Centering prayer, as a form of contemplative practice, involves silently focusing on a sacred word or phrase while fostering a sense of surrender and acceptance. This unique approach not only helps quiet the mind but also creates a profound sense of connection to something beyond oneself, which may be particularly healing for PTSD patients who often feel isolated and disconnected due to their trauma.⁵⁸⁻⁶⁰ This is particularly important, as PTSD manifests differently depending on the nature, severity, and context of trauma, and centering prayer may offer a promising therapeutic approach to help these women process trauma and heal.

We have also shown that QEEGt might represent a biological marker to follow up the clinical course of patients who have PTSD treated by CP. The findings of increased theta activity in the parietal regions among PTSD patients, as observed through QEEGt, offer significant insights into the neurophysiological underpinnings of this disorder.

Theta dysregulation, particularly in the 4–8 Hz range, has been linked to compromised abilities in processing emotional memories and integrating sensory information. This aligns with the broader literature on PTSD, which suggests that individuals with this disorder often experience heightened difficulty in regulating emotional responses and interpreting sensory inputs, especially those related to trauma-associated cues. This increase may reflect problems with memory processing, emotional regulation, and cognitive control, which are common in PTSD.^{14, 39, 61-64}

In summary, in PTSD, increased theta activity in the parietal and temporal regions represents the brain's attempt to process unresolved trauma and maintain hypervigilance. This theta elevation stems from trauma-induced dysregulation in the hippocampus, DMN overactivity, neurochemical imbalances, and the brain's maladaptive adaptation to chronic stress. These changes collectively impair memory processing, emotional regulation, and cognitive control, contributing to the core symptoms of PTSD.

Most of the CP healing effects on PTSD symptoms might be explained by the polyvagal theory. The Polyvagal Theory, developed by Dr. Stephen Porges, provides a new perspective on how the autonomic nervous system (ANS) regulates emotional and social behaviors, particularly in response to safety, danger, and life-threatening situations. The theory emphasizes the vagus nerve's role, a significant component of the ANS, in these processes.⁶⁵⁻⁷²

4.1. Vagus Nerve and Dual Pathways

The vagus nerve is central to Polyvagal Theory. It has two branches:

- **Ventral Vagal Branch:** Promotes safety, connection, and physiological states conducive to social engagement.
- **Dorsal Vagal Branch:** Governs immobilization and energy conservation in life-threatening situations.

4.1.1 Neuroception

- A subconscious process by which the nervous system evaluates the environment and internal states for safety, danger, or threat cues.
- Influences behavior without conscious awareness, leading to appropriate autonomic responses.

4.1.2 Role of Safety

- Safety is critical for activating the ventral vagal system, allowing optimal social, emotional, and physiological functioning.
- When safety is compromised, the system shifts into defensive modes (fight, flight, or freeze).

The connection between **Polyvagal Theory** and **Centering Prayer** lies in their shared focus on calming the nervous system, fostering feelings of safety, and facilitating self-regulation. Centering Prayer, a contemplative Christian practice, aligns well with the principles of the Polyvagal Theory, particularly in activating the **ventral vagal state**—a state of safety, calm, and connection.^{58, 59}

To explain our findings in QEEGt and its relationship with the polyvagal theory and brain functional connectivity, we should emphasize that the vagus nerve is a critical pathway connecting peripheral autonomic states with the brain, particularly the prefrontal cortex, insula, and other cortical areas. Areas associated with emotional regulation and social

behavior. EEG studies often show cortical activity related to autonomic states modulated by vagus nerve activity can reflect vagal influence and its role in emotional regulation. Moreover, the autonomic nervous system (ANS) is heavily influenced by various cortical and subcortical brain regions, which integrate sensory input and modulate autonomic output to maintain homeostasis and regulate emotional and physiological states.⁷³⁻⁷⁹

In summary, the relationship between Polyvagal Theory and QEEGt cortical stimulation lies in how vagal activity influences cortical states and how cortical activation, in turn, modulates autonomic responses. This bidirectional interaction is measurable through QEEGt markers and is crucial for understanding emotional regulation, stress resilience, and social connectivity.⁸⁰⁻⁸²

Sexual abuse, which may occur repeatedly over time, often involves less immediate physical harm but exerts prolonged psychological stress and trauma. Victims may experience complex PTSD, a variant involving emotional dysregulation, negative self-concept, and relational difficulties stemming from protracted exposure to abuse rather than a single traumatic event.^{13,17,83,84}

One of the distinguishing strengths of centering prayer lies in its **spiritual dimension**. While practices like meditation and hypnosis have shown efficacy in managing PTSD symptoms, centering prayer may offer additional therapeutic benefits by incorporating a spiritual component, which provides a sense of meaning and peace. For individuals with PTSD, especially those who turn to spirituality or faith as a source of resilience, centering prayer fosters an environment where they can find solace and empowerment. Unlike meditation, which often emphasizes non-attachment and observing thoughts without judgment, centering prayer encourages a mindful surrender and a gentle letting go, which might resonate more deeply with trauma survivors who struggle with control and anxiety. The mechanics of CP are also notable for their accessibility and ease. Unlike some forms of meditation that require extensive practice to effectively manage intrusive thoughts and reach a state of deep relaxation, centering prayer provides a straightforward approach that can be quickly adopted and practiced independently. The simplicity of repeating a sacred word or phrase serves as an anchor, grounding individuals in the present and helping to regulate physiological arousal levels. This grounding effect is crucial for PTSD patients, as it creates a safe mental space that counteracts hypervigilance and other heightened stress responses.⁵⁸⁻⁶⁰

Compared to hypnosis, which aims to access a deep state of relaxation, CP requires no specialized guidance or susceptibility to suggestion. Hypnosis often relies on a practitioner to guide the patient into a suggestible state where trauma-related perceptions can be restructured. Still, it may lack the self-sustaining, daily practice aspect beneficial for long-term symptom management. In contrast, centering prayer empowers individuals to cultivate a sense of inner calm and safety, promoting a consistent practice that builds resilience over time. This independence not only fosters self-reliance but also strengthens patients' understanding of agency—a quality often diminished in PTSD, where individuals may feel that they lack control over their responses to trauma.^{58-60,64}

Of course, a critical limitation of our study is the limited number of patients. Stimulated by these results, we are programming to conduct more extensive studies.

Therefore, CP can be a valuable complementary practice for patients with post-traumatic stress disorder (PTSD), even in cases where the condition has persisted for more than 40 years. Here's how centering prayer might be beneficial: Spiritual Practices and Trauma: Spiritual practices, including CP, have been associated with better-coping mechanisms and quality of life in patients with PTSD. CP can be a valuable complementary practice for patients with post-traumatic stress disorder (PTSD), even in cases where the condition has persisted for more than 40 years.^{11,22,59,85,86}

4.2. Benefits of Centering Prayer for PTSD

- **Stress Reduction:** Centering prayer emphasizes mindfulness and inner stillness, which can help reduce physiological stress responses that are common in PTSD.
- **Improved Emotional Regulation:** Regular centering prayer can foster a sense of calm and emotional resilience, helping individuals cope with intrusive thoughts or hyperarousal.
- **Reconnection to Self and Spirituality:** For those who value spirituality, centering prayer can provide a sense of meaning and connection, which may help counteract feelings of isolation or existential distress.
- **Neuroplasticity:** Meditative practices like centering prayer have been shown to influence brain regions associated with trauma, such as the amygdala and prefrontal cortex, potentially reducing hypervigilance and improving cognitive control.
- **Trauma Processing:** While not a replacement for psychotherapy, centering prayer can complement trauma-focused therapies by creating a safe mental space for reflection and healing.
- **Severity of PTSD Symptoms:** For severe cases of PTSD, centering prayer should be used alongside evidence-based

treatments like trauma-focused cognitive-behavioral therapy (CBT) or eye movement desensitization and reprocessing (EMDR).

- Trauma-Sensitive Approach: Some individuals may initially find silence or introspection triggering. Modifications or a guided approach may be needed for those with severe trauma.
- Duration of Practice: Results from centering prayer are gradual, and individuals may benefit most from consistent, long-term practice.
- Supporting Evidence
- Mindfulness and PTSD: Studies have shown mindfulness-based interventions can reduce PTSD symptoms, and centering prayer shares many principles with mindfulness.

The study involved the application of standardized scales and assessment through QEEGt, comparing with an aged-matched sample of normal subjects. This approach was ensured by strictly adhering to the exclusion criteria, which emphasized the removal of any individuals exhibiting PTSD-related symptoms. By excluding these cases, the study aimed to focus solely on subjects without PTSD, ensuring the accuracy and reliability of the findings in a non-PTSD population. This rigorous selection process allowed for a precise evaluation of QEEGt patterns and their relevance in a normative context."

5 Conclusion

In conclusion, CP appears to offer a distinct and accessible pathway for managing PTSD, promoting emotional regulation, resilience, and a sense of inner peace rooted in spirituality. CP uniquely combines the benefits of these practices with a spiritual foundation that can provide both immediate relief from PTSD symptoms and long-term personal growth.

Of course, the limitation of this research is the limited number of patients. Future research could explore the comparative long-term outcomes of CP with larger samples of patients and also compare other contemplative practices in PTSD treatment, especially in individuals for whom spirituality plays a significant role in their healing journey.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest is to be disclosed.

Statement of informed consent

Informed consent was obtained from all participants included in the study.

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