

# Controlled Rhythmic Yogic Breathing as Complementary Treatment for Post-Traumatic Stress Disorder in Military Veterans: A Case Series

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## ABSTRACT

**Background:** Post-traumatic stress disorder (PTSD) is a cluster of symptoms in which a person persistently relives a traumatic event, through recurring thoughts, nightmares, and flashbacks for at least 1 month or more. There are various behavioral and medical treatment options for PTSD. Mind–body techniques, such as bio-feedback and breathing-based stress reduction, have shown some promise in the treatment of PTSD symptoms. The purpose of this case series was to examine controlled yogic breathing as a complementary treatment of PTSD in military veterans. A retrospective review was performed from 2012 to 2016 in 3 cases, and participant demographics, member statements, and PTSD Checklist—Military Version (PCL-M) scores, pre-and-post course, were extracted.

**Cases:** Three military veterans with PTSD participated in a standardized 5-day course designed to teach them controlled rhythmic yogic breathing exercises.

**Results:** Subjectively, all 3 participants reported a decrease in PTSD symptoms after the course. Objectively, all 3 participants had a reduction in their overall PCL-M scores after the course. Among all 3 participants, there were score decreases in the Avoidance and Increased Arousal categories. The most dramatic improvement occurred in the participant with the most severe symptoms.

**Conclusions:** Controlled yogic breathing, specifically *Sudarshan Kriya* (SKY), appeared to reduce the symptoms of PTSD in 3 veterans of the Armed Services.

**Keywords:** post-traumatic stress disorder (PTSD), military veterans, yoga, *Sudarshan Kriya*, *pranayama*

## INTRODUCTION

**P**OST-TRAUMATIC STRESS DISORDER (PTSD) is a cluster of symptoms in which a person persistently relives a traumatic event, through recurring thoughts, nightmares, and flashbacks for at least 1 month or more. According to the *Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-V)*, diagnostic criteria for PTSD include: exposure to actual or threatened death; serious injury; and/or sexual violence. These criteria also include the presence of

symptoms from each of four clusters: (1) intrusion; (2) avoidance; (3) negative alterations in cognition and mood; and (4) increased arousal and reactivity.<sup>1</sup>

Although some of the symptoms of PTSD are similar to post-traumatic stress (PTS), there are significant differences in symptom intensity, duration, and treatment. Both PTS and PTSD are associated with feeling fearful and nervous, avoiding the activity or place associated with the traumatic event, and nightmares. However, symptoms that continue for more than 1 month and interfere with daily functioning

are characteristic of PTSD. Typical symptoms of PTSD that inhibit daily functioning include avoiding situations or people that remind the patient of the event, having persistent negative thoughts or feelings, and constant feelings of being jittery, nervous, or “on edge.”

Among military veterans of the Vietnam War, Gulf War, and Operations Enduring/Iraqi Freedom the documented prevalence of PTSD ranges between 12% and 30%.<sup>2–5</sup> In 1995, the Department of Defense conducted an extensive study of sexual victimization among active duty populations and found rates of sexual harassment to be 78% among women and 38% among men over a 1-year period.<sup>6</sup> Rates of attempted or completed sexual assault were 6% for women and 1% of men. In one study, 23% of female users of Veterans Administration (VA) healthcare reported experiencing at least one sexual assault while in the military.<sup>7</sup>

The most successful treatment interventions offered to patients with PTSD are cognitive-behavioral therapy (CBT) and medication. Specific CBT approaches include Prolonged Exposure, Cognitive Processing Therapy, and Eye Movement Desensitization Reprocessing. These forms of CBT are considered first-line treatments for PTSD and have strong evidence bases.<sup>8</sup> Sertraline (Zoloft<sup>®</sup>) and paroxetine (Paxil<sup>®</sup>) are selective serotonin reuptake inhibitors that are the first medications to have received Food and Drug Administration approval as indicated treatments for PTSD.<sup>9,10</sup> Another frequently used therapeutic option for patients with mild-to-moderate PTSD is group therapy. Empirical support for group therapy, however, is sparse. In group therapy, the patient can discuss traumatic memories, symptoms, and daily functional deficits with other patients who have had similar experiences. Group therapy has been most successful with war veterans and rape/incest victims.<sup>11</sup>

The National Center for Complementary and Alternative Medicine defines complementary and alternative medicine (CAM) simply as a group of diverse medical and health care interventions, practices, products, or disciplines that are not considered part of conventional medicine.<sup>12</sup> The “complementary” part refers to the use of these interventions in combination with conventional approaches. The “alternative” part refers to the utilization of these interventions in instead of conventional practices.

The use of CAM therapies specifically for management and treatment of mental health problems overall is common<sup>13</sup> and increasing.<sup>14,15</sup> A study published in 2013 looked at the use of CAM specifically for the management of PTSD symptoms. In a nationally representative sample, 39% of patients with PTSD indicated that they had used CAM in the previous year to address self-reported emotional and mental health problems.<sup>16</sup> A study in veterans found that those with PTSD were 25% more likely than veterans without PTSD to report CAM use, in particular, biofeedback and relaxation.<sup>17</sup> In addition to acupuncture, such as the Helms Medical Institute Auricular Trauma Protocol,<sup>18</sup> mind-body practices, such as meditation, yoga,

and relaxation, can be viable complementary treatments for mental health.

Yoga, one of the most commonly practiced forms of complementary treatment in the United States, incorporates the mind-body techniques of breathing exercises, physical movement, relaxation, and mindfulness.<sup>19</sup> Such mind-body practices can increase the number of self-care tools/techniques that a patient with PTSD can use to reduce stress and cope with unpleasant feelings.<sup>20,21</sup> One theory is that yoga modulates the body’s response to stress via 3 different physiologic systems: (1) the autonomic nervous system; (2) the hypothalamic-pituitary-adrenal axis; and (3) the gamma-aminobutyric acid-ergic system.<sup>22</sup> Abnormalities in these systems are critical as they are associated with the development and maintenance of PTSD.

Controlled yogic breathing exercises or *pranayama* could comprise a particularly beneficial complementary treatment for PTSD. Breathing and emotions are tightly coupled processes with reciprocal influences.<sup>23</sup> Breathing exercises have improved emotion regulatory processes in healthy populations.<sup>24</sup> Breathing exercises have also normalized parasympathetic activity in persons with anxiety<sup>25</sup> and in healthy populations with experimentally induced anxiety.<sup>20</sup>

The purpose of this report is to describe a retrospective case series documenting the clinical course and symptom response to the *Sudarshan Kriya* (SKY), a type of *pranayama*, in three military veterans with symptoms of PTSD, who voluntarily participated in a yogic breathing training course.

## CASES

A retrospective review was performed on 3 randomly selected veterans who participated in the Power Breath Workshop between 2012 and 2016. The Power Breath Workshop is a 5-day mind-body course for military veterans, run by the nonprofit Art of Living Foundation. The participants were all military veterans who either: (1) were referred by physicians or counselors at the VA or (2) signed up on their own through their local veterans’ service locations. The course is a total of 15–18 hours. Each day’s session lasts ~3–4 hours. The course is structured so that participants: (1) learn light stretching/yoga; (2) have group discussions on self-care and self-empowerment; and (3) learn SKY—called Power Breath during the course.

SKY is a type of controlled breathing practice with roots in traditional yoga. It has four distinct breathwork components as described by Brown and Gerbag:<sup>20</sup>

- (1) *Ujjayi* (“Victorious Breath”) is a slow breathing technique (2–4 breaths per minute) that increases airway resistance during inspiration and expiration and controls airflow so that each phase of the breath cycle can be prolonged to an exact count.
- (2) *Bhastrika* (“Bellows Breath”) is a rapid breathing technique wherein the air is rapidly inhaled and

forcefully exhaled at a rate of 30 breaths per minute. The technique is performed in combination with overhead arm extension and flexion.

- (3) *Om* is chanted three times with very prolonged expiration.
- (4) *Sudarshan Kriya*, which is a Sanskrit term meaning “proper vision by purifying action,” is an advanced form of rhythmic, cyclical breathing with slow, medium, and fast cycles.

During the workshop, the participants practice SKY with the goal of incorporating the technique into their daily self-care regimens. Each course was led by 2 teachers with at least 2 years of experience teaching SKY and conducting the Power Breath Workshop. The average number of participants per course was 10–15 people. Written consent, demographics, and PTSD Checklist—Military Version (PCL-M) scores were obtained from the participants before they started the course.

For this retrospective review, participant demographics, participant statements, and PCL-M scores, pre-and-post course, were extracted. The pre-and-post information had been collected by Art of Living for their purpose of programmatic/workshop review. The current authors did not interact with the 3 participants and the information provided was de-identified before the authors’ receipt. This study was evaluated by the institutional review board of the University of Connecticut and was not deemed human research.

### Case #1

A 75-year-old male veteran experienced the following cluster of symptoms: (1) negative alterations in cognition and mood and (2) alterations in arousal and reactivity. Specifically, he had thoughts of self-harm and suicide. He also had fears and nightmares that interfered with his sleep and daily activities, such as driving. He had experienced these symptoms for more than 6 months. He was receiving treatment from his primary care physician for these symptoms.

He did not recall a particularly traumatic event but rather a culmination of episodes. He had a past medical history of high blood pressure, deep venous thrombosis, PTSD, and depression. He was in the United States Army. He had 5½ years of Service, including 6 months working at a VA Army Hospital. He had been stationed in Kansas, Germany, and South Korea (at the demilitarized zone). He never saw active combat. He had since retired. Personally, this participant’s primary medical concerns before the course were: suicidal thoughts; osteoarthritic knees; and deep venous thrombosis for which he was taking warfarin (Coumadin®).

The participant learned about the Power Breath Workshop from his physician. Before the 5-day course, he participated in the hospital-supported VA Move Group. He credited improvement in his health to taking part in the VA Move group. The dates of his 5-day course were 8/25/16–8/29/16.

Per documentation, before the course, he experienced the following moderately severe PTSD symptoms: (1) numb-

ness, such as loss of interest in things he used to enjoy; (2) significant feelings of being distant/cut-off from other people; and (3) difficulty with sleep and hypervigilance.

This participant learned and practiced the SKY technique during the 5-day course. All of his recorded symptoms and measures improved both subjectively and objectively. His sleep improved the first time he took the course. After completing the course a second time, he stopped having nightmares; the quality of his sleep improved; he had decreased anhedonia and increased confidence; and was able to handle stress better. He continued to do the breathing exercises on a daily basis and noted that “the more you do it, the more it benefits—it is something I will do the rest of my life.”

### Case #2

A 57-year-old female veteran experienced the following cluster of symptoms: (1) intrusion; (2) avoidance; (3) negative alterations in cognition and mood; and (4) alterations in arousal and reactivity. Specifically, she had recurrent panic attacks, feelings of isolation, and depression. She had experienced these symptoms for more than 6 months.

She recalled that the inciting event was a sexual assault that had occurred early in her military career—30 years earlier. She had a past medical history of bipolar disorder and depression. She was in the United States Air Force. She had 11 years of Service. She had been stationed at Lackland, TX; Aurora, CO; Biloxi, MS; Colorado Springs, CO; and Riverside, CA. She did not see combat. She had since retired. Personally, this participant’s primary medical concerns before the course were: anxiety; binge eating; and fibromyalgia. The assault occurred during her time of service while stationed at one of the bases. Over the next few decades, she experienced panic attacks, severe depression, and anxiety. She had trouble interacting with men and especially had trouble being alone with them. She normally did yoga twice a week. She took herbs, supplements, and homeopathic products. Before the five-day course, she participated in the hospital supported VA Move Group, VA Pain classes, and guided imagery. The dates of her 5-day course were 5/21/15–5/25/15.

Per documentation, before the course, she experienced the following moderately severe PTSD symptoms: (1) avoidance of activities or situations that might trigger memories of the traumatic event; (2) feeling moderately cut-off from other people; and (3) feeling irritable or having angry outbursts.

This participant learned and practiced the SKY technique during the 5-day course. All of her recorded symptoms and measures improved both subjectively and objectively. As she progressed through the course, she was able to reflect on the sexual assault actively. After the course, she reported only mildly avoiding activities or situations that might trigger a traumatic memory. Her feeling of being cut-off from other people was also milder. She felt much less angry and irritable. Overall, she took the course twice.

Toward the end of the second course, she confronted her attacker and pressed charges through the VA System. Before the course, she avoided talking or thinking about the sexual assault, but during and after the course, she noted an increased ability to tolerate thoughts about the incident. While some of her symptoms of depression and PTSD remained, she had had fewer episodes of anger and irritability. She preferred to do the breathing exercises in a group, and she was learning to feel safe when alone. "I didn't believe I could process my trauma—I have a voice—I am not going to be quiet anymore!"

### Case #3

A 72-year-old male veteran experienced the following cluster of symptoms: (1) negative alterations in cognition and mood and (2) alterations in arousal and reactivity. Specifically, he had hypervigilance, volatile emotions, and insomnia after his tour of duty. He had experienced these symptoms for more than 6 months.

He recalled a traumatic event of "going on a big patrol and pull[ing] dead bodies." He had a past medical history of hypertension, hypercholesterolemia, and depression. He was in the United States Marines Corp. He had 4 years of Service. He had since retired. He had seen combat and fought in the Vietnam War. Personally, this participant's primary medical concerns before the course were: lack of focus; anxiety; insomnia; and being "short-tempered." The dates of his 5-day course were 3/22/12–3/26/12.

Per documentation, before the course, he experienced the following severe PTSD symptoms: (1) extreme levels of increased arousal; (2) severe trouble sleeping; (3) severe anger and irritability; (4) significant trouble concentrating; and (5) being hypervigilant. He avoided thinking or talking about the traumatic event, because he had moderately severe reactions toward reexperiencing the traumatic event. He also had moderately severe physical reactions when something reminded him of the event.

This participant learned and practiced the SKY technique during the 5-day course. All of his recorded symptoms and measures improved both subjectively and objectively. Within the first few days of the course, he noticed that his emotions were less volatile and he was able to handle being in crowded places more easily. After completing the course, he had (1) a decrease in depersonalization episodes, (2) less emotional volatility, (3) decreased hypervigilance, (4) increased concentration, and (5) an improved quality of sleep. Before the training "if I wasn't angry, I was going to find something to get angry about." In addition to continuing his breathing exercises, he became an advocate of the program and speaks to groups of veterans about the benefits.

## RESULTS

All participants filled out the PCL-M, a validated instrument based on the *DSM-IV*, which was developed in

1993 by Weathers et al.<sup>3</sup> The participants completed the PCL-M both before starting and after finishing the course. There are two methods of scoring the PCL-M: (1) the overall score and (2) the symptom cluster method (SCM).<sup>26</sup> The overall score ranges from 17 to 85, with an increased likelihood of PTSD correlating with a higher score. The SCM scoring divides the questions into three categories: (1) Re-experience; (2) Avoidance/Numbing; and (3) Increased Arousal.<sup>27</sup>

According to the *DSM-IV*, Re-experiencing the traumatic event involves any of the following: recurrent memories; recurrent dreams; acting as though the trauma were recurring (including flashbacks); psychological distress; and physiologic reactions. Avoidance occurs when a person goes out of his or her way to avoid certain situations, people, or thoughts that might trigger a memory of the trauma. Numbing includes the inability to remember certain pieces of the trauma; decreased interest in activities; feeling detached from people (even loved ones); and predominantly having negative thoughts and feelings, and negative expectations about the future. Increased Arousal includes angry or irritable outbursts for little or no reason, hypervigilance, easily startled, trouble concentrating, and difficulty with sleep.<sup>28</sup>

The PCL-M cut-off score varies depending on the estimated prevalence within the population being studied. In a VA specialty mental health clinic, the estimated prevalence of PTSD is ~40%, and the suggested cut-off score is at least 45 for the screen to be positive for PTSD.<sup>26</sup> In other settings, such as a VA primary care clinic, the cut-off score is at least 36 reflecting the lower prevalence of PTSD in that population. In a civilian primary care clinic, the cut-off score is at least 30. Participant #3 started with the highest overall precourse PCL-M score of 72. Using the PCL-M cut-off score of 45, he would have been screened in for PTSD in a VA mental health clinic. However, using the lower cut-off scores of 36 and 30, Participants #1 and #2 each met the criteria to be screened for PTSD in VA and civilian primary care clinics, respectively.<sup>26</sup> With a higher precourse PCL-M cut-off score, Participant #3 had a more severe form of PTSD than the other two participants.

The PCL-M is also used to monitor a change in symptoms. After the course, all 3 participants had a decrease in their overall PCL-M scores (Table 1). Specifically, post-course, all 3 participants had a PCL-M point score decline of >5. This indicates that all 3 participants had positive responses to the intervention and that this was not due to chance.<sup>27</sup> Participant #3 had PCL-M point score decline of greater than ten points. This indicates that his response is clinically meaningful.<sup>27</sup>

SCM scoring is considered more sensitive than the PCL-M overall score cut-off method<sup>26</sup>; however, when using the SCM method, only Participant #3 met the screening criteria for PTSD. In SCM scoring, there must be at least 1 item in the Re-experience domain of at least moderate severity of

TABLE 1. CHANGE IN PCL-M OVERALL SCORES

Participants	Score prior to course	Score after course	Change in PCL-M
#1 (male)	45	36	-9
#2 (female)	31	22	-9
#3 (male)	72	53	-19

PCL-M, PTSD Checklist—Military Version; PTSD, post-traumatic stress disorder.

symptoms, 3 or more items with a moderate or severe score in the Avoidance/Numbing section, and at least 2 items in Arousal scored at least moderate in severity.

In evaluating the SCM subcategories, the most dramatic postcourse SCM score changes occurred with Participant #3, who also had the highest overall precourse SCM scores. However, all 3 of the participants had decreased scores when comparing precourse to postcourse scores (Table 2).

The SCM subcategory with the least change in score was Re-experience. Both Participants #1 and #3 had minimal changes in this category. Participant #2 had no change in this category pre- or postcourse. Specifically, the participants had minimal change toward the two following situational questions: (1) acting or feeling as if the traumatic event were happening again and (2) having a physical reaction when something reminded each of them of the traumatic event. The two question responses decreased from 4 of 5 to 3 of 5 on a Likert scale.

The SCM subcategory with the greatest change in score was Increased Arousal. All 3 participants reported improvement in concentration. Participants #1 and #3 reported improved sleep. Participants #2 and #3 felt less irritable and had fewer angry outbursts. Participants #1 and #3 were less vigilant after the course. Participants #1 and #2 were less “jumpy” and not as easily startled. Participant #3 scored this question 4/4 each time.

## DISCUSSION

PTSD is a cluster of dysregulated: (1) emotions; (2) feelings; (3) thoughts; and (4) behaviors. To influence or adjust a person’s behavior, it is not enough to just treat or

TABLE 2. CHANGE IN PCL-M SCM SCORING

Participant	Re-experience		Avoidance/ Numbing		Increased Arousal	
	Prior	Post	Prior	Post	Prior	Post
#1 (male)	10	9	18	16	17	11
#2 (female)	8	8	14	9	9	5
#3 (male)	17	13	28	22	24	16

PCL-M, PTSD Checklist—Military Version; PTSD, post-traumatic stress disorder; SCM, symptom cluster method.

adjust their thoughts. It is even not enough to address the deeper aspects of their feelings and emotions. To change a person’s behavior, there must be a change in the person’s basic physiology. Physiology is just streams of data that tell a person what is going on in his or her body, such as heartbeat and respiration. Pulse or heart rate, unfortunately, cannot be changed voluntarily. Respiration, however, can be altered voluntarily.<sup>29,30</sup>

Respiration is the only physiologic function of the autonomic nervous system (ANS) that is both voluntary (i.e., holding one’s breath), and involuntary (i.e., breathing during sleep). Respiration is the one way of influencing the sympathetic and parasympathetic nervous system balance. Heart rate and breathing are coupled by the physiologic process/measurement of heart rate variability.<sup>29</sup> Respiration and emotions are tightly coupled. For example, typically, the feeling of anxiety is coupled with short rapid breaths, while the feeling of depression is coupled by short, shallow inhalations and long exhalations.<sup>29</sup>

This case series shows that all 3 participants via the SKY intervention had objective, measurable reductions in the SCM category of Increased Arousal. Subjectively, the participants had less hyperarousal and improved sleep. This finding correlates with previous research showing that breathing techniques can reduce: (1) anxiety<sup>31</sup>; (2) depression<sup>32</sup>; (3) impulsivity<sup>33</sup>; and (4) sleep disorders.<sup>34</sup> Published studies suggest that, specifically, SKY significantly reduces symptoms of PTSD, depression, and anxiety in victims of both combat<sup>35</sup> and mass disasters,<sup>36</sup> and that those results persist after completion of treatment. Specifically, Seppälä et al. found similar findings of a reduction in the Increased Arousal category in military veterans who practiced SKY both immediately post-intervention and also at a 1-year follow-up.<sup>37</sup>

There was also an observed SCM reduction of Avoidance/Numbing in the 3 participants. Subjectively, the participants were able to focus their thoughts better and interact with other people more efficiently. Again, previous research on breathing techniques showed that they can increase: (1) emotional regulation,<sup>38</sup> (2) cognitive function,<sup>39</sup> and (3) quality of life (QoL).<sup>40</sup> Seppälä et al. posits the conclusion that SKY could reduce trauma by decoupling the traumatic memories from the fear response.<sup>37</sup> They note that participants reported re-experiencing traumatic memories while breathing in an induced, relaxed physiologic state but these memories did not affect the patients as strongly. These findings could have been noted in the 3 participants in the current study as well.

The goal of PTSD treatment overall—no matter what the methodology might be—is to improve the patient’s QoL and performance. Treatment will touch upon one or more of the dysregulated items; CBT targets thoughts and behaviors, biofeedback targets thoughts and feelings, and medication targets physiology.

*Pranayama* exercises such as SKY most likely work by targeting the patient’s underlying biology—by modulating the ANS without drugs. Regulating the respirations with

rhythmic breathing patterns can augment the participant's emotions and resulting feelings. These changes in what the patient feels can modify the participant's interpretive thoughts, which, in turn, can change the patient's behavior. Repeated habitual behavioral changes then possibly can adjust/change a person's QoL.

Albert Einstein famously said: "No problem can be solved from the same level of consciousness that created it." By addressing the participants' respiratory patterns, SKY could provide complementary assistance with patients' PTSD treatment not at the level of behavior or thought but by regulating physiology at the foundational level of the breath.

## CONCLUSIONS

The 3 participants highlighted in this case series all benefited from learning the SKY breathing technique. Their concentration, sleep, and hyperarousal improved after the training. These improvements may positively affect the participants' QoL and mental and physical health. SKY is a tool that course graduates can use for the rest of their lives in conjunction with medications and therapy. SKY may be used alone for patients with mild PTSD or patients who prefer to avoid medications, preferably while under the care of a physician who can monitor their mental health status.

There were a few limitations in this study. Some limitations centered on the design of the study itself—a case series. Because this was a case series of only 3 participants, the current authors cannot draw any broad conclusions about the breathing technique. A large-scale randomized study of the technique would show how much of an impact SKY breathing has on the symptoms of PTSD. Additionally, recent follow-up was not done for these 3 patients; therefore, the current authors are not able to determine the long-term sustained maintenance of the results found in this study. A future study showing how long the effects have lasted and if the results were sustained would be very informative.

Other limitations centered on the structure of the workshop itself. The group setting with other veterans with PTSD could have had a confounding effect on the results. The group might have acted as a support group, and the participants could have derived benefit from this in addition to, or instead of, the SKY breathing technique. Finally, only people who can tolerate groups will participate in the workshop, and this could skew the results. Most people with agoraphobia will be unable to attend because it is too difficult for them to leave their homes and be around strangers or in large groups.

There is potential that SKY breathing or other forms of controlled rhythmic yogic breathing could play a role in future PTSD research. As understanding of how breathing and meditation influences working memory and cognition increases, combining this breathing technique with functional

magnetic resonance imaging studies or cognitive testing would help researchers understand how changing physiologic parameters—such as respiration—affects brain activity.

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## AUTHOR DISCLOSURE STATEMENT

No competing financial interests exist.

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