

Ashtanga Vinyasa Yoga For PTSD in a Veteran Population

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## Abstract

**Objective:** Posttraumatic stress disorder (PTSD) is a serious medical and mental health issue currently faced by many veterans. The number of veterans diagnosed with PTSD is rising quickly. Existing treatments have not proven to be fully effective. The purpose of this study was to test Ashtanga Vinyasa Yoga (AVY), a breath-based yoga intervention, designed to improve the symptoms of PTSD and sleep quality in a veteran population.

**Methods:** This was a quasi-experimental pilot study. Sixteen veterans who screened positive for PTSD were assigned to a ‘yoga group (treatment)’ or a ‘waitlist yoga group (control).’ Assessments were conducted for both groups at pre-treatment and post-treatment. Differences in pre and post-treatment self-report symptom survey data were compared. Treatment group and non-treatment group pre and post-treatment scores were also compared. Outcome measures were the Posttraumatic Stress Disorder Checklist for the DSM-5 (PCL-5) and the Insomnia Severity Index (ISI).

**Intervention:** The ‘yoga group’ was provided a one-month, eight-session, twice-a-week, 60-minute AVY intervention class adapted for all mobility levels.

**Results:** At the conclusion of the study, 88% of the treatment group no longer met criteria for a provisional diagnosis of PTSD using the self-report PCL-5 and 88% no longer displayed moderate or severe clinical insomnia scores on the ISI. There was no change in the control group. Clinically significant reductions in the PCL-5 and ISI scores were shown in the treatment group. The control group showed no meaningful reduction in PCL-5 and ISI scores.

**Conclusions:** Results of this study support existing evidence and demonstrate AVY is an effective and safe intervention for people experiencing the symptoms of PTSD.

*Keywords:* Post-traumatic Stress Disorder, Ashtanga Yoga, Meditation, Pranayama, Veterans, Yoga Breathing

## Introduction

Posttraumatic Stress Disorder (PTSD) is an anxiety disorder that can develop anywhere from 30 days to many years after exposure to a traumatic event<sup>1</sup> and is a serious medical and mental health issue faced by many veterans. Existing treatments have not proven to be fully effective<sup>2,3</sup> especially for the sets of symptoms described by the Diagnostic and Statistical Manual of Mental Disorders, 5<sup>th</sup> Edition (DSM-5) marked by “negative affect” (criteria D) and “hyper-arousal” of the autonomic nervous system (Criteria E)<sup>1,3,4</sup>. Criteria D and E are also responsible for the greatest negative impact on quality of life and survivability.<sup>5</sup> Both the Veterans Administration (VA) and the Institute of Medicine (IOM) have called for more research into potential treatments for PTSD<sup>6,7</sup> especially those based in complementary and integrative medicine (CIM).<sup>8</sup>

Military veterans are particularly at risk for PTSD due to the nature of the trauma they are exposed to.<sup>1</sup> Recent studies have increased understanding of the disorder yet the number veterans with PTSD is increasing<sup>9</sup>, the costs of PTSD-related treatment for the Veterans Administration (VA) and the Department of Defense (DoD) are in the billions.<sup>10</sup> PTSD is implicated in the average 20 Veteran suicides occurring daily.<sup>11</sup> The empirical evaluation of yoga applied to manage stress syndromes such as PTSD in Veterans is logical given the evidence base for the use of yoga for other medical and psychophysiological illnesses in other populations and because PTSD is a psychophysiological condition.<sup>12</sup> Ashtanga Yoga is an ancient system of mind-body practice with emphasis on breath and posture and is known to provide an experience of focus, peace, equanimity, physical, and mental strength.<sup>13</sup> Breath-based yoga has been shown to improve mental and physical health and improve quality of life in Veterans.<sup>14</sup> Clinical studies suggest breath-based yoga can address the physiological underpinnings of PTSD symptoms,

particularly hyperarousal symptoms and other related disorders.<sup>15</sup> As of 2012, only one qualitative study documented the effects of yoga in Veterans with PTSD. In that study, Veterans reported improved sleep, reduced rage, reduced anxiety and emotional reactivity and improved self-awareness using a yoga nidra intervention (iREST).<sup>16</sup>

More recently, studies that include a yoga protocol with an emphasis on breath and physical posture (asana) have shown improved effect on the most difficult to treat criteria D & E symptoms.<sup>17</sup> A 2009 study<sup>18</sup> suggests that yoga interventions focusing on the modulation of breath and posture is key in balancing allostasis and modulating affect, mood, and stress response. Body and breath-based yoga practice is known to create emotional, physical, and mental health and to increase the transmission of the inhibitory neurotransmitter gamma amino butyric acid (GABA)<sup>19,20</sup> also known to be poorly distributed in persons with moderate to severe PTSD.<sup>19</sup> Three studies to date<sup>21,22,23</sup> evaluate the impact of yoga pranayama (breath-based) on a unique and specific population of veterans and military service personnel with PTSD. All showed significant changes in criteria E hyperarousal symptoms. Two controlled studies with civilian populations<sup>24,25</sup> evaluated the impact of pranayama alone on PTSD symptoms and a third study on Bihar flood survivors<sup>26</sup> used a breath-based yoga protocol. Two remaining breath-based yoga studies were randomized controlled trials<sup>27,28</sup> that included veterans and civilians with PTSD. Finally, a randomized controlled trial<sup>29</sup> examined a trauma-informed yoga intervention with pranayama as an adjunctive treatment for women with chronic, treatment-resistant PTSD. Most yoga studies reviewed show significant improvement in PTSD and insomnia symptoms, and more importantly, none showed any negative or iatrogenic effects. To our knowledge, this is the first study using Ashtanga Yoga adapted for all mobility levels addressing PTSD and insomnia symptoms in Veterans. Based on the review of literature, the

purpose of this preliminary pilot study was to examine the impact of a four week Ashtanga Vinyasa Yoga (AVY) intervention on PTSD criteria symptoms especially Criteria D & E and sleep problems among Veterans with PTSD.

### **Materials and Methods**

This project was a quantitative quasi-experimental interventional pilot study. All protocols and measures were approved by the Institutional Review Board (IRB) at the University of Massachusetts, Lowell. Recruitment then took place using fliers posted at a large North Carolina Veterans Affairs hospital, local community health centers serving veterans, local veteran centers, veteran transitional housing programs and advertisements on Craigslist. Participants were initially screened by phone to assess eligibility using the Primary Care Posttraumatic Stress Disorder screening tool (PC-PTSD).<sup>30</sup> Eligible consented subjects attended an initial baseline assessment meeting where they were consented and given a baseline demographic questionnaire and two self-report measures to assess the severity of their PTSD and insomnia symptoms. Measures used were the Posttraumatic Stress Disorder Check List for the DSM-5 (PCL-5),<sup>31</sup> and the Insomnia Severity Index (ISI).<sup>32</sup> Measures were administered at baseline and post-intervention for both yoga intervention and waitlist control group participants.

### **Participants**

Inclusion criteria for participants were military veterans, age 18 and older, able to attend 60-minute class twice a week for four consecutive weeks, and be diagnosed with PTSD by having a score on the PCL-5 that meets the minimum diagnosis of mild to moderate PTSD.<sup>33</sup> Veterans who had taken a yoga class in the past six months, had a recent change in psychiatric medications, had an active substance abuse problem in the past three months, or were assessed as at risk for suicide or homicidal behavior, were excluded. Three yoga class participants dropped

out prior to the first class due to schedule changes related to job or family and the remaining participants were assigned to the yoga group (n=9). The remaining eight participants were assigned to the assessment-only control group and one was lost to follow up for unknown reasons (n=7). All seven were offered the intervention following the yoga group, but all declined due to scheduling conflicts, family obligations, and changes in employment status. Table 1 provides demographics of the sample.

## **Measures and Variables**

### **Primary Care Posttraumatic Stress Disorder Screening Tool (PC-PTSD)**

The PC-PTSD<sup>30</sup> is a 4-item PTSD symptom tool and was used to initially screen participants for inclusion. This psychometrically validated four item brief screening instrument has been approved for and is used regularly to preliminarily screen for PTSD at major medical centers in the United States and Department of Veterans Affairs Medical Center.<sup>9</sup> The PC-PTSD is a summary of the four-cluster symptom sets in the DSM-5. This screening tool is measured as psychometrically sound for screening measures of PTSD symptoms.<sup>30</sup> In a study of the instrument's psychometric properties, Prins et al.,<sup>30</sup> found that the PC-PTSD demonstrated acceptable temporal stability ( $r = 0.83$ ) and has a sensitivity of 0.78 and a specificity of 0.87. For the purposes of this study, positive endorsement of at least two items on the screening tool was considered positive.<sup>9</sup>

### **Posttraumatic Stress Disorder Check List for the DSM-5 (PCL-5)**

The PCL-5 was updated in 2014 with diagnostic criteria for PTSD in the DSM-5.<sup>31</sup> The PCL-5 is a 20-question Likert scale self-report measure that assesses 20 DSM-5 symptoms of PTSD.<sup>1</sup> An overall symptom severity range can be obtained by summing total scores for each of the 20 items. The scores range from 0-80, where 80 is the most severe. Symptom cluster

severity scores can be obtained by totaling the scores for the items within each cluster, i.e., criteria B “re-experiencing” symptoms (items 1-5), criteria C, “Avoidance” symptoms (items 6-7), criteria D, “negative affect” symptoms (items 8-14), and criteria E, “hyperarousal” symptoms (items 15-20).<sup>33</sup> Psychometric properties of the PCL-5 have been extensively validated, exhibiting strong internal consistency with a Cronbach  $\alpha$  of 0.94, test-retest reliability correlation coefficient of  $r = .82$  with good convergent and moderate discriminant validity.<sup>17, 31</sup> Overall, results indicate that the PCL-5 is a psychometrically sound measure of overall and criteria specific PTSD symptoms.<sup>17</sup>

### **Insomnia Severity Index (ISI)**

The Insomnia Severity Index (ISI) was developed by Gagnon, Belanger, Ivers, & Morin.<sup>32</sup> The ISI is used to detect cases of insomnia in population and clinical samples and has been consistently found to be psychometrically sound for measuring overall perceived sleep difficulties.<sup>32, 34</sup> Excellent internal consistency has been found for this measure with a Cronbach  $\alpha$  of 0.91.<sup>32</sup> This information is gathered in a five point Likert scale where “0” is no problem and “4” is very severe or concerning. Total severity scores range from 0-28, with 28 being the most severe insomnia.

### **Intervention**

The ‘yoga group’ was given a trauma-sensitive<sup>35</sup> Ashtanga Vinyasa Yoga class for 60 minutes twice a week for four weeks. Classes were taught by the investigator who has advanced training in Ashtanga Vinyasa Yoga (AVY) technique. The class sequence was developed by the investigator and an expert consultant who is an authorized Ashtanga Yoga instructor. The AVY intervention is a therapeutic system of yoga and meditation that is considered trauma-sensitive.<sup>35</sup> It was adapted in this study for Veteran trauma survivors of all mobility levels and based on the

technique of the Sri K Pattabhi Jois' Ashtanga Yoga Research Institute of Mysore, India.<sup>36</sup> This yoga style emphasizes a breath technique that is linked directly to movement, body posture, and a meditative visual focus point. The breath and body are linked synchronously and provide the practitioner with the experience of focus, peace, equanimity, physical, and mental strength.<sup>36</sup> The yoga intervention involved two classes a week for 60 minutes. Each group session was structured into four distinct sections that involved a short introduction, check-in, and yoga theory, guided breath practice, poses with visual focus points, and an integrative relaxation period. Poses with breath and focus started with Surya Namaskara (Sun Salutation) and moved into standing poses, seated poses, side angle poses, forward bending and simple backbending poses followed by a slow set of inversions and finishing poses. The same sequence was followed in each session, adding poses to the sequence as the class advanced. The instructor provided support to each participant individually when they needed assistance doing poses safely and correctly. Participants were taught a "comfort pose" to which they could retreat if they felt uncomfortable at any time during class. Participants were reminded that they were not required to do a pose and encouraged to stay connected to their breath and retreat to the "comfort pose" if necessary. Coordinating breath with postures and visual focus point gradually progressed over each session, thus allowing participants to achieve a greater inner focus and calm. Incorporating an intentional breath to each posture was a priority of this intervention. While physical postures were important, the intervention emphasized attention and kindness to self, emotional regulation, distress tolerance, well-being and self-care.



## **Results**

### **Participant Characteristics**

Data was analyzed for the 9 participants in the ‘yoga group’ who complete pre and post intervention self-report questionnaires (PCL-5, ISI) and the 7 participants in the control group who completed the pre and post self-report questionnaires (PCL-5, ISI). Differences between the two groups were examined as well as differences within each group of pre and post intervention scores using both paired and independent sample t-tests. To overcome the limitations of a non-randomized group assignment and a small “n”, Levene's Test for Equality of Variances was run. The test of equality of variance is not significant for PCL-5 scores ( $F = .059, t=1.833, p=.812$ ); and the ISI ( $F = 2.02; t = .687; p = .165$ ). Thus the assumption of equality of variance is met for both PTSD and insomnia symptoms.

### **PTSD and Insomnia Symptoms**

Outcome data for this study includes individuals who completed at least six of the eight-hour total-dose intervention. The mean intervention dose was 7.43 hours. All yoga and control group participants completed both pre and post intervention self-reports surveys.

Table 2 provides paired t-test and mean baseline and post intervention scores on PTSD and insomnia measures for Yoga Group. Table 3 provides independent sample t-tests for PTSD and insomnia measures. The mean post-intervention overall PCL-5 score difference between the two groups is 15.032 which is clinically significant. Mean post-intervention ISI score difference is 2.0375. Due to small sample size, statistical significance cannot be claimed. Table 4 provides mean baseline and post intervention score changes for the yoga and control groups for both PTSD and insomnia measures.

## **Discussion**

Results of this pilot study suggest that this breath-based Ashtanga Yoga program is a viable and effective intervention for PTSD and may have particular usefulness in addressing the difficult to treat Criteria E hyperarousal symptoms. The overall improvement in PTSD symptoms and sleep quality also suggest further inquiry utilizing this intervention is warranted. Participants in the yoga group experienced a mean reduction in overall PCL-5 scores of 16 points, which is a clinically significant improvement in PTSD symptoms.<sup>33</sup> None in the control group showed a significant change and all continued to show moderate to severe PTSD symptoms. The yoga group also showed clinically significant improvement in sleep quality while the control group continued to show scores indicating clinical insomnia. The score reductions in the yoga group were clinically significant. While the difference in pre-post intervention scores were statistically significant, the small sample size precludes the ability to make this assertion. However, the study does demonstrate that this breath-based yoga is potentially an effective intervention to treat PTSD.

Results of this study support existing data from other recent studies using breath-based yoga for the treatment of PTSD. In addition to showing overall PTSD symptom reduction, each of the hyperarousal scores decreased significantly in the yoga group, supporting data from other protocols that used a breath-based yoga intervention to treat PTSD<sup>25,21,28,22,23</sup> three of which also used a veteran or military personnel population only.<sup>21,28,23</sup> Brown & Gerbarg,<sup>37</sup> noted a striking finding where PTSD hyperarousal symptoms improved only when the yoga intervention included a breath-based component. Yoga breath, or pranayama, has long been known to influence PTSD symptom related physiological functions such as heart rate variability.<sup>38</sup> Due to small sample size, statistical significance cannot be stated. Clinical significance is indicative of treatment effects and there were clinically significant improvements in this study. Due to

recruitment challenges, the groups could not be randomized. A larger sample size and randomized sampling is needed to demonstrate a large effect size. In addition, differences in intervention effects on specific criteria may be more pronounced, strengthening conclusions. However, the results of this study do have clinical implications for potential use of this intervention. Most importantly, no adverse effects have been reported in the breath based yoga interventions implemented in this project. Other limitations include the researcher conducting the yoga classes and the self-report nature of the measures. It is possible that social desirability bias could enter into the participant responses.

Access to PTSD treatment using yoga is limited and many barriers still exist for target populations. A recent survey of VA Medical Centers around the country found that common barriers to care included lack of trained staff, lack of funding and lack of evidence based research.<sup>39</sup> However, as discussed in this paper, several other original studies using a yoga or a breath-based yoga intervention have been published since 2012 that add to the evidence base. This yoga program was accessible for all mobility levels, well attended and enthusiastically received. Participants asked for instructions to continue home practice at the conclusion of the study and some planned to continue meeting regularly for group yoga sessions. This suggests that other programs of this kind would be appealing to those who would not normally have access to yoga programs and classes where cost and location are prohibitive such as the sample population used in this study.

An effective, affordable, intervention for PTSD with few adverse and iatrogenic effects will have significant clinical implications. Body-based contemplative practices used as prescribed therapeutic interventions are highly preferred and indicated for high-trauma populations such as war veterans, torture survivors and people who have suffered from mild to

serious mental illnesses.<sup>40</sup> Ashtanga Yoga is an effective and safe intervention for this population. As shown in this pilot study, it can potentially improve treatment resistant PTSD symptoms such as hyperarousal, avoidance, and re-experiencing. The results of this study will also add to existing data on contemplative neuroscience studies and yoga interventions and strengthen overall evidence. Further investigation is warranted to support current findings.

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### **Author Disclosure Statement**

No competing financial interests exist.

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