Research

Efficacy of a Satyananda Yoga Intervention for Reintegrating Adults Diagnosed with Posttraumatic Stress Disorder

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Abstract

The prevalence of posttraumatic stress disorder (PTSD) in ex-combatants from illegal armed groups in Colombia has been estimated at 37.4%. This high prevalence indicates a need to explore alternative and adjunctive therapies in the treatment of PTSD. A randomized controlled trial was undertaken to evaluate the efficacy and safety of a protocol based on Satyananda Yoga® in PTSD-diagnosed reintegrating adults in Colombia. One hundred reintegrating adults (n = 50 for each of the yoga and control arms) from Bogota and Medellin participated in this study. Yoga participants engaged in a Satyananda Yoga intervention for 16 weeks while the control group continued the regular demobilization program. The Posttraumatic Stress Disorder Checklist - Civilian Version (PCL-C) was used to evaluate the effects of the applied therapy. Outcomes were assessed before entry and after the treatment. T-tests revealed a treatment effect of $d = 1.15$ for the yoga group and a between-groups effect size of $d = .73$. The difference in improvement in PCL-C scores between both groups was 18.91% ($p < 0.05$). The highest percentage of improvement was observed in the re-experiencing symptom cluster (23.71%; $p < 0.05$), with a treatment effect of $d = 1.40$ for the yoga group and a between-groups effect size of $d = 1.15$. The data suggest that Satyananda Yoga methodology is an effective therapy for reintegrating adults diagnosed with PTSD. Further research is needed in order to evaluate prolonged effects of this alternative therapy.

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Introduction

Posttraumatic Stress Disorder (PTSD) is a clinical psychiatric condition that affects individuals that have been exposed to traumatic experiences such as natural disasters or combat. PTSD affects individuals as well as their families and carries high costs for society, especially for individuals who have been exposed to combat (Goldberg et al., 2014; Ramchand, Rudavsky, Grant, Tanielian & Jaycox, 2015). The term "reintegrating" is used to refer to ex-combatants from illegal armed groups who gave up their weapons in recent years. PTSD prevalence in reintegrating persons in Colombia has been estimated at 37.4% (Baldovino, 2014) to 57% (La Espriella & Falla, 2009). Another study of 1,570 individuals participating in the reintegration process revealed a PTSD prevalence of 40% (Molina & Aponte, 2010). This finding is consistent with data from the National Center for PTSD (2012) on the prevalence of PTSD in American veterans (39%).

PTSD prevalence in reintegrating persons may be associated with combat-related trauma acquired during the ongoing domestic armed conflict that has been running in Colombia for more than 50 years (Perez-Olmos, Fernandez-Piñeres, & Rodado-Fuentes, 2005). In 2002, the Colombian government initiated a peace transition program coordinated by the Colombian Agency for Reintegration (Agencia Colombiana para la Reintegración; ACR) that facilitates the demobilization and reintegration of individuals from various illegal armed groups (ACR, 2013). The reintegration process involves participation in a mandatory program that all individuals who have relinquished their weapons must follow in order to be integrated back into society. Individuals engaged in the armed groups also often come from low income and violent backgrounds and have lived through traumatic events associated with rights violations, domestic violence, and lack of opportunities during their childhood and adolescence (Castellanos et al., 2012).

According to the ACR, 26,712 persons were participating in the reintegration process at the end of 2014 (ACR,

2015), which indicates that over 10,000 reintegrating persons are likely suffering from PTSD. Until today, such cases have been referred to public clinical care services for treatment. Treatment alternatives for PTSD in Colombia are limited due to a lack of public clinical care services. Furthermore, there is not sufficient evidence on treatment efficacy and adherence (Posada-Villa, Aguilar-Gaxiola, Magaña & Gómez, 2004). Taken together, these factors indicate a need for further research on alternative and adjunctive therapies for the treatment of PTSD (Perez-Olmos, Fernandez-Piñeres, & Rodado-Fuentes, 2005).

No rigorous study has been published to date on the efficacy or effectiveness of alternative treatments for PTSD in Colombia. Currently, publicly available treatments include selective serotonin reuptake inhibitors (SSRIs) and serotonin norepinephrine reuptake inhibitors (SNRIs), whose effect on combat-related PTSD remains questionable (Baciu et al., 2007; Brady et al., 2000; Cukor et al., 2009; Davidson et al., 2006a, 2006b). A review of common PTSD treatments by Cukor et al. (2009) suggested that behavioral treatments, social and family-based treatments, imagery-based treatments, distress tolerance-focused therapy, and technology-based treatments are the most common and effective PTSD treatments. However, the majority of these treatments are unavailable to reintegrating persons seeking assistance through the public health services in Colombia (Ministerio de Salud, 2015).

Studies based on mindfulness programs with war veteran samples have shown moderate benefits for veterans diagnosed with PTSD (Kearney, McDermot, Malte, & Simpson, 2012; Kearney, McDermot, Malte, & Simpson, 2013; Vujanovic, Niles, Pietrefesa, Schmertz, & Potter, 2011). These studies mainly involve meditation associated with the Buddhist Zen tradition, but they share the aim of creating awareness with the yoga practices chosen for this study. Other evidence-based interventions for PTSD, such as prolonged exposure therapy (PET), have shown mixed results and low adherence rates (Back, Killeen, Foa, Santa Ana, & Gros, 2012; Nacasch et al., 2011; Powers, Halpern, Ferenschak, Gillihan, & Foa, 2010; Tuerk, Grubaugh, Myrick, Hamner, & Aciemo, 2011).

Recent studies have demonstrated the positive effects of yoga therapy on PTSD symptoms, suggesting that multicomponent body-mind programs may be effective interventions for PTSD (Clark et al., 2014; Descilo et al., 2010; Dick, Niles, Street, DiMartino, & Mitchell, 2014; Mitchell et al., 2014; Seppälä et al., 2014; Staples, Hamilton, & Uddo, 2013; van der Kolk et al., 2014). A meta-analysis by Cabral, Meyer, and Ames (2011) promoted yoga as a beneficial adjunct treatment and reported a mean effect size of -3.25. In a study exploring the effect of a 10-week trauma-informed yoga intervention for 64 women with chronic, treatment-resistant PTSD, van der Kolk et al. (2014) established a moderate overall treatment effect of d = .41 (group x time interaction). Specifically, the yoga intervention produced a large effect size (d = 1.07) whilst the control group demonstrated moderate symptom reduction (d = 0.66). A recent randomized controlled longitudinal study reported a large effect size of d = 1.16 for total PCL-M score reduction in a sample of 21 U.S. Army Veterans after a one-week Sudarshan Kriya program (Seppälä et al., 2014).

Furthermore, a study of 12 war veterans in the United States reported a moderate treatment effect of d = .36 for hyperarousal symptom reduction after 12 yoga sessions (Staples et al., 2013). Telles, Singh, and Balkrishna (2012) reported effect sizes of d = .5 and d = .8 in a group of high school students with PTSD from the Kosovo War after completing a treatment program of meditation and breathing techniques. However, these results should be interpreted with caution due to the lack of a control group. Another study of war-related PTSD reported a large treatment effect of d = 2.20 in a sample of 31 children exposed to war in Sri Lanka after six sessions of meditation and relaxation (Catani et al., 2009). The yoga nidra variant, iRest, has also rendered positive results for combat-related stress (Stankovic, 2011). Whilst this is promising, it should be noted that iRest is based on the practice of Satyananda Yoga Nidra, which was developed by Swami Satyananda, the founder of Satyananda Yoga (Saraswati, 1998). The present study utilized Satyananda Yoga Nidra in the treatment protocol.

Other studies have indicated the beneficial nature of yoga for PTSD and have encouraged further research on the subject (Baciu et al., 2007; Cabral et al., 2011; Cocfield, 2007; Da Silva, Ravindran, & Ravindran, 2009; Descilo et al., 2011; Dick et al., 2014; Salmon, Lush, Megan, & Septhon, 2009; Mitchell et al., 2014; Stankovic, 2011; Stoller, Greuel, Cimini, Fowler, & Koomar, 2012; Telles, Singh, & Balkrishna, 2012; van der Kolk et al., 2014). Nevertheless, other authors have suggested that controlled studies in diverse cultures are needed to extend these findings to other populations (e.g., Descilo et al., 2010). Yoga for PTSD has also been recommended when first-line treatments are not successful or require augmentation (Cukor et al., 2009). Caution should be taken before employing any emerging therapies outside of research protocols developed to test their efficacy (Cukor et al., 2009; Descilo et al., 2010). This study explores the efficacy of a Satyananda Yoga program in a Colombian sample where first-line treatment has not been sufficiently successful.

Satyananda Yoga classes focus on four key aspects of yoga: asana (physical postures), pranayama (breathing exercises), yoga nidra (deep relaxation), and meditation (Saraswati, 2008). The practices of asana and pranayama are drawn from the hatha yoga tradition, while the practices of

yoga nidra and meditation are taken from the raja yoga tradition. All Satyananda Yoga practices are aimed at creating awareness in an integral or holistic approach, which harmonizes the body, mind, emotions, and spiritual aspects of the practitioner (Saraswati, 1996; Vivekananda, 2005). The asana and pranayama component can reduce anxiety, depression, and stress symptoms by helping participants to focus on awareness of the present moment (Vivekananda, 2005), rather than focusing on traumatic events of the past or future uncertainties. Asanas and pranayamas also have a significant effect on hormone secretion, including increased dopamine and serotonin secretion and reduced emission of the stress hormone cortisol (Thirthalli et al., 2013), which could account for an improvement in hyperarousal and re-experiencing symptoms.

Deep relaxation has also been linked to an improvement in sleep patterns, including a positive increase in electroencephalographic (EEG) alpha waves, as well as significant changes in galvanic skin response (GSR; Kumar, 2006). Both of these metrics are associated with the fight-or-flight response. Meditation, the fourth component of a Satyananda Yoga class, has also been associated with regaining the sense of control that is often lost during a traumatic event (Posadzki, Parekh, & Glass, 2010). Meditation has been shown to lead to an increased sense of self-efficacy, which could improve coping in trauma survivors (Waelde, Thompson, & Gallagher-Thompson, 2004). Meditation has further been associated with an increase in telomerase activity (Jacobs et al., 2011), 5-hydroxyindole-3-acetic acid (5-HIAA) and serotonin levels, as well as a decrease in vanillic-mandelic acid (VMA), each of which may engage the relaxation response rather than the fight-or-flight response (Bujatti & Biederer, 1976). Finally, Satyananda Yoga meditation has been associated with an increase in low frequency EEG activity (Thomas, Jamieson, & Cohen, 2014), which could be responsible for an improvement in hyperarousal and other PTSD symptoms. Satyananda Yoga was selected for use in the present study because the classes incorporate the benefits of these four practices in a holistic approach so that all PTSD symptom clusters are addressed in the most integral way.

The aim of the present study was to test the efficacy of an intervention based on a Satyananda Yoga protocol for PTSD on reintegrating adults exposed to the Colombian armed conflict. It was hypothesized that a 16-week Satyananda Yoga intervention would significantly improve PTSD symptoms.

Methods

A randomized controlled trial (RCT) design was implemented to test the efficacy of Satyananda Yoga in PTSD-diagnosed reintegrating adults. The Independent Ethics Committee of the Military Central Hospital approved the protocol, the informed consent form, and the researchers. The research was performed at all times in strict compliance with the principles established in the Declaration of Helsinki (World Medical Association, 2013). The research was conducted by Los Andes University and the Colombian non-profit Dunna Corporation. The research was funded sponsored y the Bolivar Davivienda Foundation and the ACR.

Participants

One hundred reintegrating individuals were recruited from a total population of 417 reintegrating individuals from Bogotá and Medellín, the two largest cities in Colombia. The 417 individuals were pre-selected by the ACR in Bogotá and Medellín as per prior PTSD-risk assessment or preliminary clinical observations by ACR psychologists. The sample size calculation was conducted using the EPIDAT statistics package and resulted in a sample size proportional to the following values: alpha .05%, power 80%, an expected effect size of -3.25 (as reported by Cabral et al., 2011), and a ratio of one yoga group participant per one control group participant. A sample of 92 individuals (46 per arm) was calculated. Adding an expected loss of 10%, the investigative group decided to invite a total of 100 individuals after obtaining informed consent from participants. The 417 individuals were invited to a session where the yoga intervention was explained in detail. The first 100 individuals who signed the informed consent form after this session were invited to the study. See Figure 1.

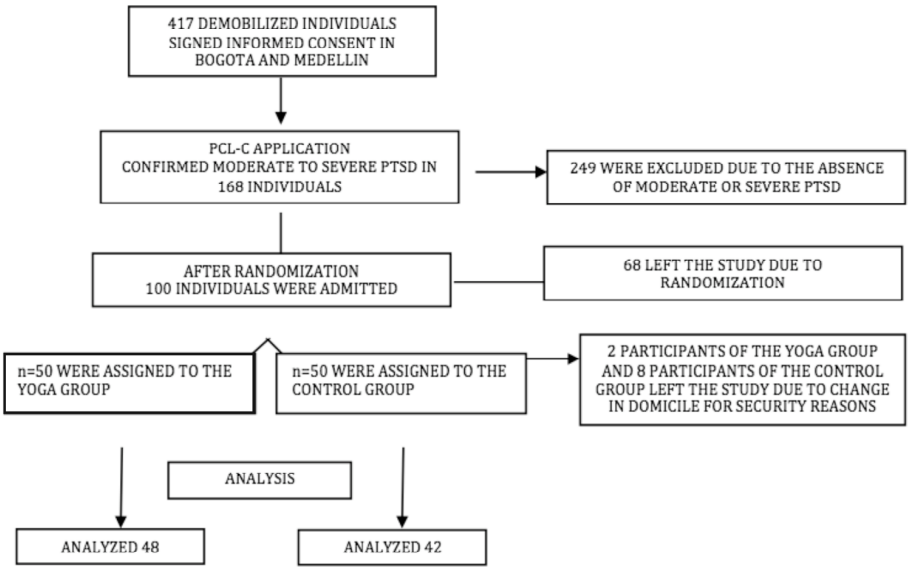

Figure 1. Flow chart of study participants.

After baseline assessments, participants were randomly assigned by computerized randomization to one of two groups: the intervention group (n = 50) or the control group (n = 50), using the EPIDAT statistical package, version 3.1. Researchers who performed statistical analyses were blinded to the assignment of the participants. During the 16-week trial, the intervention group received the mandatory ordinary assistance for reintegrating individuals plus two weekly sessions of Satyananda Yoga, while the control group only received the mandatory ordinary assistance protocol designed by ACR for reintegrating individuals, which included a monthly appointment with a trained psychologist designed to follow up on individual progress in the reintegration process. The control group was placed on a waiting list for yoga classes.

In the intervention group, two individuals withdrew due to a change in domicile for security reasons. In the control group, four individuals withdrew the informed consent. Assistance to Satyananda Yoga sessions was rigorously controlled during the trial.

Measures

Trained psychologists applied the Posttraumatic Stress Disorder Checklist - Civilian Version (PCL-C) (Andrykowski, Cordova, Studts, & Miller, 1998; McDonald & Calhoun, 2010), which an expert psychiatrist interpreted to confirm the diagnosis of PTSD. The PCL-C was chosen as it has been validated as an accurate measurement tool in Spanish for the Colombian population (Marshall, 2004; Miles, Marshall, & Shell, 2008; Pineda, Guerrero, Pinilla, & Estupiñán, 2002). The factors used to measure the severity of PTSD were the occurrence and prevalence of symptoms in each participant. The yoga intervention was evaluated by comparing PCL-C scores in the group that participated in yoga classes against PCL-C scores in the group receiving no treatment. Inclusion criteria involved signing informed consent and a diagnosis of PTSD confirmed by a minimum total PCL-C score of 44 (Pineda et al, 2002). Exclusion criteria included the non-signature of the informed consent and absence of PTSD.

Yoga Intervention

The 16-week intervention consisted of yoga classes taught twice a week by 8 yoga teachers; each city had four groups, each of which were taught by a different teacher. Each yoga teacher had 10 or more years of experience with Satyananda Yoga. In addition, a yoga expert and a psychiatrist guided the design of a handbook for participants and a teacher program for each session. The protocol was peer-reviewed by a Satyananda Yoga teacher with extensive experience working with war veterans affected by PTSD in Australia.

The yoga techniques and practices included in the study protocol were drawn from the Satyananda Yoga tradition, which was developed by Swami Satyananda Saraswati, and were adapted to meet the needs and requirements of reintegrating persons affected by PTSD in Colombia. In the spirit of Swami Satyananda's teachings, participants were encouraged to listen to and respect their bodies rather than to push for perfectly executed poses. The protocol also encouraged them to practice slowly so that awareness of the present moment was maintained. Satyananda Yoga does not use props, which facilitated the process of accepting, appreciating, and trusting one's body as it is. Regarding physical assists, Satyananda Yoga teachers generally refrain from adjusting students, trusting that they are able, in the short or long term, to adjust the practices to their own capabilities and will.

Classes were taught in an undisclosed location due to security reasons. The room was spacious and adequately lit. Each one-hour class included a component of asana (postures), pranayama (breathing techniques), yoga nidra (deep relaxation), and meditation techniques to facilitate the process of reconnecting body, mind, and emotions, and to develop acceptance of and trust in one's own self. All references to devotional aspects of yoga were removed. Postures were drawn from the beginners and intermediate Satyananda Yoga asana series (Saraswati, 1996). Relevant pranayama practices may be found in the same manual on pages 372-403 (Saraswati, 1996). Guided meditations (Saraswati, 2001) and full transcripts of Satyananda Yoga Nidra are also publicly available (Saraswati, 2006). Each class included five sections: (1) settling the mind and body and establishing awareness (5 minutes); (2) asana (20 minutes); (3) pranayama (5 minutes); (4) Satyananda Yoga Nidra (20 minutes); and (5) meditation (10 minutes).

Participants in the intervention group were encouraged to practice yoga at home during and after the intervention. To facilitate this process, individuals that were part of the intervention group were given a CD of Satyananda Yoga Nidra and various meditations, as well as a handbook detailing the postures and breathing exercises practiced during the intervention. Participants did not receive compensation for their participation in the study. However, the intervention group received a light snack after each session. Participants whose data were included in the final analysis attended at least 75% of the sessions offered during the intervention; their attendance was acknowledged by the government in a formal closing session where attendance diplomas were delivered.

Statistical Analysis

Participant data, including demographics, trauma history, and PTSD symptom duration, were collected at baseline. One week after the intervention was completed, study par-

ticipants in both groups were readministered the PCL-C. Data were analyzed using IBM SPSS Statistics Version 22.0.

Both the yoga and control groups were compared to verify PTSD scores and comparability and homogeneity of demographic variables. Chi-square tests and t-tests were used to determine group comparability depending on each variable. Hypothesis tests at the 5% level (one-tailed tests) were performed to evaluate the differences (X^2 and t-distribution for each arm, depending on the case). There was no data imputation since lost values did not exceed 5%. Once homogeneity was confirmed, we conducted t-tests to establish the efficacy of yoga in improving PTSD symptoms. Cohen's d effect sizes were calculated, alongside the percentage of improvement, which is considered clinically significant above 12% in the context of mental health (Long, 2011). Finally, regression analyses were performed to determine whether demographic variables influenced symptom recovery.

Researchers kept a strict record of serious and non-serious adverse events according to good clinical practice (GCP) (Idänpään-heikkilä, 1994). No serious adverse events occurred. Two participants reported minor headaches. The pre-test was conducted during the first week of the yoga intervention at the Satyananda Yoga venues. The post-test was conducted the week after the final yoga session, followed by qualitative analyses based on findings derived from focus groups conducted at the end of the intervention (n=16; 5 questions on the perceived benefits of the program by participants). Experienced clinical psychologists conducted both assessments and analyses.

Results

The PCL-C detected a PTSD prevalence of 86% [95% CI: 80.56%, 92.81%], which is markedly higher than the average prevalence reported for Colombia in other studies concerning reintegrating persons (De la Espriella & Falla, 2009; Molina & Aponte, 2010). However, a study on PTSD with internally displaced persons reported a prevalence of 92.27% (Sinisterra, Figueroa, Moreno, Robayo, & Sanguino, 2010). Yoga group and control group participants did not differ significantly on any demographic variable after performing chi-square tests (see Table 1).

Mean and standard deviations for total PCL-C scores and symptom cluster scores for both groups before and after the intervention are reported in Table 2. Group comparisons of PCL-C total scores and symptom-cluster scores at pretest and post-test are also reported. Both groups experienced significant decreases in PCL-C total scores (as indicated by statistically significant linear trends and statistically significant differences) and symptom cluster scores. However, the yoga group demonstrated a large treatment effect (d = 1.15), whilst the control group exhibited a small-medium treatment effect (d = 0.42). Large treatment effects were also observed in the yoga group for each symptom cluster, including re-experiencing symptoms (yoga group: d = 1.40; control group: d = 0.25); avoidance symptoms (yoga group: d = 1.09; control group: d = 0.43) and hyperarousal symptoms (yoga group: d = 0.99; control group: d = 0.46).

	Control Group			**Treatment Group**			X^2
Variable							
Sex	Male	Female			Male	Female	
	76.20%	23.80%			70%	30%	0.64
	None	Incomp.	Incomp.	None	Incomp.	Incomp.	
Education		Elemen.	Highsch.		Elemen.	Highsch.	
	24%	23.80%	47.60%	2%	22%	46%	0.93
Marital status	Single	With partner	Separated	Single	With partner	Separated	
	26.20%	66.60%	7,10%	42%	52%	4%	0.38
Religion	Catholic	Christian	Atheist	Catholic	Christian	Atheist	
	69%	26.20%	4.80%	72%	26%	2%	0.75
Geographic	Rural	Town	City	Rural	Town	City	
origin	35.70%	35.70%	28.60%	34%	42%	24%	0.8
Wounded	Yes	No		Yes	No		
in combat	69%	31%		54%	46%		0.1
Death of peers in	Yes	No		Yes	No		
combat	88%	11.90%		88%	10%		0.53
Prior	Yes	No		Yes	No		
Treatment	7.10%	92.90%		10	86%		0.43

Table 1. Baseline analysis of demographic variables by control and treatment group

	Descriptives						
	Pre-treatment		Post-treatment		Pre-treatment-Post-treatment change		
Measure	Mean	SD	Mean	SD	*b*	*t*	Cohen *d*
PCL-C Total score							
Control	54.9	17.403	48.26	14.099	0.20**	3.407	0.42
Yoga	56.3	15.484	38.84	14.914	0.50***	9.593	1.15
Rexperiencing symptoms							
Control	16.17	5.717	14.86	4.519	0.13*	2.027	0.25
Yoga	17.16	4.613	11.7	4.765	0.57***	9.356	1.40
Avoidance symptoms							
Control	22.26	7.768	19.31	5.62	0.21**	2.759	0.43
Yoga	22.88	6.73	15.84	6.156	0.48***	8.246	1.09
Hyperarousal symptoms							
Control	16.48	5.474	14.1	4.863	0.22**	3.740	0.46
Yoga	16.26	5.314	11.3	4.661	0.44***	7.317	0.99
*p<0.05 **p<0.005 ***p<0.001							
Abbreviations: *b* = unstandardized regression coefficients. PCL-C = PTSD Checklist Civilian Version							

Table 2. Outcomes by PCL-C total and symptom cluster scores pre-treatment and post-treatment

The yoga group demonstrated a clinical improvement of 31.01%, compared to an improvement of 12.10% in the control group. According to Long (2011), significant clinical difference is indicated by a difference of 12%. The difference in PTSD symptom improvement between groups in the present study is 18.91% (p < .005). This suggests that the Satyananda Yoga program elicited significant clinical improvement in PTSD symptoms (see Figure 2a). As shown in the figure, the mean PCL-C score for the yoga group post-intervention (38.84) is below the cutoff score for establishing the presence of PTSD (44.00). However, the mean PTSD score in the control group (48.26) indicates persistent PTSD symptoms that reintegrating persons who did not complete the yoga program continue to suffer.

Similar results were obtained in analyses by symptom clusters (see Figures 2b, 2c, 2d). We observed a significant clinical improvement (>12%) for all symptom clusters, especially in the re-experiencing symptom cluster, which elicited a clinical improvement of 23.71% (see Figure 2b).

Linear regression analyses were performed to identify factors associated with greater improvement in PCL-C scores. Results suggest that decreases in PCL-C scores (total scores and specific symptom-cluster scores) reflect the work of the yoga intervention rather than other demographic or social variables (see Table 3).

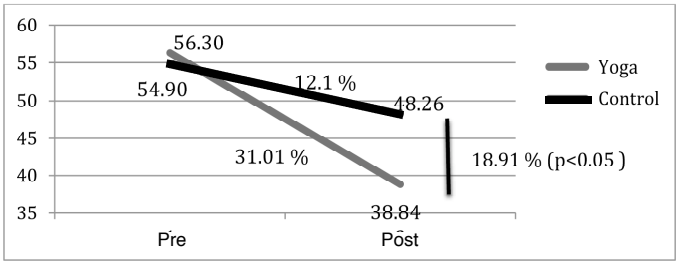

Figure 2a.
Percentage of clinical improvement for both groups in PCL-C scores.

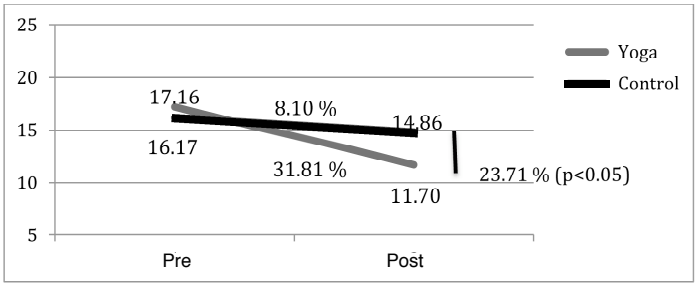

Figure 2b.
Percentage of clinical improvement for both groups in Re-experiencing symptoms scores from the PCL-C.

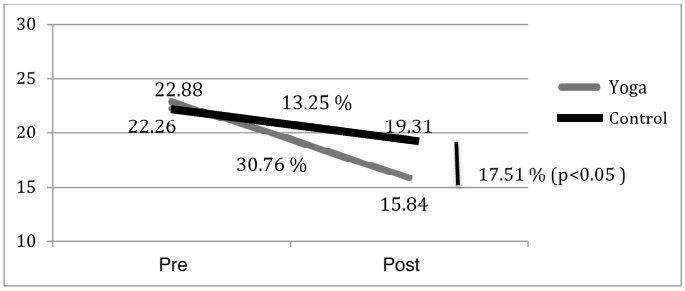

Figure 2c.
Percentage of clinical improvement for both groups in Avoidance symptoms from the PCL-C.

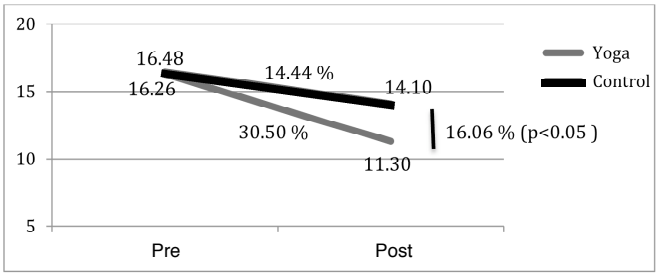

Figure 2d.
Percentage of clinical improvement for both groups in Hyperarousal symptoms from the PCL-C.

Regarding participant safety, no serious adverse effects according to GCP standards were present during the one-month post-intervention follow-up period.

Discussion

Colombia's persistent civil unrest creates a need to evaluate alternatives for treating the population affected by PTSD. Results of this study suggest that yoga is a safe, non-pharmacological alternative for former combatants from Colombian illegal armed groups, whose mental health is key to successful reintegration into society as civilians. Only two participants left the yoga group due to a change of address, which demonstrates that Satyananda Yoga generates high adherence rates in the reintegrating population.

The central finding in this study shows that the group that received Satyananda Yoga decreased its PCL-C scores with a statistically significant difference ($p < .005$) post-intervention. PCL-C scores for the control group also decreased but at a lower rate. Mitchell et al. (2014) reported similar results, and other studies also show that the control group also improved their PTSD symptoms (Telles et al., 2012; van der Kolk et al., 2014). The decrease in the total PCL-C scores for the control group in this study may be attributed to the fact that all reintegrating persons have to go through a reintegration program that includes psychosocial support in the form of monthly individual sessions with trained psychologists. It is important to note, however, that the mean PCL-C score for the yoga group after the intervention, but not for the control group, falls below the cutoff point for PTSD diagnosis as suggested by the PCL-C scale. This is comparable to the findings reported in a recent study (van der Kolk et al., 2014) where 52% of the intervention group no longer met PTSD diagnostic criteria according to the Clinician Administered PTSD Scale (CAPS) after completing a yoga program.

The clinical improvement observed was 31.01% in the yoga group compared to 12.10% in the control group, which demonstrates the efficacy of the program for this population. Furthermore, regression analyses indicate that the effect is attributable to the yoga intervention and not to

	Total PCL-C scores		Re-experiencing symptoms		Avoidance symptoms		Hyperarousal symptoms	
	Beta	**R^2**	**Beta**	**R^2**	**Beta**	**R^2**	**Beta**	**R^2**
Model 1a	-9.611**	0.090	3.195**	0.090	-3.571**	0.085	-2.846**	0.07
Model 2b	-9.91**	0.091	-3.285***	0.089	-3.701**	0.088	-2.923**	0.066
Model 3c	-10.29***	0.110	-3.405***	0.102	-3.907**	0.113	-2.982**	0.069
Model 4d	-9.20**	0.075	-3.132**	0.073	-3.491*	0.085	-2.581*	0.036
Model 5e	-8.99*	0.084	-3.103**	0.06	-3.373*	0.111	-2.512*	0.043
Model 6f	-8.49*	0.095	-2952*	0.074	-3.215*	0.114	-2.326	0.062
Model 7g	-8.67*	0.112	-2962*	0.073	-3.293*	0.147	-2.415	0.073
*p<0.05 **p<0.005 ***p<0.001								
a= adjusted model by age								
b= adjusted model by [a] and sex								
c= adjusted model by [a.b] and marital status								
d= adjusted model by [a.b.c.] and education								
e = adjusted model by [a. b.c. d] and religion								
f= adjusted model by [a.b.c.d.e] and wounded in combat								
g= adjusted model by [a.b.c.d.e.f] and death of peers in combat								

Table 3. Linear regression models for analysis of treatment effect over demographic and social variables in PCL-C scores and subscales.

other demographic variables. The yoga group demonstrated a large treatment effect (d = 1.15), while the control group only reported a small-medium effect size (d = .42). There was an overall treatment effect of d = .73. This finding is consistent with effect sizes reported for a smaller sample (n = 21) of U.S. Army Veterans from Iraq and Afghanistan after a one-week Sudarshan Kriya program (Seppälä et al., 2014). The study reported an effect size of d = 1.16 one week after the intervention, d = .96 one month after and d = 1.00 one year after the intervention for total PCL-C scores.

The effect size for this study was larger than the effect reported by van der Kolk et al. (2014; d = .41), although the effect size for the yoga group (d = 1.07) was similar to that obtained in the present study (d = 1.15). The differences may be attributable to the type of PTSD (combat-related vs. domestic-violence related), to the yoga protocol, or to differences in the population, as the study conducted by van der Kolk et al. (2014) only included women affected by violence in a domestic setting. Effect sizes observed in this study were also larger than those reported for children affected by the war in Kosovo (Telles et al., 2012), which may be due to the fact that this study also included asana and deep relaxation and these additional components may have contributed to a larger effect size. On the other hand, the effect size of d = 1.15 obtained in this study is smaller than the effect size reported for children exposed to war and tsunami in Sri Lanka (d = 2.20) in a study with no control group. This could be explained by the presence of higher resilience levels in children (Keyes et al., 2014) as compared to reintegrating adults.

Clinical improvement by symptom cluster was more than 12%, which is the suggested minimum for clinical conditions (Long, 2011). Improvement was especially large for re-experiencing symptoms, with an effect size of d = 1.40 in the intervention group. Positive effects of this intervention on individuals affected by combat-related trauma can be explained by a mind shift that results from the yoga practice, specifically in the reduction of emotional suppression (Dick et al., 2014); yoga group participants became aware of their mind, became more detached, and learned to accept and let go of worries (Vivekananda, 2005; Waelde et al., 2004).

The effect size for hyperarousal symptoms (d = .99) is larger than that reported for a sample of U.S. military veterans (d = .36) after 12 yoga sessions (Staples et al., 2013). This difference could be attributable to the longer intervention chosen for this study or to the yoga protocol. Another study, however, reported an effect size of d = 1.40 for a sample of 21 veterans after a Sudarshan Kriya program, which could suggest that a decrease in hyperarousal symptoms could be associated with intensive breathing practices. The positive effect on hyperarousal symptoms could also be explained by the hypothesis that Satyananda Yoga meditations help participants to experience somatosensorial withdrawal as evidenced by Thomas, Jamieson, and Cohen (2014) when examining EEG patterns in individuals practising Satyananda Yoga meditations. Increased alpha wave activity could also occur as a result of deep relaxation practices, as reported by Kumar (2006) in a study of a yoga nidra program. This experience is likely to reduce startle and other hyperarousal symptoms, as the participant is consciously able to withdraw from outside stimuli into a calmer, meditative state. Hormonal regulation, as reported in other studies (Bujati & Biederer, 1976; Jacobs et al., 2011, Thirthalli et al., 2013), could also aid in the reduction of hyperarousal symptoms in reintegrating persons participating in this study.

Regarding re-experiencing symptoms, Satyananda Yoga produced a larger effect than Sudarshan Kriya as reported by Seppälä et al. (2014). This could be explained by the effects of yoga nidra and Satyananda Yoga meditation practices, which are aimed at re-wiring the brain and introducing a non-judgemental witness attitude that allows individuals to accept the past (Satyananda, 2006). Regarding avoidance symptoms, Sudarshan Kriya reported a slightly smaller between-groups effect size (d = .55). Improvement in avoidance symptoms could be explained by the focus on the present moment brought by the practices (Satyananda, 2008). The Satyananda yoga approach, which is based on awareness, breathing, and relaxation, was intended to bring participants' minds to the present moment, helping them learn to live in the here and now, which may have lowered the prevalence of intrusive memories (related to living in the past) and anxiety (related to living in the future). This could explain the improvement in re-experiencing symptoms, which may also be associated with regaining a sense of control (Engel et al., n.d; Posadzki, Parekh, & Glass, 2010).

Avoidance symptoms were also reduced for participants in the study, but the effect size was smaller than the one observed for other DSM-IV symptom clusters. This may be due to the fact that avoidance has been associated with poorer treatment response for chronic PTSD (Badour, Blonigen, Boden, Feldner, & Bonn-Miller, 2012).

Contrasting with other studies that explore the effect of alternative treatments for PTSD, the present study takes into account a significantly larger sample and presents minimal subject loss. In addition, the randomized and controlled nature of the study enables the research community to scientifically demonstrate the efficacy of the Satyananda Yoga-based protocol in the management of PTSD symptoms. This data support requirements regarding validation studies in different cultures (Descilo et al., 2010).

It is important to consider that the intervention took place during an ongoing armed conflict. Specifically, disarmed individuals are still threatened by armed groups where the latter are chased and forced by the former to re-arm, re-join the group, and continue combat. In this sense, the threatening environment in which the intervention participants live may have hindered the alleviation of their symptoms. In other words, it is critical to understand the changes the participants had as a result of the intervention in light of the ongoing violent setting in which they live. Thus, it may be possible that within a peaceful environment the intervention results, or more specifically the improvement of PTSD symptoms and the number of subjects lost, may have been better. This hypothesis may be important in terms of political and social views that determine reintegration programs and expectations of peace.

In summary, the present study demonstrates that Satyananda Yoga-based programs are effective in reducing PCL-C total scores, and therefore PTSD symptoms. The large effect sizes observed for different symptom clusters, especially for re-experiencing symptoms, indicated a significant clinical improvement in the intervention group.

Study Limitations and Future Directions

A limitation of the study was the inability to determine the long-term effects of the intervention; further research on the subject is necessary. Specifically, information on any relapses of PTSD symptoms, as well as the possibility of returning to an armed group during the three months after completing the intervention, is unavailable. Thus, it is not possible to determine whether the positive effects of yoga will be retained. However, the intervention trained participants to practice yoga at home, which was intended to guarantee a long-lasting effect.

Further research could compare specific features of the Satyananda Yoga methodology for the management of PTSD symptoms with other types of treatments, such as pharmacological and cognitive-behavioral treatments (e.g., PET; Powers et al., 2010). For instance, Satyananda Yoga therapy can be assessed both alone and as an adjunctive treatment. This issue is especially important because alternative therapies, such as yoga, are recommended after first-line treatments (Cukor et al., 2009), and their use requires multicultural validation studies (Descilo et al., 2010).

Given the positive effects observed in the present study, further research on the impact of Satyananda Yoga on other trauma survivors of the Colombian armed conflict is strongly encouraged.

Conclusions

This study suggests that yoga is effective for reducing PTSD symptoms in ex-combatants from the illegal armed groups in Colombia. The practical relevance of the results of the present intervention for yoga teachers and the Colombian healthcare system are notable. On the one hand, yoga group participants culminated their yoga sessions with significant satisfaction levels. Some participants showed interest in training as yoga teachers themselves; this outcome is very important since it entails the possibility of making yoga interventions and projects with non-privileged individuals more sustainable in the long-term. In this sense, former reintegrating populations diagnosed with PTSD can be trained to alleviate the suffering in other victims of violence, which, in turn, becomes an employment opportunity for a trauma survivor. Training as a yoga teacher has the potential to change his or her life and break the cycle of violence by promoting knowledge, awareness, and peace through holistic yoga.

References

Agencia Colombiana para la Reintegración ACR (2008). *Documento CONPES 3554. Politica de Reintegración.* http://www.reintegracion.gov.co/Reintegracion/Politica_de_reintegracion/Documents/conpes_3554.pdf. Accessed January, 2013.

ACR (2015). *26.712 People Undergoing a Reintegration Process.* Retrieved June 1, 2015 from http://www.reintegracion.gov.co/en.

American Psychiatric Association (2013a). *Diagnostic and statistical manual of mental disorders* (5th ed.) Arlington,VA: American Psychiatric Publishing.

American Psychiatric Association. (2013b). *Let's talk facts brochure - PTSD.* Retrieved from http://www.psychiatry.org/ptsd in January 15 2013.

Andrykowski, M.A., Cordova, M.J., Studts, J.L., & Miller, T. (1998). Posttraumatic stress disorder after treatment for breast cancer: Prevalence of diagnosis and use of the PTSD Checklist-Civilian Version (PCL-C) as a screening instrument. *Journal of Consulting Clinical Psychology, 66* (3), 586-590.

Baciu A., Geller, A., Tollerud, D., & Martinez, R.M. (2007). Treatment of PTSD: An assessment of the evidence. *Institute of Medicine (IOM).* Retrieved from http://www.iom.edu/~/media/Files/Report%20Files/2007/Treatment-of-PTSD-An-Assessment-of-The-Evidence/PTSDReportBriefFINAL2.pdf. Accessed January 10, 2013.

Back, S., Killeen, T., Foa, E., Santa Ana, E.,& Gros, D.B.K. (2012). Use of an integrated therapy with prolonged exposure to treat PTSD and comorbid alcohol dependence in an Iraq veteran. *American Journal of Psychiatry, 169*, 688-691.

Badour, C. L., Blonigen, D. M., Boden, M. T., Feldner, M. T., & Bonn-Miller, M. O. (2012). A longitudinal test of the bi-directional relations between avoidance coping and PTSD severity during and after PTSD treatment. *Behaviour research and therapy, 50*(10), 610-616.

Baldovino, M.T. (2014). *Prevalencia de estre_s postrauma_tico y trastorno antisocial de la personalidad en la poblacion desmovilizada de las guerrillas colombianas en Bogotá, D.C.* Retrieved from Repository- Master Thesis Dissertation Series Universidad Católica. Available at http://repository.ucatolica.edu.co:8080/jspui/bitstream/10983/2090/1/TESIS%20DE%20MAESTIA%20%20PREVALENCIA%20DE%20TEPT%20Y%20TAP%20EN%20DESMOVILIZADOS%20DE%20LAS%20GUERRILLAS%20COLOMBIANAS-020414.pdf

Brady, K., Pearlstein, T., Asnis, G.M., Baker, D., Rothbaumet, B., Sikes, C., & Farfel, G.M. (2000). Efficacy and safety of sertraline treatment of posttraumatic stress disorder: A randomized controlled trial. *Journal of the American Medical Association, 283* (14), 1837-1844

Bujatti, M., & Biederer, P. (1976). Serotonin, noradrenaline, dopamine metabolites in transcendental meditation-technique. *Journal of Neural Transmission, 39*(3), 257-267.

Cabral, P., Meyer, H.B, & Ames, D. (2011). Effectiveness of Yoga Therapy as a Complementary Treatment for Mayor Psychiatric Disorders: A meta-analysis. *The Primary Care Companion for CNS Disorders, 13*(4).

Castellanos, J., Santos, A., Conde, A., Ramírez, E., Ortiz, H., & Carreño, M.E. Corporación Compromiso (2012). *Caracterización Socioeconómica de la Población en Proceso de Reintegración.* Bucaramanga, Santander: Gobernación de Santander. http://www.corporacioncompromiso.org/?apc=I1--83-83-&x=620

Catani, C., Kohiladevy, M., Ruf, M., Schauer, E., Elbert, T., & Neuner, F. (2009). Treating children traumatized by war and Tsunami: a comparison between exposure therapy and meditation-relaxation in North-East Sri Lanka. *BMC Psychiatry, 9*(1), 22.

Clark, C. J., Lewis-Dmello, A., Anders, D., Parsons, A., Nguyen-Feng, V., Henn, L., & Emerson, D. (2014). Trauma-sensitive yoga as an adjunct mental health treatment in group therapy for survivors of domestic violence: A feasibility study. *Complementary Therapies in Clinical Practice, 20*(3), 152-158.

Cocfield, D. (2007). *Yoga as an Adjunctive Therapy for Posttraumatic Stress Disorder: Lessons Learned and Next Steps.* Retrieved from www.pdhealth.mil/.../. Accessed January, 2013.

Cukor, J., Spitalnik, J., Difede, J., Rizzo, A., & Rothbaum, B. (2009). Emerging Treatments for PTSD. *Clinical Psychology Review, 29*, 715-726.

Da Silva, T., Ravindran, L., & Ravindran, A. (2009). Yoga in the treatment of mood and anxiety disorders: A review. *Asian Journal of Psychiatry, 2*, 6-16.

Davidson J., Baldwin D., Stein D.J., Kuper, E., Benattia, I., Ahmed, S., Pedersen, R., & Musgnung, J. (2006a). Treatment of posttraumatic stress disorder with venlafaxine extended release: A 6-month randomized controlled trial. *Archives of General Psychiatry, 63*(10), 1158-1165.

Davidson, J., Rothbaum, B., Tucker., P., Asnis, G., Benattia, I., & Musgnung, J. (2006b). Venlafaxine extended release in posttraumatic stress disorder: A sertraline- and placebo controlled study. *Journal of Clinical Psychopharmacology, 26*, 259-267.

De la Espriella, R., & Falla, J.V. (2009). Reflexiones sobre la atención en salud mental de desmovilizados de grupos armados en Colombia. *Revista Colombiana de Psiquiatría, 38*(2), 230-247.

Department of Veterans Affairs Health Services Research & Development Service (VA HSR&D)- Evidence-based Synthesis Program. (2011). Efficacy of complementary and alternative medicine therapies for posttraumatic stress disorder. Retrieved from www.hsrd.research.va.gov/. Accessed January, 2013.

Descilo, T., Vedamurtachar, A., Gerbarg, P.L., Nagaraja, D., Gangadhar, B.N., Damodaran, B., Adelson, B., Braslow, L.H., Marcus, S., & Brown, R. P. (2010). Effects of yoga breath interventions alone and in combination with an exposure therapy for post-traumatic stress disorder and depression in survivors of the 2004 South-East Asia tsunami. *Acta Psiquiatrica Scandinavica, 121*, 289-300.

Dick, A.M., Niles, B.L., Street A.E., DiMartino, D.M., & Mitchell, K.S. (2014). Examining Mechanisms of Change in a Yoga Intervention for Women: The Influence of Mindfulness, Psychological Flexibility, and Emotion Regulation on PTSD Symptoms. *Journal of Clinical Psychology,* doi: 10.1002/jclp.22104

Emerson, D., & Hoper, E. (2011). *Overcoming Trauma Through Yoga. Reclaiming Your Body.* Berkeley, CA: North Atlantic Books, Kindle Edition.

Engel, Ch., Goertz, Ch., Cockfield D., Armstrong, D., Jonas, W., Walter, J., Fritts, M., Greene, R., Carnes, R., Gore, K., & Miller, R. (n.d). Yoga Nidra as an adjunctive therapy for post-traumatic stress disorder: A feasibility study. http://www.irest.us/sites/default/files/WRAMH_PTSD_YN_Results_0.pdf Accessed January, 2013.

Goldberg, J., Magruder, K., Forsberg, C., Cazis, L., Üstün, T.B., Friedman, L.B., Vaccarino, V., Heagerti, P., Gleason, T., Huang, G., & Smith, N. (2014). The association of PTSD with physical and mental health, functioning, and disability (VA Cooperative Study No. 569: The course and consequences of posttraumatic stress disorder in vietnam-era veteran twins). *Quality of Life Research, 23*, 1579-1591.

Idänpään-heikkilä, J. E. (1994). WHO guidelines for good clinical practice (GCP) for trials on pharmaceutical products: responsibilities of the investigator. *Annals of Medicine, 26*(2), 89-94.

Jacobs, T. L., Epel, E. S., Lin, J., Blackburn, E. H., Wolkowitz, O. M., Bridwell, D. A., ... & Saron, C. D. (2011). Intensive meditation training, immune cell telomerase activity, and psychological mediators. *Psychoneuroendocrinology, 36*(5), 664-681.

Kearney, D.J., McDermott, K., Malte C., Martínez, M., & Simpson, T. (2013). Effects of participation in a mindfulness program for veterans with posttraumatic stress disorder: A randomized controlled study. *Journal of Clinical Psychology. 69*(1), 14-27.

Kearney, D.J., McDermott, K., Malte, C., Martínez, M., & Simpson, T. (2012). Association of participation in a mindfulness program with measures of PTSD. Depression and quality of life in a veteran sample. *Journal of Clinical Psychology, 68*(1), 101-116.

Keyes, K. M., Pratt, C., Galea, S., McLaughlin, K. A., Koenen, K. C., & Shear, M. K. (2014). The Burden of Loss: Unexpected Death of a Loved One and Psychiatric Disorders Across the Life Course in a National Study. American *Journal of Psychiatry, 171*(8), 864-871.

Kumar, K. (2006). A study of the improvement of physical and mental health through "Yoga nidra". *Dev Sanskriti Journal, 4*(4).

Long, P.W. (2011), *Statistical and Clinical Difference in Mental Health.* http://www.mentalhealth.com/dis-rs/rs-effect_size.html. Accessed on September 30th, 2013.

Marshall, G. N. (2004). Posttraumatic stress disorder symptom checklist: Factor structure and English-Spanish measurement invariance. *Journal of Traumatic Stress, 17*(3), 223-230.

McDonald, S. & Calhoun, P. (2010). The diagnostic accuracy of the PTSD Checklist: A critical review. *Clinical Psychology Review, 30*, 976-987.

Miles, J., Marshall, G., & Schell, T. (2008). Spanish and English versions of the PTSD checklist - civilian version (PCL-C): Testing for differential item functioning. *Journal of Traumatic Stress, 21*(4) 369-376.

Mitchell, K. S., Dick, A. M., DiMartino, D. M., Smith, B. N., Niles, B., Koenen, K. C., & Street, A. (2014). A Pilot Study of a Randomized Controlled Trial of Yoga as an Intervention for PTSD Symptoms in Women. J*ournal of Traumatic Stress, 27*, 121-128. doi: 10.1002/jts.21903

Molina, C.I. & Aponte, D.M. (2010). Evaluación de trastornos mentales, consumo de sustancias psicoactivas y factores de recaída en conductas violentas o delincuenciales en población desmovilizada del conflicto armado y en proceso de reintegración. Serie Cuadernos del CIDS. t D.C. Centro de Investigaciones sobre dinámica Social, Universidad Externado de Colombia.

Nacasch, N., Foa, E.B., Huppert, J.D., Tzur, D., Fostick, L., Dinstein, Y., Pollack, M., & Zoha, J. (2011). Prolonged exposure therapy for combat- and terror-related posttraumatic stress disorder: a randomized control comparison with treatment as usual. *Journal of Clinical Psychiatry , 72*, 1174-1180.

National Center for PTSD (2012). National vietnam veterans' readjustment study. *United Stated Department of Veterans Affairs.* Retrieved from http://www.ptsd.va.gov/professional/research-bio/research/vietnam-vets-study.asp. Accessed July 1, 2014.

Pérez-Olmos, I., Fernández-Piñeres, P. E., & Rodado-Fuentes, S. (2005). The prevalence of war-related post-traumatic stress disorder in children from Cundinamarca, Colombia. *Revista de Salud Pública, 7*(3), 268-280.

Pineda, D., Guerrero, O., Pinilla M., & Estupiñan M. (2002). Utilidad de un cuestionario para rastreo del estrés post-traumático en una población Colombiana. *Revista de Neurología, 34*(10), 911-916.

Posada Villa J. (s.f.). Síntomas de estrés post traumático en desmovilizados del conflicto armado en Colombia después de una intervención con Yoga: un estudio aleatorio controlado. *Corporación Dunna.* Unpublished manuscript.

Posada Villa, J., Aguilar-Gaxiola, S.A., Magaña, C., & Gómez, L.C. (2004). Prevalencia de trastornos mentales y uso de Servicios: Resultados Preliminares del Estudio Nacional de Salud Mental. Colombia, 2003. *Revista Colombiana de Psiquiatría, 33*(3), 241-262.

Posadzki, P., Parekh, S., & Glass, N. (2010) Yoga and Qigong in the psychological prevention of mental health disorders: A conceptual synthesis. *Chin J Integr Med, 16*(1), 80-86

Powers, M., Halpern, J., Ferenschak, M., Gillihan, S., & Foa, E. (2010). A Meta-Analytic Review of Prolonged Exposure for Posttraumatic Stress Disorder. *Clinical Psychology, 30*, 635-641.

Ramchand, R., Rudavsky, R., Grant, S. T., & Jaycox, L. (2015) Prevalence of risk factors for and consequences of posttraumatic stress disorder and other mental health problems in military population deployed to Iraq and Afghanistan. *Current Psychiatry Reports 17*(37), 36-46.

Salmon, P., Lush, E., Jablonski, M., & Septhon, S. (2009). Yoga and mindfulness: Clinical aspects of an ancient mind/body practice. *Cognitive and Behavioral Practice 16*(1), 59-72.

Saraswati, S. S. (Ed) (1996). *Asana, Pranayama, Mudra, Bandha.* Munger, India: Bihar School of Yoga.

Saraswati, S. (1998). *Yoga Nidra (6th ed.).* Munger, Bihar, India: Yoga Publications Trust.

Saraswati, N. (2003). *Dharana Darshan-Yogic, Tantric and Upanishadic Practices of Concentratrion and Visualization.* Munger, Bihar, India: Yoga Publications Trust. 439.

Saraswati, S. S. (2001). *Meditations from the Tantras.* Munger, Bihar, India: Yoga Publications Trust. 367.

Saraswati, S. S. (2006) *Yoga Nidra. (6th ed.).* Munger, India: Bihar School of Yoga. 261.

Sinisterra, M., Figueroa, F., Moreno, V., Robayo, M., & Sanguino, J. (2010). Prevalencia del trastorno de estrés postraumático en población en situación de desplazamiento en la localidad de ciudad Bolívar, Bogotá, Colombia, 2007. *Psychologia: Avances de la disciplina, 4*(2), 83-97.

Staples, J.K., Hamilton, M.F., & Uddo, M. (2013). A yoga program for the symptoms of post-traumatic stress disorder in veterans. *Military Medicine, 178*(8), 854-860.

Stankovic, L. (2011) Transforming trauma: A qualitative feasibility study of integrative restoration (iRest) yoga nidra on combat-related post-traumatic stress disorder. *International Journal of Yoga Therapy, 21*, 23-37.

Stoller, C.C., Greuel, J., Cimini, L.S., Fowler, M.S., & Koomar, J.A. (2012). Effects of sensory-enhanced yoga on symptoms of combat stress in deployed military personnel. *American Journal of Occupational Therapy, 66*, 59-68. doi: 10.5014/ajot.2012.001230.

Swami Ahimsadhara. (In press). *12 Week Satyananda Yoga War Veterans Program. Reasons why Satyananda Yoga is the Most Appropriate Style.* Tasmania: Swan Yoga Publications.

Swami Ahimsadhara Saraswati (2014). From War to Peace - Yoga for the Management of Post-Traumatic Stress Disorder, *Yoga Magazine.* November /December 2006 http://www.yogamag.net/archives/2006/lnov06/post.shtml

Swami Satyananda Saraswati (2008). *Asana Pranayama.* Mudra, Bandha. Munger: Yoga Publication Trust, Fourth (revised) Edition.

Telles S., Singh, N., & Balkrishna, A. (2012). Managing Mental Health Disorders Resulting from Trauma through Yoga: A Review. *Depression Research and Treatment,* doi:10.1155/2012/401513

Thirthalli, J., Naveen, G. H., Rao, M. G., Varambally, S., Christopher, R., & Gangadhar, B. N. (2013). Cortisol and antidepressant effects of yoga. *Indian Journal of Psychiatry, 55*(Suppl 3), S405-S408.

Thomas, J., Jamieson, G., & Cohen, M. (2014). Low and then high frequency oscillations of distinct right cortical networks are progressively enhanced by medium and long term Satyananda Yoga meditation practice. *Frontiers in Human Neuroscience, 8.*

Tuerk, P.W., Voder, M., Grubaugh, A., Myrick, H., Hamner, M., & Aciemo, R. (2011). Prolonged exposure therapy for combat-related posttraumatic stress disorder: An examination of treatment effectiveness for veterans of the wars in Afghanistan and Iraq. *Journal of Anxiety Disorders, 25*, 397-403.

van der Kolk, B., Stone, L., West, J., Rhodes, A., Emerson, D., Suvak, M., & Sinazzola, J. (2014). Yoga as an Adjunctive Treatment for Posttraumatic Stress Disorder: A Randomized Controlled Trial. *Journal of Clinical Psychiatry, 75*, e1-e7.

Vivekananda, R. (2005). *Practical Yoga Psychology.* Bihar, India: Yoga Publications Trust.

Vujanovic, A. A., Niles, B., Pietrefesa, A., Schmertz, S. K., & Potter, C. M. (2013). Mindfulness in the treatment of posttraumatic stress disorder among military veterans. *Spiritually and Clinical Practice, 1*, 15-35.

Waelde, L.C, Thompson, L., & Gallagher-Thompson, D. (2004) A pilot study of a yoga and meditation intervention for dementia caregiver stress. *Journal of Clinical Psychology 60*, 677-687.

World Medical Association (2013). Declaration of Helsinki: Ethical principles for medical research involving human subjects. *Journal of the American Medical Association, 310*(20), 2191-2194. Retrieved July 24, 2015 from doi:10.1001/jama.2013.281053. PMID 24141714.