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Bending without breaking: A narrative review of trauma-sensitive yoga for women with PTSD



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ABSTRACT

Objective: The purpose of this review is to evaluate the peer-reviewed empirical evidence on the use of Trauma-Sensitive Yoga (TSY) for the treatment of women with post-traumatic stress disorder (PTSD); specifically interpersonal trauma such as intimate partner violence. To date, no such review has been conducted.

Methods: Articles meeting study inclusionary criteria were identified through electronic database searches. A total of five studies ($N = 5$) were selected and reviewed. These studies included two randomized controlled trials (RCT), one follow-up of an RCT, one quasi-experimental study, and one qualitative study.

Results: There is tentative evidence to support the efficacy of TSY in reducing PTSD, depression, and anxiety symptomatology for women with PTSD; there is also tentative evidence confirming the feasibility of implementing TSY as an adjunctive mental health intervention, particularly for individuals who are non-responsive to cognitive-based psychotherapies. The qualitative findings speak to a number of benefits of yoga practice stimulated by TSY participation centering on the phenomenon of peaceful embodiment.

Conclusions: Replication of these results using larger and more diverse samples and rigorous study designs by independent researchers would add credibility to these findings and contribute to the growing body of knowledge on TSY. Additionally, there is a dearth of studies on this nascent form of therapeutic yoga. Therefore, further research is needed to explore the potential efficacy of TSY with other types of trauma, populations, and settings.

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1. Introduction

Trauma is a serious and prevalent social problem in the United States [30]. Certain psychotherapeutic modalities such as cognitive-behavior therapy have long been the gold standard for treating trauma-related issues such as post-traumatic stress disorder (PTSD). However, there is a growing sentiment that these therapies may not adequately address the unique idiosyncrasies of trauma, particularly interpersonal trauma [13]. Concomitantly, a host of alternative and complimentary interventions are increasingly being employed to address the mental and physical aspects of trauma. One such intervention is yoga. Its popularity is increasing, notably in mental health praxis [26]. This review will examine the efficacy of a therapeutic form of yoga called Trauma-Sensitive Yoga (TSY) for the treatment of women with PTSD.

2. Understanding trauma

PTSD, which is classified under a category called Trauma and Stress Related Disorders in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* [1] is defined as exposure to actual or threatened death, serious injury, or sexual violence with symptoms in the following clusters: re-experiencing, avoidance, negative alterations in cognitions and mood, and hyperarousal and reactivity. There are two subtypes: delayed onset and with dissociative symptoms. Some common sources of trauma include sexual and domestic violence, accidental injury, natural disasters, and military combat. Reactions to trauma depend largely on individual factors and the nature of the traumatic event—among other considerations [16]. The potential for trauma to have a devastating and potentially debilitating impact on one's mental, physical, and psychological wellbeing is high. The effects of trauma can threaten one's quality of life and lead to increased service utilization, both medical and psychiatric/psychological [2].

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According to the National Center for PTSD [30], 60% of men and 50% of women will experience trauma at some point in his or her lifetime. In the U.S., 7–8% of people will go on to develop PTSD at least once in his or her life; women are at increased risk compared to men. Other factors that put one at increased risk for developing PTSD include membership to a racial/ethnic minority group, personal or family history of mental health disorders, prolonged or repeated exposure to trauma, low education, and poor social support.

2.1. Interpersonal trauma and intimate partner violence in women

Interpersonal or person-on-person trauma, which is often repeated and/or prolonged in nature, can result in a number of symptoms such as anger, shame, self-injurious or self-defeating behaviors, an inability to recall traumatic events, failed attempts at self-protection, and an altered or impaired ability to make meaning of events [19]. A common form of interpersonal trauma is intimate partner violence (IPV). IPV can be understood as physical, sexual, or psychological harm caused by a current or former partner or spouse [7]. According to the World Health Organization [32]; about 35% of women worldwide have experienced some form of violence, most frequently at the hands of an intimate partner. Additionally, approximately 30% of women who have been in a relationship report experiencing physical and/or sexual violence by an intimate partner. In addition to PTSD symptoms, the fallout from IPV can include substance abuse [10], depression, anxiety, suicide, self-injury, and a plethora of physical ailments [11].

3. Yoga

As defined by the National Center for Complementary and Alternative Medicine [23]; yoga is “a mind and body practice with origins in ancient Indian philosophy. The various styles of yoga typically combine physical postures, breathing techniques, and meditation or relaxation.” Yoga originally stemmed from the tenets of Hinduism, but it contains elements of Buddhism, and Jainism as well. Spiritually, the goals of yoga are expansion of consciousness, self-transcendence, and *mukti* (liberation from *samsara*—the birth-death-rebirth cycle). In addition to the postural or hatha-based styles popular in the West, there are several other forms of yoga, including bhakti yoga (yoga of devotional love), karma yoga (yoga of good deeds), mantra yoga (yoga of sound), and jnana yoga (yoga of knowledge). Some seminal ancient yogic texts include the *Upanishads*, *Bhagavad Gita*, *Hatha Yoga Pradipika*, and Patanjali's *Yoga Sutras*. Swami Vivekananda is credited with bringing yoga to the United States in 1893 [15].

The practices of yoga—unifying mind and body—has been utilized as a way of reducing stress and dis-ease for thousands of years and has the distinction of being one of the oldest spiritual practices in the world [20]. Practitioners of yoga report a number of physical benefits of yoga, such as improved weight, sleep, diet, and energy level [27]. However, there is a growing body of literature to suggest that yoga can result in improved mental health as well. Yoga has been empirically shown to be efficacious in reducing anxiety, depression, and other PTSD symptomatology [21]. As yoga is increasingly employed in the mental health milieu, there is a concomitant interest and need for research to evaluate its efficacy and utility.

3.1. The neuroscience of yoga and trauma

While investigation into the exact mechanisms through which yoga assists in stress and anxiety reduction remains ongoing, there is mounting evidence that yoga impacts autonomic nervous system

(ANS) activity. The ANS is comprised of the sympathetic nervous system (SNS) and the parasympathetic nervous system (PNS). Together, the SNS and the PNS responses regulate the body's innate reaction to stress. Stress disrupts the body's equilibrium, which results in ANS imbalance: specifically increased SNS activity and decreased PSN activity. While this is an adaptive survival response in the short-term, chronic exposure to stress or trauma can have deleterious physiological effects due to allostatic overload—wear and tear on the body consequent to repeated or prolonged exposure to trauma and stress [29].

A regular yoga practice may increase PNS activity, particularly through the regulation of breathing. Breathing is essential to survival; thus, information the brain receives regarding respiration is given top priority. Slow rhythmic, and controlled breathing sends information to the brain that positively impacts perception, cognition, emotion regulation, and behavior through the stimulation of the vagal nerves, which act as the primary pathway of the PNS [3–6]. Chanting mantras (such as “OM”) is believed to stimulate vagal activity and induce physiological relaxation through vibration and altered breathing [4–6]. Studies have also shown that yoga may reduce the stress hormone cortisol, increase the inhibitory neurotransmitter GABA, and lower heart rate variability. This can reduce stress reactivity for individuals with PTSD [9,22,28].

4. The purpose of this review

This review will examine the efficacy of Trauma-Sensitive Yoga, which is posited to be uniquely able to address the needs of traumatized individuals vis-à-vis other forms—therapeutic or otherwise. To date, no such review of TSY has apparently been conducted. The studies in this review will be used to answer three questions: (1). Is TSY effective in reducing PTSD symptomatology in traumatized women? (2). What, if any, other benefits does TSY provide for women who have experienced trauma? (3). What role can TSY play in the treatment of trauma?

5. Methods

5.1. Intervention

Trauma-Sensitive Yoga (TSY). Developed by David Emerson and his colleagues at the Trauma Center at the Justice Resource Institute in Brookline, MA [12], this style of yoga adapts the typical studio yoga class—which may be overwhelming and unwelcoming for an individual with PTSD—to be trauma-informed. TSY aims to create an environment that is welcoming and reduces triggers such as vulnerability and lack of a felt sense of safety. TSY classes begin with a seated centering exercise and warm-ups. During the warm-ups, the instructor sets a tone of non-judgment, safety, and gentleness. The bulk of class focuses on a postural (*asana*) practice that is suited to the abilities and needs of diverse students. Classes conclude with a traditional *savasana*, or final relaxation pose, with eyes closed; recognizing that individuals who have experienced trauma may not feel comfortable with this due to hypervigilance or other PTSD symptomatology, students are given the option of concluding with *savasana* with open eyes or a seated meditation (eyes open or closed). Due to the unique nature of trauma, psychically adjusting or touching students by an instructor—common practice in most yoga styles—is prohibited in TSY. Other modifications include the use of invitational language; rather than telling students what to do, instructors invite students to engage in particular activities. In TSY, there is also a strong emphasis on allowing students to make choices about what they do and refrain from doing with their bodies. The overarching intentions of TSY are to respect the experiences of trauma survivors and to empower

them to feel and take control of their bodies and lives.

5.2. Search methods

An electronic literature search was performed using the following databases: Cochrane Center Registry of Controlled Trials, Campbell Collaboration Library, Justice Resource Institute's library of publications, JSTOR, PsychInfo, and Web of Science. The search terms that were used included "Trauma-Sensitive Yoga," "Trauma-Sensitive Yoga and trauma," "Trauma-Sensitive Yoga and PTSD," and "yoga and trauma." Articles were screened for inclusion at three stages. The primary stage involved screening articles based on title, language, and type of literature (gray or not). The second stage involved a more thorough review of titles and abstracts. The final stage involved a review of the text of each article, focusing primarily on participants, type of yoga intervention, study design, and outcome measures.

5.3. Selection of studies

All studies in this review have been published in peer-reviewed journals and are written in English. Other requirements for inclusion were TSY as the intervention and women with PTSD as participants. This process yielded a total of five studies for review: two randomized controlled trial (RCT), one quasi-experimental study, one follow-up of an RCT, and one qualitative study. Upon consultation, the developer of TSY stated that, to his knowledge, the studies in this review represent the totality of empirical research on TSY to date (D. Emerson, personal communication, March 29, 2016). See the flowchart in Fig. 1 for a visual depiction of the screening process.

5.4. Population

The participants in all of the studies in this review were women with PTSD. The primary types of trauma experienced were intimate partner violence (IPV) and other interpersonal trauma.

5.5. Outcome measures

The primary outcome for most of the studies in this review was PTSD symptom reduction; however, many studies also examined secondary outcomes such as depression, and anxiety symptoms reduction. Other outcomes included TSY implementation feasibility and the qualitative experience of TSY participation.

5.6. Data extraction and management

Data of interest that was extracted from each article included sample size, participant characteristics (e.g. demographics), study design, type of yoga intervention, outcome measures, and study limitations. Data was managed using a data extraction form, which allowed for easy analysis of each constituent study, as well as for comparisons among studies. Corresponding authors were contacted for study-related questions and requests for missing data. See Table 1 for pertinent study information.

6. Results and discussion

6.1. Clark et al. [8]

This quasi-experimental study aimed to determine the feasibility of implementing a 12-week TSY protocol as an adjunct to group therapy for women who have experienced IPV. Using a community-based participatory research design, researchers at the

University of Minnesota Medical School partnered with the Domestic Abuse Project (DAP), which is an agency that provides services and groups for survivors of IPV. In addition to determining the feasibility of incorporating TSY into group treatment, outcome measures included depression, anxiety, and PTSD symptoms.

Participants were recruited using DAP's database of women who completed the 16-week Primary group who were interested in the 12-week Aftercare group. Interested participants were contacted via flyers and telephone and, if interested, were then screened for appropriateness. To be included in this study, women had to be 18 years of age or older, be able to read and understand English, not have any behavioral problems that would disrupt the group (as determined by group leaders) and not have any injuries or medical conditions that would make yoga unsafe. The total sample consisted of 17 women; using non-random convenience assignment, eight women were assigned to the group therapy plus TSY group and nine were assigned to the group therapy control group. The therapy group ran for 2 h each week and consisted of a combination of psychoeducation and processing. The yoga group received the same group therapy, but also received 30–40 min of TSY led by a certified yoga instructor. The yoga group ran for 15 min longer than the control group. Both groups were held at the DAP facility and facilitated by the same therapist.

At baseline, participants were administered the Patient Health Questionnaire. The baseline mean for this measure was 12.4 with a standard deviation of 6.5 ($n = 15$). To measure depression and anxiety, participants were given the Hospital Anxiety and Depression Scale and the State-Trait Anxiety Inventory. The mean for the former was 8.1 with a standard deviation of 3.5 ($n = 15$) for the depression subscale and 12.9 with a standard deviation of 5.1 ($n = 15$). The latter anxiety measure revealed a baseline mean of 45.9 with a standard deviation of 13.3 ($n = 16$). Each of these scales was given weekly. In order to measure PTSD symptoms, the Post-Traumatic Stress Disorder Diagnostic Scale Parts I and II were administered; however, it soon became apparent that this scale was not appropriate for this population, and at week four, the PTSD Checklist- Civilian Version was administered instead. This scale revealed a mean of 43.7 and a standard deviation of 11.7 ($n = 14$). Nine participants in the sample displayed significant depression symptoms, 13 had significant anxiety, and seven had PTSD. The authors did not provide any information on these measures other than baseline data.

The mean age of the sample was 43. The majority of the sample ($n = 12$) was White. Eleven had sought mental health treatment after completion of DAP's Primary group. None of the participants had been hospitalized for mental health problems, but nine were on psychotropic medications. Twelve of the participants reported no drug or alcohol use, though seven did report a history of drug use/abuse. Of the five that did report alcohol use, two drank daily.

The researchers had intended to assign 12 individuals to each group; however they failed to recruit and retain enough participants. They recruited 17 out of 20 (85%) eligible participants and had an overall dropout rate of 33%. In terms of feasibility, the authors reported that TSY is a safe and inexpensive adjunct to group therapy. The vast majority of participants reported satisfaction with the intervention. In addition to cost and participant satisfaction, emotional and physical safety was of concern to the researchers. None of the participants were physically or emotionally harmed as a result of the intervention. Choice and modification as necessary were emphasized during the TSY sessions in order to protect the wellbeing of the participants.

The researchers acknowledged several limitations of this study. In addition to a very small sample and attrition, they stated that their study was underpowered to test difference between groups. A lack of follow-up after 12 weeks also limits the ability to know if

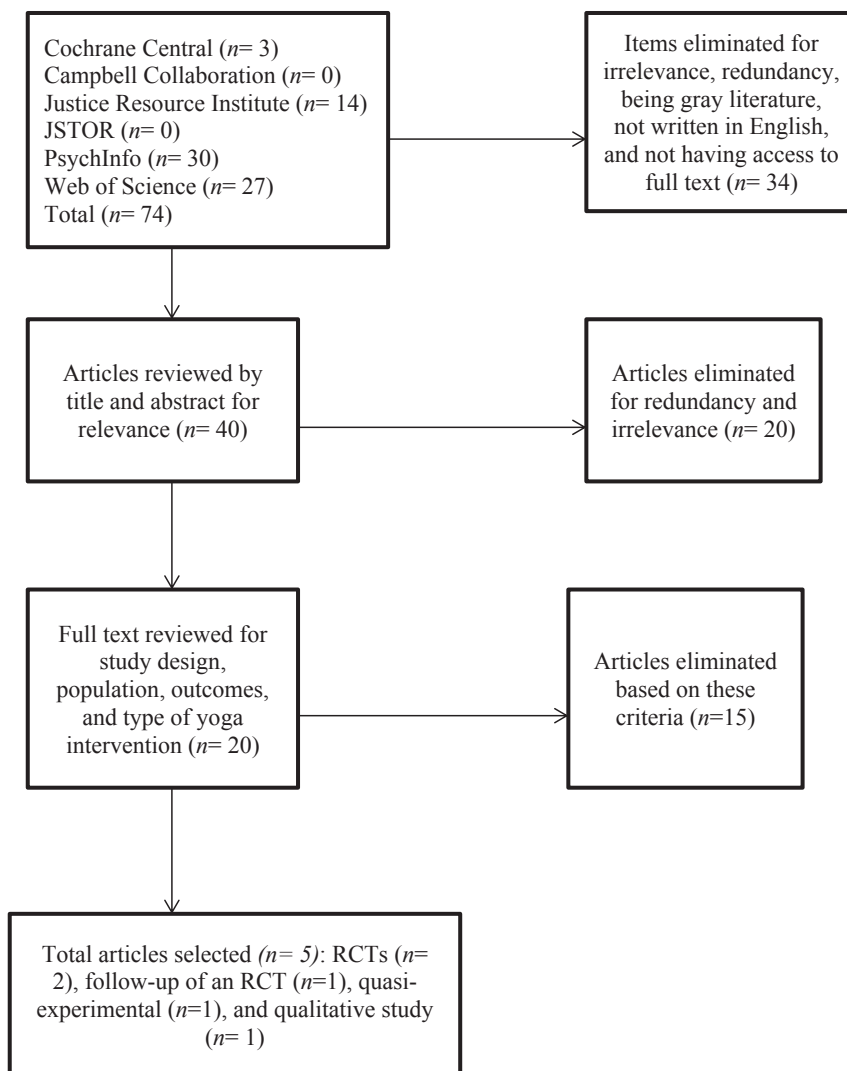


Fig. 1. QUORUM flowchart.

any gains that may have been made during the intervention were maintained over time. Other limitations include the lack of reported data to determine across-subjects improvements. Though depression, anxiety, and PTSD symptoms were primary outcomes, the authors failed to report whether there were any improvements in any of these domains. The study's corresponding author was contacted to obtain missing data, but did not respond to this request. The verdict regarding TSY was that it is reasonably easy and inexpensive to implement; however its efficacy in terms of reducing mental health symptomology remained unanswered at the conclusion of this study due to unreported outcome measures.

6.2. Mitchell et al. [33]

Researchers conducted an RCT using a hybrid of TSY and Kripalu Yoga (KY), which is a style of hatha yoga that is gentle, present-oriented, and intended to meet the physical and emotional needs of individual practitioners [14]. The two aims of the study were to determine if this type of yoga intervention would reduce PTSD, depression and anxiety symptoms and to ascertain the extent to which implementation of such an intervention was feasible. Civilian and military women were recruited at Veterans Administration facilities and on Craigslist. Interested individuals were

screened to ensure that they met the criteria for PTSD using the Primary Care- PTSD Screen. Women were excluded if they did not meet the PTSD diagnosis, had participated in yoga in the last six months, reported substance abuse in the last three months, were at high risk for suicide or homicide, or had a recent psychiatric medication change. In total, 41 women were interviewed. After randomization, the yoga group consisted of 20 women and the control consisted of 18; however, after dropout, the final yoga group was comprised of 14 and the control group was comprised of 12 women, making the final sample 26. All yoga participants had to be cleared by a physician before beginning the intervention.

Participants were compensated \$30 for the initial assessment and \$20 for each yoga session or measurement completion (depending on assignment). Yoga participants were also given a mat, and water bottle; participants in the control group were offered the yoga intervention post-study. All participants were compensated \$30 for completing one-month follow-up measures. TSY/KY participants were given a choice of 12 weekly 1-h sessions or two 1-h sessions over six weeks. Those in the former completed measures weekly, and those in the latter completed the same measures every other session. Participants in the control group completed measures weekly. In addition to the screening measures used to diagnose PTSD prior to randomization, participants were

Table 1
Evaluative studies of TSY for women with PTSD.

Study	Intervention	Study design	Study population	Measures	Results
[8]	Yoga (TSY + group therapy) Control (Group therapy)	NR O ₁ -X-O ₂ O ₁ O ₂	Women with PTSD who completed DAP Primary group Treatment completers (N = 17): Yoga group (n = 8) Control (n = 9)	<ul style="list-style-type: none"> • Patient Health Questionnaire • Hospital Anxiety and Depression Scale • State-Trait Anxiety Inventory • Post-Traumatic Stress Disorder Diagnostic Scale Parts I and II • PTSD Checklist- Civilian Version 	<ul style="list-style-type: none"> • No post-intervention measures reported. • Participant satisfaction in yoga group reported • TSY deemed a safe and inexpensive adjunct to group therapy
[33]	Yoga (TSY/KY) Control (yoga waitlist)	R O ₁ -X-O ₂ -O ₃ O ₁ O ₂ O ₃	Civilian and military women with PTSD Treatment completers (N = 26): Yoga group (n = 14) Control (n = 12)	<ul style="list-style-type: none"> • Primary Care- PTSD Screen • Demographic questionnaire • Traumatic Life Events Questionnaire • PTSD Checklist- Civilian Version • State-Trait Anxiety Inventory • Center for Epidemiological Studies- Depression Scale 	<ul style="list-style-type: none"> • Significant declines in all outcomes for both groups, but no significant group differences • Significant decreases, differences on PTSD Checklist for both groups when re-experiencing, avoidance, and hyperarousal items analyzed separately, but no significant group differences • Marginally significant decreases in depression for both groups, but no significant group differences • Significant decreases in state and trait anxiety for both groups, but no significant group differences
[31]	Yoga (TSY) Control (Women's health education classes, yoga waitlist)	R O ₁ -X-O ₂ O ₁ O ₂	Women with PTSD Treatment completers (N = 60): Yoga (n = 31) Control (n = 29)	<ul style="list-style-type: none"> • Clinician Administered PTSD Scale • Inventory of Altered Self Capacities (Tension-Reducing Activities and Affect Dysregulation subscales) • Dissociative Experiences Scale • Beck Depression Inventory • Davidson Trauma Scale 	<ul style="list-style-type: none"> • 16 out of 31 (52%) of the yoga group and 6 out of 29 (21%) of the control group lost PTSD diagnostic status • Decrease in PTSD symptoms for both groups • Improvement on Davidson Trauma Scale from baseline to mid-treatment for both groups, but yoga group continued to improve while the control group relapsed • Significant decrease in depression symptoms for both groups, but no significant differences between groups • Significant reduction in the Tension Reducing Activities subscale of the for yoga group and significant changes on the Affect Dysregulation subscale of the Inventory of Altered Self Capacities for both groups • No improvements in dissociative symptoms for either group
[24]	N/A	Qualitative: phenomenological	Completers of van der Kolk et al. [31] RCT Treatment completers (N = 39)	<ul style="list-style-type: none"> • Semi-structured phenomenological interviews 	<ul style="list-style-type: none"> • Core theme: peaceful embodiment. • Three meta-themes: yoga supporting the process of claiming peaceful embodiment, new perspectives by claiming peaceful embodiment, and facilitators and barriers
[25]	N/A	Follow-up of RCT	Completers of van der Kolk et al. [31] RCT Treatment completers (N = 49) Yoga (n = 33) Control (n = 16)	<ul style="list-style-type: none"> • Clinician Administered PTSD Scale • Inventory of Altered Self Capacities- Tension-Reducing Activities subscale • Beck Depression Inventory • Dissociative Experiences Scale 	<ul style="list-style-type: none"> • Post-RCT, 39 of the women began practicing yoga in a variety of settings • Reduction in PTSD symptom severity • Reduction in depression symptom severity • Increased likelihood of loss of PTSD diagnosis • No significant findings regarding dissociation or tension-reducing activities

asked to complete a demographic questionnaire and the Traumatic Life Events Questionnaire at baseline. The PTSD Checklist- Civilian Version, State-Trait Anxiety Inventory, and the Center for Epidemiological Studies- Depression Scale were administered at baseline, the end of the study, and at the one-month follow-up. A shorter version of the PTSD Checklist was also administered weekly.

In addition to obtaining demographic descriptive data, growth curve modeling with multilevel framework with data nested within-person was used to analyze data. A variable including the

number of days since baseline was included in the models. Between-group difference effect sizes were also calculated using Cohen's d. Due to the number of analyses that were run, an alpha of 0.001 was used to determine significance.

In terms of race/ethnicity, the yoga group was predominantly White (60%), whereas the control group was even split evenly between White and Black (44.4%). The highest level of education in the yoga group was post-baccalaureate degree (40%) and some college/associate's degree (60%) in the control group. The majority of both groups reported a regular yoga practice of less than one

month and prior mental health contact. A considerable percentage of both groups (yoga: 46.7%, control: 35.7%) reported prior PTSD psychotherapy. A number of types of interpersonal trauma were reported including childhood physical/sexual abuse, IPV, and adult sexual abuse.

The results of statistical analyses significant scores on the PTSD Checklist for both groups from baseline to post-study and baseline to follow-up. There were significant declines in all outcomes for both groups, but no significant group differences ($\beta = -0.03$, $t = 0.83$; $p = 0.59$). When analyzed separately, the yoga group showed more decline, with only marginal differences demonstrated for the control group. Analysis of the PTSD Checklist on items related to re-experiencing yielded significant changes, but no group differences ($\beta = -0.01$, $t = 0.54$; $p = 0.59$). Similarly analysis of the PTSD Checklist's avoidance items yielded marginally significant differences, but no group differences ($\beta = 0.01$, $t = 0.25$; $p = 0.81$); decreases were marginally significant for the control group, but not for the yoga group. PTSD Checklist hyperarousal items analyses also revealed significant decreases for both groups, with group membership exhibiting no significant impact ($\beta = 0.003$, $t = 0.19$; $p = 0.85$); analyzed separately, the yoga group experienced significant decreases, and the control group experienced only marginal differences. Between-groups effect sizes were 0.2 (total), 0.32 (re-experiencing), 0.09 (avoidance), and 0.08 (hyperarousal).

Analysis of depression scores yielded marginally significant decreases overall, but no differences between groups ($\beta = 0.02$, $t = 0.42$; $p = 0.68$); no significant differences were found for either group upon separate analysis. State anxiety analyses yielded significant decreases, but, once again no group differences ($\beta = 0.01$, $t = 0.35$; $p = 0.73$). Analyzed separately, scores decreased significantly for the control group, but not the yoga group. Trait anxiety analyses revealed significant decreases, with group membership having no significant impact. Once again, the groups were analyzed separately, revealing significant reductions for the control group, but not the yoga group. Between-groups effect sizes were 0.15 (depression), 0.12 (state anxiety), and 0.1 (trait anxiety).

The results of this study revealed declines in outcome measures across the board, independent of group assignment; group differences were detected only when analyzed separately. The researchers hypothesized that one possible expansion for the decline in scores for the control group could be the positive effect of having a routine (filling out weekly measures). Despite positive feedback from participants, the results of this study do not support significant improvements for the yoga group versus the control group. Perhaps the hybrid KY/TSY intervention did not adequately address the needs of the individuals in the yoga group. It is impossible to know whether or not the results would be different if the researchers had used a strictly TSY intervention. Though KY shares many similarities with TSY, it may not be sufficiently nuanced for women with PTSD. A small sample size also impacted the results of the study to detect group differences, as indicated by a power analysis. The issue of feasibility was not addressed in the findings.

6.3. van der Kolk et al. [31]

Researchers at the Trauma Center at the Justice Resource Institute in Brookline, MA conducted a randomized-control trial to test the efficacy of TSY in decreasing PTSD symptoms in women (ages 18–58) with nonresponsive PTSD due to interpersonal trauma such as IPV. Nonresponsive PTSD was operationalized as being in therapy for three years for trauma prior to the study, without significant remission or reduction of symptoms. Participants were recruited through newspaper and radio ads, the Trauma Center's website, as well as from referrals by mental health professionals. Women were

excluded due to pregnancy or breastfeeding, unstable medical conditions, drug or alcohol abuse in the past six months, high suicide risk or life-threatening self-injury, experience with yoga (four or more sessions), and a Global Assessment of Functioning score less than 40. In total, 101 women were assessed, 83 of whom met the criteria for PTSD as determined by a score of a score of 45 or less on the Clinician Administered PTSD Scale; seven women withdrew before randomization, and three withdrew before treatment. The total sample included 64 women.

After assessment, participants were randomly assigned to the yoga group, which received weekly 1-h TSY sessions for 10 weeks, or a control group, which received weekly 1-h women's health education classes. These health education classes included topics such as seeking medical treatment, discussing and normalizing body talk, and engaging in self-care activities. The women in the control group were offered 10 weeks of TSY after study completion. Each group consisted of 32 women; however, one woman in the yoga group and three women in the control group dropped out before study completion. There were no significant differences between the groups at baseline. The mean age of the sample was 42.9. The majority of the sample (78.1%) was White and had at least a college degree (73.4%). Almost half the sample (45.3%) reported a single marital status, and 59.4% of the women were employed at the time of the study.

At pre and post-treatment, the Clinician Administered PTSD Scale, the Inventory of Altered Self Capacities (with Affect Dysregulation and Tension-Reducing Activities subscales), and the Dissociative Experiences Scale were administered. The Beck Depression Inventory and Davidson Trauma Scale were administered prior to treatment, mid-treatment (week five), and post-treatment (week ten). Hierarchical linear and nonlinear modeling with maximum likelihood estimates was used to analyze the data. The regression analyses included an examination of time and group interaction.

PTSD symptomology was the primary outcome of interest. Based on Clinician Administered PTSD Scale scores, 16 out of 31 (52%) of the yoga group and 6 out of 29 (21%) of the control group lost PTSD diagnostic status. Both groups showed a decrease on this measure, with the yoga group displaying a large effect size decline ($d = 1.07$) and the control group displaying a medium to large effect size decline ($d = 0.66$). Both groups showed significant improvement from pre-treatment to mid-treatment on the Davidson Trauma Scale; the yoga group demonstrated a significant linear medium effect size ($d = 0.52$), and the control group demonstrated a quadratic medium effect size ($d = 0.46$), but no significant linear effect. These results indicate that the yoga group continued to show improvement from mid-treatment to post-treatment, while the control group relapsed over time.

Both groups exhibited a decrease in scores on the Beck Depression Inventory (yoga group: $d = 0.6$, control group: $d = 0.39$); however, there were no significant difference between the groups in score reduction. The yoga group showed a significant reduction ($d = 0.44$) in the Tension Reducing Activities subscale of the Inventory of Altered Self Capacities, but the control group did not. Both groups demonstrated significant changes on the Affect Dysregulation subscale (yoga group: $d = 0.6$, control group: $d = 0.38$). There was no significant interaction between group and time for either subscale. Neither group demonstrated significant changes on the Dissociative Experiences Scale.

The results of this study support the use of yoga as an adjunctive treatment for women with nonresponsive PTSD. The researchers posit that the effect of TSY is comparable to that of psychotherapeutic and psychotropic interventions. Some limitations on the study include the restricted type of trauma (interpersonal), age, inclusion of only women, and co-occurrence of other mental health

issues such as depression and anxiety. The researchers stated that replication on different populations (e.g. younger individuals, different types of trauma) is needed to further explore the utility of TSY. An additional limitation is the absence of a follow-up; thus, the extent to which the improvements in the yoga group were sustained over time was unknown at the conclusion of the study. However, follow-up studies were conducted later, the details of which are described below.

6.4. Rhodes [24]

Following the van der Kolk et al. [31] RCT, a qualitative study was conducted to understand the lived experiences of the women who completed TSY. After completion of the RCT, completers were contacted and asked if they wished to participate in a qualitative follow-up. Thirty-nine of women agreed to participate in semi-structured phenomenological interviews. The interviews varied in length from 20 min to 1 h. Data was analyzed using hermeneutic phenomenological analysis at three levels. The first level involved analyzing the full text of interview transcripts. The second level of analysis involved a more thorough line-by-line analysis. After analyzing 20 interview, the researchers realized that they had reached saturation in terms of codes. An analytic memo was written for each interview. The final level of analysis was a thematic analysis of the analytic memos. Multiple researchers coded the interviews in order to achieve inter-rater reliability.

The mean age of the sample was 40. The majority of the sample was White (76%), single (48.7%), and had at last a college degree (74.4%). Most of the women were unemployed at the time of the study (61.5%). Thirty-two women (82.1%) were in the original TSY intervention group, and seven women (17.9%) were in the control group. The mean number of yoga sessions since the RCT was 50. Most of the sample (74.4) continued practicing yoga after the study, but less than once a week, followed by practicing at least once a week (20.5%). A small percentage (5.1) reported that they stopped practicing after the study.

The core phenomenon that emerged from the interviews was that of peaceful embodiment. This can be understood as a felt sense of control over and connection with one's body, thoughts, and emotions. For survivors of interpersonal violence, it can often feel unsafe to connect to one's body. The data revealed that TSY provide the skills and the environment to not only connect to one's body, but to do so in a serene manner. A number of themes emerged around this core phenomenon that fall into three categories or meta-themes: yoga supporting the process of claiming peaceful embodiment, new perspectives by claiming peaceful embodiment, and facilitators and barriers.

This study revealed that yoga facilitated and supported the process of peaceful embodiment. One theme that emerged related to this meta-theme was experiencing new, present-oriented, positive embodied experiences. Yoga was able to assist these women in staying present and experiencing corrective body-related experiences. Another theme was interoceptive exposure, desensitization, and taking effective action; this theme refers to the ability to notice and identify sensations in the body, tolerate distress, and take necessary action. The third theme was yoga as a tool to cope with trauma stressors and triggers. Yoga served as an outlet for these women to deal with the effects of their PTSD in a more mindful and healthy manner.

The second meta-theme centered on gaining new perspectives as a result of the peaceful embodiment facilitated by yoga. The first theme was practicing pause and developing a grounded response; by centering and grounding, the women reported the ability to be less reactive to stress and triggers. The second theme was hope initialing change; having been beleaguered by PTSD and the

aftereffects of trauma for an extended period of time, the ability to feel hope and have that hope lead to change was heartening for the women. The third theme was priority and capacity for self-care; whereas many of the women may not have prioritized or known how to care for themselves before, yoga helped them developed a sense not only of the importance of self-care, but the ability to engage in these activities. Lastly, the women reported increased emotional and physical intimacy. This is a very big gain for survivors of any trauma, particularly interpersonal trauma, as emotional and physical distancing had likely served as a protective mechanism for them, the final meta-theme focused on facilitators and barriers. Facilitators to peaceful embodiment through yoga included a gentle, choice-oriented class, an instructor with whom the women felt safe, and the consistency of a regular practice. There were two types of reported barriers: external and internal. External barriers included cost, finding a suitable class, and monitoring one's progressing without an instructor. Reported internal barriers primary centered on motivation and fear. Many women reported struggling with motivation; interestingly fear—including fear of getting better—proved to be a barrier for some. Thus, while the initial RCT lent quantitative support for TSY for women with PTSD, this study fleshed out the qualitative, phenomenological mechanisms by which this intervention may have served as an impetus for further healing.

6.5. Rhodes, Spinazzola, & van der Kolk [25]

One of the acknowledged limitations of the van der Kolk et al. [31] RCT was a lack of quantitative follow-up after study completion. In order to ascertain the long term mental health effects of TSY, researchers and clinicians at the Trauma Center attempted to contact the 60 completers of the RCT in order to assess PTSD depression, and anxiety symptoms, dissociation, and tension reducing activities, as well as to test the hypothesis that yoga practice frequency influenced long-term outcomes. Following the original TSY study, individuals in the control condition were given an opportunity to participate in a 10-week TSY intervention. The original study, which began in 2008, consisted of six cohorts: three yoga groups ($n = 31$) and three control groups ($n = 29$). This served as the sampling frame for the follow-up study. An independent-sample t -test revealed no significant differences between the completers who chose to follow up and those who did not. The researchers were blinded to participants' original group assignment and their frequency of yoga practice at the time of assessment.

Of the 60 completers, 49 completed follow-up measures. This sample consisted of 26 women assigned to the yoga group, 16 women who were assigned to the control group (women's health class), and seven women who were initially assigned to the control condition, but went on to participate in the 10-week TSY program offered after study completion. The mean age of the sample was 42.8. The sample was mostly White (71.4%) and had at least a college degree (71.4%). Slightly less than half (46.9%) of the sample reported a marital status of single, and 38.8% were employed at the time of the follow-up study. The length of time between completion of the RCT and follow-up ranged from 39 to 143 weeks.

Consistent with the original RCT, the Clinician Administered PTSD Scale, the Inventory of Altered Self Capacities- Tension-Reducing Activities subscale, Beck Depression Inventory, and the Dissociative Experiences Scale were administered. Additionally, the Stressful Life Events Screening Questionnaire was administered to ascertain the extent of trauma exposure. Participants were also given a questionnaire inquiring about post-RCT activities such as whether or not they had started seeing a therapist or attending a support group, were on psychotropic medication, or had undergone

some other type of trauma/mental health treatment.

Data was analyzed comparing original baseline score to follow-up scores on the above measures. Analyses revealed no significant differences between the 26 women originally assigned to TSY and the seven who participated in it after the study; thus, they were collapsed into one group, making the total number of yoga participants 33. Due to the discrepancies in time between RCT completion and follow-up, a ratio variable was calculated by dividing number of reported yoga sessions by the number of weeks post-RCT. The yoga practice frequency variable was subsequently turned into an ordinal variable with codes ranging from 1 (an average of less one yoga session a week) to 3 (an average of more than one yoga session a week). Bivariate correlations were run among all study variables. Hierarchical linear and logistic regressions were then conducted using four models. The first model consisted only of lifetime exposure to trauma. Post-RCT treatment changes were added in the second model, treatment group status was added in the third model, and yoga frequency was added in the final model.

The results revealed that 39 of the women began practicing yoga after the RCT: twenty-three out of twenty-six in the original yoga group, nine out of sixteen in the control group, and seven who completed TSY in a subsequent post-RCT cohort. The women reported practicing in a variety of settings, including their homes, yoga studios, and gyms. The researchers did not inquire or provide information on the styles of yoga practiced. Bivariate analyses indicated no significant relationship between original treatment group and any of the outcome variables; however, frequency of yoga was correlated with likelihood of loss of PTSD diagnosis ($r = 0.28$; $p < 0.05$) and decrease in depression symptoms ($r = 0.33$; $p < 0.05$).

Regression analyses revealed three major models: reduction in PTSD symptom severity, reduction in depression symptom severity, and increased likelihood of loss of PTSD diagnosis; no significant findings were yielding regarding dissociation or tension-reducing activities. With respect to PTSD symptom reduction, adding frequency of yoga practice significantly changed the model ($R^2\Delta = 0.11$; $p < 0.05$); higher frequency of yoga practice was associated with decreased PTSD symptom severity ($b = 12.24$; $p < 0.05$). The addition of frequency of yoga practice also made group membership significant, with members of the control group showing greater reductions in PTSD severity than yoga group members. Group differences were further analyzed using independent sample *t*-tests, which yielded null findings regarding differences in yoga practice frequency between the yoga and control group. The addition of frequency of yoga practice to the depression symptoms linear regression resulted in a significant model change ($R^2\Delta = 0.15$; $p < 0.001$); higher frequency of yoga practice was associated with decreased depression symptom severity ($b = 7.84$; $p < 0.001$). A hierarchical logistic regression predicting likelihood of loss of PTSD diagnosis indicated that frequency of yoga practice was associated with decreased likelihood of meeting the diagnostic criteria for PTSD ($b = 1.58$; $OR = 0.21$; $p < 0.05$).

The results of this study support the utility of yoga in improving long-term mental health outcomes for women with nonresponsive PTSD. Though this study did not test the effects of TSY directly, it indicated that exposure to TSY led to both an increased likelihood of practicing yoga after the study and improved outcomes from baseline to follow-up. A limitation of this study is the difficulty in isolating the effects of the original intervention on the outcome measures. It is unknown why no significant findings were found for dissociation or tension-reducing activities, nor is it known why the control group displayed a greater reduction in PTSD symptom severity. Additional limitations were reliance on self-report and the limited number of control variables due to sample size. The

researchers recommend future research that focuses on unpacking some of this study's findings, as well as exploring whether or not there is an optimal "dosage" of yoga that engenders the ability to sustain positive outcomes. Also the number of people unavailable to assess post-treatment (11 missing) is a problem to be noted.

7. Conclusions

The findings of these studies lend tentative support for the use of Trauma-Sensitive Yoga in treating women with trauma: specifically interpersonal trauma such as IPV. Additionally, TSY may also reduce co-occurring disorder symptomology such as depression and anxiety. The qualitative study gives life to the quantitative findings by describing the experience of TSY in rich detail, primarily the phenomenon of peaceful embodiment. All of the studies reported yoga participant satisfaction, as well as physical and emotional safety. Participation in the van der Kolk (2014) RCT indicated increased likelihood to maintain a therapeutic yoga practice, which may augment the effects of the initial intervention. Regardless of statistical findings, the benefits of TSY reported by researchers included feasibility, participants' felt sense of safety and control, yoga as an effective adjunct to group or individual psychotherapy, and healing potential for those who are unresponsive to conventional psychotherapies. Incorporating what happens "on the mat" into therapy and everyday life may enhance the effects of TSY, so the importance of applying the skills outside of yoga is often heavily emphasized.

The extent to which this intervention can be applied to other types of trauma, populations, and settings is unknown. There are a number of limitations that beleaguer the current research on TSY. It is a very new form of therapeutic yoga; as such, there is a dearth of research on its efficacy. Furthermore, all studies contained small, homogenous samples that confounded the results. Clinicians and researchers at the Trauma Center in Brookline, MA—many of whom contributed to developing the TSY protocol—contributed to all but one of the included studies. This is not to discredit them or their work, but to emphasize the importance of replication by independent researchers.

It is worth noting that this review considered only published literature. It is possible that more extensive and rigorous research has been conducted in gray literature that did not meet the inclusion criteria of this study. Despite the current lack of published studies on TSY, more research is on the horizon: A feasibility study using TSY was conducted at the Veterans Administration facility in Atlanta, GA; the manuscript delineating the results of this study is currently under review. Also, a small study using TSY protocol with adolescent girls is in its beginning stages (D. Emerson, personal communication, March 29, 2013).

Future research should include larger-scale, rigorous studies that examine more diverse populations and larger samples and should be conducted by independent researchers. Fidelity issues must also be addressed; TSY is not manualized, so it may be difficult to gauge the extent to which future TSY research is consistent with the intended protocol. Given the safe, respectful, and positive atmosphere that TSY attempts to create, future research may also focus on the use of TSY with individuals without a self-reported trauma history who have other mental health disorders (e.g. eating disorders, substance abuse, depression, or self-injury) or trauma and co-occurring disorders other than anxiety and depression. It is possible that the benefits of TSY may transcend trauma. Though the published research on TSY to date is scant, the preliminary evidence indicates that this therapeutic form of yoga warrants further empirical investigation.

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