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Assessment of yoga as an adjuvant treatment for combat-related post-traumatic stress disorder

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Abstract

Objectives: This study assessed yoga as an adjuvant strategy for symptoms of combat-related post-traumatic stress disorder (PTSD).

Methods: Subjects had significant, combat-related PTSD. Control data were collected during an eight-week waiting period. Trauma-sensitive yoga sessions of 90 minutes duration were provided every seven days for eight weeks. Assessments included the PTSD checklist (PCL); the Depression, Anxiety and Stress Scale (DASS); the Pittsburgh Sleep Quality Index (PSQI); the Adult/Adolescent Sensory Profile (AASP); the SF36 Quality of Life instrument; and a brief, structured pre-enrolment assessment of attitudes towards yoga. Biomarkers were also assessed.

Results: Thirty participants were recruited, with 28 completing the protocol (M_{age}=63.5 years). For most variables, there was no significant change in results after the waiting period. Comparing measurements obtained immediately prior to the commencement of the intervention to those taken after completion of eight yoga sessions, significant changes included an increase in the serum dehydroepiandrosterone concentration, decreased total PCL score (and all PCL sub-scales), decreases in all DASS sub-scale scores and significant improvements in PSQI and SF36 scores. No adverse events were reported.

Conclusions: A range of benefits were observed after yoga, consistent with the theoretical construct for the long history of yoga as a strategy to reduce stress and promote well-being.

Keywords: yoga, post traumatic stress disorder

Yoga has been used for thousands of years to calm both mind and body, reducing autonomic sympathetic activation, muscle tension and blood pressure. Yoga exerts positive effects upon neuroendocrine and hormonal function, decreases physical and emotional symptoms of distress and enhances quality of life. Yoga has previously been acknowledged as a potentially beneficial strategy to assist with the management of cognitive, emotional and physiological symptoms of post-traumatic stress disorder (PTSD).[1] The practice of yoga is known to increase vagal tone, enhance GABA pathways in the brain (thereby facilitating inhibitory neurotransmission) and increase oxytocin and prolactin release (associated with positive emotions like safety, bonding), and is associated with an enhanced sense of well-being.[2]

With ongoing armed conflict and military/peace-keeping deployments, the prevalence of combat-related PTSD is not expected to diminish in the coming years. Although considerable research has already assessed various treatment modalities, it is clear that psychological interventions and pharmacological treatments that have been explored to date have not been able to provide full relief of symptoms or adequate diminishment of symptoms in all cases.[3] Many combat veterans continue to be affected by residual symptoms of PTSD, which in turn

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are associated with significant distress and disability, as well as being linked to serious co-morbidities such as depression and substance-use disorders.[4] This being the case, there is a pressing need to explore various other approaches that may be used as adjuvant self-management strategies in cases where incomplete treatment response is observed. Given that the fundamental characteristics of yoga appear to be well suited as a potential intervention for PTSD, it is not surprising that some research to date has confirmed the potential clinical utility of this strategy.[5–9] As there has been no specific research into the use of yoga as a therapeutic intervention for PTSD in the Australian setting, the present study was conducted to ascertain whether this approach may prove helpful for Australian military veterans affected by this serious and disabling condition.

Methods

This was an unblinded observational study assessing the effects of yoga as an adjuvant strategy for the management of PTSD. Cognitively intact subjects (Folstein MMSE score >23/30) with significant, combat-related PTSD were recruited by referral from the psychiatry unit of an Australian tertiary referral hospital with a focus on veteran psychiatry. All participants had a diagnosis of PTSD that was confirmed to exceed the diagnostic cut-off point of the Clinician Assisted PTSD Score (CAPS) instrument. The design of the study was naturalistic, and thus subjects were not excluded on the basis of any specific psychiatric/substance-use disorders or physical co-morbidities (provided that subjects were able to provide informed consent). After providing informed consent, participants proceeded to an eight-week waiting period involving continuation of usual management, during which time, baseline control data were collected. After this, participants attended a series of eight simple Hatha yoga sessions with trauma-sensitive elements, each lasting 90 minutes and conducted every seven days. The yoga sessions were conducted by a practitioner with relevant qualifications in physiotherapy, yoga and mindfulness practices, and were supplemented with an audiovisual recording that provided brief practice instructions for home use. The extent of home practice was not prescribed and was left to the discretion of the participants. The frequency and duration of practice was not recorded. Throughout the course of the study, all other empirical treatment, including pharmacotherapy and psychological treatments, was maintained as usual by each subject's treating clinician.

Each of the eight yoga sessions offered a unique theme and brief theoretical explanation. Sessions began with a settling-in sensory and breath awareness. Participants were then invited to explore, employing modifications as required, a variety of lying, sitting, standing and restorative postures individually and linked into flowing sequences. The invitational style of guidance aimed to facilitate a sense of present-moment safety, an attitude of curiosity to bodily sensory experience, self-compassion with disengagement from judgemental thoughts, encouragement of self-adaptation to the instructions and an acknowledgment of moments of empowerment. Each session concluded with a guided body-awareness meditation and a period of silence.

At each study visit, a range of assessments were completed and included the PTSD checklist (PCL), the Depression, Anxiety and Stress Scale (DASS), the Pittsburgh Sleep Quality Index (PSQI), the Adult/Adolescent Sensory Profile, the SF36 Quality of Life instrument, and a brief, structured pre-enrolment assessment of attitudes towards yoga prior to the commencement of sessions. A range of biomarkers were also assessed, including heart rate, respiratory rate, blood pressure, salivary cortisol concentration and serum concentrations of C-reactive protein, dehydroepiandrosterone (DHEA) and tumour necrosis factor. Results obtained at the conclusion of the eight sessions were compared to those from the pre-assessment baseline and the measurements immediately prior to the commencement of yoga sessions. Paired *t*-tests were used for comparison of mean values, and Fisher's exact test was employed for comparison of categorical variables.

Results

A total of 30 subjects were recruited, with 28 completing the protocol (M_{age}=63.5±7.6 years; 27 males). One subject was lost to follow-up, and one declined further participation in view of the need for surgery related to an intercurrent illness. For most variables, there was no significant change in results after the waiting period. However, after the conclusion of the eight-week waiting period, there was a significant decrease in scores from the PCL sub-scales for avoidance (p=0.03) and re-experiencing (p<0.001), as well as for the total PCL score (p=0.01). There was also a reduction in the DASS stress sub-scale score (p<0.001) and in the mean serum concentration of DHEA (p=0.015), and small but significant increases in the mean heart rate (p=0.042) and PSQI score (p=0.025).

At the study endpoint, it was apparent that there was significant improvement across the board in the results of psychometric assessments, with decreases in total scores and all sub-scales of the PCL and DASS results (see Table 1). In addition, scores related to sleep quality and quality of life had also improved significantly in comparison to those measured immediately prior to the commencement of the yoga intervention (Table 1). Scores for several domains of the Adult/Adolescent Sensory Profile decreased significantly in comparison to those from before the implementation of yoga. In contrast, for the most part, values for various biomarkers did not change significantly relative to baseline, with the exception of an increase in the mean serum concentration of DHEA, the clinical significance of which is uncertain (see Table 2).

After the implementation of the intervention, the proportion of subjects with a PCL score less than the diagnostic cut-off point of 50 was 18/28 (64%), and the mean

Table 1. Results of psychometric assessments, before and after yoga programme

Parameter	*Mean score pre yoga*	*Mean score post yoga*	p-*Value*
PCL Re-experiencing Sub-scale (4–20)	13.6±4.4	12.0±4.1	<0.01
PCL Avoidance Sub-scale (7–35)	21.9±4.7	19.2±4.4	<0.001
PCL Hyper-arousal Sub-scale (6–30)	18.4±3.8	15.1±4.0	<0.001
PCL total	53.2±11.7	45.9[a]±10.5	<0.001
DASS Depression Sub-scale	17.4±8.5	12.9±7.8	0.001
DASS Anxiety Sub-scale	16.0±7.2	12.9±7.8	<0.01
DASS Stress Sub-scale	18.4±3.8	15.1±4.0	<0.001
AASP Low registration[b] Sub-scale	41.9±7.9	39.2±7.5	0.018
AASP Sensation seeking Sub-scale	38.1±5.8	39.1±6.1	0.142
AASP Sensory sensitivity[b] Sub-scale	43.2±6.2	41.2±7.1	<0.01
AASP Sensation avoiding[b] Sub-scale	46.9±6.3	43.4±6.7	<0.01
PSQI[b]	12.4±3.7	11.19±4.1	0.035
SF36	319.4±104.2	371.1±102.3	0.031

[a]Below diagnostic cut-off point.

[b]Lower scores are better.

PCL: PTSD checklist; DASS, the Depression, Anxiety and Stress Scale; AASP, the Adult/Adolescent Sensory Profile; PSQI: Pittsburgh Sleep Quality Index; SF36: SF36 Quality of Life instrument.

PCL score amongst all subjects was 45.9±10.5, nearly 10% below the lower limit of the diagnostic cut-off point. There was significant inter-individual variation in the response to the intervention, with five subjects experiencing a mild/moderate increase in PCL after the intervention. However, the majority of those participating (23/28; 82%) had a decreased PCL after completing the series of yoga sessions.

It is also noteworthy that *all* subjects in the study had clinically significant elevation of salivary cortisol concentrations, both before and after the yoga intervention. In addition, about 25% of subjects had other elevated inflammatory markers, both before and after yoga. The majority of the subjects in the study had relatively severe PTSD symptoms. It is clear that these subjects were affected by chronic and severe PTSD, and thus were representative of

Table 2. Biomarker values, before and after yoga programme

Parameter	*Mean value pre yoga*	*Mean value post yoga*	p-*Value*
Serum DHEA (1.9–11.6 mmol/L) Men	2.75±1.7	3.08±2.1	0.015
Salivary cortisol (<5 nmol/L)	13.65±6.7	14.05±7.2	>0.5
C reactive protein (<5 mg/L)	2.88±3.5	3.61±4.9	0.114
Serum TNF (1.2–15.3 pg/mL)	70.1±10.9	71.68±13.4	0.445

DHEA, dehydroepiandrosterone; TNF, tumour necrosis factor

a cohort with refractory PTSD that was characterised by severe symptomatology, despite extensive routine intervention, in part explaining the relative lack of effect reflected in influences upon biomarkers. Even so, a positive pre-intervention attitude towards yoga was not predictive of treatment response. Perhaps most importantly, this study was associated with a very low drop-out rate (6.6%), far less than many other studies assessing other treatments for PTSD such as various pharmacotherapies. Interestingly, at the end of the study, most subjects reported having a positive view about the benefits of the yoga approach, but a positive pre-intervention attitude towards yoga during pre-intervention assessment was not associated with a significant treatment response ($p>0.5$).

Conclusions

There remains a relative dearth of definitively effective treatment options for the management of chronic, severe PTSD. Despite acknowledgement of the existence of the condition dating back some centuries and the recognition of the specific diagnostic constellation nearly 40 years ago, PTSD (particularly PTSD associated with combat-related trauma) remains a very significant challenge. Current treatment options remain somewhat labour intensive, and drug treatments are associated with significant adverse effects and modest efficacy. For these reasons, any investigation of potentially effective treatment options for this difficult condition is particularly worthwhile. This modest study adds to the existing knowledge base regarding the potential efficacy of yoga as a treatment modality for PTSD. The small number of subjects and the unblinded approach to the investigation are obvious limitations of the study methodology, but not withstanding this, the results from this research appear to reinforce positive outcomes observed by other investigators. It is important to note that the majority of subjects (24/28) included in the convenience sample recruited for research were veterans from the Vietnam War aged in their 60s, and that the results may not necessarily be generalisable to younger people. Further studies should incorporate a double-blind approach that recruits subjects from a balance of both sexes and from a range of age groups, specifically including younger veterans from more recent conflicts such as Iraq and Afghanistan. Data were not collected about the extent of between-session practice, and nor was there any follow-up data collected to assess long-term retention of benefits. Considering all of these factors, it seems evident that further research into the clinical utility of yoga as a potential treatment modality for combat-related PTSD is warranted.

Disclosure

The authors report no conflict of interest. The authors alone are responsible for the content and writing of the paper.

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