

Original Article

Influence of Intensity and Duration of Yoga on Anxiety and Depression Scores Associated with Chronic Illness

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Abstract

Background: Chronic illness is commonly associated with anxiety and depression. Both anxiety and depression respond to yoga. However, there is no report on the association between the intensity and duration of yoga practice with the benefits seen. **Aim:** The present study was intended to determine whether the daily duration of yoga practice and the duration of experience in months would predict anxiety and depression, associated with chronic illness. **Subjects and Methods:** Seven hundred and sixty-three volunteers with ages between 14 and 86 years (group mean age standard deviation, 50.2 [14.2]) who attended a 7 day residential yoga camp in the north of India were included in this cross-sectional study. All participants had chronic illnesses, which were under control with treatment, and which were categorized and are detailed. Participants were assessed for state anxiety scores using State-Trait Anxiety Inventory and for anxiety with hospital anxiety and depression scale (HADS-A), and depression was assessed using HADS-D scores of the HADS. Linear multiple regression analyses were performed using PASW SPSS version 18.0 (Armonk, New York, U.S.) to determine how the daily and monthly duration of yoga practice could influence state anxiety, hospital anxiety and depression of the participants. **Results:** Yoga practice in months and the time spent practicing yoga each day significantly predict the level of state anxiety ($P < 0.001$, $P = 0.03$) and HAD-A ($P < 0.01$, $P < 0.01$). The duration of yoga practice in months alone was a significant predictor of the HAD-D ($P < 0.01$). **Conclusions:** The results suggest that the duration of yoga practice in months and daily practice in minutes predict anxiety associated with chronic illness. In contrast the duration of yoga practice in months alone, predicted depression scores.

Keywords: Anxiety, Chronic illness, Depression, Linear multiple regression, Yoga practice

Introduction

Physicians often focus on the somatic component of illness while emotional aspects are overlooked.^[1] The reasons for this are usually valid. All the same emotional disorders require adequate consideration, as an emotional disorder (i) may frequently occur concomitantly with a somatic illness, or (ii) may present as a somatic disorder.^[2-4]

Chronic diseases are often associated with symptoms of an emotional disorder. Chronic diseases are being considered seriously the world over, as conditions such as heart disease, stroke, and diabetes are leading causes of death in the U.S.^[5] and other countries.^[6] The association between chronic disease and unhealthy lifestyle choices is becoming increasingly apparent.^[7] As a result, nonpharmacological therapies that change the lifestyle are being considered in the management of many chronic diseases.^[8] Among them, yoga has been shown to have therapeutic benefits and is useful in stress reduction.^[9]

A review, conducted by searching three electronic databases (Ovid Medline, PsycINFO, CINAHL), with yoga as the keyword, yielded 2349 articles published between 1980 and 2007.^[10] Among the articles, 861 considered yoga and chronic disease. The number of articles post-2007 is likely to

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have increased. However, this article is referred to here, as it examined the importance of noting the frequency and duration of yoga sessions. The author, Yang (2007) stated that ‘the total dose of yoga training, which depends on both the duration and frequency of yoga sessions, also needs to be considered in evaluating and comparing yoga studies’.

As described earlier, chronic disease is often associated with an emotional component.^[11] Two aspects of emotional disorders that clinically have the most relevance are anxiety and depression.^[11] Both anxiety and depression have benefited through yoga practice.^[12] The present study was conducted on participants who had already been practicing yoga but had self-elected to enroll for a yoga program as they had a somatic disorder.

The aim of the study was to determine whether there would be associations between duration or intensity of yoga practice and the anxiety and/or depression experienced by these participants who already had a chronic somatic disease.

Subjects and Methods

Seven hundred and sixty-three participants self-elected to enroll for 7 day yoga based stress management program. Statistical calculation of the sample size was not done prior to the experiment. However, *post-hoc* analyses were carried out for the present study, with the sample size as 763 in each group. The power was calculated for the multiple linear regression of total time and time per day as a predictor of State-Trait Anxiety Inventory (STAI-S) using G* Power Software version 2.0 (University of Dusseldorf, Dusseldorf, Germany).^[13] The adjusted R^2 value was used, and an effect size of 0.028 (small) was found; however with a sample size of 763 (large) the power was 0.989. For HAD-A, the adjusted R^2 value was used and an effect size of 0.25 (small) was found; however with a sample size of 763 (large) the power was 1.00 and for HAD-D, the adjusted R^2 value was used and an effect size of 0.009 (small) was found; however with a sample size of 763 (large) the power was 0.6446. The α -level was set as 0.05.^[14]

The program was held in a Residential Yoga Center in North India. Their ages ranged between 14 and 86 years (group mean standard deviation, 50.2 [14.2] years), 95% confidence interval (CI) ± 1.01 (49.2, 51.2) and there were 260 females in the group. Recruitment was by advertisements in a television channel and a yoga magazine. To be included in the trial participants had to meet the following criteria (i) their chronic illness had to be under control through the use of conventional medicine or other remedies; verified by the appropriate tests, (ii) they had to be sufficiently physically and mentally healthy to perform the yoga techniques, and (iii) literate, to complete the questionnaires. Participants were excluded from the trial if they could not complete the questionnaires ($n = 331$, 30.3%). Participants were excluded due to incomplete or inadequately completed questionnaires. The details of the participants are

provided in Table 1. The signed consent of all participants was obtained. The project was approved by the Patanjali Research Foundation Ethics Committee, in February 2014. The study was completed between February 2014 and April 2014.

Design

The study was a single time, cross-sectional assessment.

Assessments

All participants were given with three questionnaires to fill in. These were (i) STAI-the subsection for state anxiety,^[15] (ii) the hospital anxiety and depression scale (HADS)^[11] and (iii) a set of questions to determine the participants’ experience and daily duration of yoga practice.

State-trait anxiety inventory

State anxiety was measured using a sub-scale of Spielberger’s STAI,^[15] which contains 20 items used to describe the intensity

Table 1: Baseline characteristics of the 763 participants

Characteristics	Details
Age, gender	
Group mean age (SD), years	50.2 (14.2)
Age range	14-86
Gender: Male: female as actual values, %	503:260, 65.9:34.1
Years of education (%)	
<10 years of education	2 (0.3)
10 years of education	224 (29.4)
≥ 12 years of education	333 (43.6)
≥ 17 years of education	181 (23.7)
No details (%)	23 (3.0)
Annual income ^[50] (%)	
Low class	264 (34.6)
Middle class	255 (33.4)
High class	6 (0.8)
No details	238 (31.2)
Diseases (blocks, ^[51] number) %	
Certain infectious and parasitic diseases	A00-B99, 7 (0.9)
Neoplasms	C00-D48, 8 (1.1)
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	D50-D89, 10 (1.3)
Endocrine, nutritional and metabolic diseases	E00-E90, 103 (13.5)
Diseases of the nervous system	G00-G99, 33 (4.3)
Diseases of the eye and adnexa	H00-H59, 9 (1.2)
Diseases of the ear and mastoid process	H60-H95, 2 (0.3)
Diseases of the circulatory system	I00-I99, 82 (10.8)
Diseases of the respiratory system	J00-J99, 46 (6.0)
Diseases of the digestive system	K00-K93, 88 (11.5)
Diseases of the skin and subcutaneous tissue	L00-L99, 9 (1.2)
Diseases of the musculoskeletal system and connective tissue	M00-M99, 154 (20.2)
Diseases of the genitourinary system	N00-N99, 22 (2.9)
No details	190 (24.9)

Values are group mean (SD). SD: Standard deviation

of feelings at the moment of testing. The participants had to choose one out of the four options provided for each item that is, not at all = 1, somewhat = 2, moderately = 3, and very much so = 4. The STAI scores range from 20 to 80, and they increase in response to stress and decrease under relaxing conditions. The reliability and validity have been established for use in an Indian population.^[16]

Hospital anxiety and depression scale

The HADS was used to assess anxiety and depression in the participants. This scale was designed to identify cases of anxiety disorder (HADS-A) and depression (HADS-D) in a nonpsychiatric hospital and clinic patients.^[11] The HADS has 14 items out of which item numbers 1, 3, 5, 7, 9, 11, 13 measure anxiety and the remaining items that is, 2, 4, 6, 8, 10, 12, 14 measure depression. Each item is on a 4-point scale, and the scores are added to give a total ranging from 0 to 21 for anxiety and 0–21 for depression. The reliability and validity have been established for use in an Indian population.^[17]

Yoga practice was ascertained by three questions

For these questions, it was mentioned that yoga practice meant the practice of postures (*asanas*), regulated breathing (*pranayamas*), and meditation, either in combination or as a single technique selected out of the three.

Of the three questions, one was a close-ended dichotomous question (question 1, below), the second question (question 2, below), and the third question were both open ended.

The three questions were as follows. Question 1: ‘Are you a regular practitioner of yoga?’ Here regular was specified as a minimum of 4 days in a week. The options were two, yes or no. Question 2 was ‘For how long have you been practicing yoga?’ (With the option to fill in the number of days, months or years).

The third question was 3. For how many minutes/hours do you practice yoga daily?

Since this was not a regular questionnaire, but three questions with straightforward responses, there was no attempt to establish the reliability and validity for these questions.

Results

Linear multiple regression analysis using PASW SPSS version 18.0 (Armonk, New York, U.S.) was performed with STAI scores (State Trait Anxiety Inventory), HADS-A, and HADS-D scores of the HADS as the dependent variables and with the duration of yoga practice in months and time spent practicing yoga each day as independent variables. Linear multiple regression showed that yoga practice in months and time spent practicing yoga each day both predicted STAI scores (State Trait Anxiety Inventory). The resulting model had an adjusted $R^2 = 0.03$ (standard error of the estimate = 11.4), $df (2,760)$, $F = 11.4$, and was significant for yoga practice in months at $P < 0.001$ with 95% CI = (-0.02, -0.05) and time spent practicing yoga each day at $P = 0.03$ with 95% CI = (-0.01, -0.04] and for HAD-A, adjusted $R^2 = 0.02$ (standard error of the estimate = 4.0), $df (2,760)$, $F = 8.8$, and was significant for yoga practice in months at $P < 0.01$ with 95% CI = (-0.01, -0.01) and time spent practicing yoga each day at $P < 0.01$ with 95% CI = (-0.01, -0.02]. For depression scores, the results were different; the duration of yoga practice in months alone predicted HAD-D scores and the resulting model had an adjusted $R^2 = 0.01$ (standard error of the estimate = 3.7), $df (2,760)$, $F = 4.6$, and was significant at $P < 0.01$ with 95% CI = [-0.01, -0.01], while time spent practicing yoga each day did not predict depression scores.

The group mean values (SD) for STAI-state subscale scores, HAD-A anxiety scores, and HAD-D depression scores and details of the linear multiple regression are given in Table 2.

Discussion

In 763 persons who had a chronic illness, the duration of yoga practice in months was associated with lower anxiety and depression scores, whereas the time spent practicing yoga each day, for at least 4 days in a week was associated with lower anxiety scores, but was not associated with the depression scores.

Most studies on the therapeutic benefits of yoga for chronic diseases have examined the effects on the quality of life, anxiety and depression, in addition to the clinical outcomes.^[18] In this study, an attempt has been made to understand which factor that is, duration or daily intensity of yoga practice has a greater effect on the two most common emotional responses to chronic illness, anxiety and depression.

Table 2: Anxiety and depression scores predicted by duration and intensity of yoga practice for 763 participants

Measures	Mean value (SD)	Duration of practice in months as predictor					Intensity of practice in minutes/day for at least 4 days/week as predictor				
		F	df	Adjusted R ²	β	Tolerance values	F	df	Adjusted R ²	β	Tolerance values
STAI-state subscale	35.5 (11.5)	11.4***	2760	0.03	-0.2	1.0	11.4*	2760	0.03	-0.1	1.0
HAD-A	5.3 (4.0)	8.8**	2760	0.02	-0.1	1.0	8.8**	2760	0.02	-0.1	1.0
HAD-D	5.3 (3.7)	4.6**	2760	0.01	-0.1	1.0	4.6	2760	0.01	0.0	1.0

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$, linear multiple regression. SD: Standard deviation, STAI: State-Trait Anxiety Inventory, HAD-A: Hospital Anxiety and Depression Anxiety, HAD-D: Hospital anxiety and depression-depression

It is known that anxiety is associated with high rates of medically unexplained symptoms and increased utilization of healthcare resources.^[19-24] In fact, the disability and related poor physical and economic outcomes associated with anxiety disorders may be as great as with depression.

The neural pathways that process visceral pain also regulate the stress response and anxiety.^[25] Prolonged anxiety can lead to dysregulation of the hypothalamic pituitary axis, as well as altered autonomic control with reduced heart rate variability.^[26]

The practice of yoga has been found to help in stress reduction^[9] and in correcting imbalances of the autonomic nervous system associated with sympathetic hyperactivity.^[27] This may explain why yoga practice helps to reduce anxiety associated with chronic illness. The amount of time spent in practicing yoga each day as well as the duration of yoga practice were associated with a reduction in anxiety (HADS) and state anxiety.

Depression increases symptom burden and functional impairment and also worsens the prognosis for heart disease, stroke, diabetes mellitus, HIV/AIDS, cancer and other chronic illnesses.^[19,28,29] A survey of over 130,000 Canadian adults indicated that depression independently increased role impairment by 21% compared to healthy persons.^[29] When depression occurred along with chronic lung disease, diabetes mellitus or heart disease, the rate of disability increased by over 50%.^[29] It is apparent that depression has adverse effects on biological mechanisms and self-care in persons who are chronically ill.^[30-38] The latter includes adherence to diet, addictive behavior, taking medication, and exercise, among other factors.

Depression is associated with several changes at the synaptic level including aminergic reuptake inhibition, presynaptic autoregulatory desensitization, up- and down-regulation of post synaptor receptor sites and receptor-mediated second messenger and neurotrophic intracellular signaling effects.^[39-43] Neuroimaging studies have identified areas of over- and under-activity.^[44]

The present results show that a long duration of yoga practice was associated with lower depression scores in the present group of chronically ill persons. The amount of time spent practicing each day did not make the same difference.

The inverse relation between physical activity and depression is known.^[45,46] The therapeutic benefits are particularly found if exercise is continued over time.^[47] Yoga has a physical activity component, in addition to its psychological, philosophical (and depending on the program, Spiritual) components. Yoga practice has been found beneficial in depression.^[12] The mechanisms underlying the benefits have not been worked out. However, it is possible that among other effects, yoga practice acts on neurotransmitters,^[48] hence

acting mainly at the synaptic level. The fact that the changes required may involve synaptic receptors^[49] in addition to hyper/hyposecretion of certain neurotransmitters may explain why the duration of yoga practice in months, rather than the intensity (as minutes of practice each day) may be associated with lower levels of depression associated with chronic illness.

While the findings are of interest as several chronically ill people practice yoga, it has the following limitations: (i) The study may not prove a causative effect; rather it shows strong association between intensity and duration of yoga on anxiety and depression associated with chronic illness (ii) there was no attempt to assess the impact of the frequency of yoga practice; instead persons were considered regular practitioners if they practiced yoga for at least 4 days in a week. (iii) Other factors such as the severity of illness, social support, and personality traits could influence the level of anxiety and depression experienced by a person with chronic illness. Also, the same factors could influence the intensity and duration of yoga practice. However looking at these factors was not the aim of the present study. (iv) The participants varied widely in their age, severity of disease and other social factors. (v) Yoga practice included yoga postures (*asanas*), breathing techniques (*pranayamas*) and meditation. There was no attempt to differentiate between different schools of yoga or amount of time spent practicing the different techniques. Also, there was no attempt to ask the participants about whether they practiced yoga cleansing practices (*yoga kriyas*), yoga physiological 'locks' (*bandhas*) and followed a yoga lifestyle. (vi) There was no attempt to look at other aspects of emotional distress, other than anxiety and depression. (vii) Approximately 30% of the participants returned one of the questionnaires incorrectly filled in and hence had to be excluded.

Despite these limitations, some of which suggest directions for future study, the present results suggest that the duration and intensity of yoga practice are associated with a decrease in anxiety and depression associated with chronic illness.

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