

# A short-term, comprehensive, yoga-based lifestyle intervention is efficacious in reducing anxiety, improving subjective well-being and personality

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## ABSTRACT

**Objective:** To assess the efficacy of a short-term comprehensive yoga-based lifestyle intervention in reducing anxiety, improving subjective well-being and personality.

**Materials and Methods:** The study is a part of an ongoing larger study at a tertiary care hospital. Participants ( $n=90$ ) included patients with chronic diseases attending a 10-day, yoga-based lifestyle intervention program for prevention and management of chronic diseases, and healthy controls ( $n=45$ ) not attending any such intervention.

**Primary Outcome Measures:** Change in state and trait anxiety questionnaire (STAI-Y; 40 items), subjective well-being inventory (SUBI; 40 items), and neuroticism extraversion openness to experience five factor personality inventory revised (NEO-FF PI-R; 60 items) at the end of intervention.

**Results:** Following intervention, the STAI-Y scores reduced significantly ( $P<0.001$ ) at Day 10 ( $66.7 \pm 13.0$ ) versus Day 1 ( $72.5 \pm 14.7$ ). Also, positive SUBI scores (F1– F6) improved significantly ( $P<0.01$ ) at Day 10 versus Day 1. Similarly NEO-FF PI-R scores improved significantly ( $P<0.001$ ) at Day 10 versus Day 1. Control group showed an increase in STAI-Y while SUBI and NEO-FF PI-R scores remained comparable at Day 10 versus Day 1.

**Conclusions:** The observations suggest that a short-term, yoga-based lifestyle intervention may significantly reduce anxiety and improve subjective well-being and personality in patients with chronic diseases.

**Key words:** Anxiety; personality; short-term yoga-based lifestyle intervention; stress; subjective well-being.

## INTRODUCTION

Anxiety, stress, diminished feeling of well-being and altered personality are associated with most of the chronic diseases including diabetes, heart diseases, respiratory diseases, and psychiatric disorders, and often result in a compromised treatment and poor quality of life.<sup>[1-7]</sup> Recent reports have demonstrated that mental health is an important predictor of health outcomes, and hence maintaining a good mental health and positive personality is of prime concern in patients with chronic

diseases.<sup>[8,9]</sup> Yoga<sup>[10]</sup> and psychoneuroimmunology are two such potential intervention modules of alternative and complementary medicine that are emerging as foundations of mind–body medicine.<sup>[11]</sup> We have previously shown that this short-term lifestyle intervention is effective in reducing oxidative stress,<sup>[12]</sup> fasting glucose, and improving lipid profile as early as 10 days.<sup>[13]</sup>

Though health-related quality of life is generally used to measure overall well-being of an individual, a self-evaluation of health status, levels of anxiety<sup>[5]</sup> and personality traits<sup>[14]</sup> can also predict mortality and treatment outcomes, sometimes better than that predicted by current health status or other risk factors.<sup>[15-17]</sup> This might be important, especially in case of lifestyle-related diseases<sup>[18]</sup> and may provide important clinical information. However, only a few studies have evaluated the association between lifestyle and self-rated mental and physical health in a general population<sup>[19-22]</sup> or patients with other lifestyle-related diseases. Therefore, we conducted the

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current study with an aim to assess the improvement in state and trait anxiety, subjective well-being, and personality traits in patients with various chronic diseases following a pretested short-term, yoga-based lifestyle intervention program.

## MATERIALS AND METHODS

### Participants

Subjects ( $n=90$ , 46 male and 44 female; mean age  $41.37 \pm 13.91$  years) with diabetes, hypertension, asthma, musculoskeletal-pain, mental stress, mild psychiatric disorders (depression, anxiety) visiting the outpatient clinics and overweight subjects who wished to join the program for weight loss and fitness were included in the study. The main inclusion criteria were that subjects were able to perform basic yoga postures and were willing to comply with the study intervention program at Integral Health Clinic (IHC), Department of Physiology, All India Institute of Medical Sciences, New Delhi, India. Physically challenged subjects were excluded from the study. The control group included 45 healthy subjects (24 male, 21 female; mean age  $39.26 \pm 9.38$  years) who had not attended any such program in the last one year, and were recruited from amongst the hospital staff and patients' attendants. The aim of including a control group was only to see the natural variation in anxiety levels, subjective well-being and any change in personality traits within 10 days and was therefore not age- and sex-matched.

### Study design

All the participants attended a 10-day lifestyle-intervention program as an outpatient facility and were not required to be admitted. State and trait anxiety, subjective well-being, and personality traits were assessed at baseline, i.e. Day 1 and at the end of intervention i.e. Day 10. The same assessments were also done for control group within the 10-day window period in order to see the natural variation occurring in these parameters without any intervention.

The study was conducted in accordance with the Declaration of Helsinki and was approved by the appropriate local ethics committee and Institutional Review Board. All patients provided their informed consent. The trial was registered at Clinical Trial Registry India (CTRI), CTRI/2009/091/000727.

### Lifestyle intervention program

This was a comprehensive, yoga-based intervention program, 2 h each day for 10 days. It consisted of an integrated and pretested intervention<sup>[12,13]</sup> comprising of theory and practice sessions. To ensure the quality of the program and to ensure that participants get enough time

with the experts, only 6-8 participants were assigned to the program at a time. A typical day in the program started with a set of simple *asanas* (physical postures) and *pranayama* (breathing exercises) for approximately 1 h. This was followed by lectures and group discussions regarding disease-specific lifestyle measures, efforts to minimize or eliminate substance abuse and basics of calming practices. Special focus was laid on coping with stress and anxiety. Nutrition awareness program was also included; however, providing meals was not a part of the program. Questions and unstructured discussions were encouraged among the participants. Each day's program ended with relaxation through either *shavasana* (a relaxation technique) or meditation. Spouse and other members of the participant's family were encouraged to attend the program in order to facilitate compliance. The structure of this lifestyle intervention program has been published previously.<sup>[13]</sup>

### Assessment of state and trait anxiety

The state and trait anxiety was assessed by using "State and Trait Inventory-Y 1 and 2" (STAI-Y), which is a validated tool devised by Spielberger.<sup>[23]</sup> This is a self-report assessment device which includes separate measures of state and trait anxiety. State anxiety reflects a transitory emotional state characterized by subjective, consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity. State anxiety may fluctuate over time and can vary in intensity. In contrast, trait anxiety denotes a relatively stable individual difference in anxiety proneness and refers to a general tendency to respond with anxiety to perceive threats in the environment.

### Assessment of subjective well-being

The subjective well-being was assessed using a validated 'subjective well-being inventory'<sup>[24]</sup> (SUBI). This is a self-report assessment device, which measures the degree of subjective well-being of an individual in various day-to-day life concerns.

### Assessment of change in personality

The personality was assessed by using neuroticism extraversion openness to experience five factor personality inventory revised (NEO-FF PI-R), a validated tool.<sup>[25]</sup> The shortened 60-item NEO-FF PI-R provides a quick reliable and accurate measure of the five domains of adult personality. It is a concise measure of the five domains of personality and the six traits or facets that define each domain: Neuroticism (anxiety, hostility, depression, self-consciousness, impulsiveness, vulnerability); extraversion (gregariousness, assertiveness, activity, excitement-seeking, positive emotions); openness (openness to experience, feelings, actions, ideas, values); agreeableness (trust,

modesty, compliance, straightforwardness, tender-mindedness); conscientiousness (competence, self-discipline, achievement, dutifulness, deliberation).

### Statistical analysis

The STAI-Y scores, SUBI scores and NEO-FF PI-R scores on Day 1 and Day 10 were compared by Student's *t*-test for paired observations. As a part of exploratory analysis, control group was included to see the natural variation in subjective well-being, anxiety levels and personality traits; however, a comparison between the two groups was not done.

## RESULTS

The study included 90 participants (46 male, 44 female; age  $41.37 \pm 13.91$  years) in the intervention group and 45 subjects (24 male, 21 female; age  $39.26 \pm 9.38$  years) in the control group [Table 1]. Of these 90 participants, 27 were overweight, 15 had diabetes, 17 had psychological disorders, 14 had hypertension, 9 had musculoskeletal pain, and 4 each had asthma and constipation.

The level of state and trait anxiety, both decreased significantly ( $P < 0.001$ ) following the lifestyle intervention, and the overall anxiety scores were also significantly lower at Day 10 versus Day 1 [Table 2]. However, in the control group, the state and trait anxiety scores increased significantly by Day 10 as compared to Day 1 [Table 2].

Regarding the SUBI scores, following the lifestyle intervention, participants showed a significant improvement in all the positive factors (F1 to F6) from Day 1 to Day 10 [Table 3]. For the negative factors, Factor 11 (general well-being negative affect) showed a significant decrease from Day 1 to Day 10 following

lifestyle intervention while there was no notable change in Factors 8, 9 and 10. Surprisingly primary group concern (Factor 8) showed a further worsening [Table 3]. In the control group, the positive factors remained comparable except for Factor 4, which showed significant improvement. Regarding the negative factors, in a 10 day period, Factors 7 and 8 showed significant decrease while Factors 9 and 11 showed significant increase [Table 3].

The NEO-FF PI-R personality assessment showed a significant improvement in personality by decreased scores for neuroticism ( $P < 0.001$ ), and increased ( $P < 0.001$ ) scores for extraversion, openness to experience, agreeableness, and conscientiousness [Table 4]. The control group did not show any changes in personality within 10 days.

## DISCUSSION

The intervention in this study was a comprehensive short-term, yoga-based lifestyle intervention comprised of simple physical exercises, relaxation techniques, stress management, diet and other aspects of lifestyle. The results showed that even a short-term lifestyle intervention reduced anxiety levels, improved personality and to an extent enhanced subjective well-being. This benefit, especially when achieved within a short time frame, appears promising because patient compliance becomes higher with shorter period of their engagement with the hospital/clinic and hence increases the clinical utility of the intervention. These benefits were spread over a wide range of chronic diseases, which implies that lifestyle intervention has an efficacy regardless of specific diagnosis as shown previously by other studies.<sup>[26-29]</sup>

Anxiety is known to aggravate ill health and also reduces the efficacy of medical or surgical treatment.<sup>[1-7]</sup> Therefore, reducing anxiety in these patients may not only improve the quality of life but also improve the treatment efficacy. The present study demonstrated a significant reduction in anxiety following a simple yoga-based lifestyle intervention. These findings are similar to those observed in previous studies that showed a significant decrease in the trait anxiety scores following meditation<sup>[30-36]</sup> and breathing exercises as the relaxation techniques; and in state anxiety following muscle relaxation techniques and listening to music.<sup>[37]</sup> Further, there was a clinical improvement in patients with chronic neck pain following a yoga-based intervention.<sup>[38]</sup> Together these findings

**Table 1: Baseline parameters**

Parameters	Intervention group (n=90)	Controls (n=45)
Male, female	46, 44	24, 21
Age (mean±SD), years	$41.37 \pm 13.91$	$39.26 \pm 9.38$
Weight (mean±SD), kg	$67.911 \pm 9.53$	$62.42 \pm 10.51$
Body mass index (mean±SD), kg/m <sup>2</sup>	$25.33 \pm 4.13$	$22.69 \pm 3.41$
Blood pressure (mean±SD), mmHg		
Systolic blood pressure	$122.30 \pm 12.10$	$118.72 \pm 6.42$
Diastolic blood pressure	$80.81 \pm 10.14$	$81.20 \pm 3.80$
Respiratory rate (mean±SD), per min	$17.68 \pm 4.96$	$15.20 \pm 2.14$
Pulse rate (mean±SD), per min	$74.46 \pm 7.59$	$74.41 \pm 5.40$

**Table 2: State and trait anxiety questionnaire scores in the intervention and control groups at day 1 and day 10**

	Intervention group (n=89)		P value P <sub>1</sub>	Control group (n=45)		P value P <sub>2</sub>
	Day 1	Day 10		Day 1	Day 10	
State anxiety	$34.5 \pm 7.7$	$31.5 \pm 6.9$	<0.001	$26.6 \pm 6.2$	$29.0 \pm 5.9$	0.001
Trait anxiety	$38.0 \pm 7.9$	$35.3 \pm 6.9$	<0.001	$27.4 \pm 6.4$	$29.6 \pm 5.4$	0.003
Total scores	$72.5 \pm 14.7$	$66.7 \pm 13.0$	<0.001	$54.0 \pm 11.7$	$58.6 \pm 10.8$	0.001

All values are mean±SD; P<sub>1</sub> - Paired t-test, for intervention group, P<sub>2</sub> - Paired t-test, for control group

**Table 3: Subjective sense of well-being inventory scores in the intervention and control groups at day 1 and day 10**

Factors	Interventional group (n=89)		P value P <sub>1</sub>	Control group (n=45)		P value P <sub>2</sub>
	Day 1	Day 10		Day 1	Day 10	
F 1	6.6 ± 1.3	7.9 ± 1.2	<0.001	7.6 ± 1.2	7.6 ± 1.2	0.673
F 2	6.4 ± 1.01	7.4 ± 1.2	<0.001	7.1 ± 1.0	7.1 ± 1.0	0.821
F 3	6.5 ± 1.4	7.7 ± 1.3	<0.001	6.9 ± 1.2	6.9 ± 1.2	1.000
F 4	6.8 ± 1.1	7.6 ± 1.2	<0.001	7.1 ± 1.1	7.2 ± 0.9	0.031
F 5	7.2 ± 1.5	7.9 ± 1.2	<0.001	7.3 ± 1.7	7.3 ± 1.6	0.372
F 6	7.3 ± 1.3	7.8 ± 1.5	0.007	7.3 ± 1.2	7.4 ± 1.2	0.160
F 7	4.6 ± 2.8	6.1 ± 3.2	<0.001	6.4 ± 3.6	6.1 ± 3.4	0.012
F 8	13.2 ± 3.0	13.1 ± 2.9	0.961	16.4 ± 2.6	16.0 ± 2.6	0.018
F 9	12.5 ± 2.2	12.8 ± 2.1	0.226	15.4 ± 2.1	15.9 ± 2.7	0.008
F 10	6.6 ± 1.4	6.7 ± 1.3	0.691	7.3 ± 1.0	7.4 ± 0.9	0.623
F 11	6.5 ± 1.4	7.2 ± 1.4	<0.001	7.4 ± 1.2	7.8 ± 1.2	0.001

All values are mean±SD; P<sub>1</sub> - Paired t-test for intervention group, P<sub>2</sub> - Paired t-test for control group

**Positive factors:** Factor 1: General well being, positive affect, Factor 2: Expectation achievement congruence, Factor 3: Confidence in coping, Factor 4: Transcendence, Factor 5: Family group support, Factor 6: Social support

**Negative factors:** Factor 7: Primary group concern, Factor 8: Inadequate mental mastery, Factor 9: Perceived ill-health, Factor 10: Deficiency in social contacts, Factor 11: General well being, negative affect.

**Table 4: Neuroticism extraversion openness to experience five factor personality inventory revised (NEO-FF PI-R) scores in the intervention and control groups at day 1 and day 10**

Components	Interventional group (n=90)		P value	Control group (n=45)		P value
	Day 1	Day 10		Day 1	Day 10	
Neuroticism	22.0 ± 4.5	16.9 ± 3.6	<0.001	18.4 ± 3.6	18.9 ± 3.8	0.091
Extraversion	28.7 ± 4.3	30.8 ± 3.5	<0.001	28.6 ± 3.4	28.8 ± 3.7	0.454
Openness to experience	23.2 ± 3.9	25.0 ± 2.8	<0.001	25.8 ± 2.5	25.4 ± 2.7	0.061
Agreeableness	27.5 ± 3.4	29.5 ± 3.3	<0.001	26.5 ± 3.1	26.5 ± 3.1	0.949
Conscientiousness	32.0 ± 4.2	33.9 ± 3.7	<0.001	30.7 ± 3.1	30.5 ± 3.1	0.441

All values are mean±SD

suggest that reducing anxiety is beneficial in improving clinical profile as well as enhancing the efficacy of treatment offered to these patients.

Regarding subjective well-being, all individual factors of the SUBI scoring system, the general well-being (F1), expectation achievement congruence (F2), confidence in coping (F3) and transcendence (F4) showed improvement in these patients as well as those who were overweight. These factors together indicate an improvement in feeling of success, satisfaction for achievements in life, and confidence in coping with crisis. Other parameters of SUBI scores like family group support, and social support also showed an improvement. Consistent with these findings, the negative factors of SUBI scores like general well-being negative effect (F11) showed a reduction, indicating a positive effect of intervention. These results are in-line with previous studies where a beneficial effect of yoga was observed on various physiological and psychological parameters.<sup>[39]</sup> However, the subjective well-being is largely culturally oriented and the results of the present study can be therefore compared to the studies in Indian patients only. A previous study which evaluated change in SUBI scores after four months of yogic practices in healthy subjects did not show any significant changes for family group support and social group support (Factors 5 and 6).<sup>[40]</sup> We observed a significant improvement in the general well-being negative affect (Factor 11), which is contradictory to a previous

study with a yogic intervention.<sup>[41]</sup> The results of current study support our previous findings where this short-term lifestyle intervention was effective in reducing oxidative stress,<sup>[12]</sup> and also improved serum lipid profile and fasting plasma glucose.<sup>[13]</sup> This study therefore re-emphasizes the benefits of a short-term, yoga-based lifestyle intervention program.

Though alteration of personality is most marked in psychological disorders,<sup>[42]</sup> other chronic diseases also result in altered personality traits<sup>[43,44]</sup> and personality has a known effect on managing self-rated health<sup>[45]</sup> as well as clinical outcome.<sup>[46]</sup> Further, high neuroticism and low conscientiousness are known to be associated with inflammation and interleukin-6.<sup>[47]</sup> This suggests that a reduction in neuroticism not only improves the personality but may also reduce inflammation, which is a hallmark of these lifestyle-related diseases. The “Five Factor” model used to assess personality in this study is known to provide a valid assessment, captures the major axes of psychological and behavioral variation in humans and is associated with an array of important health behaviors and outcomes.<sup>[48,49]</sup> Overall, the present study demonstrated that there was a positive change in the personality of these subjects, which may reflect not only a better quality of life, but also a positive outlook, improved self-rated health and a possible enhancement of medical treatment as shown in a previous study including patients with diabetes.<sup>[50]</sup> In



the control group, it was observed that anxiety increased significantly, subjective well-being changes remained inconclusive while personality traits remained unaffected at Day 10 *versus* Day 1.

There were certain limitations in this study. Firstly, this was not a randomized controlled trial. The control group was included with an intention to see if there is any measurable difference in a time period as short as 10 days without any intervention. Secondly, the medical treatment outcome could not be related to the reduction in anxiety, improvement in subjective well-being and personality. Thirdly, the intervention group was a heterogeneous group of patients with different chronic diseases. Despite these, the results of this study are in line with the previous studies where lifestyle and stress management programs were beneficial irrespective of the diagnosis.<sup>[22]</sup> This further supports the importance and efficacy of a short-term, yoga-based lifestyle intervention as we have shown in our previous studies.<sup>[12,13]</sup>

Overall, the results of the present study suggest that the yoga-based lifestyle intervention program caused a significant reduction in state and trait anxiety levels, had a favorable effect on subjective well-being and significantly improved the five facets of personality even in a short-time period. Since lifestyle is an integrated entity, a yoga-based intervention, which aims at influencing the total lifestyle, has much in favor as compared to changing only one aspect of lifestyle at a time hence resulting in an increased efficacy and compliance.

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