

Influence of Suryanamaskar Practice on Selected Psychological Variables of Students

Asfakulla¹, Dr. Abha Srivastav², Dr. Subhabrata Kar³

¹Research Scholar, Shri Venkateshwara University, NH-24, Rajabpur, Gajraula, Distt. – Amroha (U.P.), India

²Principal, IAMR B.ED. College, Gajraula, Distt. – Amroha (U.P.), India

³Associate Prof., UCT College, Berhampore, Murshidabad, W.B., India

Abstract-- The purpose of the study was to determine the effect of Surya Namaskar practice on the psychological fitness of college students. 60 male subjects were selected from different colleges in West Bengal for the study. The subjects' ages ranged from 20 to 25 years. The selected subjects were divided into two groups of 30. One group was the Surya Namaskar practice group, and the other was the control group. Each group was selected randomly.

The training period of the experimental groups was eight weeks, five days per week with a duration of 45 minutes. The control group did not undergo any training program other than their routine work. The data was collected on psychological components of Stress, Anxiety and Aggression of two groups before the experimental period (pre-test) and also after eight weeks of training (post-test) respectively. Psychological fitness data was collected by using a suitable Questionnaire for Stress (IASM Questionnaire), Anxiety (STAQ) and Aggression (AS) for both groups.

To find out the effect of treatment on the psychological variables of the subjects the primary data was analysed by using suitable statistical methods. The result showed the enhancement of mean performance scores of three psychological variables in the case of the experimental group after eight weeks, five days per week with a duration of 45 min. Surya namaskar practice. The control group showed no improvement due to treatment. Significant improvement was noticed in the stress, anxiety and aggression scores in the case of the experimental group.

Keywords-- Surya Namaskar, Psychological variables, Treatment, College students

I. INTRODUCTION

Yoga focuses on harmony between mind and body. To achieve this, yoga uses movements, breath, posture, relaxation, and meditation to establish a healthy, lively, and balanced approach to life. Yoga plays an important role in games and sports also. Yoga improves near about all physical fitness and wellness components required by sportsmen. Regular yoga exercises along with other fitness exercises help develop certain aspects of fitness like flexibility, strength, endurance, balance rhythm, meditation and relaxation. Doing yoga regularly along with other fitness methods is very helpful in developing certain aspects of fitness that can improve performance in competitive sports.

In Sanskrit, 'Surya' means sun and 'namaskar' means greeting or salutation. Surya Namaskar is then a greeting to the sun! It is an ancient ritual of twelve steps that warms up the body preparing it for yoga practice. That is why it is practiced at the beginning of a yoga class. This warming sequence has a rich history and holistic benefits for the body and mind. Read more to find out about this widely known and ancient yoga practice!

A. Surya Namaskar Kriya

Kriyā is a Sanskrit term. It is derived from the Sanskrit root, kri, meaning "to do". Kriyā means "action, deed, effort". The correct way to refer to Sun Salutations is to call it a kriya. Surya Namaskara is an action consisting of 12 steps. Unlike popular belief, it is *not* a series of asanas! Surya Namaskara Kriya is linked to engaging the solar plexus to raise solar energy within the body and to solar energy itself.

B. The Purpose of Surya Namaskar

Performing asanas in the rays of the sunrise sounds beautiful and inviting but what are the real reasons why we should practice Surya Namaskar?

Surya Namaskar comprises 12 steps that are purposefully woven together to benefit the mind and body in various ways. Surya Namaskar is a practice in itself as well as a warm-up before performing further yoga asanas. It allows for "opening" of the body as it stretches, strengthens and lengthens all muscle groups. Surya Namaskar stimulates *prana*, life force energy through the body helping to regulate our mental and physical faculties.

The practice of Surya Namaskar has mental health benefits. The consistent practice of Surya Namaskar sharpens one's ability to focus, improves self-confidence, and helps to develop self-discipline. It calms the nervous system and its consistent practice can contribute to managing anxiety, depression, and insomnia.

An essential aspect of Surya Namaskar (SN) performance is controlled breathing, making it relevant to compare the effects of Dynamic Surya Namaskar (DSN) with pranayama (yogic breathing).

Crisan's study showed that after 8 weeks of pranayama practice, 19 patients with known mental disorders experienced reduced anxiety symptoms, lower heart rates, and increased galvanic skin resistance.

These findings, along with those from other studies, suggest that both pranayama and SN can similarly reduce stress levels over several months.

DSN practice also incorporates another key yoga technique: focusing attention or 'dharana' in Sanskrit. Literature on yoga and its psychological benefits confirms the positive effects of this mental focus. These studies demonstrate yoga's efficacy in maintaining physical and mental health and enhancing well-being, conclusions further supported by the current study on DSN.

Proper yoga alleviates muscle tension and mental-emotional tension, making it an effective stress reliever. Knortz and Ryguła highlighted the link between physical and mental tension. This connection allows stretching and flexibility exercises to promote relaxation, toning, rehabilitation, and bodily reconstruction. Due to its high physiological intensity (14.5–16 MET), DSN demands significant focused attention, preventing the mind from wandering or fixating on negative emotions. The cognitive ability to avoid dwelling on irrelevant thoughts can have emotional benefits, making it relevant to compare DSN with meditation techniques.

II. METHODOLOGY

A. Subjects:

60 male subjects were selected from different colleges in West Bengal for the study. Age of the subjects will range from 20 to 25 years. The selected subjects were divided into two groups with 30 subjects. One group was the Surya Namaskar practice group (EG) and the other was the control group (CG). Each group was selected randomly.

B. Research Design:

The training period of experimental groups was eight weeks, five days per week with a duration of 45 minutes. The control group did not undergo any training program other than their routine work. The data was collected on psychological components of Stress, Anxiety and Aggression of two groups before the experimental period (pre-test) and also after eight weeks of training (post-test) respectively. Psychological fitness data was collected by using a suitable Questionnaire for Stress (IASM Stress Questionnaire), Anxiety Questionnaire (STAI) and Aggression (AS) for both groups

Table No. 1: Study Variables or Criterion Measure

Sl. No.	Variables	Unit	Instrument/Test
1.	Stress	No unit	IASM Stress Questionnaire
2.	Anxiety	No unit	STAI
3.	Aggression	No unit	AS

The training period of experimental groups was eight weeks, five days per week with a duration of 45 minutes. The control group underwent no training program other than their routine work. The data was collected on psychological components of Stress, Anxiety and Aggression of two groups before the experimental period (pre-test) and also after eight weeks of training (post-test) respectively. Psychological fitness data was collected by using a suitable Questionnaire for Stress Questionnaire (SQ), Anxiety (STAI) and Aggression (AS) for both groups.

Table No. 2: Training Protocol

Component	Description
Training Method	Surya Namaskar Practice
Duration of Intervention	8 Weeks
Frequency	3 sessions per week (e.g., Monday, Wednesday, Friday)
Session Duration	Approximately 30–35 minutes
Warm-up	8–10 minutes (light jogging, dynamic stretching, mobility exercises)
Main Tabata Protocol	20 seconds of maximum effort exercise followed by 10 seconds of rest
Work-to-Rest Ratio	2 min : 30 s
One Exercise Round	8 cycles (16 minutes)
Number of Rounds	4 rounds per session
Rest Between Rounds	2 minutes of active recovery (walking/light jogging)
Total Exercise Time	1 hour

Cool-down	5–10 minutes (walking, static stretching, breathing exercises)
Exercise Intensity	50–60% of Maximum Heart Rate (HRmax) or RPE 15–18
Training Supervision	Conducted under the supervision of the researcher
Progression	Exercise intensity increased gradually by encouraging greater movement speed and effort while maintaining the 20:10 interval

The ISMA Stress Questionnaire is a 25-item self-report instrument used to assess an individual's stress level. Respondents answer each item with "Yes" or "No," and the total number of "Yes" responses determines the stress level. Scores of 0–5 indicate low stress; 6–10 suggest moderate stress, for which stress-management strategies are recommended; 11–15 reflect high stress, with identification of stressors and corrective action recommended; and 16 or more indicate severe stress, for which professional support may be beneficial. To assess anxiety, Spielberger's Trait Anxiety Questionnaire, a component of the State-Trait Anxiety Inventory (STAI) developed by Charles D. Spielberger and colleagues, was used. The STAI measures both State Anxiety (S-Anxiety), which reflects temporary feelings of anxiety in a specific situation, and Trait Anxiety (T-Anxiety), which measures an individual's general tendency to experience anxiety. The Trait Anxiety Scale consists of self-report items rated on a 4-point Likert scale ranging from Almost Never to Almost Always and is widely employed in psychological research and clinical practice.

Aggression was assessed using the **Aggression Scale** developed by **Dr. Guru Pyari Mathur** and **Dr. Raj Kumari Bhatnagar**, a standardized psychological instrument designed to measure aggression as a personality trait and behavioural tendency. The scale is suitable for adolescents and adults and evaluates multiple dimensions of aggression, including **physical aggression, verbal aggression, anger, and hostility**. It comprises a series of statements that respondents rate, typically using a **Likert-type** or **Yes/No** response format, and may be administered either by the participant or by a researcher.

Individual item and subscale scores are summed to obtain an overall aggression score, with **higher scores indicating greater levels of aggression**. Normative data and cutoff scores are used to facilitate interpretation of the results.

III. RESULT AND DISCUSSION:

Table No.3: Descriptive statistics of CG

Group/Variable	Stress score		Anxiety score		Aggression score			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
CG	P	P	P	P	P	P	P	P
	r	r	r	r	r	r	r	r
	e	e	e	e	e	e	e	e
T	T	T	T	T	T	T	T	T
	e	e	e	e	e	e	e	e
	s	s	s	s	s	s	s	s
e	s	s	s	s	s	s	s	s
	t	t	t	t	t	t	t	t
	s	s	s	s	s	s	s	s
t	t	t	t	t	t	t	t	t
	s	s	s	s	s	s	s	s
	t	t	t	t	t	t	t	t
9	2	2	3	3	6	5	1	1
	0	1	4	4	0	8	5	5
	.	.	.	.	.	.	2.	1.
9	4	4	0	0	0	0	7	5
	4	3	0	0	0	0	5	9
	3	3	0	0	0	0	5	3

Table No. 3 presents data on various variables measured before and after a certain intervention, likely related to psychological variables. It appears to include the Control Group (CG) and variables such as Stress, Anxiety and Aggression.

For stress, the mean and SD values for the pre-test and post-test measurements are 20.9 ± 4.4 and 21 ± 4.3 respectively. For anxiety, the mean and SD values for the pre-test and post-test measurements are 34 ± 6 and 34 ± 5.8 respectively and for aggression the mean and SD values for the pre-test and post-test measurements are 152 ± 19.5 and 151.7 ± 19.3 respectively.

Overall, the table provides qualitative data on the performance of the control group across different physical fitness measures before and after the intervention. It allows for comparing any changes or improvements resulting from the intervention.

Table No. 4: Descriptive statistics of EG

Group/Variable	Stress				Anxiety				Aggression			
	Mean		SD		Mean		SD		Mean		SD	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
EG	13.3	12.1	2.0	1.5	29.8	27.1	5.1	4.4	12.6	11.3	1.5	1.3

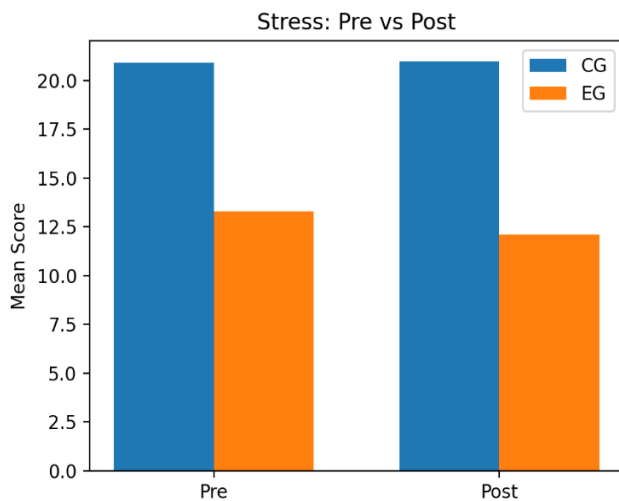


Fig. No. 1. Comparison of pre- and post-mean scores of Stress between two groups

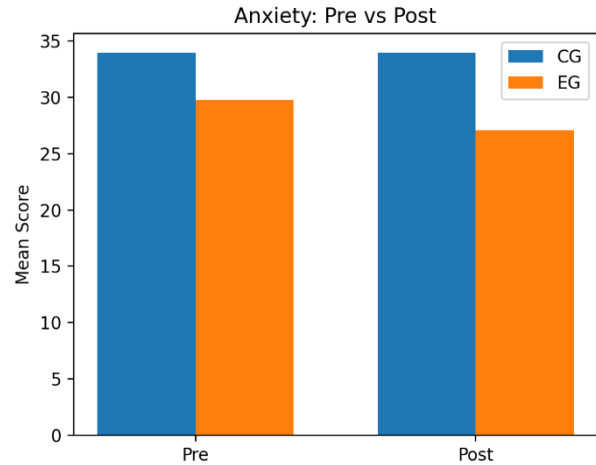


Fig. No. 2. Comparison of pre and post-mean scores of Anxiety between two groups

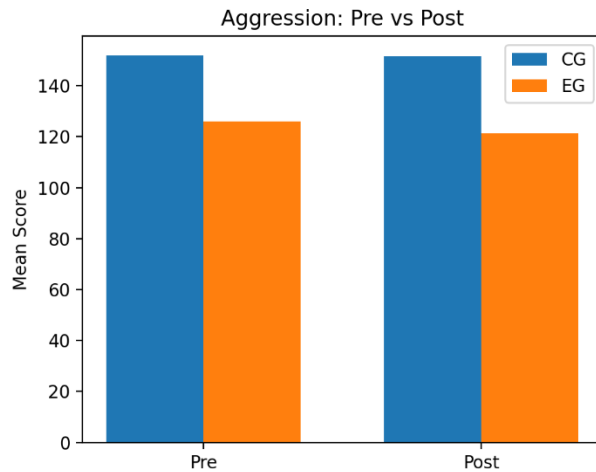


Fig. No. 3. Comparison of pre and post-mean scores of Aggressions between two groups

Table No. 4 presents data on various variables measured before and after a certain intervention, likely related to psychological variables. It appears to include the Experimental Group (EG) and variables such as Stress, Anxiety and Aggression.

For stress, the mean and SD values for the pre-test and post-test measurements are 13.3 ± 2.0 and 12.1 ± 1.5 respectively. For anxiety, the mean and SD values for the pre-test and post-test measurements are 29.8 ± 5.1 and 27.1 ± 4.4 respectively and for aggression the mean and SD values for the pre-test and post-test measurements are 126.1 ± 16.5 and 121.3 ± 16.3 respectively.

Overall, the table provides qualitative data on the performance of the control group across different physical fitness measures before and after the intervention. It allows for comparing any changes or improvements resulting from the intervention.

Compared to Table No. 3, the experimental group (EG) has shown improvements in most variables after the intervention. Specifically, there are decreases in the psychological variables. However, further statistical analysis would be needed to determine the significance of these changes and to draw more definitive conclusions about the effectiveness of the intervention.

Table No.5: Paired sample t-test, using T distribution concerning Pre and Post-test means of Stress score of CG

PSS	Pre Test	Post Test	"t" value	p-value	Remarks
MEAN	20.9	21.0	0.7218	0.4762	Not significant
SD	4.4	4.3			

Table No. 5 shows the paired sample T-test, using T(df:29) distribution (two-tailed) for stress score data of CG. Since the p-value $> \alpha$, H_0 cannot be rejected. The **After-population's** average is considered to be equal to the **Before-population's** average. In other words, the sample difference between the averages of **After** and **Before** is not big enough to be statistically significant.

A non-significance result can not prove that H_0 is correct, only that the null assumption can not be rejected. The p-value equals **0.4762**, ($P(x \leq 0.7218) = 0.7619$). It means that the chance of a type I error, rejecting a correct H_0 , is too high: 0.4762 (47.62%). The larger the p-value the more it supports H_0 . The test statistic T equals **0.7218**, which is in the 95% region of acceptance: [-2.0452, 2.0452]. The **after minus before** (0.1), is in the 95% region of acceptance: [-0.2834, 0.2834].

Table No.6: Paired sample t-test, using T distribution concerning Pre and post-test means of Anxiety score of CG

Anxiety	Pre Test	Post Test	"t" value	p-value	Remarks
MEAN	34.0	34.0	-0.2147	0.8315	Not significant
SD	6.0	5.8			

Table No. 6 shows the Paired sample T-test, using T(df:29) distribution (two-tailed) for BAI scores of CG. Since the p-value $> \alpha$, H_0 cannot be rejected.

The After-population's average is considered to be equal to the Before-population's average. In other words, the sample difference between the averages of After and Before is not big enough to be statistically significant.

A non-significance result cannot prove that H_0 is correct, only that the null assumption can not be rejected. The p-value equals 0.8315, ($P(x \leq -0.2147) = 0.4157$). It means that the chance of a type I error, rejecting a correct H_0 , is too high: 0.8315 (83.15%). The larger the p-value the more it supports H_0 . The test statistic T equals -0.2147, which is in the 95% region of acceptance: [-2.0452, 2.0452]. The after minus before (-0.033), is in the 95% region of acceptance: [-0.3175, 0.3175]. The 95% confidence interval of after minus before is: [-0.3508, 0.2842].

Table No.7: Paired sample t-test, using T distribution concerning Pre and post-test means of Aggression score data of CG

Aggression	Pre Test	Post Test	"t" value	p-value	Remarks
MEAN	152.0	151.7	-0.8982	0.3765	Not significant
SD	19.5	19.3			

Table No. 7 shows the Paired sample T-test, using T(df:29) distribution (two-tailed) of aggression score data of CG. Since the p-value $> \alpha$, H_0 cannot be rejected. The **After-population's** average is considered to be equal to the **Before-population's** average.

In other words, the sample difference between the averages of **After** and **Before** is not big enough to be statistically significant. A non-significance result cannot prove that H_0 is correct, only that the null assumption can not be rejected. The p-value equals **0.3765**, ($P(x \leq -0.8982) = 0.1882$). It means that the chance of type I error, rejecting a correct H_0 , is too high: 0.3765 (37.65%). The larger the p-value the more it supports H_0 . The test statistic **T** equals **-0.8982**, which is in the 95% region of acceptance: [-2.0452, 2.0452].

The **after minus before** (-0.37), is in the 95% region of acceptance: [-0.8349, 0.8349]. The 95% confidence interval of **after minus before** is: [-1.2015, 0.4682].

Table No.8: Paired sample t-test, using T distribution concerning Pre and post-test mean of Stress scores of EG

Stress	Pre Test	Post Test	"t" value	p-value	Remarks
MEAN	13.3	12.1	-6.8371	1.65e-7	Significant
SD	2.0	1.5			

Table No. 8 shows the paired sample T-test, using T(df:29) distribution (two-tailed) for stress score data of EG. Since the p-value $< \alpha$, H_0 is rejected.

The **After**-population's average is considered to be not equal to the **Before** population's average. In other words, the sample difference between the averages of **After** and **Before** is big enough to be statistically significant. The p-value equals 1.65e-7, ($P(x \leq -6.8371) = 8.251e-8$). It means that the chance of type I error (rejecting a correct H_0) is small: 1.65e-7 (0.000017%). The smaller the p-value the more it supports H_1 . The test statistic **T** equals -6.8371, which is not in the 95% region of acceptance: [-2.0452, 2.0452]. The after minus before (-1.2), is not in the 95% region of acceptance: [-0.359, 0.359]. The 95% confidence interval of after minus before is: [-1.559, -0.841].

Table No.9: Paired sample t-tests, using T distribution concerning Pre and Post-test mean of Anxiety scores of EG

Anxiety	Pre Test	Post Test	"t" value	p-value	Remarks
MEAN	29.8	27.1	-9.7981	1.046e-10	Significant
SD	5.1	4.4			

Table No. 9 shows the paired sample T-test, using T(df:29) distribution (two-tailed) for Anxiety score data of EG. Since the p-value $< \alpha$, H_0 is rejected. The After-population's average is considered to be not equal to the Before population's average. In other words, the sample difference between the averages of After and Before is big enough to be statistically significant. The p-value equals 1.046e-10, ($P(x \leq -9.7981) = 5.231e-11$). It means that the chance of type I error (rejecting a correct H_0) is small: 1.046e-10 (1e-8%). The smaller the p-value the more it supports H_1 . The test statistic **T** equals -9.7981, which is not in the 95% region of acceptance: [-2.0452, 2.0452]. The after minus before (-2.77), is not in the 95% region of acceptance: [-0.5775, 0.5775]. The 95% confidence interval of after minus before is: [-3.3442, -2.1892].

Table No.10: Paired sample t-test, using T distribution concerning Pre and Post-test mean of Aggression scores of EG

Aggression	Pre Test	Post Test	"t" value	p-value	Remarks
MEAN	126.1	121.3	-6.4169	5.109e-7	Significant
SD	16.5	16.3			

Table No. 10 shows the paired sample T-test, using T(df:29) distribution (two-tailed) for aggression score data of EG. Since the p-value $< \alpha$, H_0 is rejected. The After-population's average is considered to be not equal to the before population's average. In other words, the sample difference between the averages of After and Before is big enough to be statistically significant. The p-value equals 5.109e-7, ($P(x \leq -6.4169) = 2.555e-7$). It means that the chance of type I error (rejecting a correct H_0) is small: 5.109e-7 (0.000051%). The smaller the p-value the more it supports H_1 . The test statistic **T** equals -6.4169, which is not in the 95% region of acceptance: [-2.0452, 2.0452].

The after minus before (-4.8), is not in the 95% region of acceptance: [-1.5299, 1.5299]. The 95% confidence interval of after minus before is: [-6.3299, -3.2701].

The result showed the enhancement of mean performance scores of three psychological variables in the case of the experimental group after eight weeks, five days per week with a duration of 45 min. Surya namaskar practice.

Kumari, S., and Thakur, J. K. (2019) concluded that Yogic exercises are not just about physical fitness. They also specify that, more significantly, they are a way of life that promotes overall wellness, which includes mental, physical, emotional, and spiritual well-being.

They also concluded that Suryanamaskar, as yogic exercises, significantly affected and improved selected health-related fitness components (Flexibility) in female Taekwondo Players. Thus, such training can improve different components of health and skill-related physical fitness.

The findings of our study are very much relevant to the findings of the previous studies.

The study's findings align with those of Dabre (2002), who investigated the impact of aging on various physiological and psychological parameters among yoga practitioners, dynamic exercise practitioners, and inactive adults. Dabre demonstrated that yoga asanas can enhance physiological and psychological variables in adults, including heart rate and metabolic rate, thus improving overall exercise capacity. Additionally, Brown et al. (1994), as cited by Harinath (2004), found that three months of yogic practices enhanced cardio-respiratory performance. Similarly, Joshi (1992) observed that a six-week pranayama course resulted in improved ventilator function, including decreased respiratory rate and increased forced vital capacity, forced expiratory volume, maximum voluntary ventilation, peak expiratory flow rate, and breath-holding time. Furthermore, Yadav and Das (2001) reported significant increases in forced vital capacity, forced expiratory volume, and peak expiratory flow rate following 12 weeks of yoga training.

In a study Godse, A.S., Shejwal, B.R. and Godse, A.A. (2015) concluded that Surya namaskar is effective in leading to R-dispositions like mental quiet, at ease/peace, rested and refreshed, strength and awareness and joy. Surya namaskar group was lower compared with the control group on the stress dispositions- somatic stress, worry, and negative emotion.

These results are found to be in good agreement with earlier works by different researchers. Telles, Gaur, and Balkrishna (2009) examined the theoretical aspects of yoga, which appear to reduce state anxiety, showing a greater reduction following yoga practice.

IV. CONCLUSION

It is concluded that there is a significant reduction in Stress, anxiety and aggression levels of college students due to the short-term intervention of Surya Namaskar compared with the control group.

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