

EFFECT OF GRADUAL ADVANCEMENT OF INTENSITIES OF SURYANAMASKAR ON FLEXIBILITY OF COLLEGE FEMALES

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Abstract: To assess the effect of gradual increase of intensities with fixed duration of Suryanamaskar practices on trunk flexibility of college female students. To achieve the purpose of the study, total twenty eight (28) college students from Purnidevi Girls' College, Bolpur were selected as subjects at random. The age category of the subject was 18-24 years. All the subjects were divided into two groups with 14 subjects each as experimental (N=14) and control (N=14) group. Experimental group underwent Suryanamaskar practices for a period of 12 weeks (3 months), five days a week, imparting slow to fast intensities of Suryanamaskar one month interval following a scheduled training protocol. Control group did not participate in any training other than the regular routine. Pre-test and thrice post-tests on flexibility in one month interval were conducted on the experimental and control groups. To determine the effect of progressive intensities of Suryanamaskar on flexibility analysis of covariance (ANCOVA) was used. Significant improvement in flexibility of the experimental group compared with control group was observed. As the intensities of Suryanamaskar increased the trend of flexibility showed significant gradual improvement over the period of three months. Gradual increase of intensities of Suryanamaskar training interventions was effective for improving trunk flexibility.

Key Words: pre-test, mid-test, post-test, Suryanamaskar, flexibility.

1. INTRODUCTION:

Suryanamaskar or 'Sun Salutation' is a very ancient technique of paying respect or expressing gratitude to the sun that is the source of all forms of life on the planet. Daily practice of Suryanamaskar tones the entire body, helps with weight loss, strengthens muscles and joints, and develops great flexibility to the spine and joints. Suryanamaskar or sun salutation is the procedure in science of yoga. By yogic procedures fitness of external organs as well as internal organs is maintained. Suryanamaskar is designed in such a way that engages most of our muscles through the 12 poses of expansion and contraction, a set of 12 asanas, a complete workout for body and mind. It is one kind of Vyayama (physical exercise) which is most effective for health.

Physical fitness refers to a set of attributes which enable an individual to be physically active. Muscular strength, muscular endurance, cardiorespiratory endurance, and flexibility as the components of physical fitness contribute to ease of movement when completing everyday tasks, and also protect your body from injury when performing daily activities.

Flexibility is the ability to move the body joints through a maximum range of motion without strain. Lacks of flexibility in the back can be responsible for bad posture, back pain and many more (Miller, 2006).

Practice of asanas is one of the best ways to improve flexibility and Suryanamaskar is itself combination of various asanas. Repeating 20 Suryanamaskar everyday is a great way to keep the body agile and flexible. Studies of Choudhary, R et al. (2010), Kanwaljeet, et al. (2010), Shankar, G. et al. (2011) and Sisodia, A. (2017) reported a positive and significant effect of Suryanamaskar on development of flexibility. The study is an attempt to find out the effect of progressive intensities of Suryanamaskar practices from slow to fast towards the development of flexibility.

2. OBJECTIVE:

To find out the effect of different progressive intensities with a fixed duration of Suryanamaskar practices on flexibility.

3. MATERIALS AND METHOD:

Selection of subjects: Initially 18-24 years in age ranged 40 female students from Purnidevi Girls College, Bolpur, West Bengal, India were selected randomly. The selected subjects were divided into an experimental group and a control group with 20 subjects in each (N=20). Experimental group underwent Suryanamaskar practices with a scheduled

training protocol (Table-1). Finally 28 girls completed this investigation on which control group was (N=14) and experimental group was (N=14) for the training. The duration of Suryanamaskar training was continued for a period of 3 months (12 weeks).

Variables:

Suryanamaskar was considered as independent variable and flexibility was considered as dependent variable.

Test for flexibility:

Flexibility was measured using the Sit and Reach test. The investigator directed the subjects to take a long sitting position. The soles of the feet were placed flat against the box with locked knees. The hands on top of the box side by side touching the inner edge of the sliding block with the fingertips where the zero cm marking was marked. On the starting signal the subject bend and pushed the sliding block forward slowly as long as she performed. The inner edge of the sliding block where it rests the measurement was recorded from the scale. Three trials were given with adequate rest in between.

The Suryanamaskar training protocol was set-up by the researcher for the experimental group. The duration of the training schedule was continued for 3 months (12 weeks) and after each month training with respective protocol post test was administered.

The Suryanamaskar Training protocol for the Experimental group was presented in the Table- 1.

Table-1: Suryanamaskar Training Protocol for the Experimental Group

Month	Training	Repetition	Duration	Days/Week	Test
1 st month	Suryanamaskar	5 rounds/day	30 minutes	5 days/ week	End of 1 st month Post test
2 nd month	Suryanamaskar	10 rounds/day	30 minutes	5 days/ week	End of 2 nd month Post test
3 rd month	Suryanamaskar	15 rounds/day	30 minutes	5 days/ week	End of 3 rd month Post test

4. STATISTICAL ANALYSIS:

To find out the mean, standard deviation and also the graphical representations Descriptive statistics was used by the researcher.

To find out the effect of Suryanamaskar training on the dependent variables Analysis of Covariance (ANCOVA) was used.

Whenever the ‘F’ ratio for adjusted post-test means was found significant, Scheffe’s post hoc test was used to determine the significance of differences between two paired means.

Descriptive statistics (mean and standard deviation) of dependent variable (flexibility) for the experimental and control groups in Pre- test and Post- test (After 3 months) were calculated and were presented in the Table- 2.

5. RESULTS AND DISCUSSION:

Table-2: Statement of Statistics (M & SD) of the Measures in Flexibility (Sit & Reach) of the Girls at different duration

Groups	Flexibility (cm)			
	Pre-test (M±SD)	Mid-test-1 (After 1 month) (M±SD)	Mid-test-2 (After 2 months) (M±SD)	Post-test (After 3 months) (M±SD)
Exp, Group	14.15 (± 0.98)	15.60 (± 1.39)	15.59 (± 1.26)	17.20 (± 1.42)
Control Group	9.16 (± 2.99)	9.28 (± 2.58)	9.48 (± 2.82)	9.35 (± 1.93)

Table-3: Analysis of Covariance (ANCOVA) among Pre and Post-test data of the Experimental and Control group in Flexibility

Source	SS	df	MS	F
Groups	43.84	1	43.84	13.87**
Intervention	600.72	1	600.72	190.10**
Error	79.07	25	3.16	
Total	723.63	27		

* p < 0.05 ** p < 0.01

Results of ANCOVA (Analysis of Covariance):

The results of ANCOVA (Table-3) revealed that significant changes (F= 13.86, p<0.01) in flexibility was observed after different training intensities with 30 minutes fixed duration between the two groups (experimental and control). Again, statistically significant changes were evident in case of the dependent variable after different training interventions (F= 190.10, p<0.01). It appeared that all the training interventions had statistically significant effects on the dependent variable. These changes, therefore, had been discriminated further by Scheffe’s post hoc test.

Table-4: Mean Recovery in Flexibility (Sit & Reach)

Groups	Recovered Mean in Flexibility (cm)			
	Pre-test (1)	Mid-test-1 (After 1 month) (2)	Mid-test-2 (After 2 months) (3)	Post-test (After 3 months) (4)
Exp, Group	10.04	14.45	17.95	17.86
Control Group	09.95	09.78	09.80	09.87

Results on Flexibility:

Mean recovery indicated that adjusted mean scores in flexibility in pre-test, mid-test-1 (after 1st month), mid-test-2 (after 2nd month) and post-test (after 3rd month) among the subjects of experimental group were 10.04, 14.45, 17.95 and 17.86 respectively (Table-4). Similarly, the adjusted mean scores in flexibility in pre-test, mid-test-1 (after 1st month), mid-test-2 (after 2nd month) and post-test (after 3rd month) among the subjects of control group were 9.95, 9.78, 9.80 and 9.87 respectively.

Table-5: Ordered Treatment Means (after Mean Recovery) of Control group after different intensities of training followed by Scheffe’s post hoc test in Flexibility

Group (Control)	Tests in Flexibility			
	(4)	(3)	(2)	(1)
Tests	(4)	(3)	(2)	(1)
(4)	--	0.08	0.09	0.08
(3)		--	0.07	0.09
(2)			--	0.10
(1)				--

* p<0.05, ** p<0.01

Where, (1) = Pre-test
 (2) = After 1st Month
 (3) = After 2nd Month
 (4) = After 3rd Month

A) Results of Control Group in Flexibility (Table-5):

The subjects of Control group could not show any change in flexibility score after 1st month (CD=0.10, p>0.05), 2nd month (CD=0.09, p>0.05) and 3rd month (CD=0.08, p>0.05) while compared with the pre-test score. This result indicated insignificant change in flexibility over the period of 3 months. As the control group was not involved to any training intervention, perhaps it could not help to change the scores of flexibility during 1st, 2nd and 3rd months respectively.

Table-6: Ordered Treatment Means (after Mean Recovery) of Experimental group after different intensities of training followed by Scheffe’s post hoc test in Flexibility

Group (Expt.)	(4)	(3)	(2)	(1)
(4)	--	0.13	0.30*	0.41**
(3)		--	0.31*	0.42**
(2)			--	0.36*
(1)				--
* p<0.05, ** p<0.01				

Where, (1) = Pre-test
 (2) = After 1st Month
 (3) = After 2nd Month
 (4) = After 3rd Month

B) Results of Experimental Group in Flexibility (Table-6):

The subjects of Experimental group improved the flexibility scores after 1st month (CD=0.36, p<0.05), 2nd month (CD=0.42, p<0.01) and 3rd month (CD=0.41, p<0.01) while compared with the pre-test scores. Statistically significant change was evident in the scores of flexibility between the training intensities of 1st month and 2nd month (CD=0.31, p<0.05). Improved result was also observed in Experimental group while the scores of flexibility of 1st and 3rd months were compared (CD=0.30, p<0.05). Again, the scores of flexibility of 2nd and 3rd months was compared (CD=0.13, p>0.05) but no significant difference in flexibility scores between training interventions imparted during 2nd and 3rd months was evident. This suggested that the trend of flexibility showed a gradual improvement over the period of three months. The overall result also indicated that the training interventions of both 2nd and 3rd month were comparatively more effective as compared to the training imparted during 1st month in improving flexibility.

Table-7: Overall Mean Recovery in Flexibility

Groups	Flexibility (cm)		
	After 1 st month (a)	After 2 nd month (b)	After 3 rd month (c)
Cont. Vs Exp. Gr.	13.59	17.05	17.01

C) Results of Control Vs Experimental Groups in Flexibility:

The result of three months separate training interventions revealed that adjusted mean scores in flexibility during 1st month, 2nd month and 3rd month were 13.59, 17.05 and 17.01 respectively (Table -7).

However, the comparison of the adjusted mean on flexibility between 1st, 2nd and 3rd months was presented in Table-8:

Table-8: Difference between Adjusted recovered means on Scheffe’s post hoc test in Flexibility after different intensities of training intervention

Groups	(c)	(b)	(a)
(c)	--	0.07	0.33*
(b)		--	0.39*
(a)			--
* p<0.05, ** p<0.01			

Where, (a) = After 1st Month
 (b) = After 2nd Month
 (c) = After 3rd Month

- 1st month training intervention alone helped to improve the scores in flexibility (CD=0.39, p<0.05), which suggested the improvement in flexibility ability.
- 2nd month training intervention showed better flexibility ability of joints than the 1st month of training (CD=0.33, p<0.05).
- 3rd month training intervention showed improved flexibility similar to the 2nd month of training (CD=0.07, p>0.05).

The overall result revealed that three separate training interventions with progressive intensities for three months duration showed gradual improvement in flexibility scores; however, the impact of 2nd and 3rd month of training showed comparatively better than 1st month of training intervention.

6. CONCLUSION:

Progressive intensities of Suryanamaskar training was effective in the development of flexibility but both 2nd and 3rd months of intervention i.e. 10 rounds within 30 minutes duration/ day, and 15 rounds within 30 minutes duration/ day, 5 days a week was more effective compared to 1st month training for improving flexibility.

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