

EFFECT OF YOGA ON CONCENTRATION AND MEMORY IN RELATION TO STRESS

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ABSTRACT

BACKGROUND: Concentration means wholeness unity, equilibrium. It is the focusing of attention upon a particular object. Memory is an ability to recall or remember past events or previously learnt information or skills. The process of concentration of attention and a power of recalling (memory) are the major factors in learning. Improvement in concentration and memory has been reported in several yogic studies.

AIMS AND OBJECTIVES: The main objective of the study was to assess the effect of yoga module on Concentration and Memory.

MATERIALS AND METHODS: The study started with 800 adolescent students; 159 high stress students and 142 low-stress students were selected on the basis of scores obtained through Stress Battery. Experimental group and control group were given pre-test to assess their concentration as well as short term memory. A yoga module consisting of yoga asanas, pranayama, meditation, prayer and a value orientation programme was administered on experimental group for 7 weeks. The experimental and control groups were post-tested for their performance in concentration and memory tests.

RESULTS: The results show that the students, who practiced yoga module yielded higher concentration levels and exhibited better short term memory.

KEYWORDS: Concentration, Short term Memory, stress, yoga, yoga module.

INTRODUCTION

It is very well said by William Shakespeare, “We know what we are, but know not what we may be”. Today’s man is living in the web of pressures, tension and stress. Everyone is facing the menace of stress in one way or the other. The focus of our present education system is mainly on the production of mechanical intellectuals not on the creation of human beings, which is the ultimate aim of education and life.

As described in the Upanishads, 'Dharma, Artha, Kama, Moksha' or fourfold maxim of Wealth, Desire, Dharma and Moksha catering to the heterogeneous structure of the society can again give direction to set up a holistic value system, to which Swami Vivekananda recommended for bringing spiritual socialism. In such a society, wealth and affluence are acquired and used not as an end but as a means to establish Dharma or the cosmic laws of nature, internal and external, in the society^[1].

The philosophic school stresses time and again that curriculum must be oriented towards instilling pupils with humanism, empathy, socializing attitude, creativity, healthy and positive character, ethics, morality and philosophic bent of mind, secular and spiritual ideas etc.^[2]

The last and present decades are showing two important changes (though negative in nature) in our social scenario and these require to be tackled on the priority basis. One; Indian students are suffering from high level of stress, anxiety, depression and frustration, which affect them and their families adversely. Second; deterioration of healthy value system, due to which our adolescents are failed to discriminate between 'right and wrong' or 'do's and donot's'. Daily newspapers report many of the abnormal tendencies of adolescents, such as, committing suicide, drug abuse, stealing, rape, murder etc. which exhibit their mental instability.

It seems that our present education system has become more mechanical and is failed to nurture all round development of the personality of the student. Therefore, an urgent need of the hour is to overhaul our education system, so that it fulfils the dreams of our Father of Nation 'Mahatma Gandhi', who defines education – a system of an all round drawing out best in child and man – body, mind and soul. Any education system, which does not aim to develop the child in a holistic manner will fail to produce true human being.

Present study is an effort in above mentioned direction in order to prepare a yoga module to create a holistic education system, which may help educators in developing body mind and spirit of their students, so that our education system enables all the individuals to create a balance between material prosperity and spiritual growth.

When a person focuses his attention for any length of time, we refer to it as concentration. Attention is the attributive state of sensory clearness, the active selection and emphasis of one component of a complex experience, a sensory adjustment of precluding for optical stimulation of a sense modality, adjustment of the sense organs to facilitate response to a particular stimulus or situation and to inhabit response to extraneous stimulus or situation^[3]. The term 'Memory' has a dual meaning. It refers to the process or processes whereby we store and preserve newly required information for later recall.^[4] Short term memory is viewed as a system for temporarily storing and managing information required to carry out complex cognitive tasks^[5].

Yoga, which is a way of life, is characterized by balance, health, harmony and bliss^[6]. Yoga is becoming popular in different parts of the world. For the restless mind, it gives solace^[7]. For the sick, it is a boon^[8-12]. Some use it for developing memory, intelligence and creativity^[13-14]. With its multiple advantages, it is becoming a part of education^[15-16]. The practice of yoga creates harmony in the physical, mental, psychological and spiritual aspects of the human

personality^[17]. The science of yoga is a powerful stream of knowledge, which enables the practitioners to achieve radiant physical health, serene mind, continuous spiritual uplift and creates the ability for harmonious social living^[18]. The processing of sensory information at the thalamic level is facilitated during the practice of pranyama^[19]. Yoga breathing through a particular nostril increased spatial memory scores^[20]. ‘OM’ Mediation has been shown to cause mental alertness^[21]. Meditation energizes the pre-frontal lobes of the human brain and in time, the limbic system becomes harder to arouse. This results in behavioral changes including better ego, integrity, fewer minor psychological problems, less depression and anxiety and better social skills^[22].

The research done by Mind/Body Institute, Harvard Medical School and Bruce D’ Hara and his team at the university of Kentucky in Lexington, U.S. revealed a positive influence of meditation on brain functioning, performance and concentration^[23].

Transcendental Meditation has also consistently been found to increase mind-body coordination^[24-26] to reduce depression, hostility and emotional instability^[27-35]

In another study, it is found that hatha yoga practices like asanas, kriyas, mudras, bandhans and meditation techniques helped the subjects to develop awareness within themselves by improving their intellectual and somatic functions^[36].

Another study has reported that six months of yogic practices resulted a feeling of well being, reduction in body weight, increased vital capacity, acceleration in endocrinal functions occurred at physiological level, whereas at psychological level, there is an improvement in memory, fatigue rate and reduced neuroticism index^[37]. Management of anxiety and increased concentration is revealed due to practice of yogic techniques^[38]

Various research studies concluded that yoga and meditation influenced concentration positively^[39-44]. Transcendental Meditation is reported to improve short term memory^[45-50]. The investigation made by various researches proved that yogic practice improves memory of the school children^[51-53].

The present study examines whether there is an effect of yoga module on concentration and short term memory of adolescent students. With this background, the objective of this study was (i) to study the effect of yoga on concentration of the students (ii) to study the effect of yoga on short term memory of the students.

MATERIALS AND METHODS

SUBJECTS

The study was conducted in eight public schools of Jalandhar (Punjab) which were randomly selected from Jalandhar City and Cantt. Before random selecting, schools of CBSE were matched for infrastructure, student strength and human resources. Bisht Battery of Stress Scale (BBSS) was administered on 800 students of Class 9 (intact classes). The participants were 400 boys and 400 girls, with ages ranging from 14 to 15 years. ‘Stress’ was studied as an

independent variable and used for the purpose of classification i.e. High Stress students and Low Stress students. Here idea was not to compare High Stress students and Low Stress students but to study whether stress and yoga have any interaction effect on short term memory and concentration. BBSS was developed for the measurement of 13 types of stress. Out of 13 scales, two scales, i.e., scale of academic stress and scale of achievement stress were selected. These scales were consisted of 52 and 80 items respectively, which were 132 in total. Each item is of statement type (closed), to which students were to answer by ticking their option prescribed on the answer sheet. The students were assembled in a hall and made to sit in rows. Booklets containing statement items alongwith answer sheets were distributed to each student. Instructions were delivered by the investigator. Statements were written in Hindi. Meaning of difficult words was also explained. The students were told to finish their test within an hour.

The scoring was done as prescribed in the manual. On the basis of their stress scores arranged in ascending order, top 30% (i.e., 240) subjects were identified as students with low stress and bottom 30% (i.e., 240) students were identified as students with high stress. Out of these students, 50% of them were kept in experimental group and another 50% in control group. Finally 30% subjects [high stress (exp) = 89+low stress (exp) = 75 + high stress (control): 70 + low stress (control) = 67] were selected. Pretest was conducted to test their concentration and short term memory for both the groups. Ultimately 301, subjects (116 girls and 185 boys) were selected for the present study.

In order to minimize the error due to absolute marks difference, the investigator preferred the use of Adjusted Gain Scores over simple gain scores. Because many a times, simple gain scores are misleading. For example, a student, when achieves 30 marks in pre test and attains 60 marks in post test, yields gain scores of 30 marks. Whereas another student scores 80 marks in pre test and attains 95 marks in post test, yields gain scores of 15 marks. In this situation, it seems as if the strength of experiment in first situation was higher than in second situation, which is misleading because amount of effort one requires to move from 30 marks to 60 marks would be definitely less than the amount of effort one requires to move from 80 marks to 95 marks. As we move higher, increase of every single mark requires more and more effort. The formula for Adjusted Gain Score =

$$\frac{\text{Post test scores} - \text{pre test scores}}{\text{Total Marks} - \text{Pre test scores}} \times 100$$

Validity of Bisht Battery of Stress Scales (BBSS): All the scales appear to be having content validity and item validity. The method of selecting items support this supposition. In addition, construct validity (discriminability) is estimated for all scales in a two-fold fashion. The first type tested if the construct measured differentiated students is on some related construct. For this, memory is taken. The second type tested if the construct measured by the scale is not related to construct predicted by theory. For this, internal evaluation is taken. In both, the construct validity is affirmed.

ETHICS

A code was provided to the students at the time of pretest to keep their personal identity closed. Their scores were exclusively for the research purpose and were not disclosed to their educational institutions. The project was approved by the Institutional Ethics Committee, and signed informed consent was obtained from the school principal.

ASSESSMENTS

Bisht Battery of Stress Scale was used to identify different levels of stress among the students i.e., high stress and low stress. This was done before the start of experiment. Details of its administration are mentioned above under the heading 'Subjects'.

Yoga module was used as an intervention treatment for the experimental group for an hour daily in the morning for 7 weeks.

Academic performance test was used as a pretest and posttest for the experimental as well as control groups to assess the effect of yoga module on the academic performance of the experimental group and to compare it with the control group, who never practiced yoga module.

INTERVENTION

A yoga module [yogasana + pranayama + meditation + prayer + value orientation program] was shared daily for an hour in the morning with the experimental group for 7 weeks (earlier mentioned in Article 'Effect of yoga on academic performance in relation to Stress, published in IJOY, vol. 2:1, Jan-Jun-2009). Same Concentration test and short term memory test were administered on the both groups as a posttest.

STATISTICAL ANALYSIS

To study an effect of yoga and stress on the concentration and short term memory, 2 X 2 Factorial design (ANOVA) was employed on the adjusted gain scores of concentration as well as short term memory, wherein stress is a classificatory variable and studied at two levels, i.e. students with high stress and students with low stress. Yoga module has been taken as a treatment variable, was given to the experimental group. Data was displayed in Tables 1-4.

TABLE 1
MEANS AND SD'S OF ADJUSTED GAIN SCORES OF CONCENTRATION IN
HIGH STRESS AND LOW STRESS GROUPS WITH RESPECT TO YOGA
INTERVENTION

	EXP (with yoga intervention)	C (without yoga intervention)	
HS	– $X_1 = 25.38$ $\sigma_1 = 17.75$	– $X_2 = 11.83$ $\sigma_2 = 9.36$	$M_{HS} = 18.61$
LS	– $X_3 = 29.42$ $\sigma_3 = 17.63$	– $X_4 = 13.06$ $\sigma_4 = 11.11$	$M_{LS} = 21.24$
	$M_{EXP} = 27.4$	$M_C = 12.45$	

TABLE 2
SUMMARY OF ANOVA ON THE ADJUSTED GAIN SCORES OF
CONCENTRATION IN RELATION TO STRESS AND YOGA INTERVENTION

Source of Variance	df	SS	MSS	F-Ratio
Yoga (A)	1	16353.05	16353.05	73.85**
Stress (B)	1	390.17	390.17	1.76
Interaction	1	323.23	323.23	1.46
Within	297	65768.79	221.44	
Total		82835.24		

** Significant at the 0.01 level of confidence

P value= 3.87 (at 0.05 level)

= 6.72 (at 0.01 level)

TABLE 3 MEANS AND SD's OF ADJUSTED GAIN SCORES OF SHORT TERM MEMORY IN HIGH STRESS AND LOW STRESS GROUPS WITH RESPECT TO YOGA INTERVENTION

	EXP (yoga intervention)	C (without yoga intervention)	
HS	– $X_1 = 39.39$ $\sigma_1 = 44.80$	– $X_2 = 24.37$ $\sigma_2 = 21.80$	$M_{HS} = 31.38$
LS	– $X_3 = 42.55$ $\sigma_3 = 24.17$	– $X_4 = 26.65$ $\sigma_4 = 23.42$	$M_{LS} = 34.6$
	$M_{EXP} = 40.47$	$M_C = 25.21$	

EXP = Experimental group

HS = High Stress

LS = Low Stress

C = Control group

M = Group Mean

\bar{X} = Mean

σ = Standard deviation

TABLE 4

**SUMMARY OF ANOVA ON THE ADJUSTED GAIN SCORES OF SHORT TERM
MEMORY IN RELATION TO STRESS AND YOGA INTERVENTION**

Source of Variance	df	SS	MSS	F-Ratio
Yoga (A)	1	16358.27	16358.27	30.11**
Stress (B)	1	601.43	601.43	1.11
Interaction	1	282.69	282.69	0.52
Within	297	161322.17	543.17	
Total		178564.56		

df = degree of fraction

SS = Sum of Squares

MSS = Mean Sum of Squares

** Significant at the 0.01 level of confidence

P value= 3.87 (at 0.05 level)

= 6.72 (at 0.01 level)

RESULTS

Table 2 reveals that F-ratio for the difference between means of high stress group and low stress group on the adjusted gains scores of concentration was found to be significant at the 0.01 level of confidence. This indicates that the students of experimental group and control group differ on the adjusted gain scores of concentration. Table 1 depicts means and SD's of adjusted gain scores of concentration in high stress and low stress groups with respect to yoga intervention. The means of experimental group [$M_{EXP} = 27.4$] is found to be greater than that of control group [$M_c = 12.45$], meaning thereby that those students, who were exposed to yoga module exhibited better concentration than those who were not exposed to yoga module.

Table 2 further reveals that F-ratio for the difference between means of high stress group and low stress group on the adjusted gain scores of concentration was not found to be significant even at 0.05 level of confidence indicating that the students with low stress and the students with high stress exhibited comparable adjusted gain scores of concentration. Table 1 shows that the groups means of students with low stress [$M_{LS} = 21.24$] is greater than the group mean of the

students with high stress [$M_{HS} = 18.61$], meaning thereby that students with low stress performed better than the students with high stress. Table 2 further depicts no interaction between yoga intervention treatment and stress on the adjusted gain scores of concentration. Same analysis was done to assess effect of yoga module on short term memory, for which data was presented in Table 3 and Table 4. Table 4 shows that F-ratio for the difference between means of high stress group and low stress group on the adjusted gain scores of short term memory was found to be significant at the 0.01 level of confidence, which indicates that students of experimental group and control group differ on the adjusted gain scores of short term memory. Table 3 gives the details of means and SD's, which depicts that the experimental group showed higher group mean [$M_{Exp} = 40.47$] than control group [$M_C = 25.21$]. It is inferred that the students, who experienced yoga module exhibited better short term memory than the ones who were not given yoga module treatment.

Further Table 4 shows that F-ratio for the difference between means of high stress group and low stress group on the adjusted gain scores of short term memory was not found to be significant even at the 0.05 level of confidence. It indicates that students with low stress and students with high stress exhibited comparable adjusted gain scores of short term memory. Table 3 reveals that the group means of students with low stress [$M_{LS} = 34.6$] is greater than the group means of students with high stress [$M_{HS} = 31.38$], meaning thereby that students with low stress performed better than the students with high stress. Table 4 further depicts no interaction between yoga intervention treatment and stress on the adjusted gain scores of short term memory.

DISCUSSION

It is evident from the results that the students who were exposed to yoga module exhibited enhanced Short Term Memory and improved Concentration. The results are in tune with the earlier findings, which reported that yogic practice improves memory of school children^[49-51]. Other researchers found that Transcendental Meditation improved short term memory^[43-48]. Another research studies reported that yoga and meditation influenced concentration positively^[37-42]. One more research done by researchers at Harvard, Yale and Massachusetts revealed that meditation can alter the physical structure of our brain, which deals with attention and processing sensory input. It further reported that yoga improves concentration.

The findings of the present study also revealed that concentration and short term memory do not significantly differ in high stress and low stress groups. A large body of research indicates that as arousal increases, task performance may rise at first, but at some point, it falls^[52]. Other research revealed that high levels of stress can lead to hyper vigilance (inability to focus attention) or arriving at a solution too quickly (premature closure). One of the reason to this contradiction could be that in the present study, only academic and achievement stress were studied whereas in most of earlier studies stress was measured in totality and also some physical measures such as Blood Pressure (B.P.), heart rate, Pulse Rate, Brain functioning etc. were taken as indicators.

Further, in the present study, contrast groups were formulated on the basis of scores of academic and achievement stress rather than classifying students with high stress and low stress

categories by taking norms of the scale for high stress and low stress. The facility of conducting experiment in schools was provided in those times when the students were little relaxed from academic burden as well. These could be some of the probable reasons of contradiction of the findings of the present investigation with the findings of earlier studies.

It may be concluded from the findings of the study that with intervention of the yoga module, the Concentration and Short Term Memory improve which may positively effect performance of the students. It is also observed that concentration and short term memory scores tend to be more in case of Low Stress students as compared to High Stress students, which may lead to the conclusion that yoga somehow helps in reducing stress (of course, this is not inferred statistically in the present investigation) and improving Short Term Memory and Concentration. Therefore, it is suggested that yoga module should become a regular feature of the school curriculum.

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