

Effect of Integrated Yoga on Psychological Variables- A Comparative Study

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ABSTRACT

Anxiety and stress are most commonly experienced by medical students due to academic burden. Excessive stress affects their mental health causing deterioration of their psychological variables like attention, concentration and memory. Yoga is a form of exercise which shifts the autonomic system towards parasympathetic side and helps to improve cognition. The present study was conducted on 60 healthy medical students. The subjects belong to age group 18 to 25. Digit–Letter Substitution Task (DLST) and Six Letter Cancellation Test (SLCT) tasks were given. Then integrated yoga was practiced for four weeks by the students. Thereafter tasks were repeated again. The participants in yoga intervention showed significantly improved performance on all parameters in attention, concentration, and memory in comparison to that of the control group. In yoga group total score and net score improved significantly and wrong attempts reduced significantly. Thus integrated yoga improves cognitive functions in medical students.

Keywords: Memory, Attention, Concentration, Medical students, integrated yoga, Six Letter Cancellation Test and Digit substitution test

INTRODUCTION

These days anxiety, mental tensions, and stress have become almost inevitable companions of medical students. The negative impact of this leads to lack of attention, concentration, and memory. Yoga techniques are accepted as important means of reducing effects of stress, anxiety, nervousness, self-doubt, and concentration loss. [1-3] Each technique produces effects in specific brain regions, and that precise magnitude of benefits for a particular task depends on the extent to which that brain region is used in task performance. In addition to reduction in stress symptoms, beneficial effects of various relaxation

techniques include: feeling of well-being, sense of calmness and relaxation in activity, improved sleep, less emotional reactivity, increased inner directedness (self-awareness), and improved self-care. Improved performance has also been found on a variety of psychological tests, such as IQ, Tower of London Test, Baddeley Tests of Verbal and Spatial Memory, Six Letter Cancellation Test (SLCT), Digit Substitution Test and so on. [1]

In this study, the influence of integrated yoga techniques on performance of the Digit-Letter Substitution Task (DLST) and Six Letter Cancellation Test (SLCT) were investigated. These tasks are

assigned as measures of the capacity for sustained attention, concentration, visual scanning, and rapid response activation and inhibition. [4] For others, they are measures of efficiency and speed of visual scanning, [5] or selective attention. [6,7] For yet others, they are administered primarily to assess potential hemispatial inattention and visual neglect, [8,9] or motor perseverative behaviour. [10] A recent study on the symbol cancellation test provides a measure of neglect, the organizational process, and attention. [11]

In adult populations various studies have proved the importance of yoga which is better than exercise in its ability to improve psychological outcomes. [12] There are studies which compared physical education with yoga and proved yoga has better benefits in schoolchildren. [13] Some studies suggest that there is a positive relationship between fitness level and concentration of attention and memory among children. [14] Two important components of cognition that can be readily assessed are attentional control and working memory. Hence this study was undertaken to study is to evaluate the influence of yoga in attention, concentration, and memory of medical students.

MATERIALS AND METHODS

Subjects

First year MBBS students aged 18-20 years were selected for the present study. Participants were excluded from the study if they were practicing any known stress relieving or relaxation technique. Following complete description of the study, informed consent was obtained from the participants. The protocol was approved by ethical committee of the Institute. Pretested and prevalidated Digit Substitution Test and Six Letter Cancellation Test questionnaire were administered to all first year medical students.

60 students were randomly selected by software generating random numbers. 30 students those who volunteer for yoga

practice were included in the study group rest in control group.

Inclusion criteria

- First year medical students of age group 18 to 20 years.

Exclusion criteria:

Students who were

- Practicing any known stress relieving or relaxation technique.
- Those with current or previous mental or neurological diseases

Students who volunteered for yoga were given a yoga intervention for 1 month, 45mins/day for 5 days/week. At the end of 4 weeks, again digit substitution test and six letter cancellation test were assessed in both the groups.

Instruments:

The six-letter cancellation task (SLCT) consists of a sheet of 22 rows × 14 columns of randomly arranged letters of the alphabet. The top of each sheet names six target letters. Subjects are given the choice of two possible strategies to cancel target letters (i) all six letters at once or (ii) selecting a single target letter at a time. It is also suggested that, according to their own choice, they follow horizontal, vertical, or random paths on the test sheet. They are told to cancel as many target letters as possible in the test time of 90 secs.

The digit letter substitution task (DLST) test sheet consists of 8 rows × 12 columns of randomly arrayed digits. The key at the top of each sheet, pairs each of the 9 digits with 9 selected letters. Subjects have to write the corresponding letters in the empty box below each digit. Choice of strategy for substituting letters is up to each subject: horizontally, vertically, or selecting one digit at a time. Subjects have to substitute as many letters for digits as possible in the test time of 90 sec. Test supervisors timed each test on a standard stopwatch.

To compensate for test-retest, and memory effects due to short intervening time intervals, different worksheets and coding were used for each test, with different digit-letter pairing in the key and

differently randomized arrays of digits on the worksheets. Similar rules were followed for the SLCT by changing target letters and using differently randomized arrays of letters on the worksheet.

Assessment

Scoring for both tests counts total substitutions/cancellations attempted, and number of wrong substitutions/cancellations. Net Score was obtained by deducting the wrongly attempted score from total attempted score. Scoring was carried out by blind rater. Students who volunteered for yoga were given a yoga intervention for 1 month, 45mins/day for 5 days/week. Details of which are given in table 1:

Table 1: Sessions of integrated yoga with time duration

Sl. No	Integrated Yoga Practices	Time (Minutes)
1	Loosening exercises	8
2	Suryanamaskara 12 steps	15
3	Instant Relaxation Technique (IRT)	2
4	Kapahlabhati- 3 rounds	5
5	Nadisuddi pranayama	5
6	Deep Relaxation Technique (DRT)	10
7	Total	45

Daily monitoring was done and at the end of one month, again six-letter cancellation task and digit letter substitution task were evaluated in both the groups.

Statistical Analysis

Data analysis was carried out by using Statistical Package for Social Science (SPSS Software, Version 16) package. Comparison between pre-intervention and post-intervention scores of each group was carried out by paired *t*-test. All the quantitative variables are summarized using descriptive statistics such as mean and standard deviation. The level of significance was fixed at $p < 0.05$.

RESULTS

Comparison between before and after intervention of DST and SLCT scores of control group and intervention group was done. Results suggest that the group practicing yoga had significant improvement in attention, concentration, and memory in comparison to that of the

control group. This result may be due to personality development, better attention, and concentration achieved due to yoga training. Comparison between before and after intervention of memory, attention, and concentration scores of control group was done using paired *t*-test, and the results along with mean and standard deviation are given in Table 2, 3. This result shows non-significant at 0.05 level in control group. Table 2a, 3a shows that a significant change in memory, attention, and concentration in intervention group which gives $P < 0.001$ in case of attention and concentration.

Table 2: Comparison of Digit Letter Substitution Task (DLST) test scores before and after yoga in control group

DST	Before	After	P value
Total Score	46.17±9.53	46.7±9.94	0.209
Wrong Attempt	1.03±1.13	1.33±0.48	0.063
Net Score	45.13±9.71	45.33±10.11	0.233

**Significant $P < 0.01$ level. Values are expressed as mean±SD

Table 2a: Comparison of Digit Letter Substitution Task (DLST) test scores before and after yoga in intervention group

DST	Before	After	P value
Total Score	46.17±9.53	52.7±9.94	0.000 [†]
Wrong Attempt	1.03±1.13	0.33±0.48	0.000 [†]
Net Score	45.13±9.71	52.33±10.11	0.000 [†]

**Significant $P < 0.01$ level. Values are expressed as mean±SD

Table 3: Comparison of Six-Letter Cancellation task (SLCT) scores before and after yoga in control group

SLCT	Before	After	P value
Total Score	50.83±9.29	50.57±8.55	0.034
Wrong Attempt	2.07±1.28	2.90±0.923	0.023
Net Score	48.77±1.77	46.7±8.92	0.209

**Significant $P < 0.01$ level. Values are expressed as mean±SD

Table 3a: Comparison of Six-Letter Cancellation task (SLCT) scores before and after yoga in control group

SLCT	Before	After	P value
Total Score	50.83±9.29	57.57±8.55	0.000 [†]
Wrong Attempt	2.07±1.28	0.90±0.923	0.000 [†]
Net Score	48.77±1.77	56.7±8.92	0.000 [†]

**Significant $P < 0.01$ level. Values are expressed as mean±SD

DISCUSSION

The purpose of the study was to know the role of integrated yoga in psychological variables like; attention, concentration and memory of medical students which was done in a short duration of one month. A comparison was done between intervention group and control group using DST and SLCT Scale. The participants in the yoga intervention showed significantly improved performance on all parameters in attention, concentration, and

memory in comparison to that of the control group. In yoga group total score and net score improved significantly and wrong attempts reduced significantly.

A study was conducted to observe the effect of yoga on six-letter cancellation task in students under examination stress. Results showed that the total and net scores were significantly higher after practicing yoga. There was also reduction in scores for wrong cancellation. [15]

A study was conducted to observe the effect of *kapalbhati* on SLCT in different age groups- younger, medical students, middle age and older age groups. The result showed that in middle and older age groups, no change occurred in total errors after *kapalbhati*, but net scores were increased after *kapalbhati* by 32.5% and 16.4% respectively. The net scores did not change significantly in the medical students. Total errors were decreased in the younger and medical student group. [16]

Another study showed that integrated practice of yoga causes improvement in cognitive functions like memory, attention and concentration, delayed and immediate recall in premenopausal women with climacteric syndrome. [17]

Thakur et al reported that right nostril yoga breathing (*surya anuloma viloma*) leads to improvement in digit span forward and digit span backward and alternate nostril breathing increases the digit span backward task score. [18] Thus a significant improvement was seen in various cognitive areas: attention, memory retention capacity, visuo-motor speed was observed after pranayama intervention.

In another study, hypothesis could be made that improvement in cognitive functions following pranayama might be due to decrease in stress level and improved parasympathetic tone. The bidirectional vagal system is a major contributor of stress reduction following pranayama. The underlying mechanism regarding pranayama practice could be stretching of respiratory muscle, specifically the diaphragm. [19,20]

During above tidal inhalation (as was seen in Hering Breuer's reflex), stretch of lung tissue leads to inhibitory signals in the vagus nerve, which ultimately shifts the autonomic nervous system into parasympatho-dominance, that results in a calm and alert state of mind. [21]

CONCLUSION

This study suggests that after practicing yoga there was a significant improvement in attention, concentration, and memory.

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