

A study on the immediate effects of supine rest and cyclic meditation on the cognitive function of school students

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Abstract

Background: Yogic exercises are mind-body exercises which improve both physical and mental status. In the current century, the school children are overloaded both physically and mentally. If they are not able to balance their work load, they end up with mental stress. **Aim:** The aim of this study was to assess the immediate effects of two Yoga based relaxation techniques - cyclic meditation and supine rest on the cognitive function of school students. **Materials and Methods:** In this study, 192 students aged between 12-16 years from schools in Puducherry were administered simple cognitive tests like the Six Letter Cancellation Test (SLCT), digit symbol substitution tests (DSST) and digit letter substitution test (DLST) to assess the immediate effects of cyclic meditation and supine rest which they were taught to practice. Statistical analysis was done by Student's paired t-test **Results:** Comparison of the SLCT, DSST and DLST scores of the participants before and after the relaxation techniques revealed that there was a statistically significant difference ($p < 0.001$). **Conclusion:** The yoga based relaxation techniques of cyclic meditation and supine rest have been shown to have immediate beneficial effects on the cognitive function of the school students in our study. Further studies can be done to confirm these findings and these kinds of simple relaxation techniques can be recommended among school students to improve their academic performance.

Key words: cognitive function, cyclic meditation, supine rest

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Introduction

Modern day life not only producing stress to the adults and it also has influence on psychological health of children and adolescents. Yoga is practiced in India for over 1000 years; it has been shown to produce consistent physiological changes and for the past thirty years or more, yoga and associated meditation techniques have been accepted as an important means of reducing the effects of stress.¹ Stress relaxation techniques produce different spectrum of effects for different tasks. It is recognized that 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.²

Yogic science recommends many stress relaxation techniques with additional benefits like sense of wellbeing and self awareness.^{3,4} These stress-reduction techniques like 'deep breathing meditation exercises have been found useful in reducing a variety of stress-related symptoms, such as anxiety, neuroticism and depression.^{3,4} In addition, improved performance has also been observed on a variety of psychological tests, such as IQ tests for assessing human intelligence,⁵ Tower of London Test (which

assesses the executive function),⁶ Baddley Tests of Verbal and Spatial Memory,^{7,8} Six Letter Cancellation Test (SLCT),⁹ digit symbol substitution tests (DSST), digit letter substitution test (DLST), etc.

Given these findings, we intended studying the effect of two yoga techniques that could be easily performed - Cyclic Meditation (CM) developed at SVYASA¹⁰ and the Supine Rest (SR) position known as 'sleep posture' (shavasana), generally done at the end of yoga practice. We were interested in studying its effect in students studying in schools given the possible academic pressures that they could be exposed to. Due to the practice of cyclic meditation (CM) and yoga relaxation technique (Supine rest) there is possibility of improvement in memory and selective attention measure. Performance in cognitive tests like the DLST, SLCT and DSST depends on the individual's selective attention (the capacity for or process of reacting to certain stimuli selectively when several occur simultaneously) and memory. These tests are easily understood and performed by participants and are suitable for subjects of all ages, including school students. Since the DLST, SLCT, DSST involves memory and selective attention, it was hypothesized that CM would increase performance on the test; it was decided to study changes on DLST, SLCT, DSST scores immediately after performance of CM and supine rest among school students.

Methodology

After obtaining approval from the institutional ethical committee, a complete description of the study was given to students belonging to an urban school in Puducherry. Students with any history of neurological or psychiatric disturbances, subjects on medication and learning disability were excluded from the study. Written informed consent was obtained from the 192 students aged between 12-16 years who were willing to participate in the study and from their parents. The participants were taught about the procedure of CM & SR with sufficient time for practice.

Cyclic Meditation¹⁰: Cyclic Meditation lasted for 22 minutes 30 seconds. Throughout the practice the eyes were closed and subjects followed instructions and practiced slowly, with awareness and relaxation.¹⁰ The practice began by repeating the word *omm* for (40 sec) followed by isometric contraction of the muscles of the body ending with supine rest for 1 minute standing at ease (called *tadasana*) and balancing the weight on both feet (2min); then the first actual posture. Bending to the right

(*ardhachakrasana*, 1 min 20 sec); a gap of 1 min 20 sec with instructions about relaxation and awareness; bending to the left (1 min 20 sec); a gap as before (1min 10 sec); forward bending (*Padhastasana*, 1 min 20 sec); another gap (1min 10 sec); backward bending (*ardhacakrasana*, 1 min 20); supine rest with instructions to relax the body in sequence (10 min).¹⁰

Supine rest: This also lasted for 22 minutes and 30 seconds. All participants were asked to be in complete relaxation position (*Shavasana*).¹⁰

The digit letter substitution test (DLST) worksheet consists of a 8 rows × 12 columns array of random digits 1–9. Subjects are seated with the worksheet upside down until the start of the test.¹ The students were also given a coding sheet naming the specific letter to substitute for each digit 1–9 in that particular test, the same coding applying to an entire test group. They were instructed to make their own choice of letter substitution strategy, whether horizontally, vertically, or selecting each particular digit randomized in the array one at a time. They were told to substitute as many target digits as possible in the specified time of 90 seconds. Finally, they were instructed to turn over the worksheet and start the test. Each test was timed on a standard stopwatch.¹ Because the tests were administered with such a short intervening time interval, immediately before and after an intervention of only 22.5 minutes, 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 worksheet.¹ Scoring the DLST counts both the total number of substitutions attempted, and the number of wrong substitutions. Net score is obtained by deducting the latter from the former. Scoring was carried out by persons unaware of when the assessment was made, whether it was 'before' or 'after' the intervention, or whether the subject was engaged in CM or SR on that day. The use of this DLST protocol to study immediate effects has already been validated for the Indian population.¹

The six letter cancellation test (SLCT) for this six target letters were given on the top of page and below them randomly letters were given. Instructions were given to search the target letters and cancel them by slash, cancelling as many as possible within the given time (90 second). Scoring the SLCT counts both the total number of cancelled letters, and the number of wrong cancel letters.¹¹

The digit symbol substitution tests (DSST) is a pencil and paper test of psychomotor performance in which the subject is given a key grid of numbers and matching symbols and a test section with numbers and empty boxes. The test consists of filling as many empty boxes as possible with a symbol matching each number. Time is 90 seconds, and the score is the number of correct number–symbol matches.¹²

The school students who agreed to participate in the study were divided into two batches. Participants of the first batch took part in the CM session on one day and the SR session after 15 days. The order of the sessions was reversed for second batch. The subjects were alternately allocated to either schedule, to prevent the order of sessions influencing the results. DLST, SLCT and DSST scores were calculated before and after each session.

Statistical analysis: Results were expressed as Mean \pm Standard Deviation. The SLCT, DSST and DLST scores of the participants before and after the relaxation techniques were compared using the paired student's t test.

Results

This study that was conducted to assess the immediate effects of two Yoga based relaxation techniques - cyclic meditation and supine rest on the cognitive function of school students which was assessed by the digit letter substitution test (DLST), the six letter cancellation test (SLCT) and the digit symbol substitution tests (DSST) revealed the following results. Table 1 shows the participants scores in these cognitive tests before and after cyclic meditation, while Table 2 shows their scores before and after supine rest.

Table 1: Cognitive test scores before and after Cyclic Meditation

Cognitive Test	Before	After	p value
SLCT	24.36 \pm 0.56	32.97 \pm 0.28	<0.001
DLST	43.66 \pm 0.96	48.53 \pm 1.01	<0.001
DSST	44.55 \pm 0.58	50.93 \pm 1.20	<0.001

SLCT = Six letter cancellation test, DLST = Digit letter substitution test, DSST = Digit symbol substitution tests; values expressed as Mean \pm Standard Deviation of scores obtained; p value < 0.01 considered significant

Table 2: Cognitive test scores before and after Supine rest

Cognitive Tests	Before	After	p value
SLST	27.55 \pm 1.02	31.06 \pm 1.24	<0.001
DLST	44.26 \pm 0.88	46.18 \pm 0.90	<0.001
DSST	45.26 \pm 1.45	51.20 \pm 1.22	<0.001

SLCT = Six letter cancellation test, DLST = Digit letter substitution test, DSST = Digit symbol substitution tests; values expressed as Mean \pm Standard Deviation of scores obtained; p value < 0.01 considered significant

Discussion:

In this study there was a statistical significant difference in the SLCT, DSST and DLST scores of the school students showed before and after the relaxation techniques (p<0.001), with the scores increasing after the relaxation techniques, indicating that both CM and SR had an immediate positive effects on the cognitive function of our participants.

Previous studies showed that SR (supine rest) reduces physiological arousal threshold¹³ and that it was effective in helping practitioners to cope with the manifestations of stress. Bera *et al.* found that the recovery from induced physiological stress was significantly faster in the supine posture with additional progressive relaxation, compared to resting, sitting in a chair, or plain shavasana (SR).¹⁴ In another study, a significant decrease in breath rate was noted after performance of the yoga-based Isometric Relaxation Technique (IRT), when compared to SR.¹⁵

CM combines 'stimulating' and 'calming' practices. Such yoga practice is described in the Mandukya Karika, a text associated the Mandukya Upanishad, which suggests that such a combination is helpful in attaining mental equilibrium. CM consists of the practice of yoga postures (asanas) interspersed with periods of relaxation in shavasana. After the period of practice, significant reductions in oxygen consumption occur, compared to an equal period of shavasana.^{16, 17} CM has been found to be particularly effective in relieving stress, and is widely applied in professional stress management programs.

Recent studies on CM suggest that during the yoga posture phase, predominantly sympathetic activation occurs, whereas after CM, the parasympathetic nervous system becomes dominant.¹⁸ The high-frequency (HF) power of the heart rate variability (HRV) has been found to increase following both CM and SR practice. The overall result is a greater

reduction in energy expenditure.¹⁹ CM has also been found to enhance the P300 wave in the evoked potential²⁰ and a fundamental cognitive process involving attention and immediate memory.^{21, 22} Previous studies are supporting our results that CM and SR have role in improving the cognitive performance. Our results were also supported by the results of a study by Pradhan and Nagendra who found that both CM and SR led to improvement in cognitive function as assessed by SLCT.²³ Hence both CM and SR can be used as relaxation techniques to improve the cognitive function among school children.

Limitations of our study include the fact that cognitive function was assessed by using only a limited numbers of tests; different tests at different levels of task could also have been used.

Conclusion

The yoga based relaxation techniques of cyclic meditation and supine rest have been shown to have immediate beneficial effects on the cognitive function of the school students in our study. Further studies can be done to confirm these findings and simple yogic techniques like cyclic meditation and supine rest which improve cognitive function and can be incorporated as part of school curriculum.

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Conflicts of interest: Nil

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