## STANDARD INTERNATIONAL TRANSLITERATION CODE USED TO TRANSLITERATE SANSKRIT WORDS

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| a | = | अ | ṅa | = | ङ | pa | = | प |
| ā | = | आ | ca | = | च | pha | = | फ |
| i | = | इ | cha | = | छ | ba | = | ब |
| ī | = | ई | ja | = | ज | bha | = | भ |
| u | = | उ | jha | = | झ | ma | = | म |
| ū | = | ऊ | ñ | = | ञ | ya | = | य |
| ṛ | = | ऋ | ṭa | = | ट | ra | = | र |
| ṝ | = | ॠ | ṭha | = | ठ | la | = | ल |
| e | = | ए | ḍa | = | ड | va | = | व |
| ai | = | ऐ | ḍha | = | ढ | śa | = | श |
| o | = | ओ | ṇa | = | ण | ṣa | = | ष |
| au | = | औ | ta | = | त | sa | = | स |
| ṁ | = | अं | tha | = | थ | ha | = | ह |
| ḥ | = | अः | da | = | द | kṣa | = | क्ष |
| ka | = | क | dha | = | ध | tra | = | त्र |
| kha | = | ख | na | = | न | jña | = | ज्ञ |
| ga | = | ग | | | | | | |
| gha | = | घ | | | | | | |

# ABSTRACT

**Background**

Cyclic meditation combines 'stimulating' and 'calming' practices, based on a statement in ancient yoga texts suggesting that this combination may be helpful to reach mental equilibrium. Cyclic meditation consists of cycles of yoga postures interspersed with periods of supine rest. Practicing cyclic meditation reduced psychophysiological arousal based on a decrease in oxygen consumption and changes in the heart rate variability suggestive of a shift towards vagal dominance. Cyclic meditation improved the performance in a P300 event related potential task and also improved the performance in a letter cancellation task more than relaxation in the corpse posture (*shavasana*). Both tasks require selective attention and concentration. The benefits were ascribed to possible stress reducing effects of cyclic meditation, as the practice reduces physiological and cortical arousal.This was ascribed to reduced anxiety, though this was not assessed. The effects of cyclic meditation on MLAEPs have not been studied.

**Aim**

The present study was intended to compare cyclic meditation (CM) with an equal period of supine rest (SR), with respect to: (1) the performance in a psychomotor tasks, included digit-letter substitution task (DLST) which is a measure of attention, as well as two tasks for motor functions (i.e., letter copying task and circle dotting task), (2) components of Wechsler memory scale as well as state anxiety (STAI) to determine if anxiety influenced performance, and (3) midlatency auditory evoked potentials (MLAEPs) using a Nicolet Bravo, U.S.A., apparatus, to

understand whether information processing at different cortical and sub-cortical levels is facilitated or not by CM and SR,

**Methods**

The study was performed on fifty-seven healthy male participants with age range from 18 to 40 years (group average age ± S.D., 26.5 ± 4.6 years), who were each studied in two sessions, one of cyclic meditation and the other of supine rest. Each session consisted of Pre (5 minutes), During (22:30 minutes) and Post (15 minutes) states while middle latency auditory evoked potentials (MLAEPs) were recorded and all the other paper pencil tasks were assessed in Pre and Post periods of CM and SR.

**Results and Discussion**

In the present study, the increase in the Pa and Nb wave peak latencies following meditation is contrary to earlier studies in which midlatency auditory evoked potentials were recorded during and after meditation. In particular, meditation on a syllable of significance (i.e., 'OM') was earlier shown to significantly reduce the Nb wave peak latency. A reduction in the peak latency of another component i.e., the Na wave, followed an eyes open meditation where the gaze was fixed on a point of light. The reason for this contradictory result (i.e., an increase in Pa and Nb wave peak latencies following CM) compared to decreased Na and Nb wave peak latencies following other meditations may be related to the fact that CM includes the practice of both yoga postures (*āsanas*) as well as periods of meditation, rather than meditation alone.

The possibility of cortical inhibition following CM may be considered supported by the fact that changes following CM in this study were seen in the Pa and Nb components, which have cortical neural generators unlike the change following supine rest where the Na wave peak latency increased and the Na wave is believed to be generated at the mesencephalic-diencephalic level. The Pa wave corresponds to the activity at the superior-temporal gyrus and the Nb wave corresponds to the primary auditory cortex. The level of change appeared to differ between supine rest (which produced changes in the Na wave) suggesting mesencephalic-diencephalic level changes, and cyclic meditation, where the changes which followed the practice appeared to be at a cortical level.

Also, in the present study, on a different group of cyclic meditation practitioners, performance in a digit- letter substitution task improved after cyclic meditation but not after supine rest. This may be related to the fact that the two psychomotor tasks (i.e., the letter cancellation task and the digit-letter substitution task) assess comparable, yet different cognitive abilities. The letter cancellation task assesses the ability to sustain and shift attention, immediate memory, visual scanning, and motor speed for repetitive motor activity. The digit-letter substitution task also requires the ability to sustain and shift attention, immediate memory (of the digit-letter combination), and the task tests the speed of information processing, as well as the ability to process information and shift the attentional focus between digits and letters. It is difficult to say whether the improved performance in the letter cancellation task following both cyclic meditation and supine rest in an earlier study and the improved performance in the digit-letter substitution task after cyclic meditation alone in the present study, was due to differences in the abilities assessed by the tasks or the fact that the yoga practitioners in the two studies were different. In the present study, after both cyclic meditation and supine rest, the performance in the tasks for motor speed in a repetitive motor task was improved. The circle dotting task, studied here also evaluates spatial intelligence and manual speed. The letter copying task was used as a test for motor speed, which allowed the repetitive motor activity component of the digit-letter substitution task to be assessed separately as has been described elsewhere. Hence, the ability to carry out a repeated motor activity was better after cyclic meditation and supine rest, with a greater magnitude of improvement after cyclic meditation. Hence, in the present study, improved repetitive motor activity and motor speed may have contributed to the better performance in the digit-letter substitution task. The improvement in the DLST following CM was 21.0 percent (as described earlier), while the letter copying task was improved by 14.0 percent and the performance in the circle dotting task was improved by 19.0 percent. In contrast there was no improvement in DLST scores after SR, but the improvement in the letter copying task was 4.3 percent and the improvement in the circle dotting task was 4.1 percent. Hence, an improvement in motor speed may have contributed to the better performance in the DLST after cyclic meditation.

With respect to the Wechsler memory scale the increase in scores for the digit span and associate learning tasks following CM was greater [digit span forward (27.7 percent), backward (33.5 percent), associate learning, easy (20.7 percent), and associate learning hard (37.7 percent)] than the increase following

SR [digit span forward (16.1 percent), backward (9.2 percent), associate learning, easy (9.4 percent), and associate learning, hard (10.6 percent)]. Also, there was a greater magnitude of decrease in state anxiety after CM (22.4 percent) compared to after SR (5.6 percent). The digit span tests assess attention, concentration and primary working memory. Earlier studies have shown that CM practice increases selective attention more than an equal duration of supine rest. The present results suggest that primary working memory also improves with CM practice. Verbal paired associate learning assesses integration of information and episodic memory. The present results suggest an improvement in these aspects of memory after both CM and SR, with a greater magnitude of increase after CM. The present results suggest that movement as a part of cyclic meditation may actually facilitate performance in attention and memory tasks more than an equal duration of time in a conventional relaxation posture (*shavasana*).

**Conclusion**

The practice of CM has resulted in prolonged latencies of evoked potentials generated within the cerebral cortex, supporting the idea of cortical inhibition after CM. The present study also showed better performance in a digit-letter substitution task, as well as in tasks for motor speed following the practice of CM. Following a period of supine rest there was improved performance in tasks for motor speed, but not in the digit-letter substitution task. The study also showed that CM practice improves the performance in memory tasks and reduces state anxiety more than a comparable period of SR.

## LIST OF TABLES