CHAPTER-1

Introduction
Meditation has been described as a training in awareness which, over long periods produces definite changes in perception, attention, and cognition (Brown, 1977). Meditation is a specific state of consciousness featured by deep relaxation and internalized attention (Murata, Takahashi, Hamada, Omori, Kosaka, Yoshida, & Wada, 2004). However, it may not be possible for everyone to begin their practice of yoga with meditation. Meditation in fact, forms the sixth and seventh stages of the eight limbs (aṣṭāṅga) described by the sage Patañjali [Patañjali, circa 900 B.C.] (Taimini, 1986). While many practitioners do learn meditation directly, others find it easier to pass through the other stages, learning yoga postures (āsanas) and regulated breathing (prāñāyāmas), first (Nagendra & Nagarathna, 1997). For those who find it difficult to commence the practice of meditation there are two possible risks. Some people may find that they feel drowsy and even fall asleep other people may have a series of thoughts rushing through their minds preventing them getting into a meditative state. For this reason a technique of ‘moving meditation’, which combines the practice of yoga postures with guided meditation was devised, called cyclic meditation (CM), by H.R. Nagendra, Ph.D., which is conducive to getting into a meditative state. This technique has its’ origin in an ancient Indian text, Māndūkya Upaniṣat (Chinmayananda, 1984). It is interesting to note that CM does induce a quiet state of mind, which is compatible with the description of meditation (dhyāna or effortless expansion), according to Patañjali. This description states that ‘Tatra pratyayaikātānatā dhyānam’
This means that the uninterrupted flow of the mind towards the object chosen for meditation is *dhyāna* (Taimini, 1986). Indeed, all meditations, irrespective of the strategies involved are believed to help reach this state. There are several strategies in meditation. These include breath awareness, awareness of internal sensations, directing the attention to a *mantra* or a *koan*, and keeping the eyes open with the gaze fixed on the object of meditation, among other methods.

This technique i.e., CM consists of recurring cycles of physical postures (*āsanas*) and supine rest in a meditative state of mind. Earlier studies on meditation have shown that during the practice there were physiological changes which are suggestive of both alertness and rest (Telles, & Desiraju, 1993; Telles, Nagarathna & Nagendra, 1994). This has led to an interest whether the practice of meditation would improve the performance in the tasks requiring attentiveness and vigilance (Kember, 1985). However, attentiveness requires increased sympathetic nervous system (Telles, Raghuraj, Maharana & Nagendra, 2007). Hence, it would appear that meditation and performance in attentional tasks may not be compatible.

In the case of CM, which has been described above, this was not the case, studies on heart rate variability (HRV) showed that after the practice of CM the LF power and LF/HF ratio decreased whereas HF power increased which is suggestive of shift towards vagal dominance. This is similar to the HRV changes following equal duration of SR, but with lesser magnitude of change. These
changes were suggestive of reduced sympathetic activity and reduced physiological activation. However, an earlier study on oxygen consumption showed that a period of cyclic meditation significantly reduced the oxygen consumption to a greater degree (32.1 percent) than a comparable period of supine rest (Telles, Reddy & Nagendra, 2000). A recent study also showed that after the practice of CM, oxygen consumption decreased (19.3 percent) compared to following SR (4.8 percent) (Sarang & Telles, 2006a). Hence, the two studies showed that CM practice reduced oxygen consumption and minute ventilation to a greater degree than SR. In contrast to the changes in HRV, these changes were suggestive of reduced physiological activation. In a state of reduced physiological activation it could be presumed that the ability to focus attention would be less. Being attentive is a necessary pre-requisite for various tasks including primary working memory, associate learning and certain motor tasks which require precision. However, there were two studies also on the effects of CM compared to SR in normal volunteers which showed that following CM the performance in the event related P300 auditory oddball task was better both compared to the pre state and compared to the SR session (Sarang & Telles, 2006c). This improvement was a decrease in the P300 peak latency and an increase in the P300 peak amplitude (Sarang & Telles, 2006c). The P300 event-related brain potential (ERP) is a neuro-electrical measure for selective attention which does not require any motor activity. The P300 component of event-related brain potentials (ERPs) is generated when persons attend to and discriminate stimuli which differ in a single aspect. In
the study cited this was pitch, or frequency. The P300 reflects fundamental
cognitive events requiring attentional and immediate memory processes (Polich,
1999). The results suggest that CM enhanced these cognitive processes. Another
study examined the performance in a letter cancellation task, once again before
and after CM and SR, as this task requires selective attention, concentration, visual
scanning abilities, and a repetitive motor response (Sarang & Telles, 2007). As in
the P300 study the performance following CM was better in terms of improved net
scores which were significantly higher, after both practices, though the magnitude
of change was more after CM than after SR (26 percent versus 14 percent). Unlike
the P300, the performance in a cancellation task requires certain motor speed
during a repetitive motor activity. Hence, the improved performance in this task
could be related to improved attention as well as improved motor activity. This
latter speculation is particularly relevant as yoga practice has been shown to
improve the performance in motor tasks (Telles, Hanumanthaiah, Nagarathna &
Nagendra, 1993; Telles, Raghuraj, Ghosh & Nagendra, 2006).

Hence, the present study was designed to determine the effect of both CM
and SR on performance in a digit-letter substitution task, which is also a measure
of attention as well as two tasks for motor functions (i.e., a letter copying task, and
a circle dotting task). In addition to this the effects of CM and SR were studied on
components of the Wechsler memory scale as well as state anxiety (STAI) to
determine if anxiety influenced performance. Finally, in an attempt to understand
whether sensory processing at cortical and sub-cortical levels is facilitated or not
by CM and SR, midlatency auditory evoked potentials (MLAEPS) were recorded at the beginning and end of both practices.