CHAPTER-III

OVERVIEW

Mindfulness seems to play a critical role in the operationalization of response inhibition within the neuro-cognitive domain of attention. Uptil a few years ago mindfulness was being understood in a therapeutic and spiritual setting only. It is increasingly catching the eyes of cognitive neuroscience researchers for measuring arousal and being in the present moment within the purview of consciousness (Brown and Ryan, 2007). Also, drawing from the self reported claims of meditation practioners, changes in attentional resources have been the focus of several recent studies in the cognitive psychology literature. Attention is a blanket term that may be used to describe all or some of a set of discrete subprocesses that collectively underlie our ability to attend to different stimuli in the given moment. Examples of these subprocesses include alerting (becoming aware of a stimulus, such as becoming alert to a car honking), sustained attention and conflict monitoring (remaining focused on a stimulus despite the presence of a distracting or conflicting stimulus). Herein, Stroop task is a classic task of response inhibition which refers to withholding responses which are irrelevant, unintended and inappropriate and releasing the most appropriate response.

In this context, Zeidan et al., (2010) reported that a mindfulness significantly improves visuo-spatial processing, working memory and executive functioning. Williams et al., (2000) proposed that mindfulness involves noticing specific aspects of the environment without judging them or avoiding them, it should improve autobiographical memory as it seems to benefit from rich encoding of episodic details.

McKee et al.,(2007) found higher levels of negative affectivity to be significantly associated with lower levels of awareness, acceptance and mindfulness skills. They also reported higher levels of anxiety sensitivity to be significantly associated with lower levels of awareness.
From the neurological aspect, Creswell et al., (2007) attempted to discover the neural correlates of dispositional mindfulness during affect labeling and with a proper control of individual differences measures, they found that dispositional mindfulness was associated with greater widespread prefrontal cortical activation, and reduced bilateral amygdala activity during affect labeling compared with gender labeling control task. Further, they also found strong negative associations between areas of prefrontal cortex and right amygdala responses among participants high in mindfulness but not among participants low in mindfulness.

Another facet of neurobiology of mindfulness is that it is being tapped in connection with the mechanism of action. Besides the research on underlying neural networks, involved in meditation, the research is also focusing on investigating the neural mechanisms that may explain how these networks promote the reported behavioral and clinical effects of mindfulness.

In context of mindfulness and action, Attentional Control Theory, Eysenck et al., (2007) suggests that inhibition (in addition to shifting and updating) is a distinct function of the central executive. Inhibition refers to one's ability to minimize disruption or interference from task irrelevant stimuli, i.e. an increased ability to inhibit interference from task irrelevant stimuli (which engage the stimulus-driven attentional system) allows the goal-directed attentional system to continue to function with minimal disruption.

Bishop et al., (2004) predicted that increases in mindfulness should lead to increases in the specific attentional abilities of sustained attention. Also Cahn and Polich (2006) report that an extensive training in mindfulness has been found to improve alerting and conflict monitoring.

As Stroop task is a classic task of response inhibition which refers to withholding responses which are irrelevant, unintended or inappropriate. Herein, mindfulness seems to play a critical role in the operationalization of response inhibition within the neuro-cognitive domain of attention.
A musical input seems to facilitate mindfulness and it has been found to do so since long, thereby serving many important psychological functions (MacDonald et al., 2002).

With this in mind, a growing body of literature has addressed how music affects our responses e.g. psychological (Ready and Boyle, 1998); behavioral (Hallam and Price, 1998) and cognitive (Furnham et al. 1999).

Neurological studies have identified that music is a valuable tool for evaluating the brain system (Peretz et al., 2005). It is observed that while listening to music, different parts of the brain are involved in processing music which includes the auditory cortex, frontal cortex, cerebral cortex and even the motor cortex (Kristeva et al., 2003).

Each type of music has its own frequency, it can either resonate or it can be in conflict with the body’s rhythms e.g. heart rate (Asada et al., 1999). While listening to music, the power of the alpha and the theta frequencies of the human EEG increases (Sakharov et al., 2005).

Geethanjali et al., (2012) also found that attention based activities are enhanced while listening to jazz and Carnatic music as compared to hard rock music during mental task.

However, specific effects are difficult to predict when we consider the many forms of music and the multiple ways we encounter, process & experience them (Furnham and Bradley, 1997). To fully understand the effects of music we must look for the interaction dynamics between the listener, the music and the context within which the task is taking place (e.g. Mill et al, 2005). Konecni (1982) argued that all music processing utilizes cognitive capacity, so listening to music may impair cognitive task performance.

Coy et al., (2010) study indicates that individuals in the anxious condition reported more cognitive interference with regard to evaluation anxiety, phonological loop function and performance for executive task.
Rauscher et al., (1993) reported that listening to Mozart music leads to improvements on spatial IQ scores and reading comprehension of school children.

Angel et al., (2010) assessed the effects of fast tempo background music on cognitive performance of University students of both the genders and found that it increased the speed of spatial processing and accuracy of linguistic processing, hence suggesting that background music can have predictable effects on cognitive performance.

Research has opened the possibility that music produces reorganization of brain functions and that such change could be detected by analysis of the electroencephalogram.

Drumming or a participation in a drumbeat program have been found to lead to reductions in stress and anxiety and improvements in mood (Featherstone, 2008; Bittman et al., 2004).

In fact, rhythmic training has been found to be associated with higher temporal cognition, mathematical ability and improved spellings (e.g. Rauscher, 2009; Overy 2003).

It was found in a sustained attention task linked study that high anxiety group performs worse than the low anxiety group on central executive and phonological loop functioning (Elliman et al., 1997).
NEED OF THE STUDY

In view of the above, it became clear that mindfulness, when induced, can upgrade cognitive output. It has also become clear that cognitive output is vulnerable to the levels of anxiety, as well as the tempo of music. It was felt that if the cognitive output dynamics have to be understood better, the three influences mentioned above should be studied.

Also, even though much research has been done on mindfulness as a dispositional concept and its use in clinical therapy, therefore it was felt that a study such as the one envisaged herein be carried out in a paradigm utilizing the experimental tool of Stroop task.

Hence, the study in hand was entitled as “Role of Anxiety, Induced Mindfulness and Music in Cognitive Output Latency”.
OBJECTIVES AND HYPOTHESES

OBJECTIVES OF THE PRESENT STUDY

Phase-I

1. To categorize the subjects into Low, Moderate and High Anxiety groups.

Phase-II

1. To observe the difference among Low, Moderate and High Anxiety groups on Cognitive Output task.

2. To observe the effect of induction of mindfulness on cognitive output performance

3. To observe the effect of drumbeat music and free flowing music on cognitive task task across low, moderate and high anxiety groups.

4. To observe the induction of mindfulness and its dynamics across various anxiety groups.

5. To observe the effect of drumbeat music and free flowing music in the Low, Moderate and High Anxiety groups.

6. To gauge the interactive effect of the above variables on the cognitive output performance.
HYPOTHESES

1. Cognitive output of low anxiety group subjects is expected to be better than that of the moderate anxiety group subjects followed by that of the high anxiety group subjects.

2. Cognitive output is expected to be better under control condition as compared to that under blocked condition as well as that under unblocked condition, of induced mindfulness.

3. Cognitive output is expected to be better under blocked condition than under unblocked condition, of induced mindfulness.

4. Cognitive output is expected to be better for drumbeat music condition than that for guitar music condition, under all conditions.

5. Cognitive output of low anxiety group subjects shall be better than that of the moderate anxiety group subjects followed by that of high anxiety group subjects, under all induced mindfulness conditions.

6. The decline in cognitive output across the induced mindfulness conditions shall be maximum for high anxiety group subjects followed by moderate anxiety group subjects and then for low anxiety group subjects.

7. The cognitive output of high anxiety group is expected to be better than that for moderate anxiety group, followed by that for low anxiety group, for drumbeat music condition as compared to guitar music condition.

8. The cognitive output across all the three induced mindfulness conditions shall be better for drumbeat music condition than for the guitar music condition.