Chapter 3

Method

This study employed an experimental research design to study whether there was any effect of short format body-scan mindfulness on cognitive function and affect. Altogether eight primary variables were considered as the main focus of the study. The list of the variables included:

1. Mindfulness-state
2. Negative affect
3. Positive affect
4. Psychomotor function
5. Attention
6. Learning
7. Simple memory
8. Social-emotional cognition.

Among these, mindfulness-state was used to observe whether the intervention was able to increase the level of mindfulness in the first place. In theory, any practice or training is supposed to raise the degree of mindfulness to qualify as Mindfulness Awareness Practice (MAP). Positive and negative affects and the five remaining cognitive functions were the study variables. Several measures were investigated
especially on cognitive functions, but the main focus was on the primary outcome measures as indicated by the instruments. The detailed description is presented in the section below that describes the instruments.

**Participant and Sampling Technique**

The participants selected for this study included both male and female undergraduate and postgraduate students from a university in Bengaluru, India. The call-for-participation notice was put up on the college notice boards. The first 90 individuals, both female and male, (female=52, male=38) who were willing to volunteer in the study were taken. These participants were then randomly assigned to either the experimental group or the active control group using computer software for randomization (Urbaniak, & Plous, 2013). Each had an equal chance of selection in either the experimental group or the control group. Individuals who self-reported practicing any form of meditation in the last three months were excluded from the current study to avoid any confounding effects. Some of the participants left the experiment before its completion, and some other participants were also dropped because either their data was missing, or their testing trial turned out to be invalid. Finally, the data from 72 participants (mindfulness group=35, active control=37) was analyzed.

**Research design**

In view of achieving the objectives outlined in this study and to test the hypotheses, this study applied an experimental research design. Participants were
assigned to two groups, an experimental group, also interchangeably referred to as the mindfulness group and the active control group. The mindfulness group received body-scan meditation training in contrast to the active control group. In the control group, participants spent an equal amount of time as the participants in the mindfulness training group listening to soothing music and reading a non-fiction book of their choice.

**Delimitations**

Participants spoke the different regional languages of India, but the study was conducted in English medium, including the language of the instruments, to overcome the problem of the multiple languages. Participants included only individuals who had functional English proficiency to understand and interact in English. This requirement was clearly mentioned in the advertisement that was put initially while calling for participation in the study. Candidates who reported to have been practicing any other therapeutic activities in last three months were excluded to avoid the problem of having confounding variables. For example, applicants who were practicing yoga, any form of psychotherapies or counseling, any other form of meditations including body-scan meditation were excluded. The self-report question, whether any candidate had any known medical or mental illness or not, was also administered at the beginning of the study to exclude the ones who responded positively to the question.
Instruments

Well-validated questionnaire-based tools and computerized tasks were used to measure the level of different variables. The following texts describe the tools and cognitive tasks that were employed in the study along with their reliability and validity.

Mindfulness attention and awareness scale-state (MAAS-State). The MAAS-State was used to measure the level of state mindfulness (Brown & Ryan, 2003). MAAS-State is one of the widely used self-report instruments to measure the degree of state mindfulness. It requires an individual to rate items using a five-point Likert-type scale. MAAS-State has been consistently found to be a valid and reliable measure of state mindfulness (Brown & Ryan, 2003). It is a fifteen-item scale that measures an individual’s tendency to be mindful during daily activities. It produces a single score as its result and has no further subscales. Its items are intended to detect attention to present moment experiences. Besides the English version of the MAAS scale, which is being widely used across cultures, the MAAS has also been translated and used in many languages. For example, one can access the MAAS scale in Chinese (Deng et al., 2011), Persian (Abdi, Ghabeli, & Shakernagad, 2015). This scale also has been used in several Indian studies as well (Rajesh, Ilavarasu, & Srinivasan, 2013; Vinchurkar, Singh, & Visweswaraiah, 2014). As an additional precautionary measure, the items in the scale were face validated by five University level professors with known expertise in experiment designs.
The positive and negative affect scale (PANAS). This scale developed by Watson, Clark and Tellegen (1988) is one of the most widely used scales to measure mood or emotion. PANAS is very commonly used as an instrument with high validity and reliability to measure the level of positive and negative affect in both clinical and non-clinical research (Crawford & Henry, 2004). Several studies that were conducted among the Indian population have also used the PANAS, which is indicative of the high utility of the scale. For example, a study used the PANAS to measure positive and negative affect along with grit as the predictors of happiness and life satisfaction in undergraduate students (Singh & Jha, 2008). The PANAS is a self-report measure, comprising of 20 items, with 10 items measuring positive affect (e.g., excited, inspired) and 10 items measuring negative affect (e.g., upset, afraid). Each item is rated on a five-point Likert Scale, ranging from 1 = Very slightly or Not at all to 5 = Extremely, to measure the extent to which the affect has been experienced in a specified time frame. The PANAS is designed to measure affect in various contexts such as at the present moment, the past day, week, or year, or in general. Reliability and validity reported by Watson et al. (1988) were moderately good. For the Positive Affect Scale (PANAS^{pos}), the Cronbach alpha coefficient was 0.86 to 0.90; for the Negative Affect Scale (PANAS^{neg}), 0.84 to 0.87. Over an eight-week period, the test-retest correlations were 0.47-0.68 for the Positive Affect Scale and 0.39-0.71 for the Negative Affect Scale. Individuals would have to go through the 20 different affects listed on the scale and check the one he or she is feeling at that moment.
**CogState-research neurocognitive battery.** CogState’s research version of the neurocognitive battery was used to measure five cognitive functions - psychomotor function, attention, learning, simple memory and social-emotional cognition (CogState, 2011). CogState is a computerized program that is available for both commercial use and academic research. The complete CogState battery has 12 different neurocognitive tasks to measure various functions. Brief CogState battery included only four tasks. It comprises detection (DET) task to measure psychomotor function, identification (IDN) task to measure attention, one card learning (OCL) task to measure learning, and one back learning (ONB) task to measure simple memory. The study used all four tasks from the brief CogState battery and plus one additional task, i.e. the social-emotional cognition (SECT), making altogether five cognitive functions.

Each task gives multiple measures in CogState battery. However, the manual of CogState (CogState, 2011) battery suggest only one primary outcome measure for each task. According to the manual, the primary measures are recommended because they do not have flooring and ceiling effects, unlike other measures. Table 1 presents the description of the task and the primary measures associated with each task.

Manual tests of neuropsychological measures can be difficult and tedious at times and one might have to depend on only a few variables because of logistic constraints. Computerized tests may overcome this problem. CogState is one among many options with acceptable psychometric properties based on both clinical and nonclinical
population, including Indian studies (Lieberman et al., 2013). It has been used in varied cultural backgrounds (Mielke et al., 2014; Zhong et al., 2013; Maruff et al., 2009).

A pilot study was conducted in addition to the reported acceptable psychometric properties and its wide utility of CogState battery to find the ease of use of these tests, and also to find how long it takes to complete the tests. Furthermore, the opinion of five local experts in the field of the neuropsychological battery was sought to check the face validity of this battery. The experts did not have any reservation for the use of the CogState battery.
**Table 1.** Description of cognitive tasks used in the study (CogState, 2011)

<table>
<thead>
<tr>
<th>Task name</th>
<th>Cognitive function</th>
<th>Description of variable and unit of measurement</th>
<th>Variable code</th>
<th>Unit of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection (DET)</td>
<td>Psychomotor function</td>
<td>Speed of performance; mean of the log 10 transformation of reaction time for correct response</td>
<td>lmn</td>
<td>Log10 milliseconds</td>
</tr>
<tr>
<td>Identification (IDN)</td>
<td>Attention</td>
<td>Speed of performance; mean of the log 10 transformation of reaction time for correct response</td>
<td>lmn</td>
<td>Log10 milliseconds</td>
</tr>
<tr>
<td>One Card Learning (OCL)</td>
<td>Learning</td>
<td>Accuracy of performance; arcsine transformation of proportion of correct response</td>
<td>acc</td>
<td>Arcsine proportion</td>
</tr>
</tbody>
</table>

**Lower the score= better the performance**

**Higher score= better**
<table>
<thead>
<tr>
<th>Task</th>
<th>Type</th>
<th>Measure of Performance</th>
<th>Transform</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Back Memory (OBN)</td>
<td>Working memory-</td>
<td>Accuracy of performance; arcsine transformation of proportion of correct response</td>
<td>Arcsine</td>
</tr>
<tr>
<td>Social Emotional Cognition Task (SECT)</td>
<td>Social-emotional-cognition</td>
<td>Accuracy of performance; arcsine transformation of proportion of correct response</td>
<td>Arcsine</td>
</tr>
</tbody>
</table>

**Higher score = better**

performance
**Intervention and Validation**

There are different forms and traditions of mindfulness. The body-scan technique is the primary aspect of the insight-oriented meditation in *vipassana* tradition. Audio instructions for the practice of body-scan meditation are available widely on the internet, both formally and informally. The author himself has significant experience in this form of meditation. He has completed multiple courses on *vipassana* meditation, including a 10-day residential retreat and three-month online course.

For the purpose of this study, a script was developed for the mindfulness training group by the author after consulting various *vipassana* teachers and experts. The script was then validated by five experts that included two seasoned meditators, two *vipassana* instructors, and an academic expert on mindfulness meditation. Furthermore, the script was used as a practice for five adults as a tryout and their suggestions, especially regarding the clarity of instruction, were incorporated. These five adults were not the part of the main study.

The intervention comprised of a six-day practice of body-scan meditation. Each session contained 25 minutes of actual body-scan practice. The main practice was preceded and followed by a few minutes of discussion. The 25 minutes session comprised an initial 5-minute mindfulness breathing session, also called *anapana* in the Pali language, and the remaining 20 minutes were spent on the actual body-scan meditation. Mindfulness breathing is primarily concentration meditation, although one could also use it as insight-oriented meditation. Mindfulness breathing was administered at the
beginning so that the participants could calm down and prepare themselves for the body-scan meditation with improved concentration and focus.

**Detailed procedure of experimentation**

The individuals who were assigned to the experimental mindfulness meditation group practiced the meditation in two groups for six consecutive days at the same time. One session was in the morning, and the other was scheduled in the evening. Participants could choose to be a part of any one session, but they would have to remain in the same timing and group throughout the study. The author himself facilitated the entire intervention.

The baseline measures of all the variables of all the participants were taken before the first session of the mindfulness practice. Computerized forms were used to administer the MAAS-State and PANAS Scales. CogState computer software was used to measure the cognitive function. Special cautions were taken while measuring cognitive function. All the measurement was conducted in a quiet and comfortable environment in the college psychology laboratory following the protocol of the CogState battery. The same place was used to take the post-test measures. Multiple computers were used to administer the scales and tests; however, the same computer designated for an individual was used for the measurement of cognitive function as prescribed by the CogState manual. Each participant took time ranging from 15 to 25 minutes for the administration of the scales and tests.
The first day of the mindfulness training session started with the brief introduction of the concept of mindfulness and related concepts. The participants’ expectation and other relevant inquiries were discussed and clarified at the beginning. There was a brief discussion allowing participants to share their experience and clarify their doubts at the end of the 25 minutes session. The remaining sessions also began with a discussion and sharing of experiences, followed by 25 minutes of mindfulness meditation practice, and ended with a few minutes of discussion. The facilitator clarified all inquiries. The important observations made by the facilitator during and in between the sessions were documented. The post-test measures were taken at the end of the session on the 6th day.

The active control group sessions were scheduled after a week of the completion of the experimental group session. They were also placed into two groups in the afternoon and evening. They followed the same set of rules that were followed by the participants in the experimental group. The same cautions were applied while taking the measures of the active control group as well. The only difference between the active control group and the mindfulness training group was that the active control group did not practice meditation. Instead, participants in this group sat calmly and peacefully for 25 minutes for six consecutive days listening to soothing instrumental music while reading a non-fiction book of their choice. They continued to read the same book they chose on the first day. Pre-test and post-test measures were taken on the first day before the beginning of the session and at the end of the 6th day of the session respectively.
Analysis of the data

The raw scores were processed for data cleansing before it was fed in IBM SPSS for analysis. The raw score was transformed either using log10 transformation or arcsine transformation as suggested by the CogState research manual. Descriptive statistics and paired student-t test were used for the analysis followed by Cohen’s index test to assess the actual effect size (ES). Cohen’s index (d) was calculated by dividing pooled mean difference by pooled standard deviation (SD). Statistical significance was tested against 0.05 levels. Any test yielding level of significance of 0.05 or less than 0.05 is indicated by asterisk mark in results chapter.