

5. METHODS

5.1 PARTICIPANTS

5.1.1 Source of subject

Participants were healthy school adolescents who attended Yoga based Personality Development Camp (YPDC) in summer holidays in the serene campus of S-VYASA Yoga University, Bangalore. Participants' age ranged from 12 to 16 years were included.

5.1.2 Sample size

On the conservative side, considering a moderate effects size, according to Cohen (1988), sample sizes were calculated for all the studies. For correlational study (effect size = 0.3), required sample size was calculated as 138, and for the experimental design (effect size = 0.5), the required sample size was calculated as 54. For all the above calculations, G*Power 3.0 was used, and alpha was fixed at 0.05, power at 0.95, and assuming two tailed condition.

5.1.3 Inclusion Criteria

- Normal health status
- Both genders
- Normal or corrected to normal vision
- Proficiency in English
- Age ranging 12 to 16

5.1.4 Exclusion criteria

- Major disability
- History of neurological disorder

- History of psychiatric disturbance
- Undergoing any medication.

5.1.5 Ethical consideration

Signed informed consent was obtained from the parent or guardian of the child at the time of registration, after they had read the proposal that involves non invasive data collection methods and risks free intervention. All procedures were reviewed and accepted by the institutional ethical committee of S-VYASA University. The adolescents were explained in detail about the nature of the study and the voluntary nature of participation and were not provided with any incentives for their participation.

5.2 DESIGN AND PROCEDURE

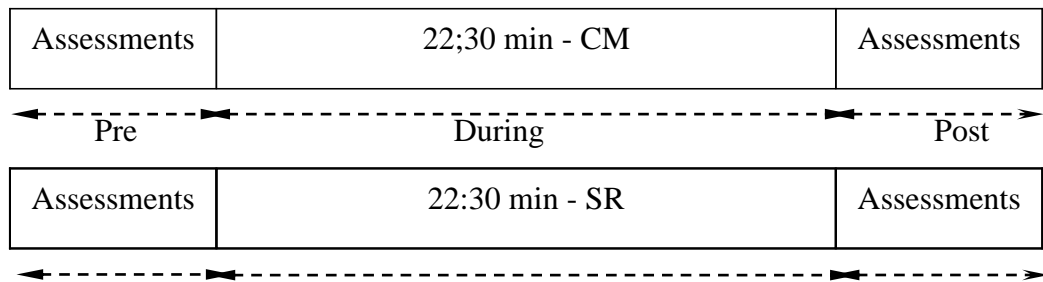
The research design was novel in incorporating different research methods such as Correlational, Pre-Post and Self as Control experimental designs. To establishing the normative data for working memory test as well as cross-section design to understand the relation between mindfulness and working memory, assessment was conducted on the initial day. Moreover, for experimental study data to evaluate the effect of yoga was assessed on the first and tenth day of the YPDC. Further for self as control design to evaluate the immediate effect of CM on working memory and state anxiety was collected on 9th and 10th day of YPDC. Detail descriptions of the designs are depicted in the following diagram. The participants were given training for the practice of both CM and SR for 8 days for self as control. They were assessed before and after equal duration of both CM and SR. The assessments were taken on two consecutive days, on day 9 and 10. The subjects were randomly assigned into two groups equally. Subjects were tested on the state anxiety and working memory immediately before and after a session of CM of 22:30 minute duration on one of the days, and immediately before

and after an equal duration of SR on the other day. The first group performed CM on day 9 and SR on day 10, and the second group with the order reversed.

Figure-5.2a: Design of the Study

PRE	YOGA BASED PERSONALITY DEVELOPMENT CAMP (YPDC)							SR	CM
Day-1	Day-2	Day-3	Day-4	Day-5	Day-6	Day-7	Day-8	Day-9	Day-10
	CYCLIC MEDITATION & SUPINE REST							CM	SR
	YOGA BASED PERSONALITY DEVELOPMENT CAMP (YPDC)							POST	

Figure-5.2b: Time allocation within sessions for self as control design.



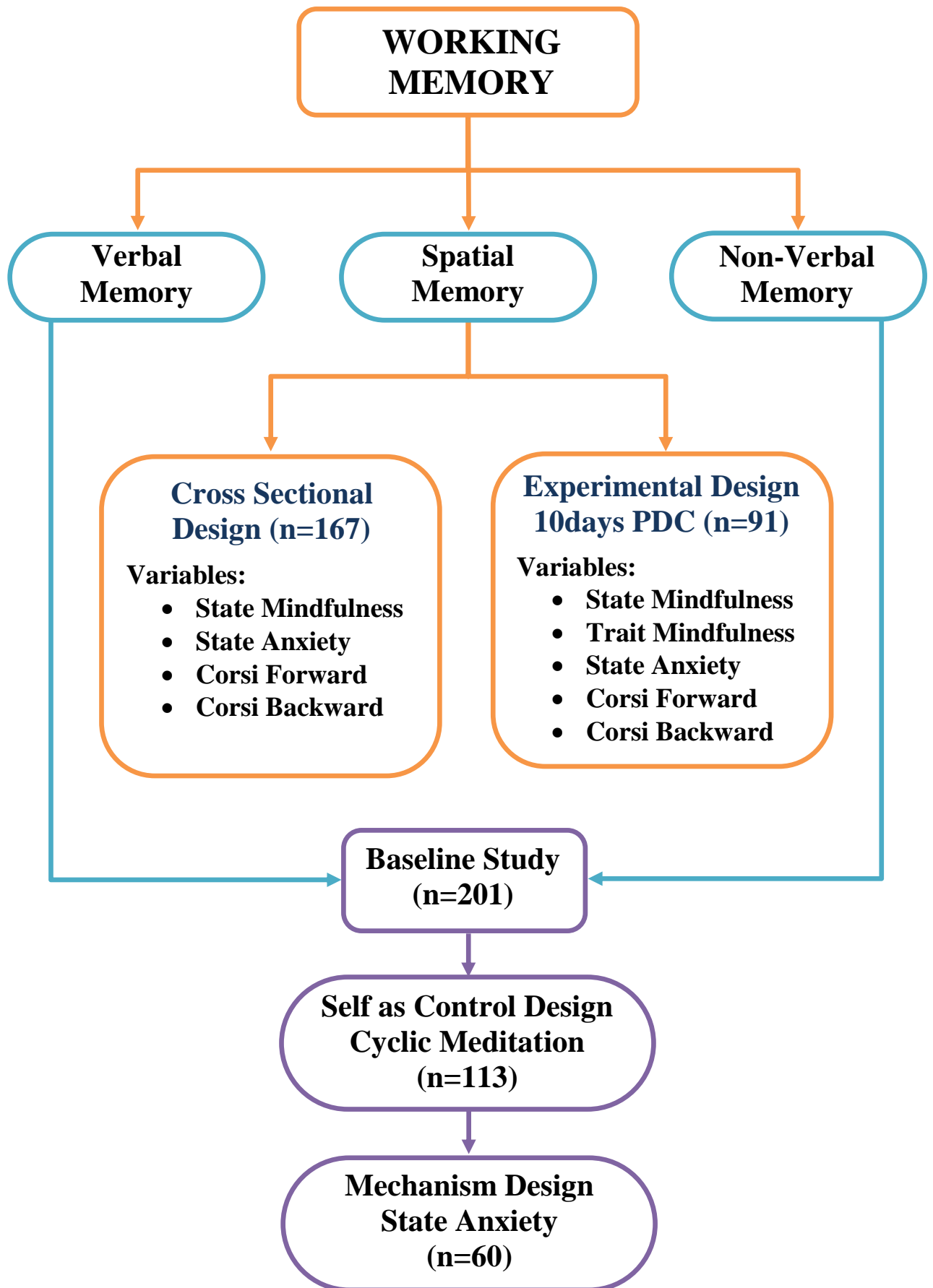


Figure-5.2c: Pictorial representation of the Designs

5.3 INTERVENTION

5.3.1 Yoga based Personality Development Program

Yoga based Personality development camp (YPDC) consisted of training in different yoga based techniques (Telles, Hanumanthaiah, Nagarathna, & Nagendra, 1993) for approximately eight hours a day, for 10 days. It included specialized yoga module for overall personality development such as yogasanas, breathing practices, eye-cleansing techniques, meditation, emotional culturing sessions, Vedic chanting, and yogic games. Further, the training also included guided relaxation and Cyclic Meditation (CM). (Detailed YPDC program given in Appendix - 2)

5.3.2 Experimental session - Cyclic Meditation (CM)

Subjects were instructed to keep their eyes closed throughout the practice during CM and SR. CM used pre-recorded instructions, which emphasized the need to carry out the practice slowly, with awareness and relaxation. Practice starts with subjects lying on their back in supine (*Śavāsana*) and consists of the following sequence:

Chanting of a verse from the *Muṇḍūkya Upaniṣat* (Chinmayananda, 1984)(0:40 min);

Isometric contraction of the muscles of the body ending with supine rest (1:00 min);

Slowly getting up by shifting the body to the left side and standing at ease (*Tāḍāsana*),

‘balancing’ the weight on both feet, called centering (2:00 min); The first standing

lateral bending posture, towards the right side (*Ardha kaṭi cakrāsana*) (1:20 min);

Tāḍāsana (1:10 min) with instructions about relaxation and awareness; *Ardhakaṭi*

cakrāsana bending toward the left side (1:20 min); *Tāḍāsana* as previously (1:10 min);

Forward bending (*Pāda hastāsana*,) (1:20 min); *Tāḍāsana* as previously (1:10 min);

Backward bending (*Ardha cakrāsana*,) (1:20 min); Slowly coming down into the supine

posture (*Śavāsana*) with instructions to relax different parts of the body in sequence (10:00 min). All postures are practiced slowly, with instructions to be aware of all felt sensations. Total duration of practice is 22: 30 minutes all postures are practiced slowly, with instructions to be aware of all the felt sensations (Balaram & Nagendra, 2010). Total duration of practice is 22.30 minutes. (Detailed CM practice is given in Appendix - 3)

5.3.3 Control Session - Supine Rest (SR)

During SR session, participants were asked to relax in the corpse posture (*Śavāsana*). In *Śavāsana* participants had been lying flat on the floor with their legs to one side, arms away from the sides of the body, palms facing upwards and with the eyes closed. This control session was also for the equivalent duration, i.e., 22:30 min. (Manjunath & Telles, 2004). During the training, participants had been given instruction to attempt to continue relaxation while being aware of body sensations during *Śavāsana* (Subramanya & Telles, 2010). This is a standard yoga posture, intended for relaxation (Muktibodhananda, 1985).

5.4 ASSESSMENT

5.4.1 Rationale for choosing these tools

One of the objectives of yoga practices is to enhance the mindfulness. The concept mindfulness and the practice employed to develop mindfulness have in recent years come into view as one of the main focus of study within the positive psychology movement. Mindfulness is conceptualized as a state of attentiveness to present events and experiences that is unmediated by discriminating cognition (Brown, Ryan, & Creswell, 2007). The study demonstrated that mindfulness brings about various positive

psychological effects, emotional reactivity, self regulation and antidotes against common forms of psychological distress (Keng, Smoski & Robins, 2011; Hayes & Feldman, 2004). Mindfulness is described as a state or trait in which an individual becomes increasingly aware and attentive in the moment. Initial researches on mindfulness-based programs were for adults, more recent focus has been on the well-being of children's and adolescents; as a result, mindfulness based activities in schools is becoming prevalent and popular. Schools-based mindfulness intervention has reported promising evidence of its acceptability, evidence of its impact on depressive symptoms, efficacy in reducing stress and bolstering well-being (Kuyken et al., 2013).

The human brain appears to have a synchronized system that directs Working memory is a limited capacity system serving to keep "active" a limited amount of information for a brief period of time, and then to operate on it (Teixeira, Zachi, Roque, Taub & Ventura, 2011), has also been conceptualized as a component of higher-order cognitive processes (Engle 2002). The majority of mental health disorder encompasses the influence of anxiety level (Kessler et al., 2009). Anxiety can be due to distraction, disruption, and incapacity, which in turn declines cognitive performance (Vytal, Cornwell, Arkin & Grillon, 2012). Anxiety evokes several distinct emotional, cognitive, and perceptual realms (Dvorak-Bertsch, Curtin, Rubinstein & Newman, 2007). Previous reports have shown, resources for the executive process of working memory engages in anxious thought and limits the resources committed to working memory (Vytal et al., 2012 & Dvorak-Bertsch et al., 2007).

5.4.2 Anxiety Assessment

The state-trait anxiety inventory (STAI) consists of two questionnaires of 20 items each (Spielberger, 1983). The first questionnaire measures state anxiety (how one feels at the

moment); the second, trait anxiety (how one generally feels). Standardized and Short-Form (SF) of state anxiety has been used for this study (Marteau & Bekker, 1992). STAI-SF consists of six items assessing the extent to which patients feel such as calm, tense, upset, relaxed, content and worried on a 4-point scale ranging from not at all to very much. Items consist of equal numbers of the anxiety-present and anxiety-absent. Few items are scored in reverse order to avoid a response bias. The items were summed to produce a total score in which higher scores are related to greater anxiety. Further standard and SF of state anxiety have demonstrated good reliability coefficient to 0.80 and 0.82. (A sample sheet of STAI & STAI-SF given in Appendix - 4&5)

5.4.3 State Mindful Attention Awareness Scale (SMAAS)

The SMAAS is a valid tool for measuring state mindfulness (Brown, & Ryan, 2003). The scale is designed to assess the short-term or current expression of a core characteristic of mindfulness; this is a receptive state of mind and sensitive awareness of observing the present moment. The SMAAS draws items from the trait form of the MAAS (e.g., "I'm finding it difficult to stay focused on what's happening in the present"). SMAAS has shown excellent psychometric properties (Cronbach's alpha = 0.92). (A sample copy of SMAAS given in Appendix - 6)

5.4.4 Child and Adolescent Mindfulness Measure (CAMM)

The CAMM (Greco, Baer, & Smith, 2011) was administered to evaluate the mindfulness. The CAMM is a 10-item measure of mindfulness and assesses the degree to which children and adolescents observe internal experiences, act with awareness, and accept internal experiences without judging them. Respondents were asked to indicate how true each item reflected their experience using a 5-point scale ranging from 0 (Never true) to 4 (Always true). All items in this scale described actions contrary to a

mindfulness perspective therefore all items were reverse scored. A total mindfulness score was generated by summing the total items. Higher scores indicate higher levels of mindfulness. The CAMM demonstrates good internal consistency, with Cronbach's alpha = 0.87. (A sample sheet of CAMM given in Appendix - 7)

5.4.5 Verbal and Non-Verbal Memory

The test stimuli were projected on a screen for 10 seconds each allowing participants to memorize. After the ten different slides had been shown, a mathematical problem (e.g., 7 minus 4 plus 9 minus 3 plus 6 minus 5 minus 8 plus 2) was shown on the screen. Immediately after this, the subjects were asked to recall and write-down (or Non-Verbal Memory, to draw) within 60 sec the 10-test items which had been shown to them. Further, to test verbal memory, standard nonsense syllables of three letters, e.g., LYB, were selected from a prepared list (Baddeley, 1993). Non-verbal Memory test consisted of ten simple stroke drawings. Geometrical or other shapes which could be described verbally, e.g., square or a circle had not been used. The drawings were very simple and easy to reproduce. Correct response for both verbal and non-verbal tests had been scored as '1' while incorrect one as a '0'. During the assessment, subjects were asked to sit erect in the floor, with participants approximately a meter apart to avoid distraction. Four different sets of 10-nonsense syllables have presented on before and after each session (experimental and control). As described for verbal Working Memory, there were four separate, similar sets of 10-line drawings each for before and after each session. Intervention sessions and assessments were done as groups by yoga therapist and trained assistants in the neuropsychological testing laboratory (A sample content of VM and NVM is given in Appendix - 8).

5.4.6 Corsi Block-Tapping Task

The Corsi Block-Tapping task is a measure of visuo-spatial working memory (Kessels et al, 2000). A digital version of the task was used. The Corsi Block task was programmed presented by the INQUISIT Millisecond software package (Inquisit 3, 2012) on a Dell computer, 17-inch colour monitor. For each trial, nine randomly arranged blue squares were shown on the screen. Each trial consisted of a sequence of blocks that light up one block per second. Adolescents were instructed to remember the sequence. Once a sequence had finished, participants reproduce the sequence, by clicking those blocks in the same order for Corsi forward recall, while they have to reproduce the order in reverse for Corsi backward. Two trials of each sequence length were shown, and sequences gradually increased in length from two to nine blocks. If participants correctly reproduced at least one of the trials of the same sequence length, then the sequence length was increased by one. The task continued until both trials of the same sequence-length were incorrect, or participants completed trials with the largest sequence. We recorded the number of the longest sequence remembered as Block Span and number of correct sequence as total correct (Teixeira, Zachi, Roque, Taub, & Ventura, 2011) (A sample image of Corsi Block-Tapping Task is given in Appendix-9).

5.5 DATA EXTRACTION AND ANALYSIS

The data were collected using self-reported questionnaire and computers. All statistical analyses were performed using the Statistical Package for Social Sciences (version 16.0). Correlation, Independent-samples t-tests and Paired sample t-tests, procedures were used for statistical analyses.

5.5.1 State anxiety

Items consist of equal numbers of the anxiety-present and anxiety-absent. Few items are scored in reverse order to avoid a response bias. The items were summed to produce a total score in which higher scores are related to greater anxiety

5.5.2 State Mindfulness

To have high scores reflect higher state mindfulness, reverse score all items then average all 5 values.

5.5.3 CAMM

Items in this scale described actions contrary to a mindfulness perspective therefore all items were reverse scored. A total mindfulness score was generated by summing the total items.

5.5.4 Verbal and Non-Verbal Memory

Correct response for both verbal and non-verbal tests had been scored as '1' while incorrect one as a '0'. The items were summed to produce a total score on verbal and non-verbal tests. Higher scores are related to verbal and non-verbal.

5.5.5 Corsi Block-Tapping Task

The number of the longest sequence remembered as Block Span and number of correct sequence as total correct (Teixeira, Zachi, Roque, Taub, & Ventura, 2011).