CHAPTER 5

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5.1 PARTICIPANTS

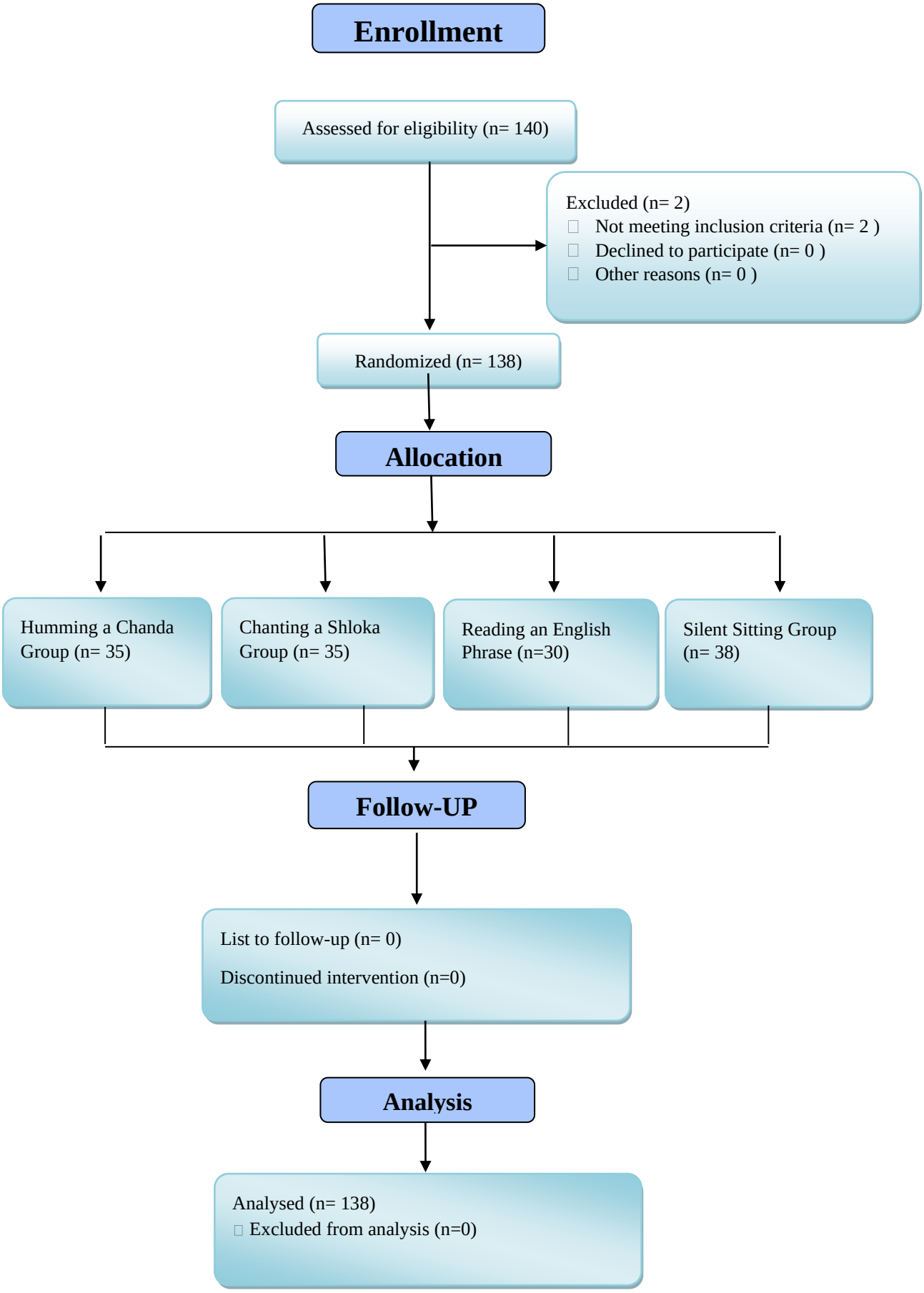
5.1.1 Sample Size

This sample size was obtained by calculating the Effect size as 0.94, fixing alpha as "0.05", power of the study as 0.8, based on the previous study (Telles et al., 2017). But considering the rate of drop out and conduct an appropriate statistical analysis, a sample size of 120 participants was considered for the proposed research.

5.1.2 Selection and Source of Participants

Participants for the study were appointed from a CBSE School called Samsidh Mount Litera Zee School, from Urban Bangalore, India. Children from grades 7 and 8 who met the inclusion criteria were allocated into 4 groups of the study. Randomization for groups could not be done as these kids already were in 4 different sections and shuffling them during school hours was not permitted. A total of 140 students (12.12 ± 0.74 years) were screened, out of which 138 met the inclusion criteria and were allocated into four groups; Humming *(HC)*, Chanting (CS), English Reading (RE) and Silent sitting (SS).

Fig 1: Trial Profile of the study



5.1.3 Inclusion Criteria

The criteria followed to include the subject in the current trial are the following

- Subjects from the age range between 11 and 13 years were recruited.
- Both male and female subjects were included in the study.
- Subjects who could read and write English were recruited

5.1.4 Exclusion Criteria

The criteria followed to exclude the subject in the current trial are the following

- Subjects diagnosed with learning disabilities and cognitive impairments were excluded.
- Subjects with auditory deficits were excluded.
- Subjects who are under medication for neurological and psychiatric disorder excluded.
- Subjects having difficulties in reading and writing English were excluded.

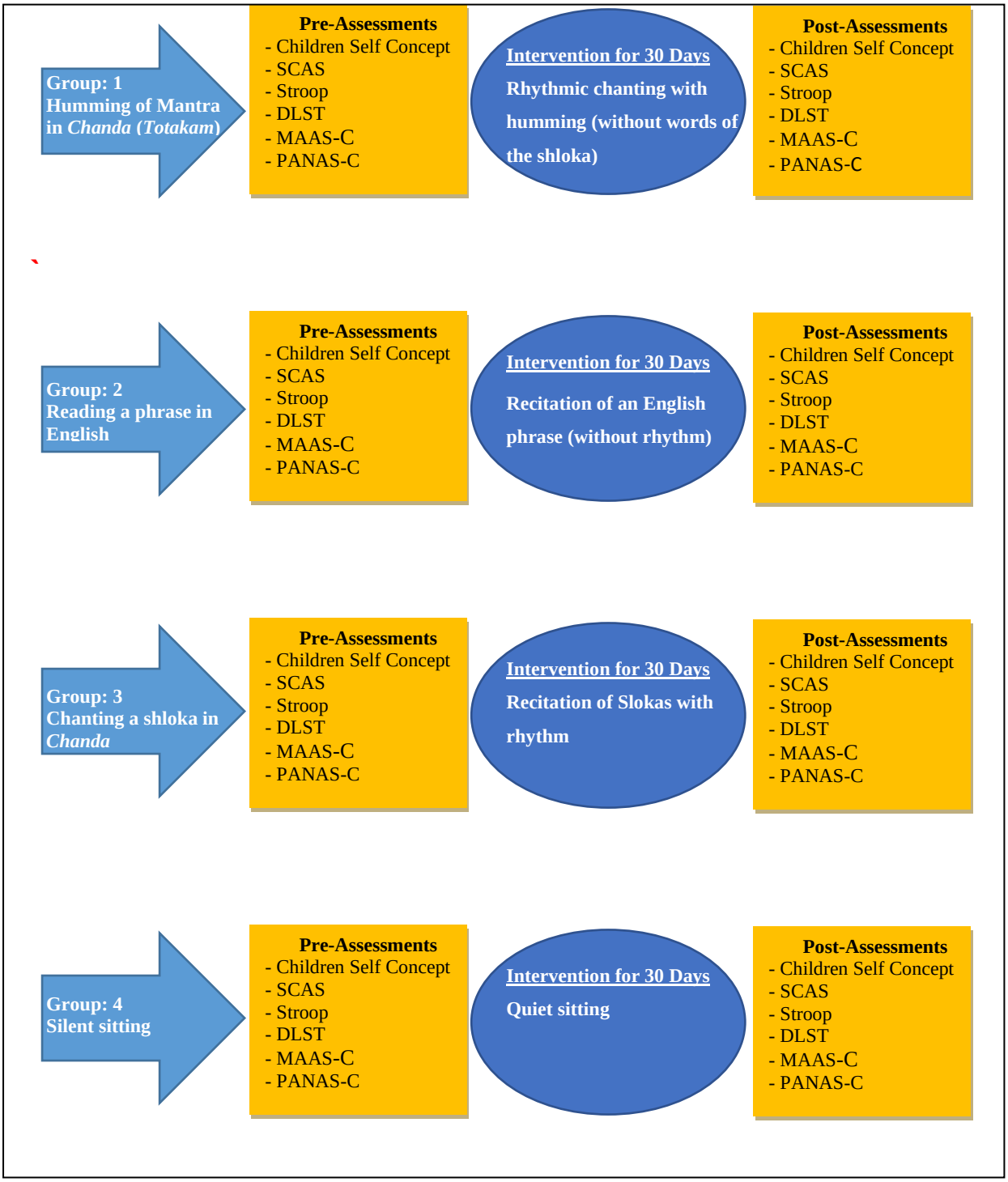
5.1.5 Ethical Consideration

The study was approved by the Institutional Ethics Committee, S-VYASA University. A written informed consent was obtained from parents of the minors after explaining the trial of this research in detail.

5.2 DESIGN OF THE STUDY

The current research was a ‘Four-armed controlled design’, wherein all the participants were divided into four groups viz., ‘Humming’, ‘Chanting’ ‘Reading an English phrase’ and ‘Silent sitting’. All the variables were recorded on ‘Day 1’ and ‘Day 30’. All the four groups were asked to practice their respective interventions for 5 minutes, 3 times a day, making it a 15 minutes intervention every day. Group wise training was carried out in separate rooms, provided by the school. Every 10 students had one volunteer teacher to administer and report adherence of their practice. The HC and CS group were trained by the authors who are experts in *Chandas* and recitation of shloka. The phrasing, smoothness and pace were closely monitored by the authors as rhythm is the most important part of chanting shlokas which is our primary intervention.

Fig 2: Capturing the design of the study.



5.3 ASSESSMENTS

5.3.1 Stroop color-word test (SCWT) –

Stroop, in 1935 originally proposed the most common type of SCWT (Stroop, 1935). The Stroop color-word task measures the executive function involving word, color and an interference naming response. In effect the test measures the participant's control over neuropsychological functions involved in color and word naming responses. SCWT is a highly reliable tool with an alpha of 0.89 for the color card, 0.93 for word card, and 0.82 for color-word card (Jensen, 1965). Two more studies conducted in India, found the test suitable for neuropsychiatric evaluation (Pilli et al., 2013; Suresh et al., 2018). Since the test is reliable, measures an important aspect of cognitive performance and has been used in Indian studies, it was included in this study. The test consists of three tables or pages and the participant needs to read these three tables as fast as possible (Scarpina & Tagini, 2017). The three tables are composed of a neutral test, a congruent test, and an incongruent test respectively. For the neutral and congruent test, individuals are required to name the color of irrelevant letters (e.g., GREEN), a color patch, or the corresponding color word (e.g., "blue" is printed in blue ink) and the incongruent test, an individual needs to suppress reading the meaning of the word and respond to the color of the ink which does not match the color name (e.g., "Blue" is printed in red ink). Usually, the incongruent test takes a longer response time when compared to both the neutral and congruent test. The delay of the response in the incongruent test is called "Stroop effect," and it associated with the control executive function (Ruff et al., 2001; Song & Hakoda, 2015; Zysset et al., 2001). The test extracts three scores namely Stroop word score, Stroop color score and Stroop color-word score. These scores were directly used for the analysis.

5.3.2 Digit Letter Substitution Test (DLST):

DLST was suggested as an alternative (M. V. Natu & Agarwal, 1995) to DSST (Digit symbol substitution test) which was the most commonly used test than any other psychomotor test back then (Stone, 1984). DLST is similar to DSST except that, digits have to be substituted by letters from the English alphabet instead of symbols. DLST consists of randomly arranged digits in rows and columns, and students are asked to substitute as many target digits as possible in the specified time of 90 seconds. The students are asked to substitute as many target digits as possible in the specified time of 90 seconds. The letter substitution may be undertaken in a horizontal, vertical, or randomized manner by selecting a particular digit. The total number of substitutions and wrong substitutions are scored. The net score was obtained by deducting the wrong substitutions from the total number of substitutions attempted (MV Natu et al., 1997).

5.3.3 Spence children's Anxiety scale:

Spence Children Anxiety Scale is used to assess a child's approach towards frequency in which they experience symptoms of anxiety like separation anxiety, social phobia, obsessive-compulsive disorder, panic/agoraphobia, fears of physical injury and generalized anxiety/overanxious disorder. The original article which demonstrated the development of Spence children's anxiety scale (SCAS) involved a large sample of Australian children aging between 8-12 years (Spence, 1998).

Spence children anxiety scale is a self-measure tool originally developed to measure the anxiety symptoms in children aged 8-12 years. This scale consists of 44 items out of which 38 items are further categorized into six sub-scales of specific anxiety mentioned above and the remaining 8 items are positive fillers in order to reduce negative response bias. Children are asked to response with the frequency in which these symptoms occur

on a four-point scale ranging from Never (scored 0) to Always (scored 3). The total score is then calculated by summing up scales of all 38 anxiety symptom items (Spence et al., 2003). In the year 1998, Spence showed high internal consistency for the total score and factor scores, acceptable 6-month test–retest reliability, and high concurrent validity with another similar scale called Revised Children's Manifest Anxiety Scale (RCMAS). SCSC has been found to be a highly reliable tool to measure anxiety in school going adolescence (alpha = 0.92) (Essau et al., 2002)

5.3.4 Children's self-concept Scale:

Self-Concept or Self Esteem is an important construct of a child's psychology and has been studied by a large number of researchers using standardized tools (Kwan et al., 2007). The Children's Self -Concept Scale was originally proposed by Piers and Harris and it has a multidimensional theory of self-concept which is Global feelings and specific feelings. Global feelings meaning 'how a person feels about himself in general' and Specific meaning 'how a person feels about himself in a specific area of functioning (Piers & Harris, 1969). This scale consists of 80 items of self-concept further divided into six sub-domains namely: intellectual and academic status (17 items), behaviour (16 items), anxiety (14 items), appearance (13 items), popularity (12 items), and satisfaction (10 items) (Yang et al., 2013). Children's Self-Concept Scale is a highly consistent tool with an alpha of 0.91 (Scatolini et al., 2017)

5.3.5 Mindfulness Attention Awareness Scale for Children (MAAS-C):

The Mindfulness Attention Awareness Scale was originally developed by Brown and Ryan (Brown & Ryan, 2003) and is one of the most popular instruments to measure mindfulness (Ruiz et al., 2016). A children's version of this scale was later developed and validated in the year 2011 which showed that MAAS-C had high internal consistency

(e.g., Cronbach's alpha) and a one-factor solution. The Mindful Attention Awareness Scale—Children (MAAS-C), as well as a battery of measures assessing a corpus of dimensions of well-being, includes self-concept, optimism, positive and negative affect, school efficacy, classroom autonomy and supportiveness, depression, and anxiety (Lawlor et al., 2014).

5.3.6 Positive and Negative Affect Scale for Children:

The Positive and Negative Affect Scale for Children (PANAS-C) was administered before and after intervention. PANAS-C is a 27-item tool (Laurent et al., 1999) to discern both positive and negative affect of an individual and is among the most extensively used instruments to measure emotional and affect impairments. Positive affect implies experiencing feelings like happiness, joy, enthusiasm, alertness etc. while Negative Affect is related to experiencing feelings like anger, fear, guilt etc. (Ortuño-Sierra et al., 2019). PANAS is a highly reliable tool with its alpha reliability ranging from 0.86 to 0 .90 for Positive Affect and from 0.84 to 0.87 for Negative Affect and when moderately intercorrelated r = -.27 (Watson et al., 1988).

5.4 INTERVENTIONS

Chandas are rhythms or pauses used in Sanskrit poetry. They are one of the most crucial tools for perfection in language and poetry. Derived from the word 'chad' which literally means delight. There is no poetry without *chandas* in Sanskrit language. Hence, thorough knowledge of *chandas* is necessary to understand and appreciate any poetic composition in Sanskrit. While there have been studies on the impact of music or chanting on children's psychology, there are no studies on the effect of *chandas* in particular. The current research trial had four groups which were (1) Humming the *Chanda* or rhythmic recitation without actual chanting (HC group), (2) Chanting a shloka (CS group), (3) reading an English phrase (RE group) and (4) silently sitting (SS group). The HC group

was oriented into learning the rhythm (by humming) of a Yoga based recitation called *totakam*. *Totakam*is Yoga based recitation with a very simple pattern and has 12 syllables where every third syllable is elongated. The reason for this intervention group was to nullify the effect of words or the meaning of verse from chanting, completely. The CS group children were made to learn the first four lines of a Sanskrit verse called*Madhurāśtakam*, in *TotakamChanda*, written by Shri *Vallabhācarya*.

अधरं मधुरं वदनं मधुरंनयनं मधुरं हसितं मधुरं

हृदयं मधुरं गमनं मधुरंमधुराधिपतेरखिलं मधुरं ॥

Adharaṁ madhuraṁ vadanaṁ madhuraṁ

nayanaṁ madhuraṁ hasitaṁ madhuraṁ

hṛdayaṁ madhuraṁ gamanaṁ madhuraṁ

madhurādhipaterakhilaṁ madhuraṁ

The RE group was taught an English phrase *"When your happiness is dependent upon what is happening outside of you, constantly you live as a slave to the external situation."* By Jaggi Vāsudev, widely known as Sadhguru.

The Silent Sitting Group was requested to sit in silence observing their thoughts with their eyes closed in a quiet room monitored by a teacher.

All the four groups were asked to practice their respective interventions for 5 minutes, 3 times a day, making it a 15 minutes intervention every day. Group wise training was carried out in separate rooms, provided by the school. Every 10 students had one volunteer teacher to administer and report adherence of their practice. The HC and CS group were trained by the

authors who are experts in *Chandas* and recitation of shloka. The phrasing, smoothness and pace were closely monitored by the authors as rhythm is the most important part of chanting shlokas which is our primary intervention.

5.5 DATA EXTRACTION

Stroop color-word test (SCWT) –

The incongruent test in the last page that is the color-word test takes a longer response time when compared to both the neutral and congruent test. The students were instructed before to work as quickly and accurately as possible, completing as many lines of the test as they could in the dedicated time. The raw scores were entered directly in excel for analysis after one month of intervention.

Digit Letter Substitution Test (DLST):

The students are asked to substitute as many target digits as possible in the specified time of 90 seconds. The total number of substitutions and wrong substitutions are scored. The net score was obtained by deducting the wrong substitutions from the total number of substitutions attempted. These raw scores were directly entered in excel for analysis

Spence children's Anxiety scale:

Children are asked to respond to all items of the scale with the frequency in which the symptoms occur. The total score was then calculated by summing up scores of all 38 anxiety symptom items. These raw scores were directly entered into excel for statistical analysis.

Children's self-concept Scale:

Raw score of six sub-domains namely: intellectual and academic status (17 items), behaviour (16 items), anxiety (14 items), appearance (13 items), popularity (12 items), and satisfaction (10 items) were calculated as per the instructions mentioned the manual of Children's self-

concept Scale. Data of all variables were transformed in excel format for statistical calculation

Mindfulness Attention Awareness Scale for Children (MAAS-C):

Students responded to the frequency in which they relate to each question of the scale and the total of these scores were directly entered in excel and compared with the post results after one month of intervention.

Positive and Negative Affect Scale for Children:

Students responded to all 27-question, marking the frequency in which they relate to each emotion and the raw score were entered in excel directly in excel to compared with the post scores after one month of intervention.

5.6 DATA ANALYSIS

The study aimed to test the hypothesis that chanting or humming slokas/mantras in a *chandah* is associated with significant differences in post intervention mean± SD to pre intervention values of children's self-concept scale, anxiety, emotions, sustained attention, executive function, mindfulness and awareness in adolescence. Data was collected on the first day and again on the 30^{th} day. Subjects were explained the details of the assessments scales and instructions were given clearly before answering the scales. Continuous variables were reported as mean ± SD, categorical variables as the frequency with percentage. For continuous outcomes; within-group pre-post comparisons were made by paired 't' test and for between-group comparisons two -sample 't' test was used to compare outcomes at baseline and follow-up. All comparisons were two-sided. $P < 0.05$ was set as the cut-off of statistical significance. A post hoc analysis was run to assess the superiority of group effect on each variable. STATA version 14.2 was used for statistical analysis.