

INFLUENCE OF VARIOUS STYLES OF MANTRA CHANTING ON STUDENT'S COGNITIVE PERFORMANCE

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Abstract

Background: Mantra is a tool to enhance mood regulation, stress management skills, and concentration and awareness. **Materials & Methods:** There were 35 participants including men and women between the age of 20 to 45 years, in the present study. They were all instructed to recite the "Mahamrityunjaya mantra (MM)" for ten days as an orientation programme. Cognitive tools such the Six Letter Cancellation Test (SLCT), Wechsler Memory Scale (WMS), and Mindfulness Attention and Awareness Scale (MAAS) were used. These tools were used to evaluate all six sessions, including the baseline. On the first day of the program, all participants underwent a 10-day orientation, a seven-day washout period, and seven days of post-recording, which included loud chanting (LC), lips movement (LM), silent chanting (SC), audio listening (AL), and silent sitting (SS). As each session lasted 20 minutes, recordings were made for the post-assessment following the intervention for 20 minutes. **Results:** The Repeated measure ANOVA, Friedman test, and Wilcoxon signed ranked tests were done to analyse the data. The Mindfulness following mantra chanting was significantly higher during loud chanting (LC) ($p < 0.05$) compared to the silent chanting (SC) and the baseline. Also, the scores of digits backward (DB) were significantly higher in LC ($p < 0.01$), LM ($p < 0.05$), SC ($p < 0.001$), and AL ($p < 0.01$), compared to baseline. **Conclusion:** Results of the current study suggested that mindfulness prevails following the practice of LC and short-term memory following SC suggestive of more information processing in the amygdala, hippocampus, and pre-central cortex.

Keywords: Mantra Chanting, Mahamrityunjay Mantra, Cognition, Mindfulness

INTRODUCTION

Every society in the world has religious traditions and a set of beliefs to remain on the path of spirituality. As essential components of this belief system, there are well-established methods to attain the ultimate goal of life and maintain good health. Yoga is one such method gaining popularity in recent days and has preventive and therapeutic benefits (Quilty, Saper, Goldstein & Khalsa, 2013). Meditation is an established yogic technique that helps in many psychological conditions such as the reduction of stress, anxiety, depression, and post-traumatic stress disorder (PTSD) symptoms, and improves the quality of life, (Khoury, Knäuper, Schlosser, Carrière & 38 Chiesa, 2017; Hilton et al., 2017 and Jayatunge & Pokorski, 2018). Promotion of emotion regulation, (Tang, Tang & Posner, 2016) improves self-efficacy, (Pandya, 2019) enhances executive attention and mindfulness, (Burger & Lockhart, 2017) working and recognition memory, and decreases negative mood state (Basso, McHale, Ende, Oberlin & Suzuki, 2019). More directly there are some yogic meditation techniques viz., Mindfulness meditation and Cyclical Meditation found to be effective in reducing depression, anxiety, perceived stress and enhances sleep and quality of life (Spadaro & Hunker, 2016 and Varghese, Balakrishnan & Pailoor, 2018). Also, this yoga tradition has many established methods to attain a quiet state of the mind viz. Mantra chanting and Mantra meditation. These techniques have been scientifically validated to demonstrate the psycho-physiological benefits in various 50 categories of subjects (Burke, Lam, Stussman & Yang, 2017). Mantra means an instrument that takes the mind from the state of activity to silence (Feuerstein, 2003). Recitation of Mantra has been a Universal practice and is considered a method to 53 slow down thoughts and attain a one-pointed state of mind (Bormann, Hurst & 54 Kelly, 2013). Mantra meditation (MM) improves attention, awareness, emotional 55 regulation, relaxation, and sleep quality and builds the capacity to cope with stress 56 (Lynch et al., 2018). In addition, MM also improved self-reported spiritual well-being, mindfulness traits, quality of life, and reduction of stress, anxiety, and anger (Orme-Johnson & Barnes, 2014; Bormann, Walter, Leary & Glaser, 2017 and Bormann, Oman, Kempainen, Becker, Gershwin & Kelly, 2006). Not only chanting mantras but listening to mantras also has an impact on general psychological

well-being such as cheerfulness and clarity of mind (Bormann et al., 2006). Transcendental meditation (TM) is also a type of mantra meditation that helps to reduce depression, and post-traumatic stress disorder (PTSD) symptoms and improves many psychological variables such as mindfulness, (Lolla, 2018; Kang et al., 2018 and Barnes, 2018) self-efficacy, mental and physical quality of life and reduced stress.

More recently the recitation of Mantra improved performance related to focused attention in school children undergoing yoga training in a residential setup (Goldstein, Nidich, Goodman & Goodman, 2012). Based on the above background, it is believed that the chanting of various styles of Mantra will have an effect on the cognitive variables in novices.

MATERIAL AND METHODS

Participants

Thirty-five novices, aged between 20 and 45 years (group age Mean and SD = 25.2 ± 6.01) participated in this trial. All participants were undergoing Yoga training at a residential yoga institution, in Bengaluru, South India and all of them were oriented to chant 108 rounds of the Mahamrityunjaya mantra in 20 minutes and every individual was asked to recite a round of mantra per breath during exhalation. Following the orientation, all the participants were asked to restrain the practice for seven days to ensure the washing-out effect of the rigorous chanting of the different styles of mantra. All of them were in normal health based on a clinical examination and none of the recruited participants had a history of smoking or consumption of alcohol or caffeinated beverages. Also, none of them were on medication and did not use any other wellness strategy. Assessments were not done during menstruation in female participants as anxiety and stress remained predominant during this phase. (Pradhan & Derle, 2012) The design of the study was explained to all the participants and their signed consent was obtained.

Design

The study was conceptualized as a “self as -control trial”. All the participants recruited in the research trial were assessed with the variables of attention, mindfulness, and memory following an orientation for ten days and a washout period of another seven days. Hence the baseline recording was done fourteen days after the commencement of orientation. Following the baseline recording, all the participants were recorded for their Baseline recording (BL) on day 1 following an orientation of 17 days including a wash-out period of seven days, and the post recordings were done every seven days subsequently viz., Loud chanting (LC), Lips movement (LM), Silent chanting (SC), Audio listening (AL) and Silent sitting (SS). For the post-assessment, recordings were done after 20 minutes of the intervention and each session lasted for 20 minutes.

Assessments

Six Letter Cancellation Test (SLCT): The six-letter cancellation test (SLCT) consists of a sheet of 22 rows \times 14 columns of randomly arranged letters of the alphabet. The top of each sheet names six target letters. Subjects were given the choice of two possible strategies to cancel target letters (1) all six letters at once or (2) selecting a target letter at a time. It was also suggested that according to their own choice, they follow horizontal, vertical, or random paths on the test sheet. They were told to cancel as many target letters as possible in the test time of 90 seconds (Pradhan & Derle, 2012). Five sets of questionnaires were replicated using the original one and all of them were validated by the experts.

Wechsler Memory Scale (WMS): The Wechsler memory scale is a neuropsychological test designed to measure different memory function in the person. Digit forward, Digit backward and Association learning (easy and hard) sections of the WMS were used in this study. There were different sections that were selected for recordings viz., Digit span forward and backward, verbal paired associate learning (easy and hard) with 10 items each. The verbal paired associate learning task involved the presentation of ten pairs of unrelated words as three trials. After the three trials, the examinee was presented with the first word in each pair and he or she was asked to provide the second word. Out of the 10 pairs, six pairs were semantically simple to recollect (e.g., table-chair). Where such associations existed, it was described as associate learning, hard. (Duchesne & Pruessner, 2013) Like SLCT, the same procedure was followed to replicate five sets of questionnaires of WMS.

Mindfulness Attention and Awareness Scale (MAAS): The MAAS is a 5 – item scale designed to assess the short-term or current expression of a core characteristics of mindfulness, attention and awareness. A reliable and validated tool to assess state mindfulness was administered to the subjects. The questionnaire contains 5 questions to be answered on a scale of 1 (not at all) to 6 (very much); Cronbach’s alpha= 0.92. (Chung et al., 2016).

Intervention

Japa or Mantra involves the repetition of a chosen word, phrase, or set of syllables while passively disregarding any internal or external distractions. Though the different phrase is used for meditation or concentration the intention is the same in research. The mental repetition is very powerful, termed Manasika Japa. The verbal or loud repetition is called

Vaikhari Japa and this Japa huts out all worldly sounds without giving any pause. Repetition in a whisper or humming is termed Upamshu Japa. Five varieties of interventions that were introduced in this trial were Manasika Japa, where the subjects were asked to recite the Mahamrityunjaya mantra (MMM) mentally for twenty minutes, Vaikhari Japa (verbal repetition) or loud chanting (LC), Audio listening (AL), and silent sitting (SS) to watch the spontaneous thoughts for twenty minutes. During the chanting, they were asked to sit comfortably with closed eyes and also, and they were also asked to chant with full devotion. This particular mantra was given during orientation and various styles of recitation as it is said to be beneficial for mental, emotional, and physical health and bestows longevity and immortality. (Sivananda, 2005).

DATA EXTRACTION AND ANALYSIS

SLCT: The total number of cancellations was scored and the net scores were calculated by deducting wrong cancellations from the total cancellations attempted. (Davanger, 150 Ellingsen, Holen & Hugdahl, 2010)

WMS: There were six pairs for the easy task and four pairs for the hard task. Each correct answer was scored as “1” and difficult or hard answer as “2”. This was based on the conventional scoring for the Wechsler memory scale. Continuously Score “1” for the correct repetition of “DF” and “DB”. (Wang et al., 154 2011).

MAAS: Reverse scoring was done for all the items and the average scores were reported. Higher scores indicate higher mindfulness. (Engström & Söderfeldt, 2010)

Data were analysed using the Statistical Package for Social Sciences (SPSS) 18.0 version. Since the data were not normally distributed, the data were analysed using non-parametric tests. For this trial, repeated measures of ANOVA equivalent non-parametric test i.e., Friedman Test was used for overall comparison between sessions, and Wilcoxon Signed Rank test was used for multiple comparisons (t-test).

RESULTS

RMANOVA was used to assess the effect of MMM within the group and between the sessions. There were six sessions Baseline (BL), Loud chanting (LC), Silent chanting (SC), Lip's movement (LM), Audio listening (AL), and Silent sitting (SS). The difference between the groups and states was assessed with the help of the Friedman Test and all sessions were compared with the baseline scores using the Wilcoxon signed rank test.

Table-1: Table showing the Mean \pm SD of the variables for different variety of sessions

Variables	Mean & SD of DF	Mean & SD of DB	Mean & SD of ASL	Mean & SD of NA of SLCT	Mean & SD of MASS
BS	6.17 \pm 2.05	4.0 \pm 2.31	15.71 \pm 3.39	31.54 \pm 7.37	4.45 \pm 1.07
SS	6.34 \pm 1.25	4.08 \pm 2.28	16.01 \pm 3.01	31.85 \pm 6.94	4.58 \pm 0.93
LC	6.51 \pm 1.94	5.2 \pm 2.34	17.84 \pm 2.84	30.51 \pm 5.32	4.74 \pm 1.03
LM	6.71 \pm 1.80	5.25 \pm 2.47	17.95 \pm 2.76	29.91 \pm 5.62	4.70 \pm 1.04
MC	6.85 \pm 2.04	6.142 \pm 2.36	17.44 \pm 3.63	32.8 \pm 6.24	4.46 \pm 1.02
AL	6.77 \pm 1.95	5.85 \pm 2.41	16.6 \pm 2.94	32.11 \pm 6.49	4.51 \pm .98

SLCT and SMAAS: It was observed that the attention score was higher after loud chanting ($p < 0.05$) compared to the baseline. Similarly, the score of mindfulness following mantra recitation was significantly higher during loud chanting (LC) ($p < 0.05$) compared to silent chanting (SC) and the baseline (BL). WMS: It was noticed that the scores of digits backward (DB) were significantly higher in LC ($p < 0.01$), LM ($p < 0.05$), SC ($p < 0.001$), and AL ($p < 0.01$), compared to BL. It was also observed that when the percentage difference of the digit backward (DB) score was calculated with LM, SC, and AL, the score of DB in SC was significantly higher and lower in LC.

Similarly, the scores of DB in AL ($p < 0.01$) were significantly higher compared to LC and LM. But the percentage score of AL was comparatively higher in LM (14.25%) and lower in LC (13.55%). The Mean \pm SD scores of all the variables and the level of significance are detailed in Table-1, 2 and 3.

Table-2: Table showing the “p” values of the variables across the sessions

Variables	Groups					
		SS - BS	LC - BS	LM - BS	MC - BS	AL - BS
Group = DF	p-value	.595	.445	.230	.105	.169
Group = DB	p-value	.257	.005	.042	.000	.001
Group = ASL	p-value	.175	.002	.005	.082	.442
Group = NA	p-value	.551	.492	.298	.279	.561

Group = MASS	p-value	.005	.011	.051	.420	.396
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Table-3: Table showing the mean, and SD of sessions compared with the baseline and the percentage change.

Variables	BS vs other styles									
	BS	SS	BS	LC	BS	LM	BS	MC	BS	AL
DF	6.17	6.34	6.17	6.51	6.17	6.71	6.17	6.85	6.17	6.77
	±	±	±	±	±	±	±	±	±	±
	2.05	1.25	2.05	1.94	2.05	1.80	2.05	2.04	2.05	1.95
DB	4.0	4.08	4.0	5.2	4.0	5.25	4.0	6.142	4.0	5.85
	±	±	±	±	±	±	±	±	±	±
	2.31	2.28	2.31	2.34**	2.31	2.47*	2.31	2.36***	2.31	2.41**
ASL	15.71	16.01	15.71	17.84	15.71	17.95	15.71	17.44	15.71	16.6
	±	±	±	±	±	±	±	±	±	±
	3.39	3.01	3.39	2.84**	3.39	2.76**	3.39	3.63	3.39	2.94
NA of SLCT	31.54	31.85	31.54	30.51	31.54	29.91	31.54	32.8	31.54	32.11
	±	±	±	±	±	±	±	±	±	±
	7.37	6.94	7.37	5.32	7.37	5.62	7.37	6.24	7.37	6.49
MASS	4.45	4.58	4.45	4.74	4.45	4.70	4.45	4.46	4.45	4.51
	±	±	±	±	±	±	±	±	±	±
	1.07	0.93*	1.07	1.03*	1.07	1.04	1.07	1.02	1.07	.98

*P<0.05, **p<0.01, ***p<0.001, comparing the Mean scores of BS with all other styles, using ANOVA statistical test

DISCUSSION

It is quite obvious from the results that the scores of attention and short-term memory following SC and LC were higher but the score of attention was comparatively higher following LC and short-term memory following SC.

In this direction, a study was carried out to compare the recitation of the Gayatri mantra (GM) with Poem line chanting (PL) based on the Digit letter substitution test (DLST). It was noticed that both GM and PL have the higher score of attention but the scores of GM were higher than PL. While comparing the attention scores of the current study with the earlier one, we found that the percentage change in the earlier study was higher (20.53%) than the LC of the current study (3.27%) which clearly indicates that the attention span is higher with a smaller magnitude following the recitation of MMM. However, the percentage scores of mindfulness based on MAAS were higher following LC (6.51%) compared to LM (5.61%), which indicates that mindfulness during LC is higher. In addition, there was another observation with respect to SC; the short-term memory following the recitation of MMM in SC was 200 higher.

To address how MMM effects the improvement of mindfulness and short-term memory following the practice of LC and SC, we need to understand the areas of the brain involved in synthesizing the above-mentioned functions following the practice of Meditation and Mantra recitation. Many previous studies reported improved functions associated with the prefrontal cortex with increased meditation (e.g., attention and working memory) and fewer studies examined the effects on the meditation of the memory functions of the hippocampus/medial temporal lobe (Pradhan & Derle, 2012) Also, it has been demonstrated that mantra-meditation triggered activations in the inferior frontal gyrus bilaterally, the medial prefrontal cortex, anterior cingulate cortex, limbic and superior parietal areas, or the hippocampus, middle cingulate cortex, and precentral cortex bilaterally. More directly Mantra repetition activates the pre-central gyrus, parietal cortex, and medial frontal gyrus. (Duchesne & Pruessner, 2013)

Mindfulness of breathing elicits activations in the dorsal medial prefrontal cortex bilaterally and in the rostral anterior cingulate cortex. During the practice of the same, activations in the bilateral dorsal anterior cingulate cortex and right medial anterior prefrontal cortex, and deactivations in the middle frontal gyrus, dorsolateral prefrontal cortex, precuneus, superior temporal gyrus, and insula have been found. (Chung et al., 2016) It is evidenced in a couple of studies that mindfulness impacts the amygdala associated with emotional processing and the hippocampus associated with memory. Hence, we can indicate that both amygdala and hippocampus are found to be active during mindfulness. Likewise, the Prefrontal cortex is deeply involved in the processing of short-term memory. (Reynolds et al., 2018)

Therefore, we can anticipate that the amygdala and hippocampus following LC and Prefrontal cortex following SC are found to be activated suggestive of significant information processing in these designated areas of the Brain. It is also suggested that there could have been recordings of fMRI during and after the practice of different styles of mantra chanting to strengthen the existing findings.

CONCLUSION

Results suggest that the recitation of mahamrityunjaya mantra improved mindfulness and short-term memory following the practice of Loud chanting and Silent chanting suggesting more involvement of the amygdala, hippocampus, and pre-central cortex.

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