



Impact of Different Styles of Mantra Chanting on Healthy Individuals Based on Cognitive Task

BiswaBandita Kar¹, Bansidhar Mulia², Chandan Kumar Mohapatra³, Pradyumna Kishore Behera⁴, Sashikant Khuntia⁵, Sanjay Kumar Panda⁶, Sanjib Kumar Patra⁷

^{1,3,4,5,6}School of Spiritualism and Yogic Sciences, KIIT University, Odisha, India.

²Kalinga Institute of Medical Sciences, KIIT University, Odisha, India.

⁷Department of Yoga, Central University of Rajasthan, Rajasthan, India.

Abstract

Background

Mantra is a tool to develop attention and awareness, improve emotion regulation and the capacity to cope with stress.

Materials and Methods

In the current study, "there were 35 participants including men and women in the age between 20 and 45 years. All of them were given orientation for chanting of 'Mahamrityunjaya mantra (MM)' for 10 days. There were six sessions including baseline and all the sessions were assessed based on the cognitive tools such as Six letter cancellation test (SLCT), Wechsler Memory Scale (WMS) and Mindfulness Attention and Awareness Scale (MAAS). All the participants were recorded for their Base line recording (BL) on day 1 following an orientation of ten days and a wash out period of seven days and the post recording in 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 as each session lasted for 20 minutes".

Results

The Repeated measure ANOVA, Friedman test and Wilcoxon signed ranked tests were done to analyze the data. The Mindfulness following mantra recitation 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) was 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 the mindfulness prevails following the practice of LC and short-term memory following SC suggestive of more information processing in amygdale, hippocampus and pre central cortex.

Keywords Mantra recitation, mindfulness, memory

DOI Number: 10.14704/nq.2022.20.8.NQ44640

NeuroQuantology 2022;20(8):6161-6169

6161



INTRODUCTION

Every society in the world has religious traditions and set of beliefs to remain in 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 its popularity during recent days has its preventive and therapeutic benefits. [1] Meditation is an established yogic technique helps in many psychological conditions such as reduction of stress, anxiety, depression and post-traumatic stress disorder (PTSD) symptoms and improve quality of life, [2,3,4] promotion of emotion regulation, [5] improves self-efficacy, [6] enhances executive attention and mindfulness, [7] working and recognition memory and decreases negative mood state. [8] More directly there are some yogic meditation techniques viz., Mindfulness meditation and Cyclic Meditation found to be effective in reducing depression, anxiety, perceived stress and enhances sleep and quality of life. [9,10]

Also, this yoga tradition has many established methods to attain 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 categories of subjects. [11] *Mantra* means an instrument that takes the mind from the state of activity to silence. [12] Recitation of *Mantra* has been a Universal practice and considered as a method to slow down the thoughts and attain one pointed state of mind. [13] *Mantra* meditation (MM) improved attention, awareness, emotional regulation, relaxation, sleep quality and builds the capacity to cope with stress. [14] In addition, MM also improved self-

reported spiritual well-being, mindfulness traits, quality of life and reduction of stress, anxiety and anger. [15,16,17,18] Not only chanting of *mantra* but listening of *mantra* also has the impact on general psychological wellbeing such as cheerfulness and clarity of mind. [19] Transcendental meditation (TM) is also a type of *mantra* meditation that helped to reduce depression, post-traumatic stress disorder (PTSD) symptoms and improved many psychological variables such as mindfulness, [20,21] self-efficacy, mental and physical quality of life and reduced stress. [22]

More recently the recitation of *Mantra* improved performance related to focused attention in school children undergoing yoga training in a residential set up. [23] Based on the above background, it is believed that the chanting of various styles of *Mantra* will have its effect on the cognitive variables in novices.

MATERIAL AND METHODS

Participants

Thirty-five novices, age 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, Bengaluru, South of India and all of them were oriented to chant 108 rounds of *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 remains predominant during this phase. [24,25,26] The design of the study was explained to all the participants and their signed consent was obtained. The research trial was approved by the Institution's Ethical Committee".

Design of the Study

The study was conceptualized as "self as - control trial". All the participants recruited in the research trail 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 base line recording was done after fourteen days of the commencement of orientation. Following the baseline recording, all the participants were recorded for their Base line 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 in 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

The following variables recorded during the trial.

Six Letter Cancellation Test (SLCT)

"The six-letter cancellation test (SLCT) consists of a sheet of 22rows × 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". [20] 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 trails. After the three trails, 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. [23] Like SLCT, the same procedure was followed to replicate five sets of questionnaires of WMS".

Mindfulness Attention and Awareness Scale (MASS)

The MASS 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. [24]

Intervention

Japa or *Mantra* involves repetition of a chosen word, phrase or set of syllables while passively disregarding any internal or external distractions. Though different



phrase is used for meditation or concentration but the intention is 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 as *Upamshu Japa*. [18] 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, they were asked to chant with full of 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. [22]

Data Extraction

SLCT

The total number of cancellations was scored and the net scores was calculated by deducting wrong cancellation from the total cancellations attempted. [27]

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 Wechsler memory scale. Continuously Score '1' for the correct repetition of 'DF' and 'DB'. [28]

MAAS

Reverse scoring was done for all the items and the average scores were reported. Higher scores indicate higher mindfulness. [29]

Data analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) 18.0 version. Since the data were not normally distributed, the data were analyzed 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 comparison (t-test).

RESULTS

RMANOVA was used to assess the effect of MMM within the group and between the sessions. There were six sessions such as 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 were assessed with the help of Friedman Test and all sessions were compared with the baseline scores using Wilcoxon signed rank test.

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 the silent chanting (SC) and the baseline (BL).

WMS:

It was noticed that the scores of digits backward (DB) was 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 ($p < 0.01$) was 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%).



DISCUSSION

It is quite obvious from the results that the scores of attention and short-term memory following SC and LC was 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 *Gayatri mantra* (GM) with Poem line chanting (PL) based on Digit letter substitution test (DLST). [30] It was noticed that both GM and PL have the higher score of attention but the scores of GM was higher than PL. While comparing the attention scores of the current study with the earlier, 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. But the percentage scores of mindfulness based on MAAS was 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 higher.

To address how MMM effects in 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 meditation of the memory functions of the hippocampus/medial temporal lobe [31]. Also, it has been demonstrated that mantra-meditation triggered activations in the inferior frontal gyrus bilaterally, [32] the medial prefrontal cortex, anterior cingulate

cortex, limbic and superior parietal areas, [33] or the hippocampus, middle cingulate cortex, and precentral cortex bilaterally [34]. More directly Mantra repetition activates the Pre central gyrus, parietal cortex, and medial frontal gyrus". [35]

"Mindfulness of breathing elicits activations in the dorsal medial prefrontal cortex bilaterally and in the rostral anterior cingulate cortex. [36] During the practice of the same, activations in 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, insula have been found". [37] It is evidenced in couple of studies that mindfulness impacts amygdala [36] associated with emotional processing and hippocampus [38] associated with memory. Hence, we can indicate that both amygdala and hippocampus are found to be active during mindfulness. Likewise, Prefrontal cortex is deeply involved in processing of short-term memory.

Therefore, we can anticipate that 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 MRI 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 suggestive of more involvement of amygdala, hippocampus and pre central cortex.

REFERENCES

1. Quilty MT, Saper RB, Goldstein R, Khalsa SB. Yoga in the real world:



- Perceptions, motivators, barriers, and patterns of use. *Global advances in health and medicine*. 2013 Jan;2(1):44-9.
2. Khoury B, Knäuper B, Schlosser M, Carrière K, Chiesa A. Effectiveness of traditional meditation retreats: A systematic review and meta-analysis. *Journal of Psychosomatic Research*. 2017 Jan 1;92:16-25.
 3. Hilton L, Maher AR, Colaiaco B, Apaydin E, Sorbero ME, Booth M, Shanman RM, Hempel S. Meditation for posttraumatic stress: Systematic review and meta-analysis. *Psychological Trauma: Theory, Research, Practice, and Policy*. 2017 Jul;9(4):453.
 4. Jayatunge RM, Pokorski M. Post-traumatic stress disorder: a review of therapeutic Role of meditation interventions. In *Respiratory Ailments in Context 2018* (pp. 53-59). Springer, Cham.
 5. Tang YY, Tang R, Posner MI. Mindfulness meditation improves emotion regulation and reduces drug abuse. *Drug and Alcohol Dependence*. 2016 Jun 1;163:S13-8.
 6. Pandya SP. Meditation Program Enhances Self-efficacy and Resilience of Home-based Caregivers of Older Adults with Alzheimer's: A Five-year Follow-up Study in Two South Asian Cities. *Journal of gerontological social work*. 2019 Jul 18:1-9.
 7. Burger KG, Lockhart JS. Meditation's effect on attentional efficiency, stress, and mindfulness characteristics of nursing students. *Journal of Nursing Education*. 2017 Jun 29;56(7):430-4.
 8. Basso JC, McHale A, Ende V, Oberlin DJ, Suzuki WA. Brief, daily meditation enhances attention, memory, mood, and emotional regulation in non-experienced meditators. *Behavioural brain research*. 2019 Jan 1;356:208-20.
 9. Spadaro KC, Hunker DF. Exploring the effects of an online asynchronous mindfulness meditation intervention with nursing students on stress, mood, and cognition: A descriptive study. *Nurse Education Today*. 2016 Apr 1;39:163-9.
 10. Varghese MP, Balakrishnan R, Pailoor S. Association between a guided meditation practice, sleep and psychological well-being in type 2 diabetes mellitus patients. *Journal of Complementary and Integrative Medicine*. 2018 Jul 19;15(4).
 11. Burke A, Lam CN, Stussman B, Yang H. Prevalence and patterns of use of mantra, mindfulness and spiritual meditation among adults in the United States. *BMC complementary and alternative medicine*. 2017 Dec;17(1):316.
 12. Feuerstein G. *The deeper dimension of yoga: Theory and practice*. Shambhala Publications; 2003 Jul 8.
 13. Bormann JE, Hurst S, Kelly A. Responses to Mantram Repetition Program from Veterans with posttraumatic stress disorder: A qualitative analysis. *Journal of Rehabilitation Research & Development*. 2013 Oct 1;50(6).
 14. Lynch J, Prihodova L, Dunne PJ, O'Leary C, Breen R, Carroll Á, Walsh C, McMahon G, White B. Mantra meditation programme for emergency department staff: a qualitative study. *BMJ open*. 2018 Sep 1;8(9): e020685.
 15. Orme-Johnson DW, Barnes VA. Effects of the transcendental meditation technique on trait anxiety: a meta-analysis of



- randomized controlled trials. *The Journal of Alternative and Complementary Medicine*. 2014 May 1;20(5):330-41.
16. Bormann JE, Walter KH, Leary S, Glaser D. An internet-delivered mantram repetition program for spiritual well-being and mindfulness for health care workers. *Spirituality in Clinical Practice*. 2017 Mar;4(1):64.
 17. Bormann JE, Oman D, Kemppainen JK, Becker S, Gershwin M, Kelly A. Mantram repetition for stress management in veterans and employees: A critical incident study. *Journal of Advanced Nursing*. 2006 Mar;53(5):502-12.
 18. Bormann JE, Becker S, Gershwin M, Kelly A, Pada L, Smith TL, Gifford AL. Relationship of frequent mantram repetition to emotional and spiritual well-being in healthcare workers. *The Journal of Continuing Education in Nursing*. 2006 Sep 1;37(5):218-24.
 19. Lolla A. Mantras Help the General Psychological Well-Being of College Students: A Pilot Study. *Journal of religion and health*. 2018 Feb 1;57(1):110-9.
 20. Kang SS, Erbes CR, Lamberty GJ, Thuras P, Sponheim SR, Polusny MA, Moran AC, Van Voorhis AC, Lim KO. Transcendental meditation for veterans with post-traumatic stress disorder. *Psychological Trauma: Theory, Research, Practice, and Policy*. 2018 Nov;10(6):675.
 21. Barnes VA. Transcendental Meditation and treatment for post-traumatic stress disorder. *The lancet. Psychiatry*. 2018 Dec;5(12):946.
 22. Goldstein L, Nidich SI, Goodman R, Goodman D. The effect of transcendental meditation on self-efficacy, perceived stress, and quality of life in mothers in Uganda. *Health care for women international*. 2018 Jul 3;39(7):734-54.
 23. Pradhan B, Derle SG. Comparison of effect of Gayatri Mantra and poem chanting on digit letter substitution task. *Ancient science of life*. 2012 Oct;32(2):89.
 24. Duchesne A, Pruessner JC. Association between subjective and cortisol stress response depends on the menstrual cycle phase. *Psychoneuroendocrinology*. 2013 Dec 1;38(12):3155-9.
 25. Chung KC, Peisen F, Kogler L, Radke S, Turetsky B, Freiherr J, Derntl B. The influence of menstrual cycle and androstadienone on female stress reactions: an fMRI study. *Frontiers in human neuroscience*. 2016 Feb 16;10:44.
 26. Reynolds TA, Makhanova A, Marcinkowska UM, Jasienska G, McNulty JK, Eckel LA, Nikonova L, Maner JK. Progesterone and women's anxiety across the menstrual cycle. *Hormones and behavior*. 2018 Jun 1;102:34-40.
 27. Agarwal AK, Kalra R, Natu MV, Dadhich AP, Deswal RS. Psychomotor performance of psychiatric inpatients under therapy: Assessment by paper and pencil tests. *Human Psychopharmacology: Clinical and Experimental*. 2002 Mar;17(2):91-3.
 28. Luna-Lario P, Pena J, Ojeda N. Comparison of the Wechsler Memory Scale-III and the Spain-Complutense Verbal Learning Test in acquired brain injury: Construct validity and ecological validity. *Revista de neurologia*. 2017 Apr;64(8):353-61.



29. Brown KW, Ryan RM. The benefits of being present: mindfulness and its role in psychological well-being. *Journal of personality and social psychology*. 2003 Apr;84(4):822.
30. Sivananda S. *Japa Yoga*. Uttaranchal: The Diine Life Trust. 2005.
31. Traditional yoga and meditation of the Himalayan masters. Available from: <https://www.swamij.com/mahamri tyunjaya.htm>
32. Davanger S, Ellingsen Ø, Holen A, Hugdahl K. Meditation-specific prefrontal cortical activation during acem meditation: an fMRI study. *Perceptual and Motor Skills*. 2010 Aug;111(1):291-306.
33. Wang DJ, Rao H, Korczykowski M, Wintering N, Pluta J, Khalsa DS, Newberg AB. Cerebral blood flow changes associated with different meditation practices and perceived depth of meditation. *Psychiatry Research: Neuroimaging*. 2011 Jan 30;191(1):60-7.
34. Engström M, Söderfeldt B. Brain activation during compassion meditation: a case study. *The Journal of Alternative and Complementary Medicine*. 2010 May 1;16(5):597-9.
35. Hölzel BK, Ott U, Hempel H, Hackl A, Wolf K, Stark R, Vaitl D. Differential engagement of anterior cingulate and adjacent medial frontal cortex in adept meditators and non-meditators. *Neuroscience letters*. 2007 Jun 21;421(1):16-21.
36. Manna A, Raffone A, Perrucci MG, Nardo D, Ferretti A, Tartaro A, Londei A, Del Gratta C, Belardinelli MO, Romani GL. Neural correlates of focused attention and cognitive monitoring in meditation. *Brain research bulletin*. 2010 Apr 29;82(1-2):46-56.
37. Lutz A, Dunne JD, Davidson RJ. Meditation and the neuroscience of consciousness: An introduction. *The Cambridge handbook of consciousness*. 2006;19.
38. Goldin PR, Gross JJ. Effects of mindfulness-based stress reduction (MBSR) on emotion regulation in social anxiety disorder. *Emotion*. 2010 Feb;10(1):83.

6168

TABLES

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

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

Table-3 Table showing the mean, SD of sessions comparing with the baseline and the percentage change.

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

6169

