

Deep Relaxation Technique Improves Sleep Quality and Reduces Stress in Healthy Volunteers during Fasting Therapy

Arun.P.G.¹, Jyosna Thayill², Prashanth Shetty³, Ashwin.V.P.⁴

¹ (Department of physiology,SDMCNYS)

²(Department of Microbiology,SDMCNYS)

³(Principal,SDMCNYS)

⁴(Department of pathology,SDMCNYS)

Abstract

Introduction: Deep relaxation technique (DRT) is one of the mind– body relaxation techniques commonly employed in Yoga therapy. Fasting is a therapeutic approach which aims at cleansing the body but at the same time leading to physical and mental stress during adaptation to low calories. Hence the present aims at evaluating the effect of DRT on stress and sleep quality in healthy volunteers undergoing fasting therapy. *Methodology:* In this single arm interventional study, 90 healthy volunteers were recruited. All subjects practiced DRT for 20 minutes for 10 consecutive days during the fasting period. Blood pressure (BP), Pulse Rate(PR), Pittsburgh Sleep Quality Index(PSQI) and International Stress Management Association (ISMA) stress questionnaire were assessed on 1st and 10th day of the intervention. *Results:* Wilcoxon matched pairs test showed a significant reduction in PSQI score ($P=0.001$), Stress scale score ($P=0.001$), PR ($P=0.001$), Systolic blood pressure (SBP) ($P=0.001$), Diastolic Blood Pressure (DBP) ($P=0.001$) values. *Conclusion:* Practicing DRT reduces stress and improves quality of sleep along with the reduction in BP and PR during fasting and hence it is concluded as having beneficial effect on reducing physical and mental stress posed by the calorie restriction during the fasting therapy period.

Key words: Deep Relaxation Technique, Fasting therapy, Pittsburgh Sleep Quality Index, Blood pressure, Pulse Rate.

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I. Introduction

Yoga is a 3000-year-old Indian tradition which is now getting attention from the western countries. National Institute of Health regarded Yoga as a form Complementary and Alternative Medicine (CAM). [1] The word Yoga comes from the root word 'Yuj' means 'to join' or 'to unite' and to concentrate one's attention. [2] It is essentially a spiritual discipline which focuses on bringing harmony between mind and the body and is considered as an art and science of healthy living. [3] Regular practice of Yoga promotes strength, endurance, flexibility along with the facilitation of compassion, greater self-control and well-being. [4, 5] Yoga is a mind body practice which involves a combination of muscular activity along with the internally directed mindful focus on awareness of the self, breath and energy. [4] The physical postures (asanas) increase the flexibility, strength and coordination and the breathing practices, relaxation techniques, meditation helps in calming the mind as well as in focusing the mind for the development of greater awareness. [6] Yoga has been used to treat a wide range of health conditions and is also practiced by healthy individuals for health promotion and disease prevention. [7] One of the main aims of Yoga is to obtain a sense of relaxation and to achieve tranquillity of the mind. [8] Relaxation can be achieved in several ways and there are a number of relaxation techniques available in Yoga which can reduce the stress response in individuals. [9] DRT is one of the yogic relaxation techniques that involves guided instructions and is regarded as the powerful tool in controlling a number of diseases caused by stress and tension such as hypertension and insomnia. [10] DRT emphasizes on part by part relaxation of the whole-body. It works at all levels of existence of an individual that is physical, mental, emotional, intellectual and spiritual levels. DRT involves relaxation of all body parts by directing the attention of the mind on different parts of the body starting from the toes to end up in the head region to propagate the relaxation feeling. [11] DRT is known to reduce the state anxiety and to improve the sustained attention. [12]

Fasting therapy involves the voluntary abstinence from solid food and stimulants for a certain period of time which leads to improved vitality. [13] It has been pointed out that fasting is not solely related to calorie restriction but is rather a multimodal treatment program that includes mind body medicine and spiritual components. [14] The most commonly studied fasting strategies are calorie restriction, dietary restriction and intermittent fasting. [15] Fasting therapy intervenes in a multitude of metabolic and physiologic regulatory

systems and thus known to affect many different organs systems as well as the psychological state and the mood. [15]Prolonged fasting has been considered as a strong physiological stimulus that is equivalent to a mild to moderate biological stress and known to activate numerous endocrine and neurobiological responses. [16]Even acute total fasting is known to result in the parasympathetic withdrawal with the simultaneous sympathetic activation which reflect the induced stress. [17]Hence, relaxation is more important during the fasting therapy period to combat the physical and the mental stress. [18] With this background, our study aimed at evaluating the effect of DRT during the fasting therapy period on sleep quality and stress level using the PSQI and ISMA stress questionnaire.

II. Materials And Methods

In this single arm interventional study, a total of 90 medical students who were healthy were recruited from a nature cure college in south India. Written informed consent was obtained from each subject participating in the study. The study was approved by the Institutional Ethical Committee. Trial profile depicted in fig 1.

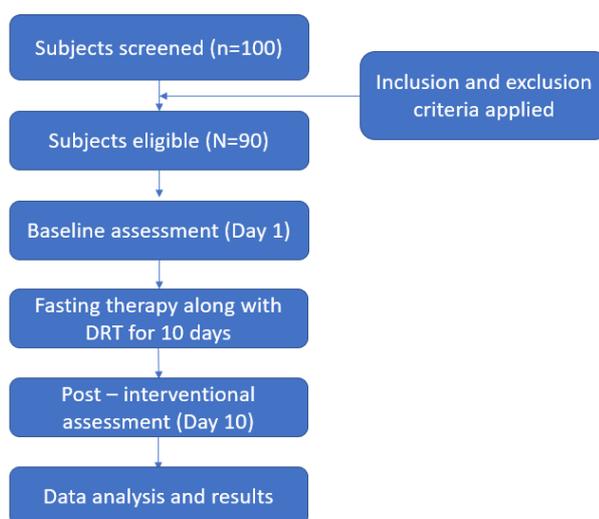


Fig 1: Trial profile

2.1 Inclusion and exclusion criteria

The subjects aged between 18 to 25 years who were considered to be healthy by a thorough medical check by a physician were recruited in the study. Subjects who broke the fasting before 10 days, female subjects during menstruation, subjects with gastritis were excluded from the study.

2.2 Intervention

Fasting was carried out for 10 days with raw diet on 1st and 10th day, fruits fasting on 2nd, 3rd, 8th and 9th day with juice fasting on 4th, 5th, 6th and 7th day of the fasting period. DRT was practiced by all the subjects for the consecutive 10 days during the fasting. DRT was performed with the closed eyes for 20 minutes in five phases guided by an audio tape.

1. Relaxing each part of the body from the tip of the toes to the waist, followed by chanting 'A'
2. Relaxing each body part from the waist to the neck, followed by chanting 'U'.
3. Relaxing head and neck, followed by chanting 'M', the last part of 'A-U-M'.
4. Letting the body collapse on the ground with a feeling of 'letting go', chanting the whole word, 'AUM'
5. Letting oneself feel apart from the physical body, aware of expansion, and merging with a limitless space like the sky. [12]

2.3 Assessments

All subjects were assessed for PSQI, ISMA stress score before and after 10 days of daily DRT intervention. And the cardiovascular parameters like SBP, DBP and PR were assessed on day 5th and 10th after the intervention.

2.3.1 Pittsburgh Sleep Quality Index (PSQI)

The PSQI is a self-rated questionnaire that assesses sleep quality and sleep disturbances. It consists of 19 self-rated questions and five questions rated by the bedpartner or roommate. The 19 self-rated questions assess a wide variety of factors relating to sleep quality, including estimates of sleep duration and latency and of the

frequency and severity of specific sleep-related problems. These 19 items are grouped into seven component scores, each weighted equally on a 0-3 scale. These seven component scores are then summed to obtain a global PSQI score, which ranges from 0-21; higher scores indicate the worse quality of sleep.[19]

2.3.2 International Stress Management Association (ISMA) stress questionnaire

The ISMA questionnaire is a 25-item scale that gives an overview of the susceptibility to stress. This questionnaire has a dichotomous response options which are YES and NO. A score of 1 is assigned to any Yes response while a score of 0 is assigned to any NO response. If the points are below 4, it indicates the lesser likeliness of suffering from stress. Points from 5 to 13 indicates the likeliness of experiencing physical or mental stress related problems in future and points above 14 indicates greater vulnerability to suffer from stress related complications. [20]

2.3.3 Cardiovascular parameters

Assessment of SBP, DBP, and PR were measured before and after 10 days of DRT sessions. BP was measured using a manually calibrated sphygmomanometer (Diamond regular BP apparatus, India). The measurement was taken in supine position. The appearance and the disappearance of the Korotkoff sounds were taken as systolic and diastolic BP readings respectively. Minimum of two-measurements with the rest period of 1-min between the measurements were taken and averaged to get a final value. In case of difference between the two-measurements by >10-mmHg, a three-measurement was taken after 1-min of rest period followed by the second measurement and the average of the two-measurements which did not differ >10-mmHg was averaged to get a final value.[21, 22] Pulse rate was measured manually on the radial artery in the right-hand wrist by a Naturopathic physician who did not have any other role in the study.

2.4 Statistical analysis

Statistical analysis was done by using Statistical Package for Social Sciences (SPSS Version 20.0). The data was screened for normal distribution using Kolmogorov-Smirnov test and analysed by using Wilcoxon matched pairs test for paired data A value <0.05 was considered as significant.

III. Results

The study was aimed to assess the effect of DRT during fasting therapy in healthy volunteers. The pre - post data were analysed using Wilcoxon matched pairs test. There were no adverse events observed during the fasting therapy period.

The mean value of PSQI score at the baseline was 4.9 ± 3.57 and the post test mean value was 2.83 ± 2.05 indicating a significant reduction with the p value <0.001 (Table 1). ISMA stress score also showed a significant reduction (p <0.001) with the mean value at the baseline 11.31 ± 3.81 and the post intervention test mean value 7.39 ± 2.25 . (Table 2)

A significant reduction was seen in the SBP, DBP and PR on 10th day as compared to the 5th day assessments with the p value <0.001 for all the parameters.(Table 3, 4 and 5)

Table 1: Comparison of pre-test and post-test time points of PSQI scores by Wilcoxon matched pairs test

Time points	Mean	SD	Median	IQR	Diff. mean	Diff. SD	% of effect	Z-value	P-value
Pretest	4.95	3.57	4.00	3.00	2.13	1.67	78.50	7.5248	<0.001
Posttest	2.83	2.05	2.00	2.00					

Table 2: Comparison of pre-test and post-test time points with ISMA stress scores by Wilcoxon matched pairs test

Time points	Mean	SD	Median	IQR	Diff. mean	Diff. SD	% of effect	Z-value	P-value
Pretest	11.31	3.81	11.00	6.00	3.92	1.89	48.16	8.1008	<0.001
Posttest	7.39	2.25	8.00	3.00					

Table 3: Comparison of day 5 and day 10 time points with SBP (mmhg) scores by Wilcoxon matched pairs test

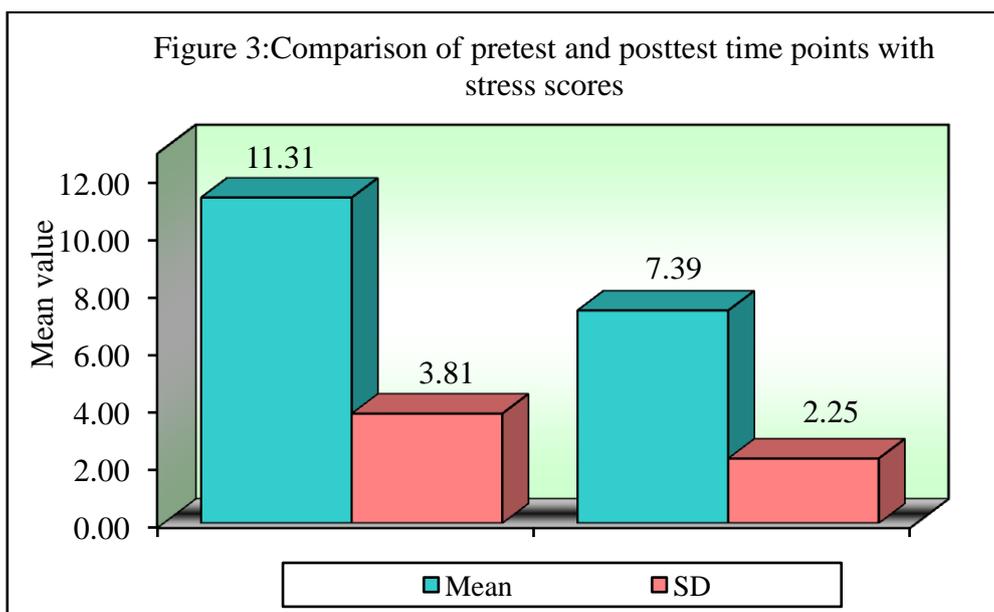
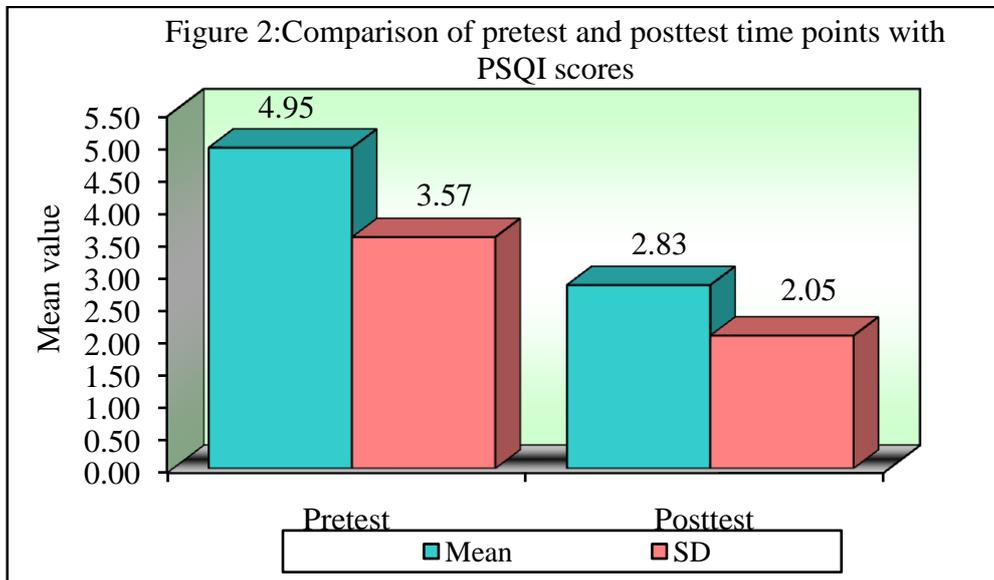
Time points	Mean	SD	Median	IQR	Diff. mean	Diff. SD	% of effect	Z-value	P-value
Day 5	110.90	10.63	110.00	18.00	2.67	2.74	102.72	6.7171	<0.001
Day 10	108.23	8.84	108.00	16.00					

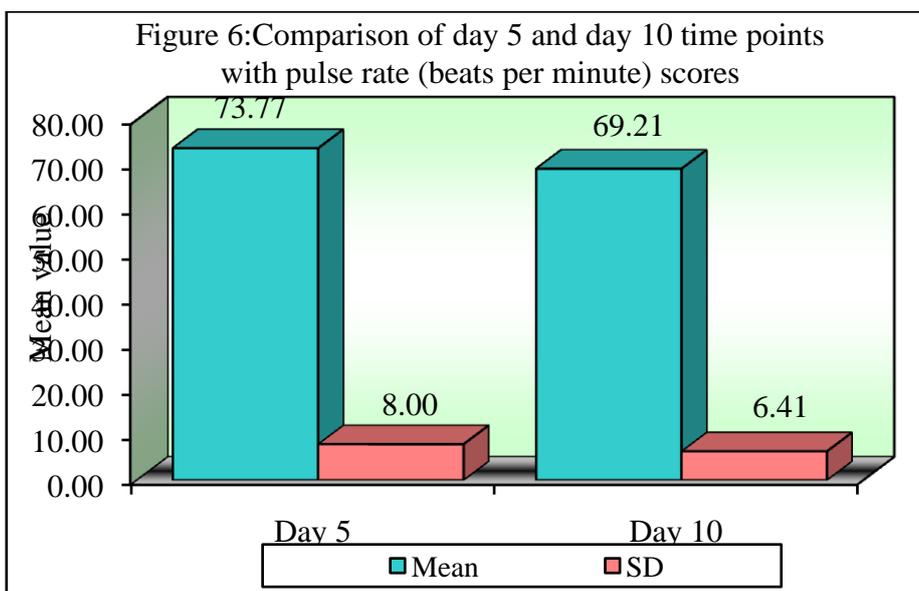
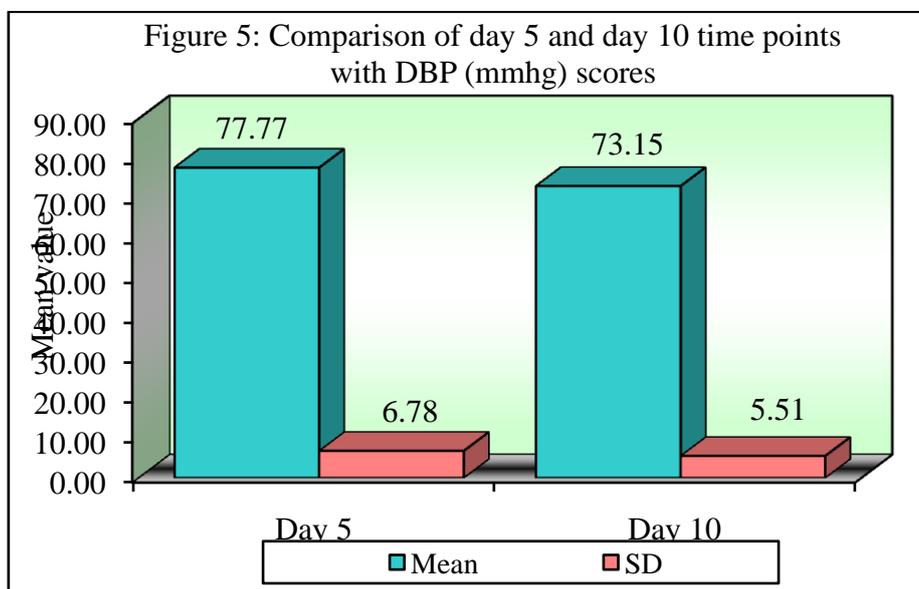
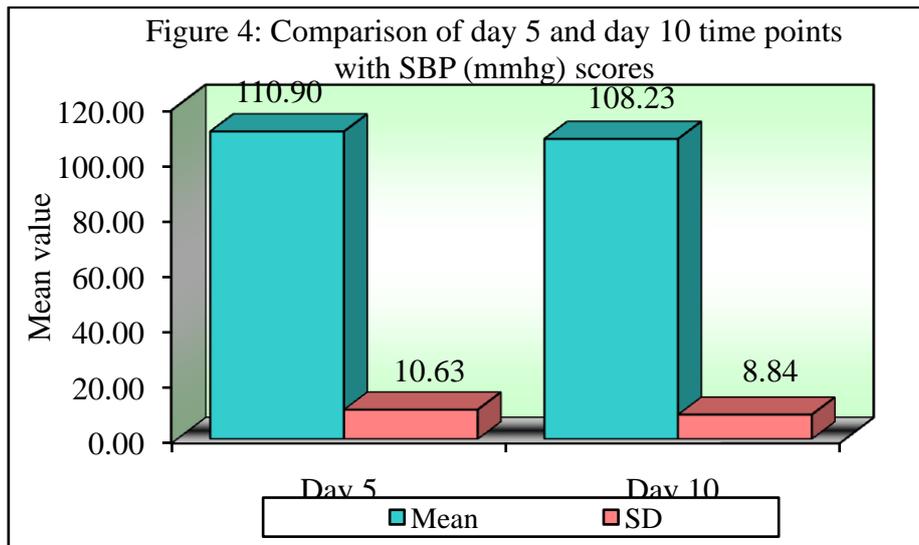
Table 4: Comparison of day 5 and day 10 time points with DBP (mmhg) scores by Wilcoxon matched pairs test

Time points	Mean	SD	Median	IQR	Diff. mean	Diff. SD	% of effect	Z-value	P-value
Day 5	77.77	6.78	78.00	10.00	4.62	2.61	56.52	8.0544	<0.001
Day 10	73.15	5.51	72.00	8.00					

Table 5: Comparison of day 5 and day 10 time points with pulse rate (b/m) scores by Wilcoxon matched pairs test

Time points	Mean	SD	Median	IQR	Diff. mean	Diff. SD	% of effect	Z-value	P-value
Day 5	73.77	8.00	73.00	10.00	4.56	2.52	55.29	7.9135	<0.001
Day 10	69.21	6.41	70.00	8.00					





IV. Discussion

The current study evaluated the effect of DRT during fasting therapy period. PSQI is a self-reported questionnaire which has a sensitivity of 89.6% and specificity of 86.5%. [23] ISMA gives overview of the stress. The present study showed a significant reduction in PSQI, ISMA stress scale scores, SBP, DBP and PR as result of DRT practice.

Earlier studies have shown that relaxation results in reduction of stress and blood pressure. [24, 25, 26] Our study also has shown the similar results as measured by ISMA scores, SBP and DBP measurements. The relaxation response leads to the reduction in the sympathetic tone which in turn reduces the adrenaline, nor adrenaline and cortisol levels. [27] Relaxation is also known to improve the positive mood. [28] It may also result in specific cognitive, behavioural, and physiological responses that are superimposed upon the reduction in arousal. [29] The relaxation technique also helped subjects to feel less tensed, more relaxed and to get distracted from the stressor in addition to the reduction in PR, SBP and DBP. The reduction in stress can also be attributed to the induction of deep relaxation which is intensified by the salient cognitive relaxation cues played through the tape during the DRT practice. [30]

In our study DRT intervention during fasting therapy helped patients to have a good quality of sleep. This might have been due to the cumulative effect of daily DRT sessions. [31] Blaruet *al* have shown that following muscle relaxation there was a reduction in sleep latency to the level below the minimum requirements to qualify for insomnia diagnosis. [32] The improvement in the sleep quality can be attributed to the DRT as it is a self-regulatory method that is known to reduce psychological stress, improve the quality of life, subjective wellbeing, lead the individual to passively ignore the deviant thoughts thus decreasing the high level of stimulation that interfere with the sleep. [33] Relaxation is also known to reduce the day time dysfunction and enhances the day time energy as well as the mind's capacity to improve physical function and performance. [34]

Our results are in accordance with the earlier study done by Telles *et al*, where heart rate reduced significantly after the guided relaxation technique. [35] This can be ascribed to the lying down posture i.e., *Shavasana* in which the body remains in a well-supported condition. The centre of gravity would be nearest to the ground and the flexors and extensors need not work against gravity, thus relaxed. This results in reduced demand on the heart to pump the blood against gravity to a greater extent thus reduced work load and heart rate which might have led to the reduced PR. [36] The outcome of our study ties well the earlier study which showed a significant reduction in blood pressure following relaxation. [37] This can be the result of reduced sympathetic tone following the relaxation practice. [38] The reduction in sympathetic tone leads to the reduction in HR and thereby reducing the blood pressure, as blood pressure is the product of cardiac output and peripheral vascular resistance and cardiac output is the product of stroke volume and HR thus HR becoming one of the determinants of SBP [39]

To the best of our knowledge, this is the first study conducted to evaluate the effect of DRT during fasting therapy. DRT is a safe, simple way to reduce the stress during fasting therapy. However, further studies evaluating heart rate variability, with a randomized controlled design would yield a better understanding.

V. Conclusion

DRT improved quality of sleep and reduced stress along with the reduction in blood pressure and pulse rate in all subjects indicating the benefit of including the practice of DRT to combat the physical and mental stress posed by calorie restriction during fasting therapy period.

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