

# An Institutional Based Observational Study to Evaluate the Audio-Visual Reaction Time in Medical and Paramedical Students After One Month Training of Pranayama

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## ABSTRACT

**Background:** Audio-visual reaction time is used in the experimental physiology to assess the sensory-motor performance. Out of these various factors, the present study was undertaken to see the effect of Pranayama on Visual reaction time (VRT) and Audio-reaction time (ART).

**Materials & Methods:** This is a prospective observational study done on 200 healthy medical and paramedical students of S.P. Medical College and A.G. groups of hospital, Bikaner, Rajasthan. All subjects were undergoes audio reaction time, visual reaction time before pranayama training and after duration of pranayama training. The participants were subjected to reaction time test in the Neurophysiology research laboratory, Department of Physiology, SP Medical College and Hospital. Test was performed between 9:00 a.m to 11:00<sup>o</sup> clock A.m. at a comfortable room temperature 25-30<sup>o</sup> C in noise free room.

**Results:** Our study showed that the mean value of audio reaction time in males in pre yoga was 0.1840±0.0179 and post yoga was 0.1342±0.0165, which was statistical significant (P<0.0001\*\*\*). In females, pre yoga was 0.1852±0.0168 and post yoga was 0.1306±0.0159, which was statistical significant (P<0.0001\*\*\*). The mean value of visual reaction time in males in pre yoga was 0.208 ± 0.0164 and post yoga was

0.137±0.0153, which was statistical significant (P<0.0001\*\*\*). In females, pre yoga was 0.210±0.0176 and post yoga was 0.139±0.0155, which was statistical significant (P<0.0001\*\*\*).

**Conclusion:** We concluded that males has lesser reaction time than females. Hence the best effects of these techniques would be evident if coupled as alternative therapy or as adjunct to conventional therapy in stress related disorders.

**Keywords:** Pranayama, Yoga, AV Reaction Time.

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## INTRODUCTION

Yoga is better understood when broken down into four historical periods. First, the Vedic Period during which The Vedas, the oldest scriptures of Hindu, were written. The time of this period is uncertain yet philological and linguistic documentation indicates that The Vedas were composed between 1700 and 1100 B.C. The end of the period occurred in 500 B.C. The Vedas are considered to be the oldest teachings of yoga, known as Vedic Yoga. People sought to live in total harmony with nature and their immediate families during the Vedic Period.<sup>1</sup>

The term yoga is derived from the Sanskrit root yuj [yu-ꣳ], meaning to bind or yoke. The exact dates of the inception of yoga are uncertain, but researchers believe the practice originated in

India around 3000 B.C. Early archaeological evidence is found in stone seals that depict yoga poses dating to this time period. Scholars believe that the roots of yoga existed long before, and have traced its origins back to Stone Age Shamanism. Both of these ancient cultures advocated similar beliefs that were thought to better the lives of individuals and strengthen a sense of community.<sup>1</sup> Yoga is mind-body technique which involves relaxation, meditation and a set of physical exercises performed in sync with breathing. Being holistic, it is the best means for achieving physical, mental, social and spiritual well being of the practitioners.<sup>1</sup> Pranayama literally, means control of Prana. Prana, in Indian philosophy, refers to all forms of energy in the universe.

Life force is one part of this energy. Life force, in an individual, is symbolised by breathing. That is why pranayama is generally considered to mean regulated breathing.

As a technique pranayama can assume rather complex forms of breathing. But the essence of the practice is slow and deep breathing. Such breathing is economical because it reduces dead space ventilation. It also renews air throughout the lungs in contrast with shallow breathing which renews air only at base of the lungs. Slow and deep breathing is a part of shavasana.<sup>2</sup>

The link between mind & the body has been scientifically related. The role of limbic system of the brain in regulating the homeostatic condition in the body by influencing the visceral mechanism through the automatic nervous outflow & endocrine secretions are now well known. The proper conditioning of the nervous system can maintain the normal homeostasis. The process of mental relaxation may thus be expected to produce such conditioning.<sup>3,4</sup> All over the world, scientists extensively studied pranayama & claimed that it increases longevity & also has therapeutic & rehabilitative effects.<sup>5</sup>

Human body responses to a number of external environmental stimuli of different modalities and gives a desired, purposeful voluntary response to different types of stimuli. Human reaction time (RT) is the time interval between the application of a stimulus and the appearance of appropriate voluntary response by a subject.<sup>6</sup>

Audio-visual reaction time is used in the experimental physiology to assess the sensory-motor performance. It is the time interval between the onset of a signal & the beginning of a response.<sup>7</sup>

Audio-visual reaction time is the index of the processing ability of the central nervous system. This test has physiological as well as clinical significance, which is a prerequisite for sports, precision surgeons & other professionals too.<sup>8</sup>

Many factors have been shown to affect reaction time including, age, gender, physical fitness, fatigue, fasting, distraction, alcohol, breathing cycle, personality type, exercise, intelligence of the subject and whether the stimulus is auditory or visual. Out of these various factors, the present study was undertaken to see the effect of Pranayama on Visual reaction time (VRT) and Audio-reaction time (ART).

## MATERIALS & METHODS

This is a prospective observational study done on 200 healthy medical and paramedical students of S.P. Medical College and A.G. groups of hospital, Bikaner, Rajasthan.

### Inclusion Criteria

1. Healthy Medical and paramedical students aged to 18-25 years
2. Willingness to participate.

### Exclusion Criteria

1. Students with history of any neurologic, psychiatric, cardiovascular, respiratory or systemic illness, smokers and alcoholic were excluded.
2. Students on psychotic drugs, antihistaminics and epileptics were excluded from study.
3. Those who are already practicing Pranayam or exercise were not included in this study.

### The Preparation for Pranayama

1. Subjects were asked to come with empty stomach and empty bladder after taking a bath.

2. The timing for pranayama practice was fixed in early morning before sunrise.
3. The place of practice of pranayama was the common room of the hostel.
4. Subjects were asked to practice pranayama while sitting on the floor on a carpet.
5. The subjects were asked to take a proper sitting position either in Padmasana (the lotus posture) or Sukhasana (the comfortable posture) or Vajrasana (the thunder bolt posture).
6. After the subjects had assumed the proper posture, they were instructed to close their eyes and concentrate on the sound of breathing.
7. They were then asked to inhale slowly and deeply followed by pronunciation of 'OM' (A-----U-----M) during slow and gentle exhalation. Three such pronunciation of 'OM' were performed before starting the pranayama.

### Procedure:<sup>9</sup>

Pranayama training was given to all subjects daily six days a week for one month. They were given pranayama training by a qualified yoga teacher.

Following pranayama techniques was daily practiced for 40 minutes.

1. Kapalbhathi Pranayama: Kapalbhathi pranayama involves a vigorous expiration with a slow, passive inspiration.
  - A) During each exhalation, subject forcefully blasted air out by vigorous inward sucking movement of the abdomen.
  - B) Then slow and gentle inhalation was done passively by relaxing the abdominal muscles.
  - C) After the end of practice; an autonomic suspension of breath was observed. Infact there was no urge for breathing for a few seconds.
2. Deergh swas Pranayama: 5 minutes: (Slow and deep inspiration through nostrils and slowly expiration through mouth. The ratio of inspiration: expiration time is 1:2.) (1-minute interval)
3. Anulom-Vilom Pranayama: Alternate nostril breathing, where in nostril is changed with each inspiration.
  - A) The right nostril was closed with the right thumb and inhalation was done slowly and deeply through the left nostril by the subjects.
  - B) The left nostril was closed with the ring and little finger and the right nostril was released, exhalation was done slowly and completely through the right nostril.
  - C) Inhalation was done slowly and deeply through the same (right) nostril, keeping the left nostril closed and then the right nostril was closed and exhalation was done slowly and completely through the left nostril.

The above completed one cycle of anulom-vilom pranayama.

4. Bhramari Pranayama: 'Bhramar' means a large black bumble bee and this pranayama is so called because during exhalation a soft humming sound like that of a bumble bee is made.
  - A) The subjects, after a deep inhalation, exhaled very slowly with a humming sound.
  - B) Bhramari pranayama was done while performing Sunmukhi Mudra. (1-minute interval)

Sunmukhi Mudra.

- A) The subjects were asked to raise the hands to the face and the elbows to the level of the shoulders.
  - B) They were instructed to place the thumb tips in the external auditory meatus to keep out external sounds.
  - C) They were asked to close the eyes and cover the eyelids with the fore and middle fingers. The upper eyelids were drawn down with the pad of the middle fingertips and the fore fingertips to keep out the light. The eye balls were kept gently pressed with the fingers.
  - D) The nostrils were kept pressed with the ring fingertips to narrow the nasal passage for slow, steady, rhythmic and subtle breathing. The little fingers were kept on the upper lip to feel the flow of breath.
5. Omkar Chanting: After completing the pranayama practice, three pronunciations of 'OM' were performed 3 times in 3 minutes at one-minute interval.
  6. Meditation: 15 minutes (Concentration on own breathing and chest movements)

One-minute interval was compulsory before next step performance pranayama.

All subjects were undergoes audio reaction time, visual reaction time before pranayama training and after duration of pranayama training. The participants were subjected to reaction time test in the Neurophysiology research laboratory, Department of

Physiology, SP Medical College and Hospital. Test was performed between 9:00 a.m to 11:00<sup>o</sup> clock A.m. at a comfortable room temperature 25-30<sup>o</sup> C in noise free room.

**Reaction Time**

The apparatus used to measure reaction time is 'Research reaction time apparatus' (Yantrashilp) manufactured by Anand agencies, Pune-2. It is a portable device within built four-digit chronoscope with least count of 1/1000 sec. i.e. 1 millisecond. Green light stimuli and high frequency beep stimuli was selected for recording visual reaction time and auditory reaction time respectively. Once the subject got familiarized with the instrument, the final reading was taken.<sup>10</sup>

For auditory reaction time three reading of the high frequency beep stimuli was recorded.<sup>11</sup>

For visual reaction time three readings of the green light stimulus was recorded in milliseconds from auto display. The average of three readings was taken.<sup>10</sup> As soon as the stimulus is perceived by the subjects, he/she were asked to responds by pressing their response switch by index finger of the dominant and for each subject the lowest reading was taken as the value for the reaction time task.

**Statistical Analysis**

The available data were entered in the Microsoft excel sheet. Appropriate tests were applied to the data to test for the significance. P-value<0.05 were consider statistically significant.

**Table 1: Effect of Pranayam on gender wise distribution of audio reaction time**

Gender	No.	Pre yoga		Post yoga		t-test	P-value
		Mean (sec.)	±SD	Mean (sec.)	±SD		
Male	38	0.1840	0.0179	0.1342	0.0165	7.823	<0.0001***
Female	162	0.1852	0.0168	0.1306	0.0159	11.56	<0.0001***

**Table 2: Effect of Pranayam on gender wise distribution of visual reaction time**

Gender	No.	Pre yoga		Post yoga		t-test	P-value
		Mean (sec.)	±SD	Mean (sec.)	±SD		
Male	38	0.208	0.0164	0.137	0.0153	12.40	<0.0001***
Female	162	0.210	0.0176	0.139	0.0155	25.47	<0.0001***

**RESULTS**

Our study showed that the mean value of audio reaction time in males in pre yoga was 0.1840±0.0179 and post yoga was 0.1342±0.0165, which was statistical significant (P<0.0001\*\*\*). In females, pre yoga was 0.1852±0.0168 and post yoga was 0.1306±0.0159, which was statistical significant (P<0.0001\*\*\*) (table 1).

The mean value of visual reaction time in males in pre yoga was 0.208±0.0164 and post yoga was 0.137±0.0153, which was statistical significant (P<0.0001\*\*\*). In females, pre yoga was 0.210±0.0176 and post yoga was 0.139±0.0155, which was statistical significant (P<0.0001\*\*\*) (table 2).

**DISCUSSION**

Medical students undergo tremendous stress during various stages of the MBBS course. Time is required for adjustment in new environment of college. Apart from these day to day problems, the students have a vast syllabus of 1<sup>st</sup> M.B.B.S. The

time they get for reading, understanding & analyzing the three subjects is very less and associated they are under the other stressful conditions.

To cope with these situations and excel in their curriculum further adds on to the stress which may lead to the decrease in the concentration, memory and remembering ability of the individual. Yoga and pranayama acts as an adjuvant and is useful for the disciplining of the mind for concentration. Hence this study was taken to study the effect of pranayam in the medical and paramedical students.

In present study the mean value of audio reaction time in males & females before pranayama training and after pranayama training was statically highly significant. The auditory reaction time was shorter in male and females in both the age groups. Madanmohan et al (1992)<sup>7</sup> done on twenty-seven male student volunteers were given yoga training for 12 weeks. They found that auditory RT before pranayama was 194.18±6.00 ms and after pranayama training was 157.33±4.85 ms, which was a significant (P< 0.001).

Another study done by Chandrashekar V Hanji et al (2014)<sup>12</sup> found that significant decrease ( $p < 0.05$ ) in the alert values of Auditory reaction time after two months of yoga training in male subjects.

This is in contrast to the findings of Shenvi and Balasubramanian (1994)<sup>13</sup> found that after pranayama training, there was a reduction in ART in both male and female.

A Conflict our results with Dr. Ritesh M. Karia et al (2012)<sup>14</sup> found that mean value of simple and choice visual reaction time in boys is  $0.13990 \pm 0.02637$  and  $0.26858 \pm 0.06664$  respectively, while that of girls is  $0.15990 \pm 0.02637$  and  $0.30268 \pm 0.07471$  respectively, which is statically significant ( $p < 0.05$ ) so boys has lesser visual reaction time than that of girls.

Effect of pranayama on reaction time could be due to greater cortical arousal & faster rate of information processing, improved concentration power, ability to ignore external stimuli i.e. less distractibility and improved memory.<sup>15</sup> During pranayama practitioner not only tries to breathe but also tries to keep attention on breathing, leading to better concentration. This act of breathing removes attention from worries & distress. Practitioner can better handle day to day emotional, physical & mental stress.<sup>16</sup> Nowadays there is noted high stress in medical students with changing relation approach with teaching faculties.<sup>17</sup> The stress can cause affecting locomotor activity and altered behavioral changes (emotions and anxiety)<sup>18</sup>.

## CONCLUSION

We concluded that males have lesser reaction time than females. Hence the best effects of these techniques would be evident if coupled as alternative therapy or as adjunct to conventional therapy in stress related disorders. Inculcating the habit of regular pranayam early in life will definitely have favourable effect in measures involved in Total Stress Management.

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