



IJCRR

Section: Healthcare

ISI Impact Factor  
(2019-20): 1.628

IC Value (2019): 90.81

SJIF (2020) = 7.893



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# Effect of Yoga Training on the Visual and Auditory Reaction Time in Young Adults – A Pilot Study

Shobana R<sup>1</sup>, Maheshkumar K<sup>2</sup>, Bagavad Geetha M<sup>1</sup>, Padmavathi R<sup>1</sup>, Venkateswaran S T<sup>2</sup>

<sup>1</sup>Department of Physiology, Sri Ramachandra Medical College & RI, RIHER, Porur, Chennai, India; <sup>2</sup>Government Yoga & Naturopathy Medical College and Hospital, Arumbakkam, Chennai, India.

## ABSTRACT

**Introduction:** Reaction time (RT) is used to assess sensory-motor performance of an individual. Regular yoga practices produce a better improvement in the health of individuals with and without ailments. Hence this study was taken to find the effect of regular form of long term yoga training on reaction time in young adults.

**Aim:** To evaluate the long term effects of Yoga practice Visual and Auditory Reaction time in young adults

**Materials & Methods:** This Pilot study includes 80 normal subjects in the age group 18-30 years consist of yoga group (n- 40) subjects were regularly practising yoga and the control group (n-40) subjects were normal healthy volunteers. Auditory (ART) and visual reaction time (VRT) was recorded in the darkroom preferably in the morning with an empty stomach.

**Result:** Subjects in the yoga group ( $192.56 \pm 18.70$  and  $224.59 \pm 32.66$  msec) showed significant ( $p < 0.05$ ) shortening of response in ART and VRT compared with the control group ( $214.74 \pm 22.98$  and  $246.03 \pm 39.46$  msec). Based on the experience in yoga practice, subjects that were practised more than 3 yrs showed significant ( $P < 0.05$ ) shortening in both ART and VRT compared to 1-2 yrs and  $< 1$  yr practised yoga subjects.

**Conclusion:** Shortening of ART and VRT in the yoga group indicates that improved sensory-motor performance and enhanced processing ability of the central nervous system in the yoga practitioners. So simple form of regular yoga training can be implemented in schools, colleges and work to improve attention and reduce stress-induced lifestyle disorders.

**Key Words:** Yoga, Visual and Auditory Reaction time, Sensory-motor performance, Long-term yoga practice, Cognitive function, Young adults

## INTRODUCTION

Reaction time (RT) is the time taken for the initial response to a particular stimulus. It can be used as one of the tools to measure the status of mental health and provides an indirect index of the processing capability of the central nervous system (CNS) and sensorimotor performance.<sup>1</sup> It can be influenced by yoga because it enhances physical & mental health and increases the performance of the practitioners.<sup>2</sup> Mental health is a state of wellbeing in which the individual realizes his or her abilities, can cope with normal stress in life, can work rewardingly.<sup>3</sup> Anxiety, stress, the disturbing feeling of well-being and altered personality are associated with most chronic lifestyle disorders like diabetes, heart diseases, respiratory diseases, and psychiatric disorders.<sup>4</sup> Yoga is an ancient science involving the various form of practices

such as asana (posture), pranayama (breathing exercise) and meditation (concentration technique) to awake ourselves and brings symmetry between psychic and somatic aspects of body functions.<sup>5,6</sup> Regular practise of any type of yoga influence cognitive functions by improving memory, strategic planning and concentration.<sup>7</sup> It is associated with self-esteem and higher academic performance which will be useful in modern curriculum.<sup>8</sup> Previous studies have shown the short term (immediate, 3 months & 6 months) effect of various yogic techniques on RT in healthy and various disease conditions but no studies, to our knowledge, available on the long term effect of yoga on RT.<sup>9,10</sup> Hence this study was undertaken on people practising yoga regularly as part of their curriculum.

### Corresponding Author:

**Dr. Bagavad Geetha M.**, Professor, Department of Physiology, SRMC & RI, RIHER, Porur, Chennai, India  
Phone: 9940265102; Email: [bgeethasru@gmail.com](mailto:bgeethasru@gmail.com)

ISSN: 2231-2196 (Print)

ISSN: 0975-5241 (Online)

Received: 19.11.2020

Revised: 08.01.2021

Accepted: 12.03.2021

Published: 20.07.2021

## MATERIALS & METHODS

This present study was done on 80 normal healthy volunteers in the age group 18-30 years. Regularly yoga practising students (n=40) were selected from government yoga and naturopathy medical college, Chennai and age and gender-matched control (n=40) not doing any kind of regular physical activity or prior yoga practice are taken from Sri Ramachandra Medical College & Research Institute. Institutional ethics committee clearance was obtained (IEC reference no: CSP-MED/15/AUG/24/01). Informed written consent was obtained from all the participants after explaining the detailed procedure. Visual (VRT) and auditory reaction time (ART) was measured by using the instrument PC 1000 Hz reaction time analyzer in the morning with an empty stomach in a dark room.<sup>11</sup> PC 1000 Hz reaction timer is an in house build add the device, used for measuring the auditory and visual reaction time. It's a 1000 hertz square wave oscillator that has a soft key for the start and stops function. It has two components (A & B) connected. The first component (A) has a start button that will be out of the view from the subjects and it is controlled by the examiner only. The second component (B) has a stop button that will be operated by the subjects. Also, it has a small red LED light for visual stimulus and headphone (1000 hertz's tone) which receives auditory stimulus respectively. Red light is selected for the experiment as the maximum number of cones is activated to red, persists for a long time in the retina.<sup>12</sup> Component A and component B is in turn connected to a personal computer that has audacity sound software installed in it. Audacity city software records the reaction time in 0.001-sec accuracy in wave format. Minimum three trials were given for both VRT and ART measurement and the average time was considered for the final VRT and ART value in msec.

## STATISTICAL ANALYSIS

Data expressed as mean and SD. Independent t-test and One-way ANOVA followed by posthoc test (Tukey HSD) were used for the comparison of mean in between the group using R free statistical software version 3.1.1.

## RESULTS

**Table 1** shows the baseline anthropometric and cardiovascular parameters. Heart rate (72.49±9.71 vs 68.28±8.04 bpm), SBP (114.86±9.25 vs 108.58±6.58 mmHg) and DBP (71.29±8.82 vs 68.43±4.80 mmHg) decreased significantly (P<0.05) in the yoga group compared to the control group. In **table 2**, there was a significant shortening in the ART (214.74±22.98 vs 192.56 ± 18.70 msec) and VRT (246.03 ±39.46 vs 224.59±32.66 msec) time in the yoga group compared to that of control group subjects. Comparison of VRT

and ART based on their year of practice (Table 3) showed that subjects practised more than 3 yrs had a significant shortened VRT (198.8 ± 29.46 msec) and ART (179.26 ± 29.32 msec) than < 1 yr and 1-2 yrs yoga group subjects.

## DISCUSSION

The present study showed significant shortening in both VRT and ART in regular yoga practising group subjects. The same kind of responses was reported earlier with various form of pranayama and yogic techniques with short term practice.<sup>10-13</sup> But this is the first-ever study reporting the status of RT in long term yoga (>1 yr) practitioners. The female participants in the present study showed a reduction(not significant) in RT in both the yoga group and control group which is similar to that of previous findings.<sup>14</sup> It may be due to time lag between the presentation of a stimulus and the beginning of a muscle contraction, which was slower in females.<sup>14,15</sup> RT is one of the methods to assess the person's central processing speed and coordinated peripheral response and it is important for drivers, pilots, surgeons etc.<sup>16</sup> Many factors influence RT like gender, age, fitness and health, muscle strength and distraction.<sup>17</sup> Shortened RT after yoga training is probably due to increase in muscle tone, greater arousal, the faster rate of information processing, increase in sensory-motor conduction velocity.<sup>18</sup> Faster reactivity after a long term of yoga practice may be due to the modulation of activity at ascending reticular activating system and information processing at the primary thalamocortical level.<sup>10</sup> Cohen et al., 2009 in their study found that cerebral blood flow has increased following the yoga training and have a greater impact on the right hemisphere, especially in the frontal lobe.<sup>19</sup> Now, it can be emphasized that the enhancement in the reaction time may be connected to the above changes because the frontal lobe is the one that acts as working memory, logical thinking, etc.<sup>20</sup> It clearly understands that a calm and peaceful mind will be able to process the task much faster and respond appropriately than a restless one. Consistent practice of yoga would bring coordination and psychosomatic integration.

## CONCLUSION

The results of present study show that regular practice of Yoga enhances processing ability of the central nervous system, and thereby reaction time has been shortened among the practitioners. Hence yoga can be implemented in today's school and college curriculum for better academic performance and wellbeing of the students.

## ACKNOWLEDGEMENTS

We would like to sincerely thank all the participants in this study for actively volunteering to undergo the cognitive tests.

**Conflict of interest**

The authors declare that they have no competing interests

**Source of Funding**

Nil

**Authors' contributions**

BGM and RP conceptualized the study. SR and KM played a key role in data collection, data entry and data analysis. RP provided intellectual input throughout the study. SR MK, BGM and RP closely supervised data collection, data entry, data analysis and contributed immensely in writing and editing the manuscript. All authors read and approved the final manuscript

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**Table 1: Base line Anthropometric and cardiovascular parameters of the participants**

Variable	Control group n=40	Yoga Group n=40	p-value
Age (Yr)	17.38±1.98	18.62± 1.62	0.26
Sex (M/F)	22/18	24/16	0.82
Height (cm)	161.2±9.27	159.86±7.92	0.78
Weight (Kg)	51.53±13.68	53.88±10.42	0.65
BMI (Kg/m <sup>2</sup> )	18.2±3.89	19.40±2.71	0.71
Heart rate (bpm)	72.49±9.71	68.28±8.04	0.03
SBP (mmHg)	114.86±9.25	108.58±6.58	0.02
DBP (mmHg)	71.29±8.82	68.43±4.80	0.05

Data expressed Mean±SD. BMI-Body mass Index, SBP- Systolic blood pressor, DBP- Diastolic blood pressor

**Table 2: Comparison of Reaction time between control and yoga group**

Reaction time (msec)	Control group (n-40)	Yoga Group (n-40)	p-value
ART	214.74±22.98	192.56 ± 18.70	0.01
VRT	246.03 ±39.46	224.59±32.66	0.03

**Table 3: Comparison of Reaction time based on year of practice among yoga group**

Reaction Time (msec)	Yoga Group		
	<1 yrs (n-18)	1-2 yrs (n-13)	>3 yrs (n-9)
ART	225.14 ± 36.42	201.82 ± 45.80*	179.26 ± 29.32**#
VRT	243.54 ± 27.65	209.6 ± 33.20*	198.8 ± 29.46**#

\* Compared with < 1 yr ; # compared with 1-2 yrs group

\* p<0.05, \*\* p <0.01; # p <0.05, ## p <0.01