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Effect Of Breathing Exercises On Audio-Visual Reaction Time In Healthy Adults

[1]Doiphode R S, [2]Shete A N
[1]Physicist, [2]Associate Professor
Department of Physiology, Government Medical College, Aurangabad, Maharashtra, India

***Corresponding Author:**
Doiphode R S
Physicist, Department of Physiology, Government Medical College, Aurangabad, Maharashtra, India

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Abstract

Background: Last few decades have witnessed yoga to be a potential alternative therapy in medicine. Many psychological and behavioural aspects of yoga help to understand it's effects, qualitatively. Reaction time (RT) is one of the measures that estimates the response of central nervous system. It serves as a simple non-invasive method to measure level of alertness providing an efficiency index of central nervous system processing.

Yoga was found to cause a better improvement in the health of the individuals of any age, with and without ailments. Hence, this study intended to show its utility as a short course for improving the reaction time in adults.

Aims and objective: To find out effect of six(6) weeks, breathing exercise training on audio-visual reaction time in adults.

Material and Methods: Audio-visual reaction time was recorded of 50 adults, before and after six (6) week training. Their age ranged between 40 to 60 years. They came voluntarily as subjects for the research project.

Results: In the present study there was significant decrease ($p<0.0001$) in Auditory Reaction Time (ART) as well as Visual Reaction Time (VRT) in adults after completion of six-week training.

Conclusion: A short course of breathing exercises have a beneficial effect on the audio-visual reaction time and hence can be used as an important and cost-effective tool for improving and increasing the level of alertness and shortening of the reaction time in adults

Keywords: Auditory reaction time (ART), Visual reaction time (VRT), Breathing Exercises, Adults

Introduction

Aging is an inevitable process. It is characterized by progressive and generalized impairment of homeostasis resulting in declining ability to respond to external or internal stresses and increased risk of diseases. It is associated with many changes including a general decline in sensory-motor functions, which may impair the ability to perform activities of daily living, safely and independently. A critical element in safe performance of day-to-day activities is the ability to react to incoming stimuli and its slowing has obvious consequences for life. With advancing age, one persistent finding in literature is slowing of responses and therefore increase in reaction time. One of the largest implications mainly for adults, that an increased reaction time may have, is in the area of slips and falls. Falls are commonly incurred by one third of the elderly population and are a common source of morbidity and mortality.(1,2)

In today's era, while ageing, stress is one of a constant companion of people. It's effects, especially in adults are detrimental on their wellbeing. As a result of some more factors like unhealthy and sedentary lifestyle, competitive and stressful environment, excess use of electronic gadgets, there is drastic impairment in the cognitive as well as the sensory motor performance, specially during ageing.

In addition to increase in the incidence of development of the co-morbidities like obesity, diabetes, hypertension etc. at an early age of life, it has also been found to be associated with increase in psychiatric illnesses like depression and/or anxiety.

Yoga is an ancient science and its components include Aasnas (postures), pranayama (voluntary breath regulation) and dhyana (meditation). Many research studies have reported beneficial effects of yoga on physiological and psychological wellbeing. Studies have also observed that, practicing yoga can reduce stress level and reaction time (auditory/visual), reflecting the sensory motor performance of an individual.(3)

Yoga is an art of exercise which is associated with a set of principles and practices which are designed to promote health and the well being through the integration of the body, breath and the mind. And hence, yoga is commonly called as a mind-body therapy. It has often been claimed that it can enhance one's ability to focus the attention, improve the cognitive abilities, decrease stress and increase and improve the organ system's strength suppleness Central Nervous System.(4)

Reaction Time is one of the important Physiological parameters for the assessment of sensory motor coordination of an individual which reflects the level of alertness. It is the time interval between the presentation of a stimulus of any modalities of sensory input (visual, auditory, pain, touch or temperature) and subsequent behavioural response measured typically by a button press, an eye moment, a vocal response, or some other observable behaviour. Reaction time provides an indirect index of the processing capability of central nervous system, concentration and cognitive skills with well proven diagnostic validity. Hence, this is being used in mental chronometry, psychometric psychology and also in training mentally challenged children also. This test has a physiological as well as a clinical significance, as

a shorter reaction time means a better performance, which is a prerequisite for sports personnel, surgeons and similarly for other professionals too. (3)

Factors affecting reaction time are –Arousal, Age, Gender, Left v/s Right Hand, practice, fatigue, fasting, distraction, personality type, punishment, stress, exercise and intelligence of the subject.(5)

However, studies have been done on the relation between gender and visual and auditory reaction times, very few studies have been made in relationship between yoga and audio-visual reaction time, specifically in elderly individuals. (6)

Hence, the present study was conducted to determine the effect of breathing exercises and training on audio-visual reaction time in adults.

Materials And Methods:-

Present study was conducted in the Department of Physiology, Government Medical College, Aurangabad. Auditory Reaction Time (ART) and Visual Reaction Time (VRT) of elderly males and females was measured once, before and then again after six(6) weeks of completion of breathing exercise training.

GROUP I: 50 elderly subjects, including both males and females of age group 40 to 60 years, were selected for the study.

GROUP II: Same subjects were examined after completing 6 weeks of training.

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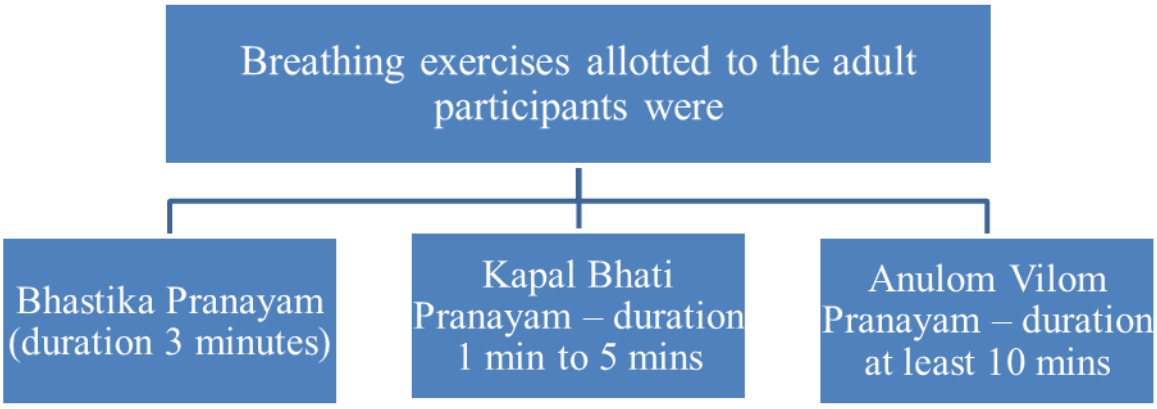

All the subjects included in the study were non-alcoholic, non-diabetic, having normal vision and normal hearing acuity and had no clinical evidence of any CNS disease and had perfect sense of physical, mental and psychological well-being. They were not on any medication therapy. Informed consent was taken from all participants.

Audio-visual reaction time was measured by the dominant hand with the Medicaid RTM-604, Audio-Visual reaction time apparatus. The instrument is specially designed to measure response time in milliseconds (ms).

It had two modes of providing stimulus- Audio and Visual. Each subject was made acquainted with the apparatus and the procedure to alleviate any fear or apprehension. The tests were done in a quiet room with the subject sitting comfortably in a chair. After familiarizing the subject with the instrument and after repeated practice, three readings for each parameter (ART & VRT) were noted. The least reading of three was taken as the value for reaction time task for both Auditory and Visual Reaction time and was noted in the subject's record profile.

Paired "t" test was applied for comparison between the two groups

Results: Table I:- Baseline Characteristics

Parameter	**Cases**
Age (Years)	52.27 ±5.26
Weight (Kilogram)	71.50 ±12.42
Height (Centimeters)	164.76 ±7.36

Table No. II- Comparison of Before and After yogic exercise effect on ART & VRT

PARAMETER	GROUP I **(Mean±S.D)**	GROUP II **(Mean±S.D)**	p VALUE
ART (ms)	369.95±31.03	321.63±19.18	< 0.0001*
VRT (ms)	406.98±34.57	381.70±15.25	= 0.0001*

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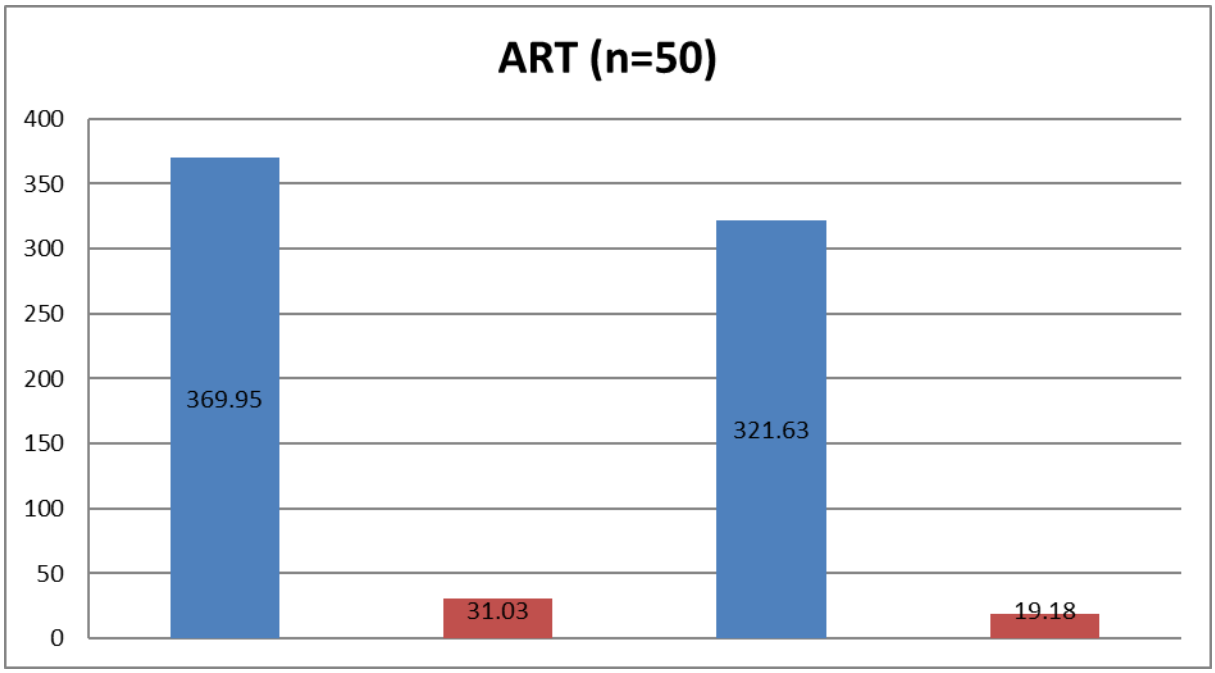

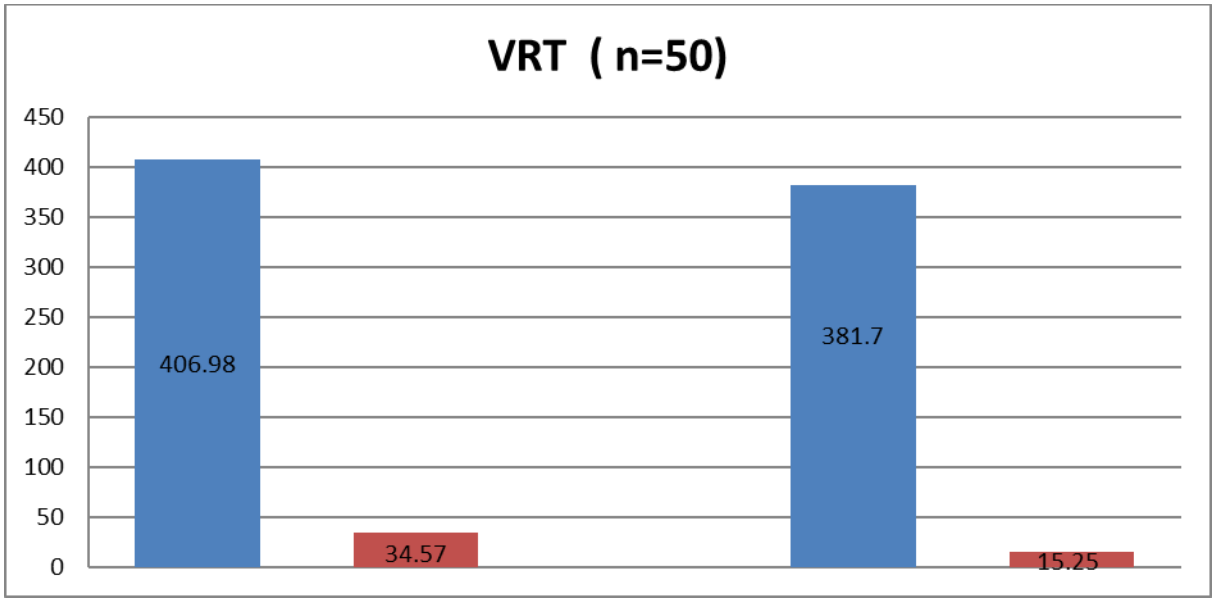

Discussion: -

In the recent years, stress and unhealthy lifestyle are the major and important risk factors for the development of co-morbidities and impairment in the cognitive as well as sensory- motor performance, mainly in adults. Against this background the present study was conducted to evaluate the effect of breathing exercises on audio- visual reaction time which is one of the easy and cost-effective tests to assess the elderly individual's sensory motor performance. Reaction time is the interval between the presentation of a stimulus to a subject and the subject's response and it is often used as an indicator of the enhanced motor skills and for the better overall fitness specially in competitive situations. (7)

In the present study there was significant decrease ($p<0.0001$) in auditory reaction time as well as ($p=0.0001$) in visual reaction time.

Similar results shown by Manjunath et al and Telles S found enhanced spatial and temporal characteristics which likely improves visual reaction.(8, 9)

Malathi Parulkar (1989) reported reduction in auditory and visual reaction time after yoga training

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and Madanmohan et al (1992) also reported that yoga practice for 12 weeks results in significant reduction in visual and auditory reaction times in the normal adult male volunteers. (10,11) Jansi Rani N and Sridevi documented that practice of yoga reduces anxiety and increases alertness and attention which can improve the subjects performance in the reaction time experiment. (12,13)

Yoga enhances physical and emotional health and increases the performance of personnel. Shortening of audio-visual reaction time after yoga training signifies greater arousal, improved concentration & faster responsiveness. (10)

The link between mind and 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 and endocrine secretions are now well known. The proper conditioning of the nervous system can maintain the normal homeostasis, during ageing also. The process of mental relaxation may thus be expected to produce such conditioning. (14,15)

A single photon Emission computed Tomography study done by Cohen DL et al demonstrated that the yoga training program increased the Cerebral Blood Flow (CBF) and that the changes in particular, appeared to have a greater impact on the right hemispheric function, particularly in the frontal lobes.(16)

Study conducted by Streeter CC et al. states that Yoga is involved in restoring the under activities of the Parasympathetic Nervous System (PNS) and the Gamma Amino-Butyric Acid (GABA) systems. This restoration may be partly through the stimulation of the vagal nerve. Reaction Time may be related to the above facts.(17)

The need of the hour is holistic health. Health as defined by WHO encompasses not only physical but also mental & social well being and not merely an absence of infirmity or disease.(18) The paradigm has now shifted from curative to preventive measures. It has been stated that "The ultimate aim of medical sciences is the attainment of optimum physical & mental health for the individual. The ultimate aim of yogic and meditation techniques is also to achieve holistic health beginning with a peaceful mind .(19)

This study shows that with getting engaged in yogic activities, even for short course (6 weeks) there can be a reduced auditory and visual reaction time which would help the elderly individuals in their transition phase by increasing agility, concentration and performance. During aging, the elderly individuals should therefore be encouraged to be more physically active to maintain homeostasis.

Conclusion

This study concludes that breathing exercise training in particular to adults can be used as an important and cost-effective tool for improving and increasing the level of alertness (which can be observed as reduction in the reaction time), in betterment of their day-to-day activity performance.

Limitations

1. This study was limited by the duration of yoga training, which needs to be extended for the longer period of training session.
2. The present study has important limitation of not comparing the effects of these breathing exercises on other body functions.

Recommendations:-

In developing and poor countries the facilities for recreational exercise and sports are not easily available and many low socio-economic group people cannot afford to utilize the available resources. Some adult individuals with physical constraints and for other reasons like lack of training may not be able to perform any other sports activity(outdoor/indoor) though they can undergo some simple breathing exercise training.

In light of these facts, these breathing exercises, especially for adults, can become: -

1. The most convenient and important way of lifestyle intervention and
2. They can be helpful for prevention of many diseases as prescribed by World Health Organization (WHO), where rigorous physical exercises are not always advisable.

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