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RESEARCH ARTICLE

Immediate effect of Anulom Vilom (pranayama) on reaction time of 18-20 years' age group

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ABSTRACT

Background: Yogic techniques produce consistent physiological changes and have a sound scientific basis. There are lots of studies reporting the long-term effect of pranayama training, but there are few reports on the immediate effects of pranayama on body functions. **Aims and Objectives:** The purpose of this study was to find out whether the pranayama has any immediate effect on human reaction time (RT). **Materials and Methods:** This study had been conducted in 40 healthy male volunteers of the age group of 18-20 years. In this study, we had studied the time taken between applications of visual stimulus and auditory stimulus and response obtained and comparison of the response in volunteer before doing the Anulom Vilom pranayama and immediately following the Anulom Vilom pranayama. Subjects were presented with two type of stimuli; visual stimuli and auditory stimuli. Paired and unpaired *t*-test was used at appropriate places as a statistical test. The $P<0.05$ was considered significant. **Result:** A significant decrease in auditory RT and visual RT was observed immediately following the Anulom Vilom pranayama. **Conclusion:** A decrease in RT indicates an improved sensory motor performance and enhanced processing ability of the central nervous system due to Anulom Vilom. This may be due to greater arousal, faster rate of information processing, improved concentration and/or ability to ignore extraneous stimuli. This is of applied value in situations requiring faster reactivity such as sports, machine operation, race driving, and specialized surgery.

KEY WORDS: Reaction Time; Anulom Vilom; Visual Reaction Time; Auditory Reaction Time

INTRODUCTION

Yogasana and pranayama are claimed to have beneficial effects on the body such as improving the functions of different systems of the body including the performance of the central nervous system (CNS).[1] Yogic techniques produce consistent physiological changes and have a sound scientific basis. There are few reports on the effects of various pranayama, i.e., Yoga breathing on body functions. Various methods of pranayama are mostly characterized by breath holding at the end of maximum inspiration or maximum expiration and slowing of the respiratory rate. They also bring equipoise between psychic and somatic aspects of bodily functions.[2]

The physiological and psychological benefits of yoga have been demonstrated in several studies.[3] These studies have shown that regular practice of yoga leads to improvement in physiological functions and human performance. Benefits have been reported in both peripheral nerve function as well as central neuronal processing.[1,4] Reaction time (RT) is an indirect index of the processing ability of CNS and a simple means of determining sensory motor association and performance.[5] Determination of RT has important implications in sports physiology, and the performance of an athlete is dependent on the duration of RT.

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It is an index of cortical arousal[1] and a decrease in it indicates an improved sensory motor performance and an enhanced processing ability of the CNS. It has been found that changes in breathing period produced by voluntary control of inspiration are significantly correlated to changes in RT.[6]

The previous studies on yoga have shown that regular practice of yoga can significantly decrease visual RT (VRT) and auditory RT (ART).[1,3] It has also been suggested that RT can be used as a simple and objective method to determine the beneficial effects of yoga training.[1,3] There are lots of studies related with the beneficial effect of long-term pranayama training, there are very few studies related with benefit of immediate effect pranayama training. Moreover, there is hardly any study related with Anulom Vilom pranayama. Hence, the purpose of this study was to study the immediate effect of Anulom Vilom pranayama. This study has been conducted on the medical students immediately after doing Anulom Vilom.

MATERIALS AND METHODS

This study was conducted on 40 healthy male medical students. They are in age range of 18-20 years. The experimental protocol was explained to them and written consent obtained. All the procedures were non-invasive, and the study plan was approved by the Ethics Committee of Index Medical College Hospital and Research Centre, Indore. All the subjects were healthy and free from any cardio-respiratory ailments and were not on any medication. Smokers were excluded from the study. The subjects were of same socioeconomic and nutritional status as they hailed from upper middle class and upper class of society sharing common hostel accommodation and food. Proper consent of volunteer students was taken.

Experimental Protocol

Anulom Vilom was done in sitting posture, and following instructions were followed by participants: (i) Sit in a comfortable balanced meditative pose, (ii) use the right-hand thumb to close your right nostril, (iii) inhale from the left nostril, (iv) close your left nostril with your right hand's index and middle fingers, (v) exhale from the right nostril, (vi) do the reverse: Inhale with the right nostril, (vii) close your right nostril with your right hand thumb, and (viii) exhale with the left nostril.

This is one round of Anulom Vilom pranayama, and such 20 cycles are repeated.

Study Procedure

The study was conducted on the medical students of Index Medical College Hospital and Research Centre, Indore. 40 male medical students fulfilling inclusion criteria were included. The apparatus used in this study was audio-visual reaction timer. Proper consent of volunteer students was obtained before the procedure. Each individual was explained about the test, and sufficient trials were given for proper understanding. All the subjects were subjected to the tests in the quiet/secluded room. The RT was noted during morning hours (10 am - 12 pm) RT measurements were done 10 min before and 10 min after doing Anulom Vilom pranayama. The apparatus was designed to measure RT for four stimuli: Two sound stimuli and two light stimuli. Two response alternatives are provided by two response keys. The chronoscope is built into count the RT. Subjects were instructed to press the response button by the RT. Index finger already on it to stop the clock as soon as he will see the visual stimuli/hear the auditory stimuli, from digital display RT was noted. Three readings of each stimulus taken and the lowest reading were taken as RT value.

A comparison was made between - (i) VRT 10 min before doing Anulom Vilom and 10 min after doing Anulom Vilom; (ii) ART 10 min before doing Anulom Vilom and 10 min after doing Anulom Vilom.

Statistical Analysis

To test whether there was any significant difference in between males and females with reference to the study variables between the study groups, paired and unpaired *t*-test was used at appropriate places as a statistical test. The $P < 0.05$ was considered significant.

RESULT

VRT, ART, and were studied in 40 male medical students of Index Medical College Hospital and Research Centre, Indore, who formed the study group.

The range of age of volunteer student was from 18 to 20 years. The results were tabulated and statistically analyzed. To test whether there was any significant difference with reference to the study variables between the study groups, paired and unpaired '*t*'-test was used at appropriate places as a statistical test.

According to Table 1, the ART before Anulom Vilom was 201.50±10.14 and the ART immediately following Anulom Vilom pranayama was 159.75±8.98. Moreover, the difference between two was found statistically significant ($P = 0.0001$). The VRT before Anulom Vilom was 239.75±11.49 and the VRT immediately following Anulom Vilom pranayama was 198.75±7.66. Moreover, the difference between two was found statistically significant ($P = 0.0001$).

DISCUSSION

The performance of 20 rounds of Anulom Vilom produced an immediate and statistically significant decrease in both VRT and ART. The faster reactivity seen post

Table 1: Effect of Anulom Vilom on reaction time (n=40)

Parameters	Before doing Anulom Vilom	After doing Anulom Vilom	*P* value
ART (ms)	201.50±10.14	159.75±8.98	0.0001*
VRT (ms)	239.75±11.49	198.75±7.66	0.0001*

Data presented are mean±SD, SD: Standard deviation, *P<0.05=Significant, ART: Auditory reaction time, VRT: Visual reaction time

Anulom Vilom.[7] may be due to a generalized alteration in information processing at the primary thalamocortical level that occurs during pranayama as postulated by Telles et al.[8] According to the traditional wisdom of yoga, pranayama is the key to bringing about psychosomatic integration and harmony. A calm mind will be able to process information much better than an agitated one. A previous study conducted by Bhavanani et al., has also reported a reduction in RT following 3 weeks of training in slow and fast pranayama.[7]

A decrease in RT indicates an improved sensor motor performance and could be due to an enhanced processing ability of the CNS. These effects of pranayama training on the CNS could be due to greater improved concentration power and ability to ignore and/or inhibit extraneous stimuli. Pranayamic practitioners are known to have better attention and less distractibility. It has been reported that this form of yoga practice, i.e., Anulom Vilom type of breathing results in a decreased in mental fatigability and an increase in performance quotient. Since the performance of an athlete is directly linked with duration of RT, determination of RT could be used to screen a large population for physical fitness. Thus, determination of RT has important implications in sports physiology.[2]

In yoga, pranayama is known to modulate autonomic output. The combination of various types of pranayama helps in achieving and maintaining an autonomic balance between two components (sympathetic and parasympathetic of autonomic nervous system). Pranayama is known since ancient times to relieve stress and stabilize autonomic function of the body.[9] It has been reported that pranayama improves cardio-respiratory functions and alters autonomic functions.[9]

Pranayama breathing has been shown to alter the autonomic activity. Telles et al. have demonstrated pranayama breathing through the right nostril results in an increase in sympathetic activity whereas left nostril breathing reduces it.[10,11] Raghuraj et al.[12] have reported that slow pranayama (Nadishuddi) increase parasympathetic activity whereas the fast pranayama (Kapal Bhati) increase sympathetic activity. Pal et al.[13] studied the effect of short-term breathing exercise on autonomic function.

CONCLUSION

A decrease in RT indicates an improved sensory motor performance and enhanced processing ability of the CNS due to Anulom Vilom. This may be due to greater arousal, faster rate of information processing, improved concentration and/or ability to ignore extraneous stimuli. This is of applied value in situations requiring faster reactivity such as sports, machine operation, race driving, and specialized surgery.

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