

**IJCRR**

Vol 05 issue 08

Section: Health Care

Category: Research

Received on:10/02/13

Revised on: 02/03/13

Accepted on:23/03/13

KAPAL BHATI PRANAYAMA MODIFIES VISUAL REACTION TIME

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ABSTRACT

Kapalbhatti is form of Pranayama, which means ('breath of life'). This exercise helps to regulate and control breathing. It is useful in clearing of mind, weight loss, diabetes, it improves the quality of life in people with heart diseases and prostate enlargement. This procedure uses excess inhaled air to flush the blood vessels in the heart and clear them of nascent block. It involves taking normal breaths, diaphragm and abdominal muscles are to be moved violently and the air is exhaled with that movement. This is done for 2 minutes and Reaction times are recorded before and after the procedure. During normal breathing, we just take shallow breaths, and we don't fill our lungs to capacity. Shallow breath causes excessive weight. Kapalbhatti teaches us how to take deep breath which increases oxygen supply to body and removes waste products. Continuous inhalation of oxygen and expulsion of carbon dioxide converts the venous blood to oxygenated blood. The heart's function to pump blood to the lungs is sub-served by the breathing technique. The heart is given extraordinary rest. Hyperventilation washes out carbon dioxide which leads to central vasoconstriction that leads to a filling of emptiness in the head. This possibly explains, scientifically why kapalbhatti cleanses the head. This is the reason we ventured to see reaction times in our study.

INTRODUCTION

Patanjali, foremost exponent of Yoga, described pranayama as the gradual unforced cessation of breathing. Pranayama is derived from two Sanskrit words - prana (life) and yama (control). Pranayama or control of prana or life force yields heart beat, pulse and mind control. Kapalbhatti is a form of pranayama, whose root meaning comes from the words kapal (skull) and bhatti (shining). This breathing exercise involves expulsion of the air with violent movements of abdomen and diaphragm. It helps in clearing the mind, weight loss and improves quality of life in people with heart diseases and prostate enlargement, as it uses excess inhaled air to flush out the blood vessels in heart and clear them from nascent block. This technique stimulates the kapal (forehead region) through rapid breathing

movements and sensitizes the frontal region to the touch of air. The impact is on the *Swadisthan* and *Ajna chakras* corresponding to sacral and medullary plexus (23). Our study is designed to observe the effect to kapalbhatti pranayama on visual reaction time.

MATERIAL AND METHODS

The pranayama is performed before meals. Twenty normal male MBBS subjects at Santosh Medical College, Ghaziabad were seated in a comfortable sitting posture with spine straight, body relaxed. Kapalbhatti pranayama starts with a short inhalation followed by exhalation of air with violent movements of diaphragm and abdominal muscles. The procedure was done for two minutes. Visual reaction time is taken before and after the kapalbhatti pranayama. Reaction

time test was taken online (24). It consists of a traffic light signal of red, yellow and green. The subject is instructed to click on a button to begin when ready, to wait for the spotlight to turn

green, and click the button when it turns green quickly! The average of five responses in seconds is taken as a reading.

RESULTS

Table 1: Visual Reaction Test before and after Kapalbhathi pranayama

	Parameters	Before	After	p-value
1.	Visual reaction time in seconds	0.44 ± 0.12	0.37 ± 0.11	$p < 0.002$.

Twenty subjects took the online reaction time. There visual reaction time decreased from 0.44 ± 0.12 to 0.37 ± 0.11 at $p < 0.002$. (Figure 1 and Table)

DISCUSSION

Pranayama appears to be a specialized respiratory exercise capable of inducing series of beneficial effects besides causing improvement of respiratory functions. It increases oxygen supply to body and decreases carbon dioxide which leads to loss of hypercapnic drive and subsequent cessation of breathing and apnea. Deep inhalation prolongs the period of apnea because there is no anoxic stimuli to stimulate breathing. Continuous inhalation of oxygen and expulsion of carbon dioxide converts the venous blood to oxygenated blood; the heart is given some extraordinary rest as its function to pump blood to the lungs is served by kapalbhathi breathing technique.

Yoga asanas and pranayama have been observed to lower rate of respiration, increase FEV/FVC, increase slow vital capacity, maximal voluntary ventilation, peak expiratory flow rate (PEFR), expansion of chest, vital capacity, ability to hold breath and reduce bronchial hyperactivity (1-5). The exact mechanism involved is not known however, pranayama releases epinephrine that helps reduce parasympathetic bronchomotor tone resulting in increasing basal airway caliber (6).

In Kapalbhathi pranayama, the abdominal wall is brought into activity. This in turn works on the diaphragm and moves it better, thus helping the lungs empty efficiently. The individual is relaxed

in pranayamic breathing, the basic need of oxygen decreases. There occurs neither oxygen debt nor increased levels of lactic acids as is otherwise associated during heavy exercises. The minimum production of carbon dioxide during stillness and inactivity of physical muscles after kapalbhathi pranayama results in slowing the activity of the lungs and heart. (7). Voluntary control by conscious effort on thoracic muscles and abdominal muscles alters the blood gas concentration. Breathing out forcefully decreases the $p\text{CO}_2$, which acts on the chemoreceptor area of the brain to modify activity of the generator neurons of respiration in the respiratory centre. (8). With pranayamic breathing the subjects felt good. Yoga relaxes, relieves stress, makes the patient feel good, alert, active and exhilarated by relaxing opioids and altering adrenocortical activity that gives pleasurable sensations and keeps body fit. (9). This helps to increase concentration that improves reaction times, as noted in our study.

Yoga employs stable postures or asanas and breath control or pranayama. Through regular practice of these, the autonomic equilibrium shifts towards a relative parasympathetic dominance. (10, 12) Parasympathetic balance is essentially concerned with conserving and restoring bodily resources and energies. This is

achieved by inhibiting the heart and alimentary activity promoting secretion. (11)

Changes of heart rate and respiration accompanying a yogic subjective activity are intended to alter the state of mind alone. (13). It has been seen that certain Yogis can alter the patterns of their cardiovascular functions voluntarily create atrial fibrillations or stop the heart at will. (14, 15) Other types of voluntary control of heart such as tachycardia, bradycardia, reduction of P wave amplitude, achieving T-wave amplitude more than that of R-wave and atrial flutter have also been recorded. (16)

There is a reduction in both systolic and diastolic blood pressure in hypertensive subjects after two or three weeks of yoga practice. The relief from high blood pressure diminishes gradually if kapalhatti pranayama is discontinued. The blood pressure was observed to return to normal in patients who started yoga asanas. This confirms the "cause and effect" relationship between yoga and blood pressure levels. (10, 17, 18)

In contrast to physical exercises such as walking that improve blood flow by movement of skeletal muscles, kapalhatti pranayama restores internal balance and homeostasis of the body by influencing the organ system, restoring the internal secretion to their normal value by securing the health of all organs. (10)

The subjects felt relaxed. In previous studies the patients have showed lower scores in excitability, aggressiveness, openness, emotionality and somatic complaints. (19)

They felt happy which has been associated with increased levels of endorphins and enkephalins after yoga. (20) Meditation often helps to relax the small vessels that control the blood pressure wall and would help reduce the pressure inside them. In a study of 112 subjects performing transcendental meditation the mean systolic blood pressure was 13.7 to 24.5 mm Hg lesser than the population mean. The analysis also showed that the meditators with more than five year

experience had a mean systolic blood pressure 7.5 mm Hg lower than meditators with less than five years of experience. (22)

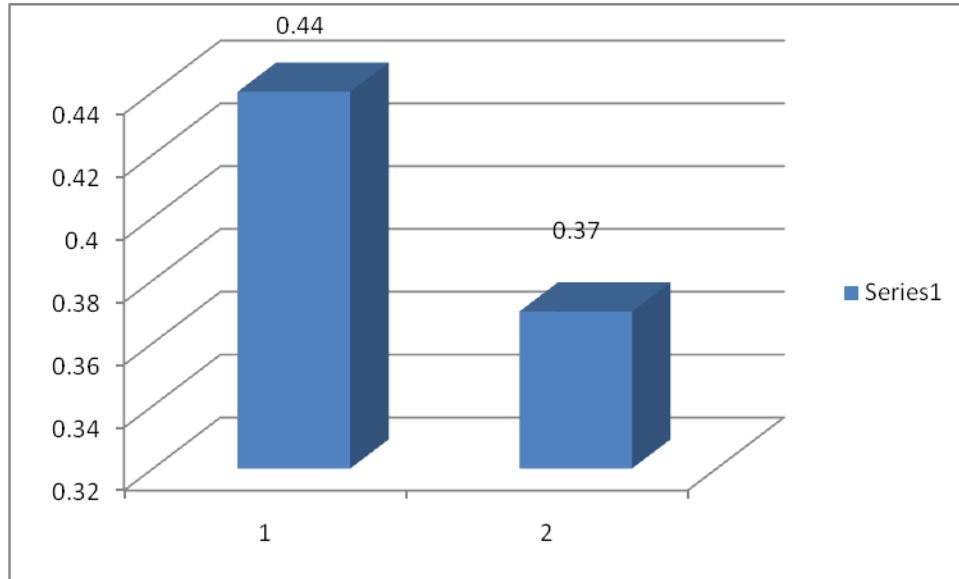
Asanas and Pranayama have beneficial effects on the body. They improve the functions of different systems of the body, increasing longevity. They bring equipoise between psychic and somatic aspects of bodily functions. They help in curing certain diseases and improve the quality of life. They invigorate the activity of lungs and heart. They calm the mind increase the concentration and give the ability to cope with tension, as seen in decrease in visual reaction time. They are a complete system for personal development promoting total physical and spiritual well being. (21)

CONCLUSION

Continuous inhalation of oxygen and expulsion of carbon dioxide converts the venous blood to oxygenated blood. The heart's function to pump blood to the lungs is sub-served by the breathing technique. The heart is given extraordinary rest. Hyperventilation washes out. Carbon dioxide which leads to central vasoconstriction that leads to a filling of emptiness in the head. This possibly explains, scientifically why kapalhatti cleanses the head. The pranayama cuts the life-force to the five sense telephones, concentrating the energies to the brain and thus decreases reaction time. This helps increase concentration of mind.

ACKNOWLEDGEMENT

Authors acknowledge the great help received from the scholars whose articles cited and included in references of this manuscript. The authors are also grateful to authors / editors / publishers of all those articles, journals and books from where the literature for this article has been reviewed and discussed. Authors are grateful to IJCRR editorial board members and IJCRR team of reviewers who have helped to bring quality to this manuscript.

Figure 1: Visual Reaction Test before and after Kapalbhathi pranayama**REFERENCES**

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