

Original Research Article

Impact of Sudarshan Kriya on Cognitive Processing: A Study on Auditory and Visual Reaction Time

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Abstract:

Background: Sudarshan Kriya, a rhythmic breathing technique, has been associated with physiological and cognitive benefits.

Objective: To assess impact of Sudarshan Kriya on auditory and visual reaction time (RT) in young healthy adults.

Material & Methods: A cross-sectional study was conducted with 100 healthy young participants, divided into a study group (n = 50) practicing Sudarshan Kriya for at least six months and a control group (n = 50) who were not practicing Sudarshan Kriya or any other meditation/yoga technique. Auditory and visual reaction time were measured using a digital reaction time apparatus. Statistical analysis was performed to compare the results between the groups.

Results: The study group demonstrated significantly shorter auditory and visual reaction time compared to the control group ($p < 0.05$), suggesting improved neural processing efficiency.

Conclusion: The findings indicate that Sudarshan Kriya may enhance sensory-motor coordination and cognitive function. Further longitudinal studies are recommended to establish causal relationships and explore underlying mechanisms.

Keywords: Sudarshan Kriya, auditory reaction time, visual reaction time

Introduction

Reaction time (RT) represents an important measure of neural processing speed and sensorimotor integration.¹ Faster RT is associated with better cognitive performance,

athletic ability and decision-making.² There is some evidence that meditation, yoga, and breathing exercises can improve RT.³

Sudarshan Kriya is a structured breathing technique that includes slow, medium, and fast breathing followed by breath retention.⁴ It affects the autonomic balance, cognitive functions, and emotional regulation.⁵ Studies have shown that regular practice of Sudarshan Kriya can change the activity of brain waves, increase oxygenation and improve neuroplasticity.⁶

Research on cardiovascular and stress-reducing benefits of Sudarshan Kriya has been extensive,⁷ but its impact on reaction time (RT) remains underexplored.⁸ This study was aimed to investigate whether Sudarshan Kriya practitioners show improved auditory and visual RT compared to non-practitioners.⁹

Materials and Methods

The study was approved by the institutional ethics committee. The present study was conducted in 100 healthy adults of both genders. Healthy adults aged 18–25 years; righthanded individuals (to minimize variability in RT testing); with no history of neurological or psychiatric disorders and willing to participate voluntarily in the study were included in the present study. Study group participants were chosen from Art of Living centres present in an urban metropolitan city. Control group had age and sex matched participants who were not practicing Sudarshan Kriya or any other meditation/yoga technique. Subjects with hearing or visual impairments; using medications affecting cognitive function and practicing any other meditation technique or yoga regularly were excluded from the present study. Written informed consent was taken from all the participants. The participants were divided into two groups.

Table 1- Division of participants into groups

Group	Number of participants	Criteria
Study group	50	Practicing Sudarshan Kriya for at least six months
Control group	50	Not practicing Sudarshan Kriya or any other meditation/yoga technique.

Sudarshan Kriya is a set of rhythmic breath techniques. The process is divided into four primary phases -

1. Ujjayi Breathing: Slow deep inhalations and exhalations with partial glottis closure, creating a gentle oceanic sound. This phase helps to calm the mind and regulate autonomic function.
2. Bhastrika (Bellows Breath) is a technique where rapid breaths are taken in and out through the nose. This is done at a controlled pace. This phase of the practice helps to energize the body, increase oxygen supply and stimulate neural pathways.
3. Om Chanting is a meditation technique consisting of a series of Om chants. This technique is used to relax and synchronize the brain waves.
4. Sudarshan Kriya (Cyclic Breathing) is a way of alternating cycles of slow, medium, and rapid breathing patterns, which help to balance sympathetic and parasympathetic activity, reduce stress, and enhance cognitive function.

The practice took place daily for approximately 45 minutes. The participants of the study group had been practicing Sudarshan Kriya for at least six months under the guidance of trained instructors.

Auditory and visual reaction time (RT) was determined in both study and control groups with the use of digital reaction time apparatus.

1. Auditory RT: The participants were required to press a key in response to a beep sound.
2. Visual RT: Participants were asked to respond to a flashing light stimulus.

Three trials were conducted and the mean RT was calculated.

Statistical Analysis:

Data were analyzed using SPSS software. The independent t-test was used to compare RT between groups. A p-value < 0.05 was considered statistically significant.

Results

Table 2: Baseline Characteristics of Study and Control Groups

Characteristic	Study Group (n=50)	Control Group (n=50)	p-value
Age (years)	21.3 ± 1.8	21.5 ± 1.6	0.42
Gender (M/F)	26/24	25/25	0.87
BMI (kg/m ²)	22.1 ± 2.5	22.4 ± 2.3	0.58

Table 3: Comparison of Auditory and Visual Reaction Time

Reaction Time	Study Group (n=50)	Control Group (n=50)	p-value
Auditory RT	180.6 ± 12.3	210.4 ± 15.8	<0.001
Visual RT	215.8 ± 14.7	250.2 ± 16.3	<0.001

Graph 1: Auditory and Visual Reaction Time Comparison

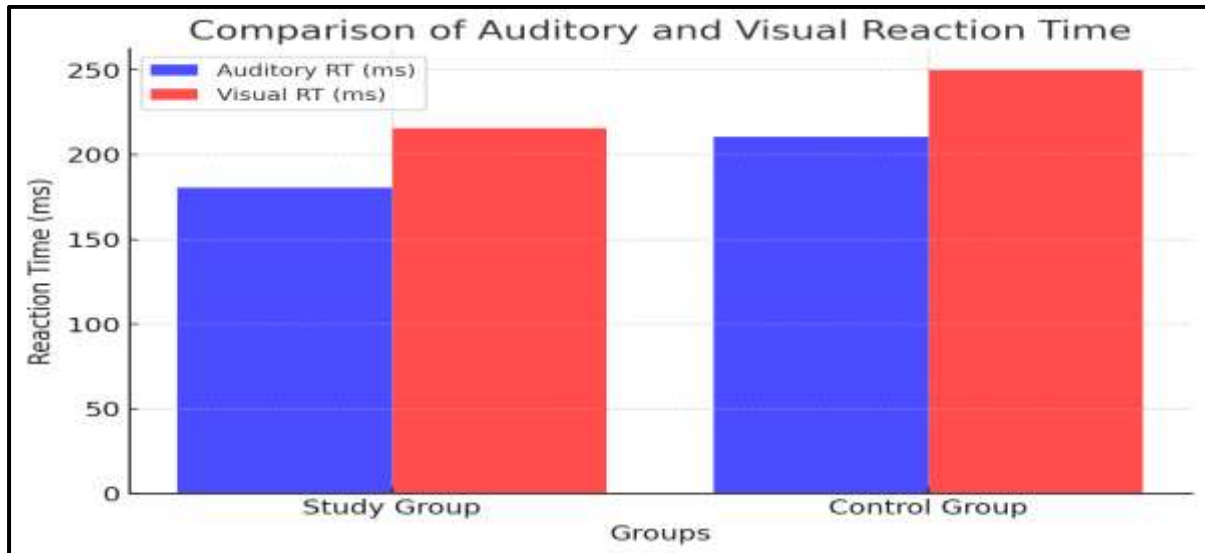
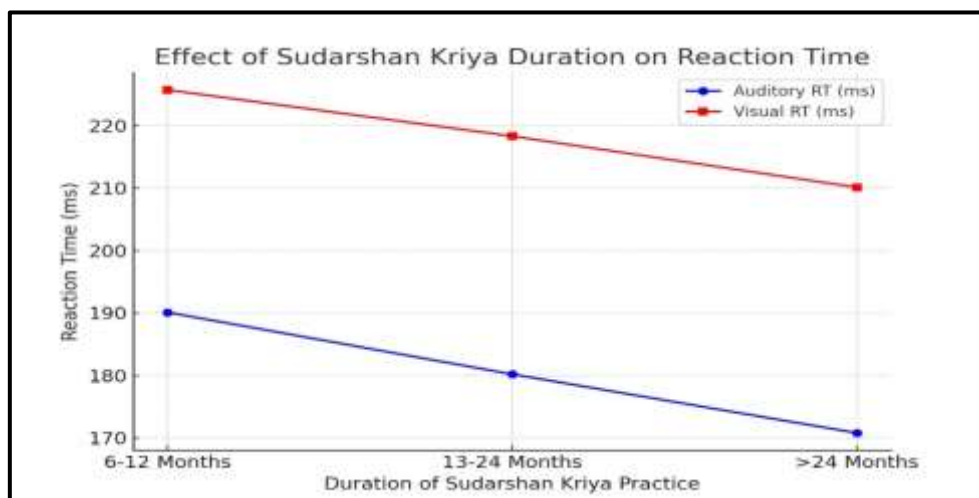


Table 4: Effect of Sudarshan Kriya Practice Duration on Reaction Time

Duration of Practice (Months)	Auditory RT (ms)	Visual RT (ms)
6–12	190.1 ± 11.8	225.7 ± 13.4
13–24	180.2 ± 10.5	218.3 ± 12.8
>24	170.8 ± 9.9	210.1 ± 11.2
p-value	<0.01	<0.01

Graph 2: Effect of Sudarshan Kriya Duration on Reaction Time



Discussion

In the present study, both the study and control groups were comparable with respect to age, BMI and gender distribution. (Table 2)

The research demonstrates that the reaction time of the auditory and visual systems of Sudarshan Kriya practitioners is significantly lower compared to those of non-practitioners.¹⁰ (Table 3, Graph 1) Also more the total duration of Sudarshan kriya practice, lesser was the auditory and visual reaction time. (Table 4) This implies that Sudarshan Kriya influences the speed of neural processing, attention and sensory-motor coordination.¹¹

Possible Physiological Mechanisms can be -

1. Enhanced Oxygenation: Regular breathing enhances oxygenation of the brain, which optimizes the operation of neurons.¹²
2. Autonomic Nervous System Regulation: Sudarshan Kriya augments parasympathetic activity which reduces stress-induced cognitive impairments.¹³
3. Neuroplasticity: Evidence suggests that regular practice increases cortical connectivity and improves sensory-motor integration.¹⁴

Research on meditation and yoga shows similar results. A study by Travis F et. al (2009) on Transcendental Meditation reports improved cognitive function and reaction time.¹⁵ Participants in a study of Pranayama conducted by Bhaskar H (2014) also showed a faster reaction time, which is consistent with our results.¹⁶

Our study extends this evidence by concentrating on Sudarshan Kriya, emphasizing its potential use in cognitive enhancement and sports performance.

Conclusion:

Regular Sudarshan Kriya practice leads to significant improvements in auditory and visual reaction times. This implies that there could be advantages in neural processing efficiency and sensory-motor coordination. Future longitudinal studies should investigate its long-term cognitive benefits.

References:

1. Luce RD. Response times: Their role in inferring elementary mental organization. Oxford University Press; 1986.
2. Jain A, Bansal R, Kumar A, Singh KD. A comparative study of visual and auditory reaction times on the basis of gender and physical activity levels

- of medical first-year students. *Int J Appl Basic Med Res*. 2015;5(2):124-7.
3. Telles S, Singh N, Puthige R. Changes in reaction time following yoga bellows-type breathing in healthy adults. *Indian J Physiol Pharmacol*. 2013;57(2):153-60.
 4. Brown RP, Gerbarg PL. Sudarshan Kriya yogic breathing in the treatment of stress, anxiety, and depression: Part I—Neurophysiologic model. *J Altern Complement Med*. 2005;11(1):189-201.
 5. Zope SA, Zope RA. Sudarshan Kriya yoga: Breathing for health. *Int J Yoga*. 2013;6(1):4-10.
 6. Streeter CC, Gerbarg PL, Saper RB, Ciraulo DA, Brown RP. Effects of yoga on autonomic nervous system, gamma-aminobutyric-acid, and allostasis in epilepsy, depression, and post-traumatic stress disorder. *Med Hypotheses*. 2012;78(5):571-9.
 7. Sharma H, Sen S, Singh S, Bhardwaj N, Kochupillai V, Singh N. Sudarshan Kriya practitioners exhibit better antioxidant status and lower stress levels. *J Altern Complement Med*. 2003;9(4):589-96.
 8. Kalyani BG, Venkatasubramanian G, Arasappa R, Rao NP, Kalmady SV, Behere RV, et al. Neurohemodynamic correlates of 'OM' chanting: A pilot functional magnetic resonance imaging study. *Int J Yoga*. 2011;4(1):3-6.
 9. Bhavanani AB, Rajajeyakumar M, Ramanathan M. Immediate effect of different yoga breathing techniques on reaction time. *N Am J Med Sci*. 2014;6(10):507-10.
 - 10.10. Khalsa SB. Yoga as a therapeutic intervention: A bibliometric analysis of published research studies. *Indian J Physiol Pharmacol*. 2004;48(3):269-85.
 - 11.11. Tang YY, Lu Q, Geng X, Stein EA, Yang Y, Posner MI. Short-term meditation induces white matter changes in the anterior cingulate. *Proc Natl Acad Sci U S A*. 2010;107(35):15649-52.
 - 12.12. Cahn BR, Polich J. Meditation states and traits: EEG, ERP, and neuroimaging studies. *Psychol Bull*. 2006;132(2):180-211.
 - 13.13. Joshi M, Telles S. Immediate effects of right and left nostril breathing on verbal and spatial scores. *Indian J Physiol Pharmacol*. 2008;52(2):197-200.

- 14.14. Field T. Yoga clinical research review. *Complement Ther Clin Pract* 2011;17(1):1-8.
- 15.15. Travis F, Haaga DA, Hagelin J, Tanner M, Nidich S, Gaylord-King C, et al. Effects of Transcendental Meditation practice on brain functioning and stress reactivity in college students. *Int J Psychophysiol.* 2009;71(2):170-6.
16. Bhaskar H, Kumari S, Sudhakar R, Satyanarayana P. Effect of Pranayama on visual and auditory reaction time in medical students. *Int J Med Res Health Sci.* 2014;3(2):360-363.