ORIGINAL RESEARCH PAPER

Psychology

IMMEDIATE EFFECT OF A TWO YOGA BREATHING TECHNIQUES ON SUSTAIN ATTENTION IN ADOLESCENTS

KEY WORDS: Kapalbhati and Bhastrika, Sustain attention, DVT, Adolescence.

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ABSTRACT

Background: Adolescents face stressors related to their transition from childhood to adulthood, with a simultaneous increase in academic pressure. The present study compared the immediate effects of 15 minutes of *Kapalbhati* and *Bhastrika Pranayama* on sustain attention. **Materials and methods:** 300 apparently healthy adolescences of the both sex, in the age range of 13 to 16 participated in the study.The subject were assessed on DVT before and immediately after both *Kapalbhati* and *Bhastrika*. **Result:** Single session of Kapalbhati and Bhastrika practice for 15 minutes showed a significant changes in the performance on DVT test which requires sustained attention, increase in total attempted score($p<0.000$), significant reduction in error percentage (p value<0.000). **Conclusion:** The findings of this study concludes that an immediate effect of single session kapalbhati and bhastrika had a significant effect on the sustained attention in adolescents.

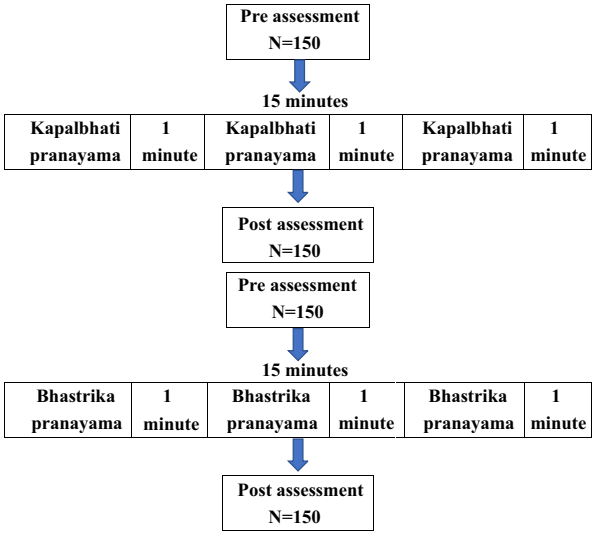
INTRODUCTION

Adolescence, transitional phase of growth and development between child and adulthood, is the time of profound physiological, intellectual, psychosocial and economic changes. In adolescent period academic performances and achievements are very important, which may be hampered due to stress related to complicated tasks like role identification and carrier choice of this period [1]. Academic pressure is a particularly important factor in those pre-teens the world over, who see education as a way to improve their own and their family's social and economic prospects [2]. Researchers from medicine and public health disciplines have assessed the usefulness and benefits of yoga for children in school settings [3]. Most of the studies described above assessed the effects of yoga breathing practiced for a number of days or weeks. However there are also acute or immediate effects of yoga breathing, which occur directly after the practice. Examples of the immediate effects of yoga breathing studied in children are discussed here. In 60 adolescents, 45 min of yoga bumble bee breathing reduced the heart rate and blood pressure [4]. Yoga breathing with an increased depth of breathing (called bellows breath), when practiced as nine rounds, where one round was one breath cycle, reduced the auditory and visual reaction time significantly in 22 healthy school boys [5]. A shorter reaction time suggested that participants responded sooner. High frequency yoga breathing practiced at breath frequencies between 1.0 and 2.0 Hz improved the performance scores in an attention-based cancellation task as an immediate effect of practice across different age groups [6]. The cancellation task requires the ability to focus attention, shift attention, as well as other abilities such as visual scanning and psychomotor speed [7]. Two different high frequency yoga breathing techniques have not been specifically compared for their immediate effect among adolescents. Hence the present study was designed to assess performance in a sustain attention based vigilance task immediately before and after 15 min of high frequency yoga breathings in 300 adolescents, in a random sequence, on separate days.

MATERIALS AND METHODS:

There were 300 adolescent students with ages ranging from 13 to 16 years (group mean age (SD), 14.3±0.8 years) recruited for the study from a non-residential school in Ahmedabad, India. The adolescents were recruited based on the following inclusion criteria: Apparently normal health based on a routine history, aged between 13 and 16 years, both genders, willingness to take part in the study. The exclusion criteria were: Girls who were menstruating, presence of any physical or mental illness and taking any medication. The study was approved by the institution's ethical committee of Lakulish Yoga University, Ahmedabad. Signed informed consent was taken from the school. also informed the parents of the students about the study and their oral approval was also taken. The students were randomly assigned to 2 groups, i.e., Kapabhati group, and Bhastrika group, Assessments of DVT was taken before and after each session.

Study sequel:



Intervention:

Kapalabhati: Kapalbhati literally translates to 'the shining forehead,' a high frequency yoga breathing technique

involves rapid nasal breathing with forceful exhalation by contracting the anterior abdominal muscles, followed by passive inhalation at a rate of 60 to 120 breaths/min [8].

Bhastrika: Bhastrika literally translates to 'Bellows' it's a type of yoga breathing which involves deep inhalation followed by complete exhalation, with an increase in breath rate [8]. Certified yoga teacher was there to monitor the practice and was familiar with the contraindications to practice high frequency yoga breathing, i.e., a history of febrile convulsions or seizures due to any cause, recent surgery or injury to the thorax or abdomen, and any breathing disorder in the children, which would make it difficult to carry out the practice. The yoga teacher was also aware of the precautions they needed to observe for signs of hyperventilating, over-breathing, or fatigued.

Assessment: Vigilance or sustained attention
Sustained attention was measured using a digit vigilance test (DVT) of proven validity and reliability [9], which consisted of the numbers 1 to 9 arranged randomly in rows . Each sheet had 50 rows with 30 digits per row. The participants were instructed to cancel only 2 digits (6 and 9) as quickly as they could. They were asked not to: (i) cancel other digits or (ii) miss any of the target digits (6 and 9). The total time taken to complete the test and the number of errors made were noted.

Data collection & extraction:
The DVT data was collected immediately before and after the 15 minutes of two high frequency yoga breathing techniques, The digit vigilance task was scored using the standard method[9]. The total time taken to complete the test (in minutes) and number of errors made were noted for analysis.

DATA ANALYSIS
The subjects were asked to cancel out digits 6 and 9. The time to complete the test along with the number of correct responses and errors was noted [10]. Statistical analysis was performed with the help of Statistical Package for Social Sciences version 19. The Kolmogorov, Smirnov test showed that the data was not normally distributed. Hence, Wilcoxon signed ranks test was used to compare means of the data collected immediately before and after the 15 minutes of two high frequency yoga breathing techniques.

RESULTS
DVT: Digit vigilance Test - The data analysis of Kapalbhati practice shows that 47.87% decrease in total time taken and 13.83 % decrease ($p<0.0001$) in error scores for DVT [Table-1].

Table-1:DVT changes after 15 Minutes of Kapalbhati practice

Variables	Pre Mean± SD	Post Mean± SD	% Change	P-value
DVT task: Time Taken (in minutes)	14.12 ± 0.1	7.36 ± 1.0	47.87	0.000**
DVT task: No. of errors	47.04 ±21.03	40.53 ± 25.48	13.83	0.000**

Note:SD=standard deviation, *significant at $p<0.05$, **Significant at $p<0.01$, ***Significant at $p<0.001$

The data analysis of Bhastrika practice shows that 25.86 % decrease in total time taken and 11.89 % decrease ($p<0.0001$) in error scores for DVT [Table-2].

Table-2: DVT changes after 15 Minutes of Bhastrika practice

Variables	Pre Mean± SD	Post Mean± SD	% Change	P-value
DVT task: Time Taken (in minutes)	7.12 ± 2.14	5.33 ± 1.5	25.86	0.000**
DVT task: No. of errors	56.93 ± 27.3	50.16 ± 29.69	11.89	0.000**

Note:SD=standard deviation, *significant at $p<0.05$, **Significant at $p<0.01$, ***Significant at $p<0.001$

DISCUSSION:
The present study intended to study the immediate effect of 15 minutes practice of Kaplbhati and Bhastrika breathing techniques on the performance in a vigilance task among adolescents. Improvement in the performance of vigilance task not only require sustain attention, but also visual scanning and cognitive flexibility. Decrease in total time taken and error scores in DVT following Kapalbhati and Bhastrika suggest improvement in vigilance task performance. Thus, the present study suggests a significant increase in sustain attention scores in adolescents following 15 minutes of kaplbhati and bhastrika, though the results of kapalbhati practice is more significant than bhastrika. It has been found that during kapalbhati practice induces parasympathetic withdrawal in reactivity phase and parasympathetic domination in recovery phase [11]. The vigilance task requires selective and sustain attention as well as the ability to shift attention[12]. The mechanism underlying the improvement in performance of vigilance task in this study might be due to enhancement in internal awareness[13], selective attention [14], and cortical inhibition[15], because of the high frequency yoga breathing techniques had influence on pre-frontal cortex[16], which is associated with memory, attention, and executive functions[17]. It may regulate the autonomic functions by dominating sympathetic [18], or parasympathetic tone [19], which could be the reason for reduction of anxiety and chronic stress levels and cause for improvement of attention. Both Kaplbhati and Bhastrika found significantly beneficial in improving sustain attention even after a single session, this prompts us the potential use these high frequency breathing techniques in academic settings.

CONCLUSION
It can be concluded that adolescents school students who practice single session kapalbhati and bhastrika for 15 minutes showed better performance in sustain attention task. Practice of pranayama alters the neurobiology of the brain and improve memory which contribute directly to the development of cognitive performance skills and executive skill of the students, possibly leading to improvement in attention if practice regularly. Larger randomized controlled trials are needed to validate these findings.

Source of funding
None

Conflicts of Interest
None

REFERENCES
1. Mangal S.K. General Psychology. Sterling Publications; 12th edition. New Delhi: 2004.
2. Hagberg S. Learning to Live or to Leave? Education and Identity in Burkina Faso. In: Melin M., editor. Education—A Way Out of Poverty? Poverty Conference, Stockholm, Sweden, 2001. The Education Division at Sida, Department for Democracy and Social Development; Stockholm, Sweden: 2002.
3. Eggleston B. The benefits of yoga for children in schools. Int. J. Health Wellness Soc. 2015;5:1–7.
4. Kuppusamy M.K., Kamaldeen D., Pitani R., Amaldas J. Immediate effects of bhramari pranayama on resting cardiovascular parameters in healthy adolescents. J. Clin. Diagn. Res. 2016;10:7–9.
5. Bhavanani A.B., Udupa K. Acute effect of Mukh bhastrika (a yogic bellows type breathing) on reaction time. Indian. J. Physiol. Pharmacol. 2003;47:297–300.
6. Telles S., Raghuraj P., Arankalle D., Naveen K.V. Immediate effect of high-frequency yoga breathing on attention. Indian J. Med. Sci. 2008;62:20–22.
7. Lezak M.D. Neuropsychological Assessment. Oxford University Press; New York, NY, USA: 1995.
8. Sharma V.K., Rajajeyakumar M., Velkumary S., Subramanian S.K., Bhavanani A.B., Madanmohan A.S., Thangavel D. Effect of fast and slow pranayama practice on cognitive functions in healthy volunteers. J. Clin. Diagn. Res. 2014;8:10–13.

9. Kelland DZ, Lewis RF. The digit vigilance test: Reliability, validity, and sensitivity to diazepam. Arch Clin Neuropsychol. 1996;11:339–44.
10. Dixit A, Thawani R, Goyal A, Vaney N. Psychomotor performance of medical students: Effect of 24 hours of sleep deprivation. Indian J Psychol Med. 2012;34:129–32.
11. Lalith s, Maheshkumar K, Shoba R, Dipika C. immediate effect of kapaalbhati pranayama on short term heart rate variability (HRV) in healthy volunteer. J complement integr med 2020;20190331
12. Telles S, Raghuraj P, Arankalle D, Naveen KV. Immediate effect of high-frequency yoga
breathing on attention. Indian J Med Sci. 2008;62:20–2.
13. Javadekar P, Manjunath NK. Effect of Surya Namaskar on Sustained Attention in School Children. Journal of Yoga & Physical Therapy. 2012; 2:2-110.
14. Sarang SP, Telles S. Immediate effect of two yoga-based relaxation techniques on performance in a letter- cancellation task. Perceptual and Motor Skills. 2007;105(2):379–85.
15. Subramanya P, Telles S. Changes in midlatency auditory evoked potentials following two yoga-based relaxation techniques. Clinical EEG and Neuroscience. 2009;40(3):190–5.
16. Bhargav H, Nagendra HR, Gangadhar BN, Nagarathna R. Frontal hemodynamic responses to high frequency yoga breathing in schizophrenia: a functional near-infrared spectroscopy study. Frontiers in Psychiatry2014; 5: 29.
17. Gray JR, Braver TS, Raichle ME. Integration of emotion and cognition in the lateral prefrontal cortex. Proceedings of the National Academy of Sciences of the United States of America. 2002;99(6):4115–20.
18. Veerabhadrappa SG, Baljoshi VS, Khanapure S, Herur A, Patil S, Ankad RB, Chinagudi S. Effect of yogic bellows on cardiovascular autonomic reactivity. Journal of Cardiovascular Disease Research. 2011;2(4):223–7.
19. Raghuraj P, Telles S. Immediate effect of specific nostril manipulating yoga breathing practices on autonomic and respiratory variables. Applied Psychophysiology and Biofeedback. 2008;33(2):65–75.