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Effect of Bhramari Pranayama and Shambhavi Mudra on Attention level of School Students

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Abstract

Attention is one of the essential components of the cognitive domain that regulates the awareness of the world as well as other cognitive functions through the mechanisms of activation, selection, and control, resulting in a self-regulated and goal-directed behavior of an individual. Studies have shown that various yogic techniques have been beneficial in improving attention levels. Therefore, the current study has aimed to investigate the effect of Bhramari pranayama and Shambhavi mudra on attention level in school children. Forty-eight participants were recruited based on a single group pre- and post-design. A convenience sampling technique was used to carry out the study, and participants aged between 16 and 18 years belonged to both male and female genders. The attention level was measured using the Digit Symbol substitution test. The baseline and post-attention scores were recorded at the beginning and on the last day of the intervention. The sample size was calculated using the G Power software, where the alpha was fixed at 0.05 with power at 0.80, and the high effect size was calculated as 1.265 based on a previous study. The calculated sample size was 8, but we included forty-eight participants. It has been observed that the p-value of the post-attention score is less than 0.001, which shows a significant increase in the attention level after doing ten days of Bhramari pranayama and Shambhavi Mudra. Hence, it is concluded that ten days practice of Bhramari pranayama and Shambhavi Mudra has been beneficial in improving the attention level of school children.

Keywords: Attention Span; Bhramari Pranayama; Shambhavi Mudra; School Students; Yoga

Abbreviations: GABA: Glutamate Amino Butyric Acid; HRV: Heart Rate Variability; DSST: Digit Symbol Substitution Test; JASP: Jeffreys's Amazing Statistics Program; SD: Standard Deviation

Introduction:

Attention is an essential component of cognition which was identified by early philosophers to bring an individual from a state of unconsciousness to awareness that includes important processing such as alertness, orienting and search [1]. It is a set of mechanisms that regulates the awareness of the world and is related to the voluntary regulation of thoughts, feelings, and actions through the processes of activation, selection, and control, which is further, linked to the self-regulated and goal-driven behavior of an individual [2]. Moreover, attention is the activity of information selection that mainly has two important functions: bottom-up (exogenous) and top-down (endogenous) attention, which involves the fronto-parietal networking system [3]. Bottom-up or exogenous attention is regulated by the neurons of the parietal lobe of the brain, mainly by the sensory cortex [4], which involves the process of attention of respective stimuli based on external factors and prominent features of the stimuli that initiates from the visual cortex and extends to the prefrontal cortex [3]; whereas, the top down or endogenous attention is controlled by the frontal lobe [4], that interprets and examines the sensory information based on the internally induced factors [3].

A study by Klinkenberg et al. stated that cholinergic signaling which releases Acetylcholine from several areas of the brain, such as the frontal lobe and hippocampus (parts of basal forebrain), play an important role in regulating the mechanism of attention along with other cognitive functions involved in the processes of learning and short-term memory [5]. Other regions of the brain, such as limbic, parietal, reticular and fronto-cortical networks, release different neurotransmitters like Dopamine (involved in Dopaminergic activity in the cortex), Norepinephrine and Glutamate amino butyric acid (GABA), which regulates the attentional processes and other cognition related functions [1]. It has been found that the potentiality of regulating the attentional

process impacts the quality of learning, understanding and information processing in school children by establishing the communication of attentive attitude between the teachers and students, resulting in better academic performance [6].

The mechanisms of attention and working memory are interlinked and involved in the top-down process of attention that influences the fluid intelligence tasks, thereby carrying out attentional control by contributing to filtering of unnecessary or inappropriate information and behavior as well as controlling distraction and interference, thus, regulating the goal-directed behavior of an individual [7]. It has been found that attention impacts statistical learning and influences linguistic skills, phonological processing skills, ability to learn words, syntactic comprehension and literacy skills, as well as other cognitive faculties regulating visual and auditory memory and also vocabulary skills in children [8]. Evidence has shown that a holistic approach, such as Yoga intervention, was administered to 116 students to assess their self-esteem and performance in attentional tasks for four and half months and the results have shown significant improvement in attention as well as the social, self and academic self-esteem scores and also positive correlation was observed between yoga and the behavior of the students [9].

A study was conducted on sixty underprivileged high school girls whose ages ranged between 14 to 17 years with an intervention of an Integrated Yoga module of five days to investigate their attention and self-esteem and it has been found that there was a significant increase in attention and self-esteem post scores as compared to the pre-scores [10]. Another study stated that a six-week yoga intervention performed on the behavioral symptoms, attentional control and Heart rate variability (HRV) of twenty-three pre-school aged children belonging to 3 to 5 years of age randomized to two groups, having 4 or more symptoms of Attention Deficit Hyperactivity Disorder were assessed and it was noted for the yoga group that there was a significant improvement in the attention scores based on their parents' rating but not much improvement was observed in the HRV scores [11].

Research have shown that Bhramari pranayama has been proven beneficial in emitting paroxysmal gamma waves in the middle temporal gyrus located in the left temporal lobe of the brain, which is associated with information processing, thereby inducing focus and attention [12] and also led to an increase in theta activity in the brain corresponding to attention as well as spatial and verbal memory functions [13]. Chapter three and verse 125 of Hatha Yoga Pradipika states that Shambhavi mudra is considered to be the greatest mudra, as it bestows alertness and awareness within the aspirant, which occurs due to stilling of the eyeballs by bringing the brain waves into a meditative state through the emission of alpha and theta waves [14]. Therefore, the present study aimed to investigate the effect of Bhramari pranayama and Shambhavi mudra on the attention level of the school students based on the Digit symbol substitution test.

The following are the hypotheses of the study:

- **Alternate Hypothesis:** Bhramari pranayama and Shambhavi mudra may improve the attention level of school students.
- **Null Hypothesis:** Bhramari pranayama and Shambhavi mudra may not improve the attention level of school students.

Subjects and Methods

Study Design and Setting

The current study uses a single group pre- and post-design conducted on the school students of Siksha Satra, Visva-Bharati, Sriniketan, Bolpur, India - 731235.

Recruitment of Participants

The research was conducted on forty-eight participants aged between 16 and 18 years, belonging to both male and female genders. The participants were recruited through the convenient sampling technique. The following are the inclusion criteria set for the study: participants must be physically and mentally healthy, and they must have signed the informed consent, according to which they have the freedom to participate and withdraw at any point from the study as well as their anonymity and confidentiality has been maintained. The exclusion criteria for the study were the participants having any kind of psychological disorder. The ethical standard has been maintained by collecting the Informed consent from the participants. The sample size was calculated using the G Power software, where the alpha was fixed at 0.05 with power at 0.80, and the high effect size was calculated as 1.265 based on a previous study [10]. The calculated sample size was 8, but we included forty-eight participants.

Parameters Measured

Demographic data consisting of name, age and gender were collected from the participants. Along With that, the attention span of the school students was measured using a Digit symbol substitution test (DSST) followed by baseline data on the first day and post data on the last day. DSST measures a range of cognitive functions such as motor speed, attention span and visuo-perceptual functions like scanning and the ability to write or draw with high discriminant validity [15].

Allocation

There was no control group since it was a single group pre- and post-study. All forty-eight participants underwent the intervention.

Intervention

The participants were made to practice Bhramari pranayama and Shambhavi mudra daily for ten days. The duration of their

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intervention was 30 minutes. Bhramari pranayama was given for twenty-five rounds, and Shambhavi mudra was conducted for ten minutes, followed by a short meditation of ten minutes.

Statistical Analysis

The statistical analysis for the study was conducted through Jeffreys's Amazing Statistics Program (JASP) software. Initially, Descriptive statistics were performed on the data to check the Mean ± Standard Deviation (SD) of the attention span scores. Normality was checked using the Shapiro-Wilk test. Based on the normality test, a parametric test, i.e., paired sample t-test, was performed on the data. The p-value has been set at 0.05.

Results

Descriptive Statistics

The descriptive statistics from Table 1 show the Mean ± SD of pre- and post-attention scores to be 43.250 ± 10.344 and 57.063 ± 12.732. The p-value of the Shapiro-Wilk test for post-attention score is 0.441, which is greater than the set p-value of 0.05. This shows that the data is normally distributed. Hence, a parametric t-test has been applied.

Table 1: Descriptive Statistics.

	Pre-Attention Score	Post Attention score
Valid	48	48
Missing	0	0
Mean	43.25	57.063
Std. Deviation	10.344	12.732
Shapiro-Wilk	0.979	0.976
P-value of Shapiro-Wilk	0.534	0.441
Minimum	20	30
Maximum	63	80

Parametric T-Test

From Table 2 above, it is observed that the p-value of the post-attention score is less than 0.001, which is less than the set p-value of 0.05. This shows that the null hypothesis has been rejected, and there is a significant improvement in the attention span of the school students after 10 days of practice of Bhramari pranayama and Shambhavi mudra.

Table 2: Paired Samples T-Test.

Measure 1	Measure 2	t	df	P
Pre-Attention Score	Post Attention score	-8.997	47	< .001

Note: Student's t-test.

Discussion

The purpose of this study was to find the effect of Bhramari pranayama and Shambhavi mudra on the attention span of school students, and it has been found that the attention levels have significantly improved after ten days of practice. Our results confirm previous studies that have shown that twelve weeks of yoga and meditation intervention have reduced inattention, hyperactivity and stress levels in students in the experimental group compared to the control group [16]. Another study was conducted on 118 older adults randomized in yoga and control groups to investigate the effect of eight weeks of Hatha Yoga intervention on their attention and processing speed and it has been found that the reaction time was significantly faster in the attentional network tasks with an improvement in the visuo-spatial and perceptual processing of the yoga group [17].

Similar research was conducted on nineteen visually impaired students aged between 15 to 19 years to assess their attention based on the Braille version of six letter cancellation test using the intervention as Bhramari pranayama and Breath awareness and it was noted that the attention scores significantly increased more after Bhramari pranayama than Breath awareness [18]. Evidence has shown that the practice of Bhramari pranayama has increased theta activity that induces deep relaxation and a meditative state as well as has also resulted in increasing the blood flow to the frontal cortex and amygdala that corresponds to memory, attentional tasks and regulating the emotions [19].

It has also been observed that the practice of Bhramari pranayama has shown neural activity in the medial temporal lobe which is linked to neuroplasticity and long term practice of pranayama have resulted in increased brain activity in the following brain areas: Prefrontal cortex, amygdala, anterior insula and anterior cingulate, which are responsible for maintaining neuroplasticity as well as emotional regulation; and it has also proven to decrease the connectivity between lateral areas of prefrontal cortex and anterior insula thereby reducing the anxiety network [13]. Hence, Bhramari pranayama and Shambhavi mudra, both used as interventions to improve attention levels, have been proven safe and enjoyed by most of the participants.

Strength of the Study

The strength of the study is that there is a significant improvement in the attention span score of the school students after doing ten days of practice of Bhramari pranayama and Shambhavi mudra. The uniqueness of the study lies in the fact that the intervention has been included as Bhramari pranayama and Shambhavi mudra together to assess the attention span of the school students based on ancient scriptures and modern research findings.

Limitations

There have been the following limitations of the study: there was no control group, the study had insufficient time and non-probability sampling, i.e., convenience sampling technique was used.

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Conclusion

The current study has shown that ten days of practice of Bhramari pranayama and Shambhavi mudra has significantly improved school students' attention scores. Hence, Bhramari pranayama and Shambhavi Mudra can be proven effective in improving the attention span of the school students.

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