IJAYUSH
International Journal of AYUSH
AYURVEDA, YOGA, UNANI, SIDDHA AND HOMEOPATHY
http://internationaljournal.org.in/journal/index.php/ijayush/

International Journal
Panacea
Research library
ISSN: 2349 7025

Original Research Article | Volume 13 Issue 10 | October 2024

EFFECT OF YOGA ON CONCENTRATION, MEMORY, ATTENTION AMONG YOUNG ADULTS

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Abstract

Background: Yoga, an ancient practice originating from the Indian subcontinent, is rooted in mindfulness and self-awareness which harmonizes the body, mind, and spirit. Online classes have led to a decrease in attention span, ability to concentrate and reduced memory of students. Even three years after the onset of the COVID-19 pandemic, the level of psychological distress among young adults remains elevated. When individuals experience high levels of stress/anxiety, their cognitive functioning can be compromised, making it more difficult to focus and concentrate on tasks. **Objective:** The main goal is to investigate the effect of yoga on concentration, memory, and attention among young adults. **Methods:** A total of 50 young adults aged 18–25 years participated in the study. 25 subjects formed the non-yoga group (only meditation) while the remaining 25 subjects formed the yoga group and were trained to practice yoga techniques for 4 weeks under the guidance of a yoga instructor. To assess changes, their attention, concentration, and memory were evaluated using the Attentional Control Scale and the Mizan Meta-Memory and Meta-Concentration Scale before and after intervention. **Results:** The study showed statistically significant improvement in attention, concentration, and memory of yoga group *(P < 0.001)* in comparison to the control group. **Conclusion:** The present study demonstrates that after yoga training, there is marked improvement in the attention, memory and concentration of young adults. These improvements are likely attributed to several factors including stress relief, enhanced relaxation, and mitigation of distracting thoughts that result from consistent yoga practice.

Keywords: yoga, memory, attention, concentration, cognitive function, young adults

1. Introduction

The global imposition of lockdown during the COVID-19 pandemic necessitated the closure of schools and colleges worldwide. Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2.[1] This situation brought about a significant transformation in the field of health as well as education, prominently marked by the widespread adoption of e-learning. This approach involved remote teaching through digital platforms. However, this shift introduced challenges, particularly concerning students' attention span, ability to sustain focus, and memory retention. Due to the shift to remote learning, students might lack a sense of active cognitive involvement and social interaction, potentially leading to negative impacts on their learning achievements.[2] Availability of electronic gadgets also affects the focus leading to reduced attention span and distraction. Three years after the onset of the COVID-19 pandemic, there continues to be an enduring increase in psychological distress among college students who fall in the category of young adults.[3] This ongoing elevated stress and anxiety levels can exert a notable influence on an individual's ability to sustain attention and concentration.

Yoga is an ancient practice encompassing physical postures, meditation, and breath control.[4] Beyond the physical realm, yoga offers profound benefits for mental and emotional well-being. Physiological response opposite to flight or fight stress response is seen due to consistent practice of yoga. By inducing a state opposing the stress response, yoga fosters a sense of balance between mind and body and produces relaxation.[5] The calming effects of yoga can enhance attention, concentration, and memory. This suggests that practicing yoga might help participants better utilize their mental abilities, process information faster and more accurately, as well as effectively learn, retain, and update information.[4]

Attention refers to the cognitive process of selectively focusing on specific information or stimuli while ignoring or filtering out irrelevant or distracting information. Cognitive processes like comprehension and reasoning depend upon attention. Not being able to focus well and being easily distracted can harm the process of learning.[6] Concentration is closely related to attention and involves the ability to sustain focused attention on a specific task or activity over a period of time. It is the state of being fully engaged and absorbed in what one is doing, with minimal distractions. Memory has a dual meaning. It relates to the way we store and retain newly learned information, so we can remember it later on.[7] Short-term memory is seen as a mechanism for temporarily holding and handling information needed for doing complex mental tasks.[8] Memory is a fundamental aspect of human cognition and plays a crucial role in learning, decision-making, and daily functioning. These cognitive processes-attention, concentration, and memory- interact and influence each other, playing crucial roles in various aspects of human cognition, learning, and performance.

Yoga is being introduced into schools as a type of physical activity. It is seen as a useful addition to the school routine with physical, cognitive and emotional benefits. [9] Many research studies have explored the potential advantages of adding yoga to school settings for children. These studies have discovered positive impacts in various areas. For example, Rao R. et al. (2019) found that yoga enhances executive function, attention, and working memory as effectively as physical exercise in adolescent school children. [10] Similar research involving adults consistently suggests that practicing yoga is more effective than regular exercise in enhancing mental well-being.[11] Additionally, there is evidence suggesting a positive correlation between fitness levels and the ability to concentrate and remember information among children.[12] Furthermore, when comparing physical education with yoga, research has consistently demonstrated that yoga provides superior benefits for school children.[13] Despite the proven benefits of yoga for school children, many schools don't include it due to time and resource constraints. However, an efficient Integrated Classroom Yoga Module (ICYM) can address these challenges and make yoga feasible within the school day.[14]

Various studies have been found focusing mainly on the effect of yoga on cognitive function, considering the stress faced by medical students. In 2016, Kondam et al suggested that by regular practice of various body postures, breathing techniques and meditation, one can obtain a sound physical body as well as a tranquil and peaceful mind with a boost of cognitive functions.[15] Joice et al. 2018 concluded that daily yoga practice for a short duration helps to improve attention, concentration, and memory of medical students.[4]

Many of the studies that have been published are mainly exploratory and suffer from various weaknesses in their methods and statistical analysis. Furthermore, while yoga is becoming more prevalent in schools and extracurricular activities, there is a dearth of research on how yoga affects young adults. Moreover, the limited existing research in this area often lacks strong research methods.[16] Given this context, this study aimed to understand how yoga impacts the attention, concentration, and memory of young adults. The study also aimed to compare the effects of yoga with other interventions on cognitive function in humans.

2. Materials and Methods

2.1 Study Design and Participants

This was randomized; single blind, two-arm parallel group clinical trial, conducted at Delhi Pharmaceutical Sciences and Research University, New Delhi. In this study, 50 healthy young adults in the age group of 18–25 years who were willing to participate were recruited. Individuals who had engaged in yoga within the last year or had a history of neurological or psychiatric disorders were not included in the study. An informed

consent form was filled out by the participants in which they were informed about the study's structure and assured of their anonymity and the option to withdraw at any point. A sample of convenience was taken. The participants were randomly allocated into two groups, 25 subjects formed the yoga group and remaining 25 subjects formed control group.The subjects were given an overview of the test scales. Attention was assessed by Attentional Control Scale [17] whereas memory and concentration were assessed by Mizan Meta-Memory and Meta-Concentration Scale. [18] The data were collected pre and post-interventions for all the participants. Figure 1 shows the flowchart of the study program. The study was approved by the Research Review Development Committee (10/801/PT/DPSRU/2022/20309).

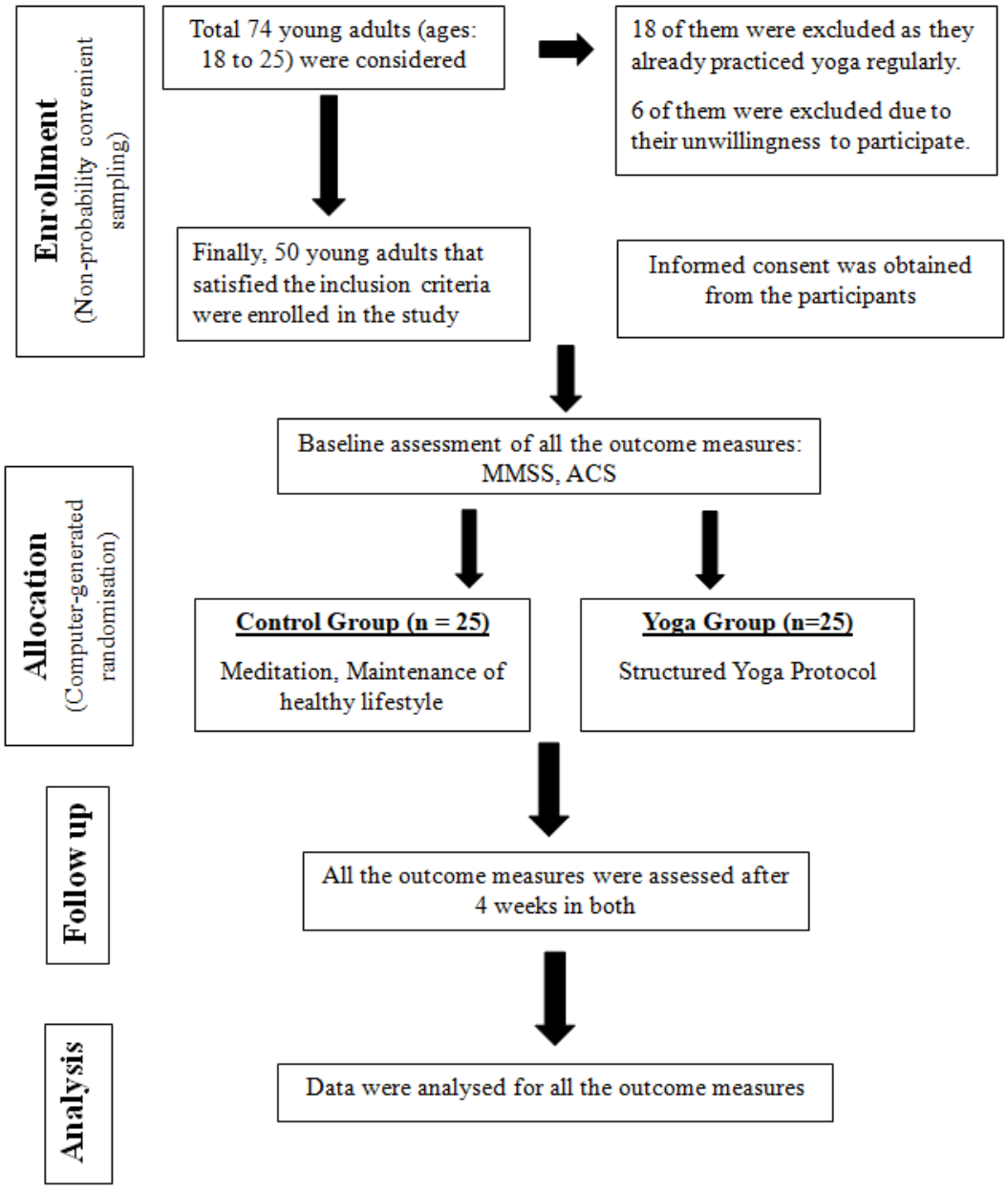

Figure 1.Study protocol

2.2 Intervention

The control group consisted of individuals who were not assigned to any specific yoga program. Instead, they were instructed to practice meditation daily for around 5-10 minutes and maintain an active lifestyle. This included following a balanced diet, engaging in physical activities like walking, strength training or cycling, getting adequate sleep, and managing stress through relaxation techniques. In the yoga group, the participants were instructed to engage in yoga sessions led by a yoga instructor for about 30 minutes, 3 days a week, and for a duration of 4 weeks. A quiet and comfortable room with yoga mats was provided for yoga practice. Yoga program included the following: [19,20]

a. **Breath regulations (10 mins)**
    - Bhramari Pranayama- 4 mins
    - Bhastrika- 3 mins
    - Nadi Shodana- 3 mins
b. **Mindful poses and movements (15 mins)**
    - Paschimottanasana - 4 mins
    - Vrikshasana (tree stand pose) - 2 mins
    - Padmasana - 4 mins
    - Setu Bandhasana – 2 mins
    - Sarvangasana - 2 min
    - Superbrain yoga - 1 min
c. **Final deep relaxation (5 mins)**
    - Shavasana (corpse pose)

2.3 Data and Statistical Analysis

Data normality was evaluated using Shapiro-Wilk test, which revealed normal distribution of the data ($p \geq 0.05$). A comparison between the scores before and after the intervention in each group was conducted using a paired t-test. An independent t-test was conducted to compare values between the yoga group and control group. Descriptive statistics, including the mean and standard deviation, were used to summarize all the

numerical variables. All statistical analysis was performed using Microsoft Excel and SPSS software version 26.0.

3. Results

A contrast was established by assessing the scores of attention, concentration, and memory before and after the intervention in both the group that did not practice yoga and the group that practice yoga. Participants comprised of 56% females and 44% males, indicating a slightly higher representation of females compared to males in the research sample. The mean age of participants in the study was 20.7 *(SD=1.18)*. **Table 1 provides a comprehensive overview of the recorded demographic characteristics of the study participants.**

Table 1.Study participants characteristics

		Control Group (n=25)	Yoga Group (n=25)
Age (Mean ±SD)		20.36 ± 1.25	21 ± 1.08
Gender N (%)	Male	12 (48%)	11 (44%)
	Female	13 (52%)	14 (56%)
BMI (Mean ±SD)		21.98 ± 2.7	21.46 ± 1.65

SD: Standard deviation; BMI: Body Mass Index

When participants were questioned about their knowledge of yoga's benefits, the results indicated that 32% were fully aware, whereas 20% had no awareness and the remaining had moderate awareness as shown in Table 2.

Table 2. Percentage distribution of participants based on their awareness regarding yoga and its benefits

Awareness among participants about the benefits of yoga {n (%)}	
Completely aware	16 (32%)
Moderate awareness	24 (48%)
Not aware at all	10 (20%)

The findings indicate that individuals who practiced yoga demonstrated notable enhancements in attention, concentration, and memory compared to those who did not participate in yoga. There was significant difference in the control group for all 3 variables post-intervention i.e., after 4 weeks *(P < 0.001)*. Upon analysing the post-intervention progress, there was a 4.28 % increase in concentration, a 4.74 % increase in memory, and a 1.46 % increase in attention among participants in the control group. However, these improvements were comparatively modest when contrasted with the remarkable improvements observed in the yoga group, as detailed in Table 3*(P < 0.001).*

Table 3.Effect on concentration, memory and attention post-intervention in the control group and yoga group

Variables	Control (Non-Yoga) group (Mean ±SD)	Experimental (Yoga) group (Mean ±SD)	MD	t-value	p-value
Concentration					
Pre	13.40 ± 2.198	11.64 ± 2.252	1.760	2.796	0.007
Post	14.00 ± 1.936	17.56 ± 2.844	-3.560	-5.173	<0.001*
MD	-0.600	-5.920			
% of change	4.28%	33.71%			
t-value	-4.243	-24.222			
p-value	<0.001*	<0.001*			
Memory					
Pre	16.08 ± 3.278	14.36 ± 3.616	1.720	1.762	0.084
Post	16.88 ± 3.395	21.36 ± 3.475	-4.480	-4.611	<0.001*
MD	-0.800	-0.7000			
% of change	4.74%	32.77%			
t-value	-4.619	-33.627			
p-value	<0.001*	<0.001*			

Attention					
Pre	51.36 ± 5.582	50.72 ± 6.705	0.640	0.367	0.715
Post	52.12 ± 5.615	58.68 ± 6.914	-6.560	-3.682	0.001
MD	-0.760	-0.796			
% of change	1.46%	13.56%			
t-value	-4.575	-28.453			
p-value	<0.001*	<0.001*			

(*): Significant *(P<0.001)*, SD: Standard deviation

Following the intervention, participants in the yoga group exhibited substantial improvements, with concentration increasing by 33.71%, memory by 32.77%, and attention by 13.56%. For all 3 variables, mean values of the pre-intervention between both groups showed no significant differences *(P > 0.001)* whereas there was significant difference in the post-intervention mean values between the groups with *(P < 0.001),* highlighting a notable impact of the yoga program, with the yoga group showing greater improvement. It's evident that yoga had a profound impact in positively impacting these cognitive functions relative to the control group, which did not experience the same level of improvement.

4. Discussion

This study sought to determine how yoga impacts the attention, concentration, and memory of young adults. After four weeks of meditation and following a yoga program, improvements in cognition was achieved in both control and yoga group. A comparison was done between yoga group and control group using Attentional Control Scale and Mizan Meta-Memory and Meta-Concentration Scale. The statistical result of this study showed that there was a statistically significant improvement from pre- to post-intervention in cognitive functioning including concentration, memory and attention in group of participants practicing yoga *(P<0.001)*. The mean gain in memory, attention and concentration has increased significantly in yoga group as compared to control group.

In summary, the results of the study lead to rejection of null hypothesis thereby confirming that yoga program followed by yoga group was effective in improving memory, concentration and attention. Improvement in concentration and memory was

found to be 33.71% and 32.77% respectively. Enhancement in attention was by 13.56%. The probable improvement in cognitive function may be due to its stress relieving effect, personality development, enhanced focused awareness on the present moment, and training of the mind to stay attentive and focused.

Yoga might enhance the responsiveness of the postsynaptic membrane and improve the effectiveness of filtering out distracting signals, potentially leading to better cognitive performance. [21] The results of our study are in accordance with the result of study done by Joice et al. (2018)[4]. In their study they compared the role of yoga on attention, concentration and memory of medical students. They found out that after 3 months of yoga training, there was positive effect on students' cognitive functions. The observed improvement was attributed to the activation of neural pathways with enhanced formation and release of neurotransmitters and also may be due to higher level of gyrification due to yoga training.[3]

4.1 Limitation of study:

This study involves questionnaires which rely on self-report measures that can be influenced by memory recall biases, social desirability biases, or participants may simply provide inaccurate information. Limited time duration is a constraint to this study which may not capture long-term effects or changes.

4.2 Future scope of the study:

The study can be replicated with a larger sample size to have a better correlation, generalizability and to improve the statistical power of the study. The time duration for yoga training can be increased to assess its long-term effects.

5. Conclusion

It can be concluded from the present study that after yoga training of 4 weeks, there is improvement in the attention, memory and concentration of young adults. This experimental research demonstrates that engaging in daily yoga sessions, even for a brief period, leads to noticeable enhancements in the attention, concentration, and memory capacities of young adults. These improvements are likely attributed to several factors including stress relief, enhanced relaxation, and the mitigation of distracting thoughts that result from consistent yoga practice. Cognitive processes, encompassing attention, concentration, and memory, engage in intricate interactions that mutually influence one

another. These processes play pivotal roles across various facets of human cognition, learning, and performance, yielding substantial impacts on our capacity to learn, execute tasks, and operate at an optimal level. The outcomes of this study underscore the significance of a regular yoga practice among young adults to cultivate cognitive functions essential for navigating daily life with heightened efficiency and proficiency.

6. Declarations

Funding

This research was conducted without any external funding.

Conflict-of-Interest Statement

The authors have no conflicts of interest to declare.

Consent to participate

Informed consent was obtained from all individual participants included in the study.

7. Acknowledgments

We would like to express our gratitude to all the subjects who voluntarily participated and to the yoga instructor who helped us devise and teach the yoga protocol for the completion of the study.

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