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# Comparative study on the effect of intense exercise and yoga on memory

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## ABSTRACT

**Aim:** There are mental benefits of yoga such as stress reduction, body awareness, better sleep, improve self-confidence, and relaxation. The primary aim of this study was to assess and analyze the impact of short-term practice of intense yoga and regular exercise on the components of human cognition, namely working memory and attentional control. The secondary aim was to compare the effects of these interventions on human cognitive power. **Materials and Methods:** In this study, 30 healthy students were recruited and are assigned at random to intense superbrain yoga and aerobic exercise groups. In this study, students were divided into two groups, each comprised of 15 students. They were all highly motivated individuals, and informed consent was obtained from them after the experiment to be conducted was explained in detail. The students with following criteria were included in the study: (i) Male, (ii) female, and (iii) age 18–21 years. **Results:** The responses of all students of each of the respective groups are compared to the results of the previously conducted trial before the practise of yoga and exercise. Hence, the results are compared based on the reaction time of every individual before and after practice of their respective physical activity. **Conclusion:** The present study demonstrates that superbrain yoga has a positive impact on both attentional control and working memory function. When compared to aerobic exercise, the effects are more pronounced on working memory and visual reaction time. Considering the positive benefits of regularly practising superbrain yoga on improving cognition, this regimen can be integrated into the physical education system of school-going pre-adolescents and adolescents.

**KEY WORDS:** Exercise, Reaction time, Superbrain, Yoga

## INTRODUCTION

There is a recent surge of interest in the west for the practice of an ancient oriental spiritual discipline and branch of philosophy that originated in India reportedly more than 5,000 years ago. The word yoga comes from the Sanskrit word “yuj” which means to join or unite. The ultimate aim of yoga is to achieve kaivalya (ultimate freedom, also known as emancipation).<sup>[1]</sup> The type of yoga used for this study is superbrain yoga. It is practised by standing up straight facing east, the direction of the sunrise, and placing the tip of your tongue just behind your teeth on the roof of your mouth. Then, grasp the right earlobe with the left hand. Place the thumb on the outside of the earlobe and the index finger behind the ear lobe. Squeeze gently. Then, grasp the left earlobe with the right hand, and

the same is done until the end of the exercise. Then, squatting is done repeatedly 18 times by inhaling while going down and exhaling while going up.<sup>[2]</sup> There are physical benefits of yoga such as increased flexibility, increased strength, improved balance, increased stamina, and improved body alignment which reduces joint pain.<sup>[3]</sup> There are mental benefits of yoga such as stress reduction, body awareness, better sleep, improve self-confidence, and relaxation.<sup>[4]</sup>

Exercise and prolonged physical activity have been found to create an impact on cognitive and executive functions. Basically, exercise aims to improve or maintain our physical fitness and health. Exercise can be broadly classified as aerobic, anaerobic, or agility training. Physical activity after menopause reduces the risk of breast cancer. Regular exercise makes people eat less by suppressing the appetite hormones in our body. Physical activity stimulates several brain chemicals that leave you feeling happier, much more relaxed, and less anxious.

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Regular exercise helps prevent and manage a wide range of health problems and concerns such as stroke, metabolic syndrome, high blood pressure, type 2 diabetes, depression, and anxiety, many types of cancer, arthritis, and falls. It also helps improve cognitive function and helps lower the risk of death from such causes.<sup>[5]</sup> Aerobic exercise improves our body's intake and usage of oxygen. Aerobic exercise is any type of cardiovascular conditioning. It includes activities such as brisk walking, swimming, running, or cycling. It is also known as "cardio."<sup>[6]</sup> A physical therapist, Col. Pauline Potts, and an exercise physiologist, Dr. Kenneth Cooper, from The United States Air Force, were the first ones to use the term aerobic exercise back in the 1960s. In 1968, Dr. Cooper had published his book named *Aerobics*.<sup>[7]</sup>

Reaction time is defined as the time interval or span between the delivery of a sensory stimulus and receiving of a motor response. It is a measure of sensory-motor coordination and also the internal processing speed within our brain. It is also considered as an index of cortical arousal (alertness) and is a simple non-invasive assessment of the central neural and peripheral structures. Exercise is also known to improve the reaction time.<sup>[8]</sup>

A greater degree of alertness and better muscular coordination is what contributes to the superior performance of the athletic group. Atkinson's and Shiffrin's (1968) multistore model was extremely successful in terms of the amount of research it has generated. However, as an outcome of this research, it became apparent that there were a number of problems with their ideas regarding the characteristics of short-term memory (STM). Baddeley and Hitch (1974) argued that the picture of STM provided by the multistore model is way too simple. According to the multistore model, STM holds limited amounts of information for a short period of time with comparatively little processing. It is a unitary system which means that it is a single system without any subsystems. However, working memory is not a unitary store.<sup>[9]</sup> Attentional control refers to an individual's capacity to choose what they pay attention to and what they do not pay attention to. It is also called endogenous attention or executive attention. In simple terms, attentional control can be described as a person's ability to concentrate. Primarily, it is mediated by the frontal areas of the brain including the anterior cingulate cortex. Attentional control may be closely related to working memory.<sup>[10]</sup> The primary aim of this study was to assess and analyze the impact of short-term practice of intense yoga and regular exercise on the components of human cognition, namely working memory and attentional control. The secondary aim was to compare the effects of these interventions on human cognitive power.<sup>[3]</sup>

## MATERIALS AND METHODS

In this study, 30 healthy students were recruited and are assigned at random to intense super brain yoga and aerobic exercise groups. In this study, students were divided into two groups, each comprised of 15 students. They were all highly motivated individuals, and informed consent was obtained from them after the experiment to be conducted was explained in detail. The students with the following criteria were included in the study: (i) Male, (ii) female, and (iii) age 18–21 years, while students with color blindness, hearing problems, any neurological deficits or those under any regular medication intake were excluded from the study. All subjects of both groups, before practising yoga and exercise, were first familiarized to the task with a practice session which began with a presentation of a number of images coming up one after the other where each image is displayed for 2 s on a screen. Good average response time for selecting the repeated images appearing on screen is <900 ms or 0.9 s. The number of correct responses made was automatically calculated (in percentage) at the end of the trial. Then, the actual trial is conducted on the students and the results are saved. After a month of intense exercise and yoga practice for each of the respective groups, another trial is conducted on the students of both groups again.

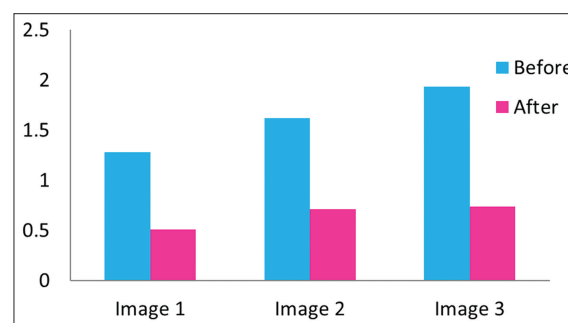
Good performance is 90%+ accuracy on repeated images.

## RESULTS

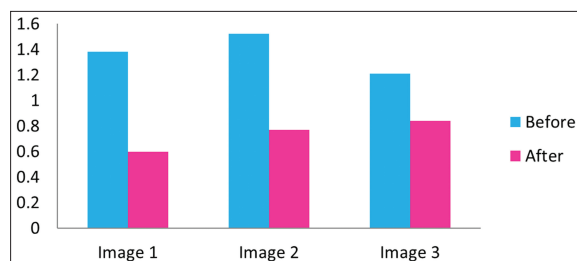
The responses of all students of each of the respective groups are compared to the results of the previously conducted trial before the practice of yoga and exercise. Hence, the results are compared based on the reaction time of every individual before and after practice of their respective physical activity [Figures 1 and 2 & Tables 1 and 2].

## DISCUSSION

In this study, the impact of practising superbrain yoga for approximately 1 month, on attentional control and working memory function, was assessed. These



**Figure 1:** Image finding before and after practising yoga



**Figure 2:** Image finding before and after practicing exercise

**Table 1: Image finding before and after practising yoga**

S. No.	Before	After
Image 1	1.28 s	0.51 s
Image 2	1.62 s	0.71 s
Image 3	1.93 s	0.74 s

**Table 2: Image finding before and after practising exercise**

S. No.	Before	After
Image 1	1.38 s	0.6 s
Image 2	1.52 s	0.77 s
Image 3	1.21 s	0.84 s

effects were compared to aerobic exercise practised over the same span of time.<sup>[11]</sup> There was, however, a significant improvement in the performance scores from initial to the final measurement session. From this study, supra brain training may improve the neurocognitive performance, which encompasses both attention and memory components.<sup>[12,13]</sup> It is proposed, here, that the observed improvement over the sessions can be attributed to the activation of dedicated neural pathways with enhanced formation and release of neurotransmitters. The increased sensitivity of the postsynaptic membrane and the effective inhibition of the distracting signals also could be responsible for the improved cognitive performance.<sup>[14]</sup>

## CONCLUSION

The present study demonstrates that superbrain yoga has a positive impact on both attentional control and working memory function. When compared to aerobic exercise, the effects are more pronounced on working

memory and visual reaction time. Considering the positive benefits of regularly practising superbrain yoga on improving cognition, this regimen can be integrated into the physical education system of school-going pre-adolescents and adolescents.

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