



Effect of A Six-Week Yoga Training Program on Eye-Hand Coordination and Reaction Time Ability Among Male Graduation Students

Mr. Narasimhappa H.

Student

Department of P. G. Studies in Physical Education
Kuvempu University, Shankaraghatta Karnataka 577451
Email: narasimhaarjun615@gmail.com

Dr. Vasanthanai P. & Dr. Prasanna kumara M. D.


Faculty Members

Department of P. G. Studies in Physical Education
Kuvempu University, Shankaraghatta Karnataka 577451



[https://doi.org/ 10.55041/ijst.v2i6.190](https://doi.org/10.55041/ijst.v2i6.190)

Cite this Article: H., N. & D., P. K. M. (2026). Effect of A Six-Week Yoga Training Program on Eye-Hand Coordination and Reaction Time Ability Among Male Graduation Students. *International Journal of Science, Strategic Management and Technology*, 02(6).
<https://doi.org/10.55041/ijst.v2i6.190>

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ABSTRACT

The present study investigated the effect of a structured six-week yoga training program on eye-hand coordination ability and reaction time ability among male graduation students. A total of sixty physical education students (aged 22–28 years) from Kuvempu University were randomly assigned into two equal groups: an experimental group (N=30) and a control group (N=30). The experimental group underwent a structured yoga intervention consisting of Asanas, Pranayama, and Kriyas for 60 minutes per session, three days per week (Monday, Wednesday, and Friday) across six weeks. The control group maintained their regular routine without participating in any specialized training. Pre- and post-tests were administered using a standardized Mirror-Tracing Task test to measure eye-hand coordination (assessing timing and errors) and an Audio/Visual Reaction Time test device to measure reaction time in milliseconds. Data were analyzed using descriptive statistics and paired samples t-tests at a 0.05 level of confidence. The results revealed significant intra-group improvements within the experimental group from pre-test to post-test for right hand eye-hand coordination ($t = 6.496, p < 0.05$), left hand eye-hand coordination ($t = 5.800, p < 0.05$), and reaction time ($t = 17.162, p < 0.05$). In contrast, the control group exhibited no significant changes across all variables. However, inter-group comparative post-test t-scores indicated no statistically significant difference between the experimental and control groups at the post-test stage. The findings suggest that while a short term six-week customized yoga program effectively enhances personal psychomotor and neuromuscular functioning, an extended intervention with higher intensity or specialized proprioceptive training may be required to establish dominant inter-group performance superiority.



Keywords: Yoga Training, Asanas, Pranayama, Eye-Hand Coordination, Mirror-Tracing Task, Reaction Time, Psychomotor Performance.

INTRODUCTION

The goal of the ancient Indian system of physical, mental, and spiritual exercises known as yoga is to bring the body and mind into balance. The Sanskrit word Yuj, which meaning to combine, join, or integrate, is where the word "yoga" originates. Yoga stresses the balanced development of physical health, mental stability, emotional control, and spiritual well-being. It symbolizes the unification of individual awareness with global consciousness. The eight limbs of yoga known as Ashtanga Yoga are described in the Yoga Sutras, which Patanjali methodically collected from ancient India over 5,000 years ago. Yoga Chitta Vritti Nirodhah, or the control or cessation of mental fluctuations, is Patanjali's definition of yoga. According to this description, yoga improves focus and inner calm by assisting people in managing stress, emotions, and mental distractions.

Yoga is not merely a form of exercise; it is a scientific and holistic discipline that includes physical postures (Asanas), breathing exercises (Pranayama), meditation (Dhyana), relaxation techniques, and ethical principles. The eight components compiled by Patanjali include Yama (ethical disciplines), Niyama (personal disciplines), Asana (physical postures), Pranayama (breathing techniques), Pratyahara (withdrawal of senses), Dharana (concentration), Dhyana (meditation), and Samadhi (self-realization). Together, these elements support mental focus, emotional equilibrium, physical fitness, and spiritual awareness. Due to its beneficial impacts on mental health, emotional well-being, physical fitness, and cognitive performance, yoga has become widely recognized in modern society. As a result, yoga is widely used to enhance general quality of life in schools, colleges, sports academies, rehabilitation facilities, and medical facilities. Yoga is regarded as a holistic health practice that enhances physical activity levels, mental wellness, flexibility, balance, and stress management, according to the World Health Organization (2021).

Frequent yoga practice enhances psychomotor efficiency, neuromuscular coordination, focus, and response time. According to research, yoga enhances motor learning, attention, memory, and coordination all of which are critical for tasks requiring focus and accuracy, such mirror-tracing tasks (Telles et al., 2013). Hand-eye coordination, motor control, visual motor coordination, and focus are all necessary for mirror-tracing performance. Such psychomotor tasks may benefit from yoga's ability to enhance nervous system functioning and mental attention. Yoga encompasses a variety of practices, including physical activity, breathing control, meditation, and relaxation. By balancing the sympathetic and parasympathetic nerve systems, these techniques enhance emotional stability and lower anxiety (Brown and Gerbarg, 2005). Additionally, yoga improves cerebral clarity, respiratory efficiency, muscle flexibility, and blood circulation.

Yoga has emerged as a key training technique for enhancing athletic performance and psychological preparedness in the fields of physical education and sports sciences. Yoga is used by athletes and sportspeople to enhance their flexibility, balance, agility, focus, coordination, recuperation, and stress reduction. Additionally, yoga improves neuromuscular efficiency and eases muscle tension, both of which are critical for the performance of motor skills. Because academic pressure, stress, sedentary lifestyles, and emotional disturbances can impair concentration and psychomotor performance, yoga is very helpful for graduate students. Frequent yoga practice enhances students' ability to concentrate, process information, regulate their emotions, and complete tasks. Therefore, by improving focus, hand-eye coordination, neuromuscular control, and mental stability, yoga can be regarded as an effective intervention for improving mirror-tracing task performance among male graduate students.



NEED AND IMPORTANCE OF THE STUDY

- Due to rising levels of physical inactivity, mental stress, poor lifestyles, emotional imbalance, and a number of ailments linked to these lifestyle choices, yoga has become a vital part of modern life. People in today's competitive environment deal with ongoing psychological pressure, work-related stress, academic pressures, anxiety, depression, and decreased physical activity. These elements have a detrimental impact on one's general quality of life, emotional stability, mental health, and physical health.
- By encouraging harmony between the body and the mind, yoga offers a comprehensive and scientific answer to these issues. Stress management is one of the main purposes of yoga. Excessive mental stress brought on by social pressure, academic competitiveness, reliance on technology, and lack of relaxation are all linked to modern lifestyles.
- By encouraging parasympathetic dominance and decreasing sympathetic nervous system activity, yoga helps regulate the autonomic nervous system and promotes tranquility and relaxation (Brown and Gerbarg, 2005).
- Yoga is also necessary to enhance functional health and physical fitness. Obesity, physical weakness, bad posture, cardiovascular illnesses, diabetes, and hypertension are all consequences of sedentary lives and inactivity.
- Yoga exercises enhance blood circulation, flexibility, muscular strength, balance, coordination, and respiratory efficiency. Frequent asana and pranayama practice improves general body function and physical endurance. Enhancing mental focus and cognitive skills is another crucial benefit of yoga.
- Students frequently struggle with academic performance, anxiety, memory, and attention. Yoga techniques that enhance focus, memory retention, emotional control, and mental clarity include breathing exercises and meditation. As stated by Telles et al. (2013).

STATEMENT OF THE PROBLEM & HYPOTHESES

The purpose of this study was to investigate the effect of a six-week yoga training program on eye hand coordination and reaction time ability among male graduation students. To achieve this purpose, the following experimental hypotheses were formulated:

1. Eye-hand coordination ability will significantly differ from pre-test to post-test situation in the experimental group.
2. Reaction time ability will significantly differ from pre-test to post-test situation in the experimental group.
3. There will be a significant difference in eye-hand coordination ability between the experimental group and the control group during the post-test situation.
4. There will be a significant difference in reaction time ability between the experimental group and the control group during the post-test situation.

METHODOLOGY

Selection of Subjects For the purpose of the present study, a total of 60 male physical education students studying in B.P.Ed / M.P.Ed were selected from Kuvempu University. The subjects were randomly selected through a purposive technique. The age of the subjects ranged between 22 and 28 years. The selected subjects were divided into an experimental group (N=30) and a control group (N=30). All selected



subjects were given a proper orientation regarding the objectives and procedures of the tests, and voluntary informed consent forms were obtained.

Variables and Criterion Measures

The independent variable selected was a six-week structured yoga training program. The dependent variables and their corresponding criterion measures are described in Table 3.1.

Table 3.1: Details on variables and criterion measures

TEST APPARATUS	VARIABLES ASSESSED	UNIT OF MEASUREMENT
Mirror Tracing Task Test	Eye-hand coordination ability	Timing (seconds) / Errors (counts)
Audio/Visual Reaction Time Test	Reaction time ability	Milliseconds (ms)

Experimental Design and Testing Procedure

An experimental research design was adopted for the study. Selected subjects were tested on eye hand coordination ability and reaction time ability before the intervention, and data were recorded as pre-test scores. After completing the pre-test, the experimental group was given a structured yoga exercise program for a total training session of one hour per day, three days a week for a period of 6 weeks. The control group was not given any specific yoga exercise and continued their regular daily activities. After completing 6 weeks, both groups were tested again on eye-hand coordination ability and reaction time ability, and the scores were documented as post-test scores.

Mirror-Tracing Task: In this task, a participant traces a geometrical figure (a star polygon) while observing its reflection in a mirror. Because the mirror reverses the image, the individual must adapt to altered visual feedback, requiring visual-motor coordination, concentration, hand-eye coordination, and motor control. The subject was seated comfortably and instructed to trace the figure as accurately and quickly as possible. The time taken to complete the task and the number of errors committed (whenever the tracing deviated from the prescribed path) were recorded.

Audio/Visual Reaction Time Test: A simple reaction time instrument was utilized to measure reaction time in milliseconds. The instrument presented visual or auditory stimuli, and the time interval between the presentation of the stimulus and the initiation of a voluntary motor response by the subject was recorded electronically.

Yoga Training Protocol

The experimental group underwent a 6-week structured yoga exercise training program, conducted 3 days per week (Monday, Wednesday, and Friday) for 60 minutes per session, under the supervision of a qualified yoga instructor. The session layout comprised: Warm-up and Surya Namaskar (15 minutes), Asanas (25 minutes), Pranayama (10 minutes), and Relaxation & Trataka (10 minutes).

The practices included: *Surya Namaskar* (a sequence of 12 postures with controlled breathing); *Tadasana* (standing posture for alignment and balance); *Vrikshasana* (tree pose for stability and focus); *Gomukhasana* (cow face pose for joint flexibility); *Garudasana* (eagle pose for neuromuscular control); *Virabhadrasana-II* (warrior pose for stamina); *Paschimottasana* and *Uttanasana* (forward bends for parasympathetic activation); *Setu Bandhasana* (bridge pose for spinal strength); *Ardha Matsyendrasana* (spinal twist); and breathing regulations including *Anulom Vilom / Nadi Shodhana*, *Kapalabhati*, and

Bhramari Pranayama. Trataka (candle-flame gazing) was integrated to enhance visual focus and concentration.

RESULTS AND INTERPRETATION

The raw data collected from the experimental and control groups during pre-test and post-test situations were subjected to descriptive and comparative statistical analyses. The statistical techniques used include Mean, Standard Deviation, and paired-samples t-test. The level of significance was fixed at 0.05.

Intra-Group Analysis (Pre-Test vs. Post-Test)

The data pertaining to the pre-test and post-test scores of the experimental group on eye-hand coordination and reaction time are presented in Table 4.1 and Table 4.2.

Table 4.1: Mean and Standard Deviation of pre and post-test scores of the Experimental Group

VARIABLES	TESTING PHASE	MEAN	STD. DEVIATION
Eye-hand coordination ability (Right Hand)	Pre-test	61.53	4.26
	Post-test	32.96	3.93
Eye-hand coordination ability (Left Hand)	Pre-test	56.33	4.05
	Post-test	34.33	3.32
Reaction time ability (seconds)	Pre-test	0.28	0.03
	Post-test	0.22	0.02

Table 4.2: Summary of t-test for differences in pre and post-test scores of the Experimental Group

VARIABLES	MEAN DIFF.	STD. DEVIATION	T-VALUE	DF	SIG. (TAILED)
Eye-hand coordination (Right Hand)	28.57	24.09	6.496*	29	0.000
Eye-hand coordination (Left Hand)	22.00	20.77	5.800*	29	0.000
Reaction time ability	0.066	0.021	17.162*	29	0.000

*Significant at 0.05 level (Critical $t_{(29)} = 2.045$)

As shown in Table 4.1 and Table 4.2, the mean right-hand eye-hand coordination score decreased from 61.53 to 32.96 (reflecting reduction in tracing time/errors, thus representing significant performance improvement). The obtained t-score was 6.496, which is significantly higher than the critical table value of 2.045 at the 0.05 level. Similarly, the left-hand coordination mean score decreased from 56.33 to 34.33, yielding a significant t-score of 5.800. The mean reaction time decreased from 0.28 seconds to 0.22 seconds, resulting in a t-score of 17.162. Therefore, hypotheses 1 and 2 are accepted, indicating that the

training program brought significant improvements in psychomotor variables within the experimental group.

The data corresponding to the control group are detailed in Table 4.3 and Table 4.4.

Table 4.3: Mean and Standard Deviation of pre and post-test scores of the Control Group

VARIABLES	TESTING PHASE	MEAN	STD. DEVIATION
Eye-hand coordination ability (Right Hand)	Pre-test	54.80	21.13
	Post-test	53.90	20.07
Eye-hand coordination ability (Left Hand)	Pre-test	55.70	18.74
	Post-test	54.63	17.59
Reaction time ability (seconds)	Pre-test	0.25	0.03
	Post-test	0.25	0.03

Table 4.4: Summary of t-test for differences in pre and post-test scores of the Control Group

VARIABLES	MEAN DIFF	STD. DEVIATION	T-VALUE	DF	SIG. (TAILED)
Eye-hand coordination (Right Hand)	0.900	2.998	1.644	29	0.111
Eye-hand coordination (Left Hand)	1.067	5.502	1.062	29	0.297
Reaction time ability	0.003	0.002	1.765	29	0.088

*Significant at 0.05 level (Critical $t_{(29)} = 2.045$)

The statistical results in Table 4.4 reveal that the control group achieved t-scores of 1.644 (right hand coordination), 1.062 (left hand coordination), and 1.765 (reaction time), all of which fall below the critical threshold of 2.045. This confirms that the control group did not show any statistically significant performance changes over the six-week period.

Inter-Group Analysis (Experimental vs. Control Group)

To understand the comparative baseline before the intervention and the comparative effects post-intervention, independent sample t-tests were executed between the experimental and control groups. Pre-test baseline comparative results are shown in Table 4.5. Post-test results are compiled in Table 4.6.

Table 4.5: Comparison of Pre-test Mean scores between Experimental and Control Groups

VARIABLES	EXPERIMENTAL GROUP (MEAN ± SD)	CONTROL GROUP (MEAN ± SD)	T-VALUE	DF	SIG.
Eye-hand coordination (Right)	61.53 ± 23.33	55.86 ± 23.06	0.946	58	0.348
Eye-hand coordination (Left)	54.56 ± 17.78	53.36 ± 14.08	0.290	58	0.773
Reaction time ability	0.28 ± 0.03	0.27 ± 0.02	1.324	58	0.191

Table 4.6: Comparison of Post-test Mean scores between Experimental and Control Groups

VARIABLES	EXPERIMENTAL GROUP (MEAN ± SD)	CONTROL GROUP (MEAN ± SD)	T-VALUE	DF	SIG.
Eye-hand coordination (Right)	32.96 ± 21.56	39.80 ± 19.88	-1.276	58	0.207
Eye-hand coordination (Left)	34.33 ± 18.20	43.06 ± 15.20	-1.116	58	0.148
Reaction time ability	0.22 ± 0.03	0.23 ± 0.03	-0.945	58	0.348

*Significant at 0.05 level (Critical $t_{(58)} = 2.000$)

As detailed in Table 4.5, no significant differences were observed between the groups during the pre-test phase, confirming baseline homogeneity. Table 4.6 reveals that during the post-test situation, the obtained t-values were -1.276 (right hand coordination), -1.116 (left hand coordination), and -0.945 (reaction time). Because all absolute t-values are lower than the critical value of 2.000, there is no statistically significant difference between the experimental and control groups at the post-test stage. Consequently, experimental hypotheses 3 and 4 are rejected.

DISCUSSION ON FINDINGS

The central finding of this investigation demonstrates that a six-week structured yoga training program significantly enhances intra-group psychomotor proficiency, specifically eye-hand coordination and reaction time, among male graduation students. The physiological mechanism underlying this improvement can be attributed to the balanced activation of the autonomic nervous system. The regular practice of balance-oriented asanas (such as *Vrikshasana* and *Garudasana*) and focused visual practices like *Trataka* improve neural coordination, visual perception, and finger dexterity. This is in complete alignment with Nayak, Pradhan, and Mishra (2021), who stated that yogic routines improve



nervous system functioning, sensory-motor integration, and mental focus.

Additionally, the breathing control techniques (Pranayama) used in this study—Anulom Vilom, Nadi Shodhana, and Kapalabhati—increase oxygen transport to brain tissues and lower cortisol levels, resulting in mental clarity and calm. This supports the claims made by Reddy and Rao (2020) and Kumar and Sharma (2022), who found that structured yoga programs significantly improved coordination and attentional control.

However, the rejection of the inter-group hypotheses (post-test experimental vs. control group) indicates that although the experimental group made extensive internal progress, the absolute post-test scores did not achieve statistically significant variance when compared to the control group. This outcome suggests that the six-week intervention period with a frequency of three sessions per week may be insufficient to fully overcome large standard deviations or to build absolute superiority over a physically active physical education control group. The results point out the crucial need for super-specialized proprioceptive training combined with higher intensity, volume, or a duration extending beyond six weeks (e.g., 8 to 12 weeks) to safely achieve distinct inter-group variance.

CONCLUSIONS

A systematic yoga program is a useful strategy for enhancing individual focus, mental alertness, and psychomotor coordination, according to the data and limitations of this study. Yoga optimizes neural system pathways through asanas, pranayama, and focus exercises, which greatly improves intra-individual eye-hand control and reaction speed. However, when compared to an active control group, the six-week introductory schedule did not produce any discernible group divergence.

RECOMMENDATIONS

Based on these conclusions, the following recommendations are put forth for future research:

- Similar studies should be conducted with female cohorts to observe cross-gender structural consistency.
- Future trials must deploy larger sample sizes to minimize standard error and improve generalizability.
- Longer tracking periods (such as 8, 12, or 16 weeks) must be tested to monitor the accumulation of greater inter-group variance.
- Academic institutions and athletic departments should actively integrate structured yoga practices to safely optimize student-athlete attention spans, psychological balance, and precision task mastery.

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